ENCYCLOPEDIA OF
environmental ethics AND philosophy

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J. Baird Callicott and Robert Frodeman
Editors in Chief

Encyclopedia of Environmental Ethics and Philosophy

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VOLUME 1

ABBEY TO ISRAEL

J. Baird Callicott and Robert Frodeman

EDITORS IN CHIEF

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J. Baird Callicott and Robert Frodeman, Editors in Chief

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Foreword

In the waning weeks of 2004, the Routledge publishing company approached one of us, J. Baird Callicott, proposing a two-volume, A-Z encyclopedia of environmental ethics and philosophy. Routledge had just published *Environmental Philosophy: Critical Concepts in the Environment*, a five-volume reference work of about one hundred classic and important papers in environmental philosophy, edited by Callicott and Clare Palmer. Routledge thought that an encyclopedia covering the field more broadly and in a more summary way would be of complementary value. Editing a collection of one hundred or so previously published papers is one thing—picking the papers; writing five or six introductions—while editing an encyclopedia of more than three hundred newly written articles by at least half as many authors is quite another. The overused expression, "herding cats," immediately came to Callicott's mind, but he accepted the challenge—with fear and trembling—despite his doubts about being up to the task.

The first thing to do was to assemble an editorial board. Working with Clare Palmer had been pleasurable as well as productive, and so she was a natural choice. No one has a deeper knowledge of the field than Holmes Rolston III, the founding "dean" of the field and compiler of the extensive annotated bibliography on the International Society for Environmental Ethics (ISEE) website. So he too was a natural choice. Robert Frodeman had just joined the Department of Philosophy and Religion Studies at the University of North Texas, as its chair, that year—of which Callicott was also a member. Frodeman had recently helped to found a sister organization to ISEE, the International Association for Environmental Philosophy (IAEP), which had budded off from the Society for Phenomenology and Existential Philosophy (SPEP)—so he could bring the perspective of "Continental philosophy" to the project, complementing the Anglo-American background of the two other associate editors and the editor-in-chief. The four of us met in Boulder, Colorado—where Frodeman was summering and which is just down the highway from Fort Collins and Colorado State University, Rolston's headquarters—in June of 2005, to sketch a list of article titles and identify potential authors.

Then, without warning, in August of the same year, Routledge decided to get out of reference-book publishing altogether and cancelled the contract. Callicott experienced mixed feelings—disappointment and relief—but, perceiving the capital importance of the undertaking, Frodeman urged that we look for another publisher. The *Encyclopedia of Science, Technology, and Ethics*, edited by Frodeman's friend and associate, Carl Mitcham,

had just been published by Macmillan; and Frodeman himself was author of several of its articles. So, after consulting with Mitcham, Frodeman pitched the project to Hélène Potter of Thomson Gale, publisher of the Macmillan imprimatur, and she immediately saw its value and secured an offer to publish the *Encyclopedia of Environmental Ethics and Philosophy*, the Foreword to which you are now reading.

In addition to his philosophical background, Frodeman brought training in science (geology), and policy (U.S. Geological Survey) experience to the project that Callicott lacked; and so Callicott asked him to come aboard as co-Editor-in-Chief. At the urging of Hélène Potter, the scope of the encyclopedia was broadened from a more narrow academic and Anglo-American focus to something more international and also inclusive of a wide range of issues and policies, points which Frodeman also favored. So the board of Associate Editors was reconfigured to reflect the larger compass of the Macmillan-published encyclopedia. Palmer, an Associate Professor of Philosophy at Washington University of St. Louis, is British and, as founding editor of the journal *Wordviews, Environment, Culture, Religion*, brought both an international perspective and an expertise in comparative religion and culture studies to the project. We (Callicott and Frodeman) invited Paul Thompson, Professor of Philosophy and Agricultural Economics at Michigan State University and Bryan Norton, Professor of Philosophy in the School of Public Policy at the Georgia Institute of Technology, to join the board of Associate Editors because of their expertise—similar to Frodeman's in this regard—in the area of environmental policy: Thompson primarily in food and agriculture policy, Norton primarily in conservation and environmental policy. Moreover, the philosophical affinities of both Thompson and Norton were oriented toward the rich tradition of American Pragmatism. As Pragmatists, their commitment to an anthropocentric approach to environmental philosophy and a greater concern for outcomes than theories complemented the non-anthropocentric and more theoretical commitments of Callicott and Palmer.

Finally, we invited Victoria Davion, Professor and Chair of the University of Georgia Department of Philosophy to join the board of Associate Editors. Davion is a well-known and -respected ecofeminist philosopher and founding editor of the journal, *Ethics and the Environment*. She brought to the board of Associate Editors, not only a feminist perspective on environmental ethics and philosophy, but also an expertise in other kinds of related intellectual hybridity, such as Deep Ecology and the kind of activist movements they inspired, such as Earth First! We are deeply gratified that all accepted to serve and we deeply appreciate their individual and collective contributions to this work. Meanwhile, Rolston was in process of retiring from Colorado State, but agreed to remain in an advisory role as Editor Emeritus and Bibliography Editor.

The two Editors-in-Chief (EICs) and the four Associate Editors (AEs) met with in-house executives, editors, and staff at the Thomson Gale headquarters in Farmington Hills, Michigan in December 2006. (Afterward Thomson Gale became Gale, a part of Cenage Learning.) The company has a vast experience in seeing encyclopedias through the process from conception to publication and that process was explained in detail to all of us. An in-house editor, Jason Everett, was assigned to work with us from beginning to end. Basically, the six of us (EICs and AEs) have been responsible for the encyclopedia's intellectual content; the publisher's staff—led, in our case, by Everett—were responsible for everything else. Our responsibilities were both limited to and tailored to what we were competent to control, the intellectual content of the encyclopedia. And the in-house editors could be in total control of the process and not have it be mismanaged by a bunch of absent-minded professors—who were also doing full-time jobs in addition to all their encyclopedia work, including, in both Frodeman's case and Davion's, chairing the philosophy departments of large public universities.

The whole field, broadly conceived, of environmental ethics and philosophy was divided among the AEs, who thus became "Area Editors." Thompson's area included food and agriculture; Norton's (like the others, among other things) conservation and related

laws; Palmer's religion and the environment and things international, such as the Earth Charter; and Davion's modern philosophy, in which she has a strong background, as well as ecofeminism and various activist movements.

Every article in this encyclopedia has been reviewed, edited, and approved by one of the AEs and both the EICs. In some cases we rejected an article outright. In almost every instance the article was returned to its author for revision. Depending on the extent of the recommended revision, a revised article would go through either the whole review process again or a more cursory review by one or the other or both of the EICs.

As we went into 2008, with a publication date set for November 7 of that year, the editorial process kicked into high gear as deadlines loomed. By mid-June, Everett had managed—with much behind-the-scenes cajoling and sometimes a little extortion—to get all the articles submitted, processed, and sent to the typesetter. In the meantime, the EICs were working on the back matter and the front matter. Rolston had submitted his annotated bibliography and it remained to us to edit it. We had selected the primary documents and, at Everett's suggestion, we invited one of our UNT graduate students, Jonathan Parker, to write the accompanying "blurbs"—the head notes preceding each. We also invited another of our UNT grad students, William Grove-Fanning, to take on the task of writing the definitions that appear in the glossary. We reviewed and edited the blurbs and the glossary. We would like to thank both Parker and Grove-Fanning for their excellent work.

The final tasks for the EICs, as July 2008 drew to a close, was to complete the Introduction and also the Foreword and the Afterword. As with most of the academic editorial tasks for this work, we tackled these jobs cooperatively. We consulted, we exchanged drafts, we cut, we pasted, we edited, and we agonized. Each of our own personal proclivities and inclinations were tempered by those of the other, to achieve what we hope is a useful, probative, balanced and, not least, inspiring Introduction.

Because the articles in the main body of an encyclopedia appear alphabetically, the user of an encyclopedia has only the guidance that the editors provide at the end of each to see how that article might be related to other articles in the encyclopedia. To augment this method of grouping, the editors have also provided a thematic or topical outline in the front matter, in which the titles of articles are grouped according to theme or topic. Most of these topics are self-explanatory and need no further explanation here in the Foreword.

However, the several categories of biography cry out for clarification. As an identifiable subject matter, environmental ethics and philosophy came into existence in the 1970s. Thus we have biographies of "self-identifying environmental philosophers"—those who do or would if pressed—call themselves "environmental philosophers." Not all self-identifying environmental philosophers have a biographical sketch devoted to them and their work. In addition to making a substantial and influential contribution to the field, we decided to limit the category to those whose body of work is complete or nearly so—in practice, those who are either deceased or have entered the seventh decade of their lives. Richard Sylvan, for example, who wrote the first philosophical paper on environmental ethics, died in 1996. Arne Naess—founder of the Deep-Ecology school of environmental philosophy—is still living, but has entered his tenth decade. Val Plumwood died in 2008, but, as a person having entered her seventh decade, already had a biographical sketch devoted to her and her work. (And, we might add in passing, she had submitted an article for publication in this encyclopedia only a few weeks before her death.) Robert Frodeman, for example, does not have a biography devoted to him and his work, despite its substance and significance, because, as a younger scholar, his contribution to the field is far from complete.

One of the first things the newly minted environmental philosophers did in the 1970s and 1980s was to identify their "precursors"—people who contributed to environmental ethics and philosophy before environmental ethics and philosophy were recognizable as such. The holy trinity consists of Henry David Thoreau, John Muir, and Aldo Leopold, but

they were by no means the only precursors. Some of the "notable environmentalists," such as Chico Mendes and Ken Saro-Wiwa, exerted their influence less through thought than through action. Others, like Eugene P. Odum (an ecologist), Edward O. Wilson (a biologist), and Gary Snyder (a poet) are certainly thinkers as well as doers, but their contributions parallel and cross-fertilize those of environmental philosophers. The "historical figures" are the thinkers of the more distant past who have attracted much attention from environmental philosophers: Francis Bacon and René Descartes are routinely vilified by environmental philosophers; while St. Francis of Assisi is routinely lionized; and Baruch Spinoza's worthiness to be regarded as a distant precursor has been hotly contested.

We would like to express our deepest appreciation and gratitude to Jason Everett, first and foremost, and the rest of the in-house editorial staff at Cengage Gale, including Ken Wachsberger who helped review the main body manuscript and managed processing of the back matter. We are keenly aware, looking back on the whole process, that this work would not exist were it not for their skills and diligence. We would like to thank Dale Jamieson for reviewing a draft table of contents and offering helpful criticisms and suggestions. Also, we would like to thank another of our UNT graduate students, who is now a doctoral student of philosophy at the University of Colorado, Erin Moore, who provided us with administrative assistance at the beginning of this project and later filled several breaches by writing a couple of articles, which, for one reason or another, were left unwritten by other authors—in addition to those she originally volunteered to write. A special thanks goes to our home institution, the University of North Texas, which has supported this project from the beginning through to completion, both financially and through release time. Our Dean of Arts and Sciences, Warren Burggren, has been stalwart in support of this project, which has been crucial to its timely completion. And last but not least, we would like to thank all the authors who contributed to this work. It is their work as much as it is ours, the editors, both in-house and academic.

J. Baird Callicott and Robert Frodeman

Introduction

In 1988 *Time* magazine's "Man of the Year" was not a man—or even a human—at all. It was the Earth itself. This Earth—simultaneously resilient and fragile, beautiful and functional, a pale blue dot floating in the inky blackness of space—has been for millennia the taken-for-granted background of all human activities. It has served as storehouse and refuse bin. It has been pushed and prodded, shaped and reshaped, sometimes beyond recognition (see the "Mining: III. Mountaintop Removal" entry). And now, it seems, humanity may be facing a day of reckoning. If the present reality were a disaster movie, its title might be *The Earth Strikes Back.*

In December 2006 the project team for the *Encyclopedia of Environmental Ethics and Philosophy* met in Farmington Hills, Michigan. Our task that day was to explain why this undertaking was worth the lives of so many trees. Our answer was that students, teachers, professors, professionals, and the public need a source that provides succinct accounts of the core values and issues surrounding humanity's relationship to the natural world. Given the importance of today's environmental challenges, a synoptic account of environmental attitudes and values is crucial.

Given the magnitude of our environmental problems, philosophy has become practical again. The development of environmental philosophy—which originated in the 1970s—was inspired by the widespread perception of an "environmental *crisis*." The manhandling of nature turned the attention of a small group of philosophers to questions concerning human obligations to (or for) nature—that is, to environmental *ethics*. The earliest work in environmental philosophy is narrowly located in the area of environmental ethics, and the bulk of it still is. The field reflects mostly the Anglo-American philosophical approach, which draws on the legacy of ethical theory inherited from modern European and North American philosophy as refined in various ways by British, Australian, and American academic (or professional) philosophers. (See the Afterword for a more detailed account.)

As the field has matured, it has attracted thinkers with a wider range of perspectives and interests. For example, feminist environmental philosophers (ecofeminists) expanded the field to a focus on epistemology, critiquing knowledge and truth claims made by those vested with power and authority. Continental philosophers entering the field focused attention on ontology with (to mention only one instance) a critique of the previously taken-for-granted Cartesian notion of an isolated immaterial self inhabiting an alien material body. To what degree are we truly distinct from nature? Analytically trained philosophers of science are now

taking an interest in ecology and conservation biology, fields closely allied with environmental ethics. And politically oriented thinkers have raised questions of justice vis-à-vis nature, especially as regards the distribution of environmental burdens and benefits across populations.

After a period of adolescence, environmental philosophy is bursting through conventional disciplinary boundaries—a trend that has placed it increasingly at odds with the academic-philosophy establishment. This encyclopedia, intended for an audience spanning both academia and the larger public, is one reflection of this development. In what follows we characterize the fields of philosophy and ethics from the point of view of concern with the natural environment. We then turn to the question of how environmental ethics and philosophy is transforming the discipline of philosophy and the world itself as the twenty-first century unfolds.

PHILOSOPHY

For most of its history, philosophy was far from an academic exercise and was deeply involved in thinking about nature. Philosophy was born independently in several isolated parts of the world during the "Axial Age," a period of world history roughly five or six hundred years before the common era (BCE). Confucius in China, Siddhartha Gautama (the Buddha) in India, and Socrates in Greece all lived at about the same time and all reflected a profound, even revolutionary change in human consciousness.

Prior to the Axial Age, myth was the main human mode of thought about the world. Mythic thought is well adapted to an oral means of communication. The linguistic form that myth takes is poetry, which both enhances its aesthetic appeal and assists in memorization. The meter and rhyme of poetry discipline memory; if the meter is out of sync or if it fails to rhyme, the rhapsode and his audience alike are alerted to an error in a myth's transmission. Myth also takes the form of narrative—a story line, which also aids memory—and thus necessarily involves action and actors faced with moral choices.

To us modern sophisticates, the great myths of the past appear quaint and fantastic, so straining credulity that we can scarcely imagine how people took them seriously. In the Greek myth of creation (or procreation), for example, a male sky god, Ouranos, impregnates a female earth goddess, Gaia, who gives birth to all the forms, features, and forces of the natural world—mountains, seas, winds, and so forth—and even to things that we would regard as psychological states, such as love (Eros).

In an age in which human consciousness has long been conditioned by literacy, such tales seem ridiculous, but they reflect the fact that for most of history, humans felt located within a cosmos. The myths themselves were a fabulous expression of a profound intuition—that humans live in a richly layered and alive universe full of meanings and portents and that their decisions and actions fit within the greater story of nature. This worldview was quite different from the post-Enlightenment picture of the world as consisting of purposeless atoms in motion, devoid of moral meaning. Aristotle represents atoms (in which he himself did not believe), quite revealingly, by analogy with letters. Letters are the meaningless elements of meaningful written words. Atoms are the meaningless elements of "meaningful" natural entities. (And yes, the atomic theory of matter itself was a product of ancient Greek natural philosophy.)

The invention of writing in many forms over many centuries created new means of storing information, freeing the human mind to do things other than maintaining and reproducing the precious oral traditions that constituted the cultural heritages of humanity. The Greek alphabet was the first to introduce symbols for vowels; it thus enabled written Greek to perfectly mirror spoken Greek. The linguistic form of literacy is prose; hence the structure of literate thought becomes less of a story line and more logically ordered.

The logical structure of thought is, like the written form it takes, quasi-spatial—a type of conceptual architecture having foundations and multiple but ordered and systematic

connections among its parts. Narratives remained, but they were more and more submitted to increasingly rigorous logical analysis. As ancient Greek philosophy progressed, logic emerged more clearly in the thought of Parmenides and Zeno and, with Aristotle, became a matter for systematic reflection and formal expression in, for example, the syllogism.

Literacy, especially the Greek alphabetic form of literacy, makes the independent status of abstract ideas both more possible and plausible. For now a word—the same word—can be both heard and seen, embodied in both sound and ink. By itself, the word is neither an audible sound nor a visible figure. It transcends both these forms of material embodiment; it flies from the world, an immaterial, abstract entity. Plato seems to have been so impressed by the novelty of the abstract idea that he idealized abstractions with his Theory of Ideas or Forms.

Moreover, literacy intensifies individuality. Oral communication—as the word *communication* suggests— necessarily involves a community; and myth is the common cognitive property of a community. In a state of orality, one's personal identity is thus merged with one's community. But one can read and write alone; the written text directly addresses the mind of the reader. One's personal identity is thus dissociated from that of the community, and it, too, is disembodied. Thought is no longer necessarily ours but can become mine or yours, personally. The prospect of personal death thus soon emerged as a leading philosophical problem, especially in both India and Greece. In India the problem was solved by meditatively dissolving one's individual being into universal Being. In Greece some thought (Plato among them) that the solution to that problem might lie in the prospect of the existence of a disembodied (or heavenly) world to which the disembodied individual self might repair upon the death of its bodily vehicle.

After its birth in the Axial Age, philosophy developed differently in China, India, and Greece. In China, consistent with the traditional Chinese veneration of ancestors, new thinking had to be tied securely to the thinking of the founder. In China, therefore, there is a long tradition of Confucianism, which survives down to the present in a form that is faithful to and would be recognizable by the Master himself. In contrast, although Socrates is a venerated figure, there is no comparable Socratism in the European and North American cultural tradition descended from the ancient Greeks. In India, consistent with the traditional Indian practices of yoga and meditation, philosophy was more intimately bound up with religious belief and practice than in it was in Greece. Siddhartha Gautama became the Buddha, the founder of a still-vital world religion.

It is important to emphasize that the first philosophy in the European tradition—the tradition in which environmental ethics first emerged—was "natural philosophy." That is, the first European philosophers asked and boldly answered questions about nature such as the following: (1) Of what is the world composed? The first answer was water; among the last was atoms. (2) What principles or laws govern its behavior? The logos, Heraclitus declared, which unites the ideational and natural world. (3) What forces move it? The worldly impulses of love and strife, according to Empedocles, and mind, according to Anaxagoras.

The first Greek philosophers who focused their thinking on nature were especially concerned with understanding the relation between the microcosm (things human) and the macrocosm (the larger natural universe). These first philosophers speculated that all things arose from a single, living, self-organizing, intelligent, and divine natural substance—variously identified as water or air—and that into it they will eventually return. Greek philosophy was founded on the assumption that there was an intelligible order to the universe and that this order expressed the purpose inherent in all things. The main concern of natural philosophy was less with what today we call *nature* (rocks, animals, ecosystems), but with the *natural*: the way things are implicated in the κοσμοσ the beautiful order and the way things are supposed to be.

Heraclitus, among the first philosophers in the European tradition—and the one most frequently invoked by contemporary environmental philosophers as a distant precursor—

certainly embedded his thinking in the natural world. His most famous dictum—that you cannot step into the same river twice—points up the temporal nature of all things. Indeed, the thought of almost all the pre-Socratics (as they are usually called) was suffused with nature: the four elements of Empedocles were earth, air, fire, and water rather than abstract and theoretical entities (such as Democritus's tiny, invisible atoms). Even though the atomic theory of matter is of ancient Greek origin, the Greek philosophic tradition, including the philosophies of Plato and Aristotle, portrayed a meaningful, living, and divine cosmos in which the human social and personal microcosms were embedded and which they reflected.

Writing is a form of technology, and so it is somewhat paradoxical that an essentially material invention made possible immaterial or abstract thought and an individual, private, and disembodied self. The birth of Greek philosophy, however, did not mark the abandonment of interest in the natural world characteristic of the mythic mode of thought—the first philosophers were primarily interested in the nature of the cosmos. With Socrates, however, philosophy made a decisive turn away from cosmology and the link between the natural world and human affairs. In Plato's *Phaedrus*—and Plato is our main source of knowledge about the philosophy of Socrates—Socrates famously claimed that his concern was only with the world of men and that nature had nothing to teach him. Moreover, as Greek philosophy progressed and Christianity appeared, distrust of the body grew, with an increasing focus on a mentalist view of life that turned away from human embeddedness in the natural world.

Reviving ancient Greek atomism, seventeenth-century natural philosophers—Bacon, Descartes, Galileo, Newton—described a natural world devoid of purpose: only efficient or mechanical rather than final causes existed. It took a while for this message to take hold: Natural theology still flourished through the eighteenth century, in the form of the argument from design. For William Paley, then the most notable proponent of that argument, the natural world exhibited an order that could only be explained by referring to a creative, purposive intelligence.

With F. W. J. Schelling's death in 1854, natural philosophy dissolved into science. Philosophers no longer sought the purpose of human life within the processes of the natural world. From then on, the scientific method provided our only rational access to the world, with the great traditions of natural philosophy and theology relegated to the shadows of history. The scientific method revealed only a physical world driven by blind causes. In 1859 Darwin's theory of natural selection delivered the final blow to teleological accounts of nature—nature explained in terms of either its inherent purposiveness or divine design—by offering a nonteleological explanation of biological adaptations. In his 1871 book, *The Descent of Man*, Darwin explained all things human by the same theory. By placing human beings firmly within a directionless natural order, Darwin left us as purposeless, in relationship to the cosmos as the merest molecule.

ETHICS

A turn from philosophy in general to ethics in particular invites a comparison of the European tradition with others that sprang from the Axial Age. Unlike other philosophic traditions, such as Buddhism, which emphasized the importance of not harming any sentient creatures, Greek and subsequent European and North American ethical thinking has traditionally operated within a human context. It was not until the twentieth century that thinkers such as Aldo Leopold explicitly sought to enlarge the moral community beyond the human.

In ordinary discourse, the term *ethics* often refers to a code of conduct or a set of rules that is supposed to govern or guide behavior. The Ten Commandments is a familiar example. Thus, readers who consult a work titled *Encyclopedia of Environmental Ethics and Philosophy* might well expect to find—at least somewhere therein—a code of environmental conduct that might look something like this:

1. Thou shalt not litter.
2. Thou shalt not pollute thy air and water.
3. Thou shalt not burn incandescent light bulbs.
4. Thou shalt not drive a Hummer.
5. Thou shalt not waste resources.
6. Thou shalt recycle.
7. Thou shalt eat organic foods.
8. Thou shalt reduce thy consumption.
9. Thou shalt xeriscape thy lawn.
10. Thou shalt install solar-energy panels on thy roof.

As treated, however, in the long history of philosophy—going back more than 2,500 years—ethics has not been particularly concerned with formulating codes of conduct. That is the task of "moralists" or, when enacted as laws, of legislators. Rather, ethics has been preoccupied with three other more general and abstract tasks.

First, one task of ethical reflection is to identify that single overarching principle—or those very few general principles—that lie behind the codified laundry lists of ethical dos and don'ts. For example, John Stuart Mill argued that lying behind our inherited code of conduct, the rules by which we govern our behavior (such as thou shalt not steal, thou shalt not commit adultery, and the like), is the "principle of utility," or the general-happiness principle. These rules guide human behavior in such a way that, on the whole and on average, following them will achieve the greatest happiness of the greatest number (of human beings): that is, the greatest utility.

Second, philosophers have sought to expose the *foundations* of ethics. Why, for example, should the principle of utility—human happiness—be a goal of human action? In sharp contrast to Mill, Immanuel Kant thought that it should not. In his estimation, reason lies at the foundations of ethics and is better suited to determine human duties. Reason, rather than happiness, is the ground of human freedom, human autonomy, and ultimately human dignity.

Third, philosophers have sought to discover the origin of ethics. Does ethics arise when groups of competing, hostile individuals agree to refrain from doing various harmful things to one another—such as killing one another and stealing from one another—that serve no one's ultimate advantage? According to the social-contract theorists, such enlightened self-interest is the origin of ethics, which humans create to protect themselves from one another. Or is ethics a natural outgrowth of family and community life, where natural bonds of affection are enlarged and codified as communitarian theorists argue?

As noted above, ethical systems in European and North American culture have expressed only a limited concern for the natural world. True, for thinkers over the 2,500 years, *nature* has signified a natural order that is simultaneously metaphysical and moral: Both individual human beings and human society are viewed as microcosms to be modeled upon the macrocosm of natural processes. Humankind has sought principles for how to live—that is, an ethic—and ethics would find its basis in an understanding of the basic purpose of the universe. This last concern fell within the domain of metaphysics. Aristotle, Plato's successor in the tradition of European philosophy, called the questions of metaphysics "first philosophy." He held that, although ethics was the fruit of philosophical reflection on practical wisdom, the principles that grounded our ethics must be sought among the cosmic "causes"—especially the final cause, which pertains to the ultimate end, goal, or purpose.

Although there has been a deep-seated ethical naturalism in European philosophy—no less than in Chinese Daoism—there was little or no consideration of what we would call

environmental ethics in that tradition until the mid-twentieth century. Nature itself, especially at the cosmic scale, seemed beyond the reach of humans' ability to affect for good or for ill. Although guidance may have been sought from an understanding of the macrocosmos, ethics was confined to the microcosmos of human affairs. The actual physical world of plants, animals, and ecosystems was relentlessly exploited. The same was true throughout the non-European world as well. For example, although Chinese philosophy, especially Daoism, promoted attitudes that were apparently more ecologically sensitive, China was ecologically ravaged and its resources exploited to the maximum degree possible for a preindustrial society. And with the rise of scientific materialism as a global worldview, philosophical commitments to an ethics grounded in nature gradually declined the world over.

Even before the final death throes of cosmos-grounded ethics and natural theology, European philosophers were seeking a noncosmological basis for ethics: Kant in the faculty of reason, Mill and Jeremy Bentham (the founder of utilitarianism) in pleasure and pain. For all their differences, what united these eighteenth- and nineteenth-century ethical theories was the sense that there was no point in looking to nature for a normative principle. Nature modeled nothing except chance and necessity. Physics and ethics, the material universe and the good life, lost their connection. One important trend in contemporary environmental ethics and philosophy is to reunite them—if not physics and ethics (and some have seen ethical implications in quantum physics), then ecology and ethics. The very first paper on environmental ethics by an American philosopher—Holmes Rolston III—was titled "Is There an Ecological Ethic?" In a subsequent paper his title asked, "Can and Ought We to Follow Nature?"

The loss of nature as a normative principle has prompted the development of proceduralist approaches to ethics. Once we deny the possibility of identifying a common good somehow rooted in nature, all that remains are rules and procedures. Justice becomes redefined as whatever comes about when one faithfully follows a set of rules. Contemporary ethics often means engaging in the proper process rather than attaining insight into the ultimate good and cultivating virtue. From a purely procedural-ethics perspective, the question of what constitutes the good life is now a private issue—private by default, because the question is no longer believed to be subject to rational debate and resolution.

By the twentieth century, then, the modern, relativistic, proceduralist, and pleasure-oriented stance toward ethics had become the received viewpoint both inside and outside the university. But although ethics became, on the common view, both subjective and relativistic, it also retained its hold on the cultural imagination. Call it a performative contradiction, but people remain insistent, even zealous, about protecting and defending their rights, even when no agreement was thought to be attainable about what rights are or why humans, uniquely, have them. This fact made it inevitable that environmental philosophy would be cast in terms of environmental ethics, even if environmental concerns regularly strain the bounds of ethics. What about animal rights? That is a reasonable and meaningful question to ponder, even if, on reflection, one concludes that animals cannot have rights. One environmental historian, however, was led to wonder, "Do rocks have rights?" It is hard to make sense of that question, much less imagine how it could be possible that they do. The silliness of that question marks the limits of environmental ethics and poses the need for environmental philosophy to go beyond ethics into the terra incognita of environmental metaphysics, epistemology, aesthetics, and other domains of philosophical inquiry.

In today's prevailing worldview, the physical world is nothing but brute matter and blind energy devoid of purpose, a world that science can in principle fully describe. In the positivist spirit of late twentieth century, metaphysics in the grand manner, aesthetics, and theology had become antiquated categories, expressions of dogmatism and subjectivity that had lost their raison d'etre. In the 1960s, when environmental issues caught the attention of the public, these concerns were naturally expressed in the two languages most likely to get a hearing: science, which defined the real, and ethics, which addressed questions of rights and obligations. John Passmore summarized the state of affairs within environmental philosophy

in the title of his book (one of the first book-length treatments of environmental ethics), *Man's Responsibility For Nature* (1974). Passmore argued that humans could not have any responsibility to the aimless material aggregation that is nature; their only responsibility was to guard against nature becoming the medium of injustice to other humans, say through the prodigal use of natural resources and wanton disposal of waste.

In opposition to Passmore's anthropocentrism, the main quest of environmental ethicists since 1980—the holy grail, so to speak, of the field—has been to find a plausible and defensible theory of intrinsic value located somehow in nature. On the hypothesis that nature has intrinsic value—which, it must be said, has been developed in many and varied ways—natural objects either have a value independent of human valuers or at least are valued for their own sakes rather than for their usefulness, their instrumental value.

ENVIRONMENTAL ETHICS AND PHILOSOPHY

An excellent historical and systematic review of environmental ethics and philosophy is found in the entry of this encyclopedia titled "Environmental Philosophy: V. Contemporary Environmental Philosophy" by Andrew Brennan. Here we have tried to locate environmental ethics and philosophy in the history and future of European and North American philosophy, the philosophical tradition from which it first emerged.

European and North American philosophy took an unprecedented and, we believe, anomalous turn at the beginning of the twentieth century. The major division of ancient Greek philosophy was that between natural philosophy and moral philosophy. After the long Christian-dominated medieval interregnum, the ancient Greek philosophical texts were rediscovered during the Renaissance, and the early modern philosophers of the seventeenth century picked up where the ancient Greeks left off. But after a century or so of development, philosophy evolved into modern science: Bacon and Descartes renounced final causes, and scientific investigations began to ramify into astronomy, physics, and chemistry.

In the late nineteenth century many of the concerns of ancient moral philosophy were budding off from the mother discipline in the form of the modern social sciences: sociology, psychology, economics, anthropology, and political science. Also at this time the U.S. college was superseded by the research university, which was dedicated to the production of specialized new knowledge. Scholarly expertise mushroomed as scholars of all types became specialists. The traditional role of the philosopher as inspired generalist seeking a view of the whole was increasingly marginal to the brave new educational enterprise.

Some philosophers protested this state of affairs; in 1905 William James complained of the "plaster-grey temperament of our bald-headed young Ph.D.s boring each other in seminaries, and writing those direful reports of the literature in the 'Philosophical Review.'" Others, however, sought to identify their own region of specialization—their own "regional ontology." Anglo-American (that is, Australian, British, and U.S.) philosophers found their own turf to stake out—the analysis of language—and, aping science, cultivated a "rigorous" science-like methodology based on logic. Why language? Philosophy, historically, especially after Kant, was concerned with the conceptual structures of the human mind. But concepts are immaterial things if they are things at all and the mind was philosophically lampooned as the "ghost in the machine." The syntactical and especially the semantic structure of language, however, embodies immaterial conceptual structures and thus gives philosophy something more material that it can analyze empirically in a science-like manner.

Although Anglo-American logical positivism, the prototype of what eventually came to be called "analytic philosophy," celebrated—to the point of adulation—science, the scientific method, and "positive" scientific knowledge, continental philosophers (i.e., those whose work evolved from thinkers from the European continent, such as G. W. F. Hegel, Friedrich Nietzsche, and Wilhelm Dilthey) offered up a wholesale critique of science and a radical alternative to it: phenomenology. Modern science posits as ultimately real a fundamental set

of entities—such as subatomic particles like electrons and photons—that we do not directly experience and, indeed, cannot even sensorially imagine. In addition to fabricating reality out of a skein of abstractions, science regards all events as causally determined, whereas human consciousness seems intentional and free. In contrast, phenomenology sought to provide a detailed description of the world that we directly experience and an exploration of "intentionality" or consciousness.

As twentieth-century philosophy developed, the discipline—in both its analytic and continental manifestations—became ever more arcane and self-absorbed. To make matters worse, the two camps became seriously estranged. Phenomenologists saw analytic philosophers as suffering from physics envy, whereas analytic philosophers dismissed continental philosophers as philosophical charlatans devoid of rigor. The natural and social sciences, meanwhile, went about their business with spectacular success, as measured by the level of funding they received, the number of the members of various scientific societies, and their usefulness to the advance of various technologies. What united the two camps of philosophers was the curiously dogmatic and unexamined assumption of specialization and expertise—that philosophers, like scientists, should specialize, drawing themselves ever more tightly into smaller and smaller communities of adepts who spoke a language impenetrable to outsiders.

Thus conditions were set when academic environmental ethics came on the scene in the 1970s: it was first ignored, and then dismissed as not "real philosophy" by both the analytic establishment and the more marginalized community of continental philosophers. The field seemed too interdisciplinary and too closely allied to real-world problems. Moreover, because it was closely allied to ecology rather than physics, analytic philosophers dismissed it, whereas continental philosophers recoiled from it as too scientific, a fellow traveler of "naturalism," guilty of a blind commitment to the methodological canons of the hard sciences. Thus, by the powers that arbitrated late twentieth century philosophy, environmental philosophy was no philosophy at all.

But the field would not go away, in part because it was engaged with something relevant and useful outside the walls of academia. Increasingly, natural-resource managers, ecologists, conservation biologists and professionals in both the theoretical and applied environmental sciences took an interest in the values aspects of environmental problems. There was, moreover, a growing demand by students for environmental ethics courses on college campuses. And the few but gradually growing number of professional philosophers who were attracted to the field realized that environmental ethics and philosophy returned philosophy to its traditional role of synthesizing as well as analyzing—philosophy conceived not as handmaiden and emulator of the sciences, not as quixotic challenger of the sciences, but, once more, as queen of the sciences.

As many of the entries in this encyclopedia attest, Lynn White Jr.'s article "The Historical Roots of Our Ecologic Crisis," published in *Science* in 1967, stimulated the development of environmental ethics and philosophy by academic philosophers. In that essay White laid the blame for the environmental crisis at the doorstep of Christianity, with its belief that "man" is created in the image of God, given dominion over the rest of creation, and commanded to subdue it. Christianity was the dominant worldview in Europe when both science and technology began to take their eventual form, and modern, science-enhanced technology is the proximate cause of the environmental crisis.

That is indeed the lurid text of that essay. But there is a deeper subtext. A constant refrain in "Historical Roots" is that what humans *do* in and to the natural environment depends on what they *think* about it. So in order to change what they do in and to the natural environment, they must first change what they think about it. More science and more technology will not solve the environmental crisis, White averred (indeed, more of the same will only make matters worse, in his view) unless we "rethink our axioms," that is, our most

fundamental beliefs concerning the nature of nature, human nature, and the relationship between humans and nature. And whose job is it to do that? Philosophers.

White thus implicitly—and, we daresay, unwittingly—set the agenda for a future environmental philosophy. The first item on the agenda is to criticize the evidently erroneous ideas that we have inherited from our past intellectual tradition about these matters. Why are they evidently erroneous? Because having guided our behavior toward the environment by what we think we know about nature and who we are in relationship to nature, we have encountered some unexpected and untoward consequences, which are more than just "side effects." These untoward surprises are collectively called the environmental crisis. It is as if nature were talking back to us and informing us that we have mistaken her for something she is not—something like a machine with which we can tinker and reengineer. White began the critical phase of this agenda with his critique of the Judeo-Christian worldview; but, as this essay amply illustrates, Christianity is by no means the only legacy of ideas originating in Europe. We must critically revisit atomism, Platonism, hedonism, and Cartesian dualism in the new light of the environmental crisis. The second item on the agenda of a future environmental philosophy, as White implicitly set it forth, is speculative: we must somehow reconceive nature, human nature, and the proper relationship between humans and nature. One way we might do that, White suggested, was to look into non-European traditions of thought for insight into these perennial themes in all human thought. That stimulated the emergence of comparative environmental philosophy. However, as White also indicated, turning for guidance to non-European traditions of thought is by no means the only way, or perhaps even the best way, to rethink our axioms.

Environmental ethics and philosophy could thus liberate philosophy from the narrowness and overspecialization into which it had fallen during the twentieth century. The environmental crisis gives philosophers an opportunity once more to ask and to try to answer the big, perennial questions that, until the twentieth century, philosophers of all the past ages and in all traditions tackled. We do not, let us hasten to say, imagine that all future ethics and philosophy will be environmental ethics and philosophy. Rather, environmental ethics and philosophy are the harbingers of the more general shape that philosophy is likely to take in the future. All future philosophy, like environmental philosophy of the present, will probably look outward toward other disciplines—rather than inward toward its own—as a vital component of interdisciplinary problem solving. In addition to environmental ethics and philosophy, biomedical ethics has been pioneering this new interdisciplinary focus, though with less radical a departure from traditional moral paradigms. Also, some philosophers in the analytic tradition have been working at the interface of philosophy of language and linguistics, philosophy of mind and neuropsychology.

INSTITUTIONAL TRANSFORMATION

The most daunting and vital challenge humankind faces today is coping with global climate change. As that challenge grows more acute and urgent with each passing day, the need for interdisciplinary approaches to knowledge will also become more acute and urgent. As Lynn White so clearly pointed out, the response to such a formidable threat cannot be exclusively scientific and technological. How can human problems be solved without employing the resources of the humanities and especially those of philosophy? For who but philosophers can undertake the task of rethinking our axioms, our most basic ideas about the nature of nature, human nature, and the proper relationship between humans and the natural environment?

One of the consequences of the inbred nature of philosophic research is that the question of the institutional status of philosophy has not been considered philosophical enough to warrant being the subject of articles, conferences, and curricular and institutional reform. For most of the past century the discipline has ignored the philosophic dimensions of the institutional setting and structure of philosophy. Why is it uncritically assumed that the proper, indeed the only real role for philosophers (environmental or not) is to write arcane philosophy papers for other philosophers? Isn't philosophy too important to simply

be left to . . . well, philosophers, cloistered academicians? Future historians may come to see the environmental crisis as the occasion for philosophers to once again do philosophy in the grand manner of the rich and marvelous two and a half millennial tradition of European philosophy—a philosophy once again abroad in the world, willing to get its shoes muddy and its hands dirty.

Environmental philosophy and ethics have exploded in a wealth of critical and creative theorizing—not only ethical theory but also, more recently, theoretical aesthetics, metaphysics, epistemology, social and political philosophy, and nearly every other domain in the European tradition from which it first emerged. Now, some think that environmental philosophers have overindulged themselves in an orgy of theory at the expense of having an impact outside the environmental-philosophy community and closely related academic fields, such as ecological restoration, conservation biology, and ecological economics. Especially the "environmental pragmatists" have vigorously registered the complaint that environmental philosophers have been too preoccupied with theory and need to become more relevant.

Bryan Norton, one of the associate editors of this encyclopedia, is well known for advocating a policy-oriented approach; he recommends thinking about environmental ethics as a force in public policy first and examining philosophical questions in passing. Norton, it is worth noting, is located in a school of public policy rather than in a department of philosophy. Norton also distinguishes between applied and practical philosophy—the former applies theoretical principles to problems, whereas the latter begins with real cases and seeks to insinuate philosophic insights into these cases in a spirit of amelioration and compromise. In a similar vein, in 1994 Donald Van de Veer and Christine Pierce published the textbook *The Environmental Ethics and Policy Book: Philosophy, Ecology, Economics.*

But none of this seems to have moved the needle. The reason is that even the environmental pragmatists are still trying to make better or different arguments rather than focusing on the institutional situation of and disciplinary limitations of environmental philosophy. It is one thing to call for relevance and engagement; it is quite another to roll up one's sleeves, get to work, and get on with the job.

The contested future of environmental philosophy—theoretical, applied, or practical, to employ Norton's taxonomy—turns on something other than more metatheoretical debates among environmental philosophers. Instead we might, for instance, raise logistical questions: should philosophers be housed (or housed exclusively) in philosophy departments, or should they be scattered across campus? Some already are. In addition to Norton's location in a school of public policy, the environmental philosopher Dale Jamieson is the director of environmental studies at New York University, with a joint appointment in the NYU Law School; he has only the most circumspect involvement with the NYU philosophy department, one of the most narrowly focused and specialized in the United States. The environmental philosopher Michael P. Nelson is located in the Lyman Briggs College of science at Michigan State University, with a joint appointment in philosophy; and Paul Thompson, also one of the associate editors of this encyclopedia, has a joint appointment in the Michigan State philosophy department and the MSU Department of Agricultural Economics in the College of Agriculture and Natural Resources. (If space permitted, this list could easily be lengthened.) We might also ask whether or to what degree environmental philosophers can find employment as philosophers, beyond academia. We might even wonder whether philosophy should be regarded as a discipline in the same sense that other fields are. Most expansively, we might ask what public roles philosophy can take in these philosophically dynamic and unsettled times.

Above all, environmental philosophy should continue explicitly to challenge the current, failing, and curiously ahistorical notion of philosophy that has dominated the academy during the past 100 years. The history of philosophy is calibrated in centuries: the sixth, fifth, and fourth centuries BCE; the seventeenth, eighteenth, and nineteenth centuries CE; and the

twentieth century has now passed into history as well. Surely it is strange that the same people who pay homage to our philosophical ancestors—Socrates, Descartes, Leibniz, Nietzsche, Dewey—fail to recognize that if a young version of any of these thinkers showed up for a job interview today he or she would be dismissed out of hand. None of these immortal philosophers in the European and North American tradition were well-trained specialists in the contemporary academic sense. None of them spent all their time reading and writing for a philosophical audience. And we think it is quite unlikely that they would unquestioningly adapt to the times and start reading and writing for the *Philosophical Quarterly* or *The Journal of Philosophy*.

There are some signs that this insular view of philosophy is finally being challenged. At our own institutional home, the Department of Philosophy and Religion Studies at the University of North Texas (UNT), we are gaining a reputation for a new, "UNT model" of a philosophy department. The difference is not limited to our focus on environmental ethics and philosophy. The entire department participates in the "dedisciplining" of philosophy—for instance, by hiring and tenuring an ecologist (with an M.A. in philosophy) within the department, by giving greater credit toward tenure and promotion for publishing *outside* rather than within the confines of recognized philosophy forums, and by projects like UNT's field station in environmental philosophy at Cape Horn, Chile.

Even the logistics of our department challenge the twentieth-century model of philosophy as a discipline among disciplines, with a well-defined subject matter, a rigorous methodology acquired through training (as opposed to education), carried on in a jargon-laden discourse unintelligible to outsiders. We are housed in the UNT Environmental Education Science and Technology building, and our offices are scattered among those of our fellow denizens, mainly geographers and biologists; and many in our department are active members of UNT's Institute of Applied Sciences. This interdisciplinary housing arrangement has not been just cosmetic. It has enormously affected the intellectual lives of almost everyone in the building, prompting philosophers to get interested in the sponsored research projects of the environmental scientists, whose research projects are in turn enriched by the contributions of the environmental philosophers, who are inspired to propose sponsored research projects of their own, enriched by collaboration with the environmental scientists.

We believe that the efforts at UNT portend a view of twenty-first century philosophy as an interdisciplinary and transdisciplinary activity rather than one among other disciplines. These are possibilities that we hope will find welcoming soil in other locations: philosophy gone wild, or perhaps better said, gone feral. *The Encyclopedia of Environmental Ethics and Philosophy* reflects this enlarged vision of the subject it treats. Although the rich, nearly forty-year history of theoretical environmental ethics and philosophy is well represented here, we have also included articles on environmental policy and law; case-study articles on important events, such as the Chernobyl nuclear accident; articles on activist movements, such as EarthFirst! and the German Green Party; articles on geophysical phenomena such as rivers, forests, and mountains; biographies of doers such as César Chávez as well as thinkers such as Holmes Rolston III; and much more, as the Thematic Outline systematically reveals. In the main body of this work the reader will find the full spectrum of what environmental ethics and philosophy was, what it is, and what, we believe, it will become.

Robert Frodeman and J. Baird Callicott

Afterword: General Types of Ethical Theory

A new development in physics, such as Albert Einstein's Special Theory of Relativity, must have some continuity with the existing state of physics that it advances and transforms; otherwise, it could not even be recognized as physics. Similarly, a new development in ethics, such as environmental ethics, must have some continuity with the existing state of ethics to be recognizable as ethics. Because environmental ethicists have advanced and transformed the existing state of ethics, we thought it would be helpful to summarize the stock of ethical theories on which environmental ethicists have built. There are a limited number of types of ethical theory that have emerged in moral philosophy over the two and a half millennia of its history. Here we review the most important. And we illustrate how they have lately been advanced and transformed by environmental philosophers.

THE THEORY OF DIVINE ORIGIN

Antedating moral philosophy was the age-old belief that ethics are of divine origin. In the Hebrew Bible there is the dramatic portrayal of Moses going up on Mount Sinai to receive from God the Ten Commandments, etched onto stone tablets. In Hesiod's *Theogony*, which functioned among the Greeks as Genesis and Exodus functioned among the Israelites, one finds an equally dramatic portrait of the triumph of Zeus and his ordination of Justice as the governing principle of mortals and immortals alike. If God or Zeus is the source of ethics, such a divinity is also the source of moral truth and authority. While one might question an ethic wrought by humans, one can hardly question a god-given ethic. And if ethics have a divine origin, they also are sanctioned by divine authority punishing transgressors. The notion that the origin of ethics is divine is a perennial theory espoused in various permutations by ancient, medieval, and modern philosophers of various religious persuasions. But contrary to the belief of the many people whose main source of moral guidance is religious scripture, a divine origin is by no means a necessary condition of a robust foundation for ethics.

As we indicated in the Introduction, Lynn White, in "The Historical Roots of Our Ecologic Crisis," blamed Christianity for the environmental crisis. He claimed that Western civilization has been premised on the idea that humankind was created in the image of God, given dominion over the creation, and commanded to subdue it. The influence of this worldview over two thousand years culminated in modern technological civilization, which, along with many wonderful things, has also brought about our current environmental crisis.

This historical analysis provoked those with strong Christian commitments and equally strong environmental concerns to develop an alternative interpretation of the biblical texts, the first two chapters of Genesis, that were the basis of White's allegations. The result was a Judeo-Christian environmental ethic of stewardship. After each day of creation, God declared his work to be "good," which can be interpreted to mean that the creation has what environmental philosophers call "intrinsic value." For humans, being created in the image of God implies unique responsibilities—first among them, to care for the creation—as well as unique privileges. Further, to have dominion over the creation is not license to destroy it, but responsibility to manage it as a steward employed by a property owner, who, in the case of the creation, is God. The stewardship interpretation of the first chapter of Genesis is confirmed in the second, where it is written that Adam, the first man, was created to "dress and keep" the Garden of Eden, which could be interpreted to refer to the whole of nature freshly created. Islam also includes Genesis among its sacred texts, so this scripture-based environmental ethic is as applicable in the context of that religious tradition as it is in the context of Judaism and Christianity.

RULES VERSUS VIRTUES

Modern Westerners are inclined to think of ethics in terms of sets of rules, or codes of conduct. The ancient Greeks, on the other hand, were inclined to think of ethics in terms of virtues, or qualities of character. Though Western civilization largely descended from Greek origins, most contemporary Westerners are inclined to think of ethics more in terms of rule obeying than in terms of acting virtuously. The reason for this is that between the ancient Greek origins of Western civilization and the present, the West was long dominated by a religious tradition of Middle Eastern origin, the Judeo-Christian tradition.

Judaism is a religion of laws, the Ten Commandments being only the most prominent. And Christianity, erected on a Judaic foundation, inherited and perpetuated a legalistic conception of ethics—a Golden *Rule*, for example. For the ancient Greeks, a good person is one who manifests virtue. In the Christian-influenced West, a good person is one who follows the moral rules, the Ten Commandments, say. While the Greeks recognized many virtues, they too had a short list of important ones, later called "the cardinal virtues" —prominently among them: justice, courage, temperance, wisdom, generosity, and piety.

SOCIAL-CONTRACT THEORY

In the history of Western moral philosophy, the first, and still viable, theory of ethics was the social-contract theory of the origin and nature of ethics. This theory of the origin of ethics is equally a theory of the origins of formal governments and political states. Thus the social-contract theory is as much a mainstay of political philosophy as it is of ethics. This is reflected in one of the great debates surrounding Plato's magnum opus, the *Republic*.

At the beginning of the second book of the *Republic*, Socrates' interlocutor, Glaucon, summarizes the social-contract theory as it was then variously articulated by the so-called sophists—among them Thrasymachus, with whom Socrates had jousted in the first book of that great work. According to Glaucon's summary, the social contract is a mutual agreement among mutually hostile egoists to practice the personal virtue of justice as a burdensome and onerous means to an end—protection from the depredations of others—not as a good in itself. And Glaucon begs Socrates to offer a plausible alternative to that widely circulating and variously expressed theory of the origin of justice. So the bone of contention in the great debate among Plato scholars about the purport of the *Republic* is this: Some argue that the central theme of the *Republic*, as its name would suggest, is political philosophy and only secondarily ethics. Others contend that Plato's description of the ideal state is only his analogical way of describing the ideal condition of the soul: virtue, especially the virtue of justice, writ large in the body politic. The *Republic*, in other words, is primarily an ethical treatise and only secondarily an exercise in political philosophy.

However that debate may be resolved, the social-contract theory of the origin and nature of ethics (and of states) was variously promulgated: most notably by Protagoras (a contemporary of Socrates) among ancient Greek philosophers of the fifth century BCE, by Thomas Hobbes among early-modern philosophers of the seventeenth century, and by John Rawls among late-modern philosophers of the twentieth century. It thus nicely illustrates how the philosophical treatment of ethics transcends apparently incommensurable popular conceptions of ethics, in this case, a Judeo-Christian legalistic conception and a Greco-Roman aretaic (or virtue) conception. That the social-contract theory could explain equally well the origin and nature of justice (in both the personal and political sense of the word) and the other cardinal *virtues* as it could the *moral rules* forbidding murder and theft testifies to its powers of generality and comprehensibility. But the social-contract theory of the origin and nature of ethics is by no means unique in this regard. All moral philosophies worthy of the name should have this capacity.

According to the social-contract theory, ethics arise when mutually antagonistic individuals agree to refrain from doing various harmful things to one another—such as killing one another and stealing from one another—which come to no one's ultimate advantage. According to the social-contract theory, the nature of ethics is enlightened self-interest. As with most historical theories of ethics, the social-contract theory in its ancient, early-modern, and late-modern iterations is anthropocentric—only human individuals were thought to be eligible parties to a social contract. If domestic animals, however, were not enslaved and domesticated by force, but voluntarily associated with humans—as some accounts of domestication indicate—then such animals and the humans they associated with had forged something analogous to a social contract. Thus has Bernard Rollin adapted the social-contract theory to nonanthropocentric animal ethics.

Animal ethics can be grounded especially well by social-contract theory in the hypothetical version of it developed by John Rawls in the twentieth century. Rawls dispenses altogether with the notion of an actual state of nature prior to the social contract, in which fully human individuals were supposed by ancient Greek sophists and, in a more circumspect way, by Hobbes to have lived as solitaries, each at war with every other. Instead, Rawls asks us to imagine an "original position" behind a "veil of ignorance," which prevents one from knowing anything about one's eventual lot in life: one's race, gender, sexual orientation, religion, intelligence, and other natural capacities. Nor does one have any prior knowledge of one's preferences or tastes, even of one's conception of the good. Rawls's version of the social-contract theory is thus an excellent illustration of what we noted in the Introduction: that ethics in the twentieth century tended to be bled dry of substance and reduced to procedural form. As long as the circumstances of rule making are guaranteed to be unbiased, that is all that is required for justice as fairness. Under such circumstances, we can well imagine that the rules such individuals would create for themselves would prohibit discrimination based on race, gender, sexual orientation, religion, and various kinds of disability. Now add ignorance of one's species to the list of things that the veil of ignorance conceals, and we can also well imagine that the rules would also prohibit discrimination based on species. Going beyond animal ethics, a contemporary French environmental philosopher, Michel Serres, has even proposed a *contrat naturel*, or natural contract, analogous to the social contract—that is, a contract between humans and a personified Nature.

PLATO'S THEORY OF JUSTICE AS HARMONY

From the point of view of the social-contract theory, ethics, though grounded robustly, are created by convention; they are human artifacts, not divine artifacts. Plato discerned three weaknesses in this stance. First, ethics and egoism—the basic assumption of social-contract theory that people are concerned only with their own interests and are indifferent to the interests of others—work against one another. One has grudgingly to give fair consideration to the interests of others in exchange for their fair consideration of one's own interests. Second, because ethics are represented as only an indirect means to achieving the ultimate

goal of maximizing one's own self-interest, one might best maximize one's own self-interest by appearing to be ethical—and thus enjoying all the benefits of a member of society in good standing—while secretly committing murder, theft, and other crimes to advance one's own ends. This is the moral of the story of Gyges in Plato's *Republic*. In the divine-origin theory, however, you can run, but you cannot hide; that is, you cannot escape detection and fearsome retribution by Zeus or God. But if morality is not divinely sanctioned, people can get away with murder, as we say. Third, Plato thought that the social-contract theory misrepresents human beings as hyperindividualistic, that is, as egoists, originally living as mutually belligerent solitaries in a state of nature. Rather, Plato thought, human beings are quintessentially social beings *naturally* living in societies or communities.

Plato believed, however, that the divine-origin theory of ethics was no longer persuasive by his time. Formerly, to the oral-mythic mind, Zeus was not only the author and enforcer of ethics, but also the cause of various natural phenomena—such as lightning and thunder, rain and snow—which, over the course of the previous two centuries, the natural philosophers had begun to explain more convincingly as phenomena that had natural, not supernatural, causes. Widespread skepticism about Zeus's existence thus made the divine-origin theory of ethics no longer viable.

So Plato devised an alternative to both the divine-artifact and human-artifact theories of the origin and nature of ethics: Justice is the natural condition of both the soul and the body politic (society), just as health is the natural condition of the physical body. Injustice, Plato observes, creates faction, hatred, enmity, and conflict in society, while justice creates unity, friendship, peace, and harmony. Injustice creates the same condition in the psyche, fracturing the soul into warring parts and inducing pangs of conscience, remorse, and guilt. Plato does not altogether challenge the presupposition that the supreme good is maximizing one's own self interest. Rather, he makes being virtuous the very essence of self-interest—it enables a life of inner personal and outer social unity, friendship, peace, and harmony. Thus, Plato identifies the supreme human good in three formally similar and *natural* manifestations: first and foremost, virtuous qualities of character (the good of the personal soul), physical health and well-being (the good of the personal body), and a just and well-organized society (the good of the body politic). These in turn "participate" in the cosmic Form of the Good, the general principle of order and harmony in the universe.

Plato's influence on environmental ethics has been both subtle and diffuse. For example, J. Baird Callicott (who began his philosophical career as a scholar of ancient Greek philosophy) has argued that the human economy is a proper part of the economy of nature, and thus that the human economy should mold itself to the same form as the economy of nature. The economy of nature is organized on the basis of a solar energy budget and the biogeochemical cycling of materials—such as carbon, nitrogen, and other elements—through the earth's ecosystem. The human economy, on the other hand, supplements its solar-energy budget with nonrenewable energy from fossil fuels; and rather than assiduously cycling materials, it causes most of them to flow linearly from sources, such as mines, to sinks, such as landfills. Thus, the human economy is out of phase with—that is, not in harmony with—the economy of nature. Practical projects as various as Wes Jackson's attempt to create an agriculturally viable "perennial polyculture," based on the form of prairie ecosystems, and "industrial ecology," in which the waste of one industry (such as spent fry oil in the fast-food industry) becomes the raw material for another (the biodiesel industry), are attempts to harmonize the human economy with the economy of nature.

ARISTOTLE'S VIRTUE ETHICS

Aristotle, who succeeded Plato in the historical dialectic of ideas in Western philosophy, thought that the supreme human good was *eudaimonia*, often inaptly translated as *happiness*. But *daimōn* in Greek means *spirit* (and is the word from which the English word *demon* is derived, although the Greek word has no pejorative connotation). And *eu-* in Greek is a prefix meaning *well* (still functioning that way in English in such words as *euphoria*, *eulogy*,

and the like). So all human action aims, Aristotle thought, at a well spirit, at a good condition of the soul. But what is this condition, more precisely? And how can it be realized?

We can get a clue, Aristotle suggests, by examining more limited human functions. What is a good musician, a good doctor, a good carpenter? Simply to realize well the nature of those professional functions. A good doctor and a bad doctor are both doctors, but the former doctors well and the latter doctors poorly. Similarly, a good human and a bad human are both human beings, but the former realizes human nature well and the latter does so poorly. And what is human nature? Aristotle gave us the classic definition: *Anthropos* (humankind) is the rational animal. Hence, to be a good human is to live the animal life—having passions and desires and experiencing their pleasurable satisfaction or painful frustration, activities that we share with all other animals—governed by reason, a capacity that is uniquely human.

One fundamental attribute of reason is the ability to weigh and measure, to find the mean or ratio (the root Latin word of the English word *rational*) between extremes. Our animal desires and passions run to extremes. Animals often sate their hunger until they are gorged and express their rage to the point of violence. And as animals, we are variously inclined to gluttony and abstemiousness, debauchery and celibacy, fury and diffidence, rashness and terror, and many similar extremes of desire and passion. However, the good *rational* animal will find the ratio, the mean, between the extremes of excess (too much) and defect (too little). From this analysis, Aristotle derives the cardinal virtues commonly recognized among his contemporaries: Temperance is the mean between eating and drinking too little (abstemiousness and teetotalism) and too much (gluttony and inebriation); courage is the mean between cowardice and rashness; generosity is the mean between stinginess and prodigality; and so on. Thus, a functionally good human being is a morally good human being, from an Aristotelian point of view, as well as a happy human being.

Just as Christianity has its Golden Rule, so Aristotle's classic ethic has its Golden Mean: the rationally determined intermediate state between excess and defect. Virtue ethics—as the ethical tradition inherited from the ancient Greeks and given classical philosophical expression by Aristotle is now called—was vigorously revived in the twentieth century, most notably by Alistair McIntyre, and was popularized by William (Bill) Bennett, who has a Ph.D. in philosophy and served as secretary of education and then drug czar in the George H. W. Bush Administration. Virtue ethics has also been adopted as one approach to environmental ethics, as detailed by the entry of that title in this encyclopedia.

HEDONISM AND UTILITARIANISM

In the *Nichomachean Ethics*, Aristotle devotes much critical discussion to the hedonistic theory of ethics, a theory promulgated by Greek philosophers as early as the fifth century BCE. It is most commonly associated with Epicurus, Aristotle's younger contemporary, who was born in the fourth century BCE and lived into the third. The Greek word for pleasure was *hēdonē*, and hedonism is the theory that the good or end of all human action is pleasure and, just as important, freedom from pleasure's contrariety, pain.

Of course, in ordinary English, a hedonist is someone who pursues the former with no regard for assiduously avoiding the latter. But Epicurus and his followers carefully examined various kinds of pleasure *and* their various attendant pains, if any, and recommended eschewing those pleasures inherently linked to pains—such as the way the pleasures of inebriation are inherently linked to the pains of a hangover or the way the pleasures of tobacco smoking are linked to the pains of lung cancer and heart disease. Moreover, they discriminated among the qualities of different kinds of pleasures, commending not only those that are "purer" (unassociated with attendant pains), but also those that are "higher," namely, the pleasures of the spirit or soul (such as those of listening to music or poetry or engaging in philosophical discussion), in contrast to those of the body (such as those associated with eating, drinking, and fornicating).

Utilitarianism is the modern descendent of ancient hedonism. According to Jeremy Bentham, founder of the modern utilitarian school, the goal of human action is happiness, and happiness, he states, consists of a greater amount of pleasure over pain. Bentham developed a crude "hedonic calculus" intended to quantify pleasures and pains in order to make a rational choice among alternative courses of action so that one might choose the alternative that would result in the greatest quantity of pleasure and the least of pain. Bentham democratically refused qualitatively to discriminate among "higher" and "lower" pleasures, instead making a case for preferring the aesthetic, intellectual, and spiritual pleasures strictly on the basis of their net quantity. John Stuart Mill, his successor in the tradition, pointedly differed in this regard. While ancient hedonism emphasized personal pleasure and pain, modern utilitarianism emphasized collective happiness or "aggregate utility"—the greatest happiness *of the greatest number*.

As clearly demonstrated by the entry herein on cost-benefit analysis, utilitarianism is the ethical theory on which contemporary economics is based. As utilitarianism developed in twentieth-century economics, its hedonistic foundations were abandoned in favor of the concept of "preference satisfaction." The goal of human action is to maximize welfare (not necessarily happiness) and welfare consists in satisfying human preferences (not necessarily in achieving a greater amount of pleasure over pain).

Utilitarianism has had a central role in the development of animal ethics. Because animals too can experience pleasure and pain, the utilitarian principle of equal consideration of equal interests requires, according to Peter Singer, that we give equal consideration to the interest that all animals—not just human animals—have in enjoying pleasure and, more especially, in living free of pain.

KANTIAN DEONTOLOGY

The principal modern philosophical antagonist to the utilitarians is Immanual Kant, whose moral philosophy has no antecedent in ancient Greek ethical theory. The utilitarians determine the moral value of an action on the basis of its consequences. If it produces utility, it is good; if it produces disutility, it is bad. Kant thought that consequences were irrelevant to whether an action is good or bad, right or wrong. He would agree, in other words, with the popular moral adage, "Do the right thing, and let the chips fall where they may"—the chips here being the morally irrelevant consequences of the right thing.

But if not by reference to consequences of actions, how do we determine what is the right thing to do? Kant's answer is that a moral action is one in accord with universal law. This is captured in the popular moral question often asked when contemplating doing an ethically questionable action: "What if everyone acted that way?" If the answer is that one would not want everyone else to act that way, then neither should one act that way oneself. According to Kant, one has a duty to act only in ways that one can universalize—that is, that one can will that others act in the same way as oneself.

Because of his stress on the moral importance of duty, Kant's ethic is technically labeled *deontology*, from the Greek word for duty *deon*. The duty to act in a way that can be universalized rests on a fundamental principle of reason: self consistency. Kant's example is promise making. Suppose that we are contemplating making a promise that we have no intention of keeping. Then we ask ourselves, What if everyone always made promises with no intention of keeping them? Then, ironically, no one could make a promise, because no promise would ever be believed, and so promise making would cease to be possible. When universalized, falsely promising self-destructs. So also with stealing. If everyone always stole everything then there would no longer be any private property, and so no one could steal anything (an alleged condition of the state of nature, made vivid by Hobbes). In every transgression of duty, we find a "contradiction of the will": We at once will that everyone act in a certain way while we make an exception for ourselves.

An idea of central importance to environmental philosophy is traceable to Kant's ethics: the concept of intrinsic value. Kant believed that reason conferred intrinsic value on rational

beings, or, more technically and precisely, that intrinsic value supervenes on rationality. Because rational beings possess intrinsic value, they deserve to be treated as ends in themselves, according to Kant, not as means only to the ends of others. Human beings routinely treat nonhuman organisms as mere means, as "natural resources." Some environmental philosophers think that one way to expand Kant's "kingdom of ends"—so that it would include some nonhuman organisms—is to find some property other than reason on which intrinsic value might supervene. Tom Regan has argued that this property ought to be robust consciousness, and that all "subjects of a life"—that is, all beings that have a subjective, conscious life, such as the "higher" animals—should have intrinsic value. Paul W. Taylor has argued that this property ought to be having interests or a good of one's own. Then all "teleological centers of life" —in effect, all organisms—would have intrinsic value.

THE THEORY OF MORAL SENTIMENTS

Kantianism and utilitarianism have dominated ethics in modern philosophy and have been the dominant schools of thought informing the ethical thinking of laypersons and policy makers, who try to achieve aggregate utility while protecting individuals' rights (resting on their intrinsic value). As noted, a third tradition, social-contract theory, has been only a little less influential in modern times, mainly among libertarians, free-marketers, and property-rights zealots. A fourth tradition in modern moral philosophy has been less widely influential, but deserves mention here: the theory of moral sentiments advanced by David Hume and Adam Smith in the eighteenth century.

As we have seen, most traditional Western moral philosophy involves reason in some centrally important role. In social-contract theory, reason illuminates the path to enlightened self-interest and the need to make peace with one's rivals. In Aristotle's virtue ethics, reason is part of the essence of the human species and the faculty that steers us toward the Golden Mean. In utilitarianism, reason calculates aggregate utility and enables rational choice. For Kant, reason is the source of the moral law and the ground of the intrinsic value of rational beings.

Hume, in the spirit of a contrarian, declared that reason is never a motive to action—neither right actions nor wrong actions—and both is and ought to be the slave of the passions. The difference between moral and immoral actions has nothing directly to do with reason, according to Hume. Rather, moral actions are motivated by other-oriented sentiments, such as sympathy and benevolence, which are just as much a part of the human psychological constitution as self-oriented sentiments, such as greed and lust—the only ones recognized by the social-contract theorists.

Reason, according to Hume, does have an important supporting role to play in the drama of ethical behavior. It discerns the often complex relations of cause and effect and the proper objects of our various other-oriented moral sentiments. Along these lines, Aldo Leopold, for example, devotes much of *A Sand County Almanac* to informing readers of the existence of a "biotic community," which he thinks should be a proper object of our moral sentiments of affection, respect, loyalty, and sociability.

EMOTIVISM

A degenerate form of Humean ethics, called emotivism, was prominent in twentieth-century analytic philosophy. The logical positivists declared that only empirical statements are meaningful. Ethical statements such as "Murder is wrong and bad!" are merely emotive ejaculations expressing the feeling of repugnance that the declarer experienced in contemplating murder. Among the many untoward consequences of this theory of ethics is moral relativism. If someone else were sincerely to say "Murder is good and right!" this person too would only express a feeling—in this case a feeling of pleasure upon contemplating murder.

However, because these expressions of feelings correspond to nothing in the real world, neither declamation regarding murder can be true or false, according to the positivists. Murder is neither right nor wrong, neither good nor bad. Moreover, all putatively assertive

ethical statements are actually just expressions of *personal* feelings, contradictions between which cannot be intellectually adjudicated and resolved any more than conflicts among children about which color is the prettiest. Emotivism has powerfully contributed to a phenomenon, noted in the Introduction, characterizing much twentieth-century ethical thought: the subjectivization and privatization of the good and the associated reduction of ethics to a procedural form.

Hume himself, in contrast, thought that the moral sentiments were a normal aspect of universal human nature. Just as all human beings normally have five fingers on each hand, so all human beings normally have the same set of moral sentiments. Thus while the statement "Murder is wrong and bad!" may be unverifiable by reference to some state of the physical world, it can be verified by reference to the normal state of human psychology. And just as, owing to accidents of birth or physical trauma, some people do not have the physically normal number of digits, so, owing to similar causes, some people do not have the psychologically normal set of human feelings. They are morally abnormal. Those who are morally abnormal to a grotesque degree, such as serial killers, are often tellingly and properly referred to as "monsters."

Thus, from a Humean perspective, moral norms are rooted in human psychology, just as medical norms are rooted in human anatomy and physiology. A temperature of 98.6 degrees Fahrenheit is the human physiological norm—deviation from which is cause for medical remediation. A strong aversion to murder is the human psychological norm—deviation from which is cause for social remediation. Yet Hume's theory of ethics does allow for some limited cultural relativism. The moral sentiments are both natural and universal, but they are often channeled differently in different cultural contexts.

Hume's theory of ethics also allows for moral education. Leaders of the American Civil Rights movement, such as Martin Luther King Jr., addressed the familial sentiments of their fellow Americans by insisting that racial differences are literally only skin deep, and that we humans are all really "brothers and sisters under the skin," members of one human "family." Similarly, Leopold, as just mentioned, tries to inform our moral sentiments by accessibly expressing information provided by the science of ecology. The most important piece of information forthcoming from ecology, Leopold thought, is that in addition to our many human-community memberships, we humans are also members of a biotic community.

EVOLUTIONARY ETHICS

Hume's theory of moral sentiments formed the basis of Charles Darwin's account of the origin and development of ethics in *The Descent of Man*. Reason-based ethical theories are suspect from an evolutionary point of view. The social-contract theory nicely illustrates why. As noted, in Hobbes's putative state of nature, fully human individuals are imagined to live in a condition of war, each one against every other. Because in such a condition, life is "solitary, poor, nasty, brutish, and short" (to quote Hobbes), it dawns on them that it would make sense to call a meeting and hammer out some rules, the mutual observance of which would make life a lot better for all, and to appoint a sovereign to enforce the contract they all agree to. But how could reason or even speech evolve in the absence of well-formed and well-integrated cooperative societies? The evolution of reason depends on the prior evolution of society, but the social-contract theory assumes that the emergence of society depends on reason, which is the source of self-interested enlightenment. Yet proto human societies could not exist without ethics. As Darwin notes, "No tribe could hold together if murder, robbery, treachery, etc., were common." Therefore, reason cannot be a sin qua non of ethics. Rather, as Hume thought, ethics must rest on something far more primitive, namely, the moral sentiments, such as affection, sympathy, and benevolence.

Darwin's theory of the evolution of ethics has been developed not in the late-modern philosophy of the twentieth century, but in twentieth- and twenty-first-century biology—first in sociobiology and later in evolutionary psychology. It has also been of great importance to environmental ethics. Aldo Leopold was the first person extensively and

systematically to outline an environmental ethic. Because he was more conversant with Darwin's biological account than with the standard philosophical accounts of ethics, he based his land ethic on Darwin's evolutionary account of the origin and development of ethics in *The Descent of Man*. And because Darwin's account rests on Hume's theory of the moral sentiments, the foundations of Leopold's land ethic are traceable to Hume.

CODA

All secular environmental ethics so far devised have built on one or another of the historical moral philosophies reviewed here. Religiously specific environmental ethics have been based on the tenets of various religious traditions—not only of Judaism and Christianity, but also of Confucianism, Daoism, Buddhism, Hinduism, Jainism, and Islam. The articles in this encyclopedia focused on religiously specific environmental ethics provide the background necessary to understand them. We thought that it would be helpful here to provide the background necessary to understand the various articles detailing secular theories of environmental ethics, which assume some familiarity on the part of the reader with the perennial types of ethical theories in Western moral philosophy and thought.

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Thematic Outline

The following classification of articles arranged thematically gives an overview of the variety of entries and the breadth of subjects treated in the encyclopedia. Along with the index and the alphabetic arrangement of the encyclopedia, the thematic outline should aid in the location of topics. It is our hope that it will do more, that it will direct the reader to articles that may not have been the object of a search, that it will facilitate a kind of browsing that invites the reader to discover new articles, new topics, related, perhaps tangentially, to those originally sought.

1. BIOGRAPHIES

HISTORICAL FIGURES

Bacon, Francis
Descartes, René
Ortega y Gasset, José
Sontoku, Ninomiya
Spinoza, Baruch
St. Francis of Assisi

NOTABLE ENVIRONMENTALISTS

Abbey, Edward
Berry, Wendell
Borlaug, Norman
Chávez, César
Commoner, Barry
Ehrlich, Paul
Jackson, Wes
Mendes, Chico
Odum, Eugene
Saro-Wiwa, Ken
Shepard, Paul
Shiva, Vandana
Snyder, Gary
Wilson, Edward O.

PRECURSORS

Bailey, Liberty Hyde
Black Elk
Burroughs, John
Carson, Rachel
Darwin, Charles
Emerson, Ralph Waldo
Jeffers, Robinson
Leopold, Aldo
Marsh, George Perkins
Muir, John
Pinchot, Gifford
Powell, John Wesley
Roosevelt, Theodore
Ruskin, John
Schumacher, Ernest Friedrich
Schweitzer, Albert
Thoreau, Henry David
von Humboldt, Alexander
White, Lynn, Jr
Wordsworth, William
Wright, Frank Lloyd

SELF-IDENTIFYING ENVIRONMENTAL PHILOSOPHERS

Bookchin, Murray
Callicott, J. Baird

Guha, Ramachandra
Jamieson, Dale
Midgley, Mary
Naess, Arne
Norton, Bryan
Passmore, John Arthur
Plumwood, Val
Regan, Tom
Rolston III, Holmes
Shrader-Frechette, Kristin
Singer, Peter
Sylvan, Richard
Taylor, Paul
Warren, Karen J.

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Bhopal
Biosecurity
Chernobyl
Hetch Hetchy
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Economic Discounting
Economics, Ecological
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Globalization
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4. CULTURAL ANTECEDENTS

Conservation
Hudson River School
Landscape Architecture, Design, and Preservation
Landscape Painters and Environmental Photography
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8. FOOD AND AGRICULTURE

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9. GEOGRAPHICAL CONCEPTS

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11. GLOBAL PERSPECTIVES

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12. GOVERNMENT AGENCIES AND ACTS

Endangered Species Act
National Science Foundation
U.S. Bureau of Land Management
U.S. Department of Agriculture
U.S. Department of the Interior
U.S. Environmental Protection Agency
U.S. Fish and Wildlife Service
U.S. Food and Drug Administration
U.S. Forest Service
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13. INTERNATIONAL DOCUMENTS, EVENTS, TREATIES, AND ORGANIZATIONS

Brundtland Report
Convention on Biodiversity
Earth Charter
Earth Summit
Intergovernmental Panel on Climate Change
Millennium Ecosystem Assessment
North American Free Trade Agreement
Rio Declaration
United Nations Educational, Scientific and Cultural Organization
United Nations Environment Programme
World Trade Organization

14. NONGOVERNMENTAL ORGANIZATIONS (NGOs)

Audubon Society
Defenders of Wildlife
Earth First!

Greenpeace
Nature Conservancy
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World Wide Fund for Nature

15. PHILOSOPHICAL ANTECEDENTS AND RESOURCES

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International Society for Environmental Ethics
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Automobiles
Energy
Nanotechnology
Nuclear Power
Pesticides
Technology
Transportation

26. TRADITIONAL CULTURES AND ENVIRONMENTAL ETHICS

African-American Environmental Ethics
Asian Philosophy
Australian Aborigines
Biocultural and Linguistic Diversity
Chicana/Chicano Environmental Ethics
Native Americans
Traditional Ecological Knowledge

27. TYPES OF ENVIRONMENTAL PHILOSOPHY

Biocentrism
Biophilia
Deep Ecology
Ecological Feminism
Environmental Justice
Land Ethic
Life: Respect/Reverence
New Environmental Paradigm
Postcolonial Environmental Ethics
Pragmatism
Queer Theory
Social Ecology
Virtue Ethics

28. TYPES OF ENVIRONMENTS

Built Environment
Urban Environment
Wilderness

A

ABBEY, EDWARD

1927–1989

Edward Abbey was born in Indiana, Pennsylvania, on January 29, 1927, and died in Tucson, Arizona. A talented author described as the Thoreau of the desert Southwest (Fadiman 1968, McMurtry 1975, Cahalan 2001), in essays and novels Abbey extolled individualism and decried the effects of the destruction of wilderness on human liberty.

In the spirit of self-invention, Abbey cultivated the image of a rough-hewn redneck (Abbey 1991), a persona that belied a sophisticate who listened to Sibelius and Shostakovich and playfully referenced Socrates, Shakespeare, Schopenhauer, and Sartre in his writings.

Abbey was not an environmentalist in the conventional sense (Berry 1990). He rolled a tire into the Grand Canyon (Abbey 1988a), rhapsodized about the virtues of littering highways with beer cans (Abbey 1977), and claimed that he killed a rabbit with a rock (Abbey 1988a, Cahalan 2001). He was not an environmental philosopher, although he earned a bachelor's degree in English and philosophy and a master's degree in philosophy. He initially resisted the path of academe (Abbey 1990a) but eventually became a tenured professor of English at the University of Arizona (Cahalan 2001).

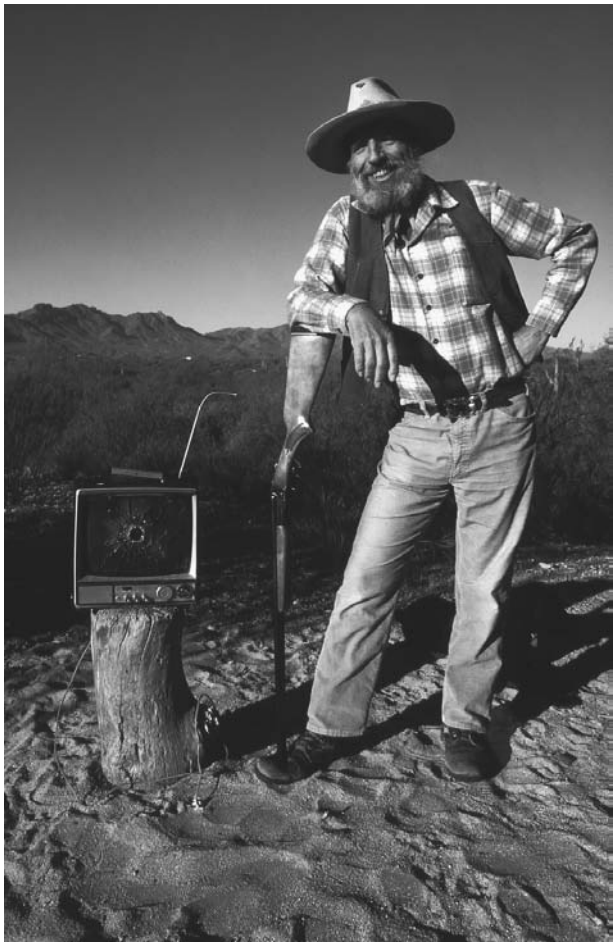
Although Abbey never produced a recondite analysis of the axiology and metaphysics of nonhuman nature, his work has important implications for environmental ethics (Rothenberg 1998). In his master's thesis in philosophy he argued that although resistance to domination is morally justified, violence against people is not (Abbey 1959). Abbey reworked this tenet decades later within the framework of environmental activism: Safeguarding wilderness from industrial defilement through sabotage of machinery is permissible as long as no injury results (Abbey 1990b).

Sabotage may be considered radical, but Abbey displayed traditional American libertarianism. According to Abbey, any form of repression—governmental bureaucracy or corporate hegemony—must be thwarted. In the western United States such authoritarianism is symbolized by rising dams, wending roads, and metastasizing suburbia (Abbey 1988b), making the means of their production legitimate targets for ''ecological sabotage.''

Existentialism—the idea that each individual must create life-directing meaning in the absence of objective ethical norms—is also a prominent theme throughout Abbey's work. Human potential cannot be achieved without the freedom to pursue possibilities, and in this activity people are on their own; no transcendent being helps them in the struggle (Abbey 1988a).

In Abbey's view, self-actualization is of the highest importance for ethics. Wilderness, with its gifts of wonder, surprise, solitude, and danger, is the ideal stage on which to act out the unfinished script each person has been handed. In wilderness lurks danger (Abbey 1987). Danger hovers at the limits of possibility. Exploration of these limits—death or exultation—is freedom. Freedom is the summum bonum of human existence (Abbey 1985).

The failure of industrial civilization lies in its inability to recognize the multidimensional noneconomic values of untrammeled land—aesthetic, ecological, and spiritual—that are essential to human well-being. Abbey



Edward Abbey. *Shown here near Tucson, Arizona in 1986, Abbey was not a typical environmentalist. Through his writings, Abbey espoused his libertarian beliefs about the threat of industrial tourism for the Wilderness.* **PHOTO BY TERRENCE MOORE. COURTESY OF TERRENCE MOORE PHOTOGRAPHY.**

at times seems misanthropic (Abbey 1988a), yet careful exegesis reveals a robust humanism.

Abbey's rant against "industrial tourism" (Abbey 1988a) can be analyzed in several ways. An environmentalist interpretation emphasizes the denigration of wilderness. A Marxian interpretation emphasizes the reification of wilderness travel into commodities purchased at visitor centers and shopping malls. An existentialist interpretation emphasizes the inauthenticity of sanitized experience: glossy pamphlets, scenic drives, paved nature walks, handrail-circumscribed overlooks, panoramic movies shown in air-conditioned and insect-free auditoriums.

Although all three interpretations are present in Abbey's work, the existentialist viewpoint looms largest: People are the real losers to industrial tourism (Abbey 1988a). The fundamental ontology of human being remains hidden amid the cacophony of civilization and is discernible only in the context of wildness.

By most measures Abbey lived wildly: drinking liberally, coveting numerous women, living from paycheck to paycheck, traveling incessantly. By his own admission, he diverged from Thoreau's fastidious New England sensibilities (Abbey 1982). Nonetheless, a comparison of the two authors is instructive. Both loved to meditate on the relevance of wilderness for the human condition. Both have been categorized as nature writers but are best characterized as prescient social commentators whose critiques have implications for environmental policy.

Abbey was an existentialist with environmentalist proclivities. It is not clear whether for him nonhuman nature has intrinsic value independently of human cognition. It is clear that nonhuman nature has extrinsic value for the authenticity of human experience it enables. Wilderness delimits ranges of possibilities; it is up to each individual to discover those limits. Wilderness experience allows people to glimpse their inner humanity.

SEE ALSO *Civil Disobedience; Earth First!; Ecosabotage; Ecotage and Ecoterrorism; Environmental Activism; Environmental Philosophy: V. Contemporary Philosophy; Thoreau, Henry David; Wilderness.*

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David R. Keller

ADAPTIVE MANAGEMENT

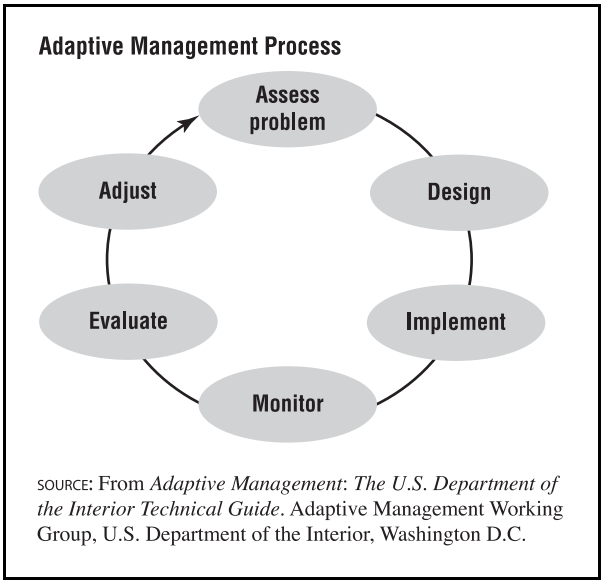
Adaptive management, also called collaborative adaptive management (CAM), has deep roots in the environmental professions reaching back at least to Aldo Leopold's emphasis on community, ecology, and prudence. CAM reflects a shift in worldview from arrogance, control, and technocracy to humility, learning, and collaboration. It accepts that ecological and social systems are so complex and dynamic that our knowledge of them will always be partial. It expects to be surprised by an unpredictable future. It views every management action as an opportunity to learn. And it helps to refine visions of a desired future as humans collaboratively adapt and reformulate management goals in response to experience.

In principle, CAM is as simple as it is powerful. Experts work collaboratively with stakeholders to define desired future conditions and identify the management actions most likely to produce those conditions. Each of these management actions provides an opportunity to learn how ecological systems function and respond to human intervention. The management actions are carefully monitored as they are implemented and progress toward agreed-upon goals, yielding feedback that leads to adjustments in both goals and management. Failures lead to a reevaluation of both the means and the ends. Scientific understanding advances through comparisons of changes in socioenvironmental conditions with predictions that were made using the best available science. CAM, therefore, provides a platform for scientific and social learning that gradually but deliberately builds the capacity to manage resilient, thriving, and sustainable biocultural systems.

CONTEXT AND HISTORY

Contemporary ecology integrates the thinking of chaos and systems theories that gained prominence in the later half of the twentieth century. Ecologists now accept the idea that natural disturbance and change are normal in most ecological systems and that many disturbance-driven changes are unpredictable (e.g., by fire, hurricane, flood, and disease). Ecological systems are organized so that changes in smaller units occur within constraints determined by the larger units in which the smaller units are nested. Changes in smaller units can sometimes induce changes in the larger, and some of these changes can be nonlinear, abrupt, and dramatic because whole systems "flip" to a new state, perhaps irreversibly, when enough change in the smaller levels accumulate to affect functions at larger levels. A celebrated example is the change from grass savannas to brushy fields in the southwest United States. This shift alarmed Aldo Leopold, who contended that this abrupt ecological revolution was caused by suppression of the region's fire regime and the introduction of domestic livestock. Contemporary ecology acknowledges that humans likely will never possess sufficient understanding and technical capacity to control the biocultural system that is constantly evolving in response to both natural and cultural disturbances and evolving human desires.

CAM has also evolved in response to the failures of rational comprehensive environmental planning, a style of decision making that dominated the twentieth-century, positivist, Progressive-Era policies of the United States. Public agencies assumed public interests were best served if decisions were made by scientists and technicians using objective methods that avoided the biases of parochial interests and political power. Rational comprehensive planning further assumed that solutions that would serve the public interest could be found if sufficient resources were available for expert analysis of problems.



SOURCE: From *Adaptive Management*: *The U.S. Department of the Interior Technical Guide*. Adaptive Management Working Group, U.S. Department of the Interior, Washington D.C.

What Is Adaptive Management? *Adaptive management focuses on learning and adapting, through partnerships of managers, scientists, and other stakeholders who learn together how to create and maintain sustainable ecosystems.* **CENGAGE LEARNING, GALE.**

Rational planning failed, in part, because environmental planning problems are not just complex, they are what planning analysts Rittel and Webber call "wicked" problems. Wicked problems are not only difficult to define, there exist no right or wrong solutions for them, only better or worse solutions because they involve competing goals, divergent values, little scientific agreement on cause-effect relationships, imperfect information, and inequitable distribution of political power in implementing and influencing planning. Furthermore, rational planning, with its reliance on experts, excludes full and informed citizen participation in decision making. The "tell us what you want, and leave it to us to find the optimal solution" public involvement strategy bred contempt and conflict between planners and their constituents. This approach to public involvement could not adequately deal with deep-seated conflicts among stakeholders. Planners were forced to resolve conflicts using their expert judgment, which often left competing interests dissatisfied and with little recourse but to work outside the planning process through litigation and political intervention, blocking plans and stopping action. A classic failure of rational planning occurred when national forest planning and endangered species habitat conservation efforts stalled when confronting the wicked problem of balancing jobs, economy, spotted owls, and old growth timber in the Pacific Northwest.

The rational planning approach offered few solutions to these wicked problems other than to collect new information and to conduct additional analysis in the never-ending search for an optimal solution that would generate enough credibility to resolve conflicts and overcome political opposition. The result was often analysis paralysis. Agencies became consumed by planning, leaving managers uninformed by a shared vision, but still forced into action as daily crises demanded responses.

Multiple ways of knowing—for example, scientific, professional, spiritual, experiential, local, and global—are not just possible but can be equal to each other in their power and utility at solving environmental planning problems; knowledge is not the exclusive domain of science experts and professional planners. Public-involvement strategies respect pluralism and accept that preferences and perceptions change through involvement as plans evolve in the light of new information and experiences. Snapshot public hearings and socioeconomic surveys neither sufficiently engage participants nor permit learning and change to occur. Planning involves learning, and learning means change.

LEARNING

Social learning is perhaps the most important outcome of CAM. Building on the adage that it is easier to create a future than to predict it, CAM provides a powerful opportunity for stakeholders to learn about cultural and ecological systems, respect and influence one another's values, and collaboratively craft scenarios and motivate actions that lead society toward a sustainable future.

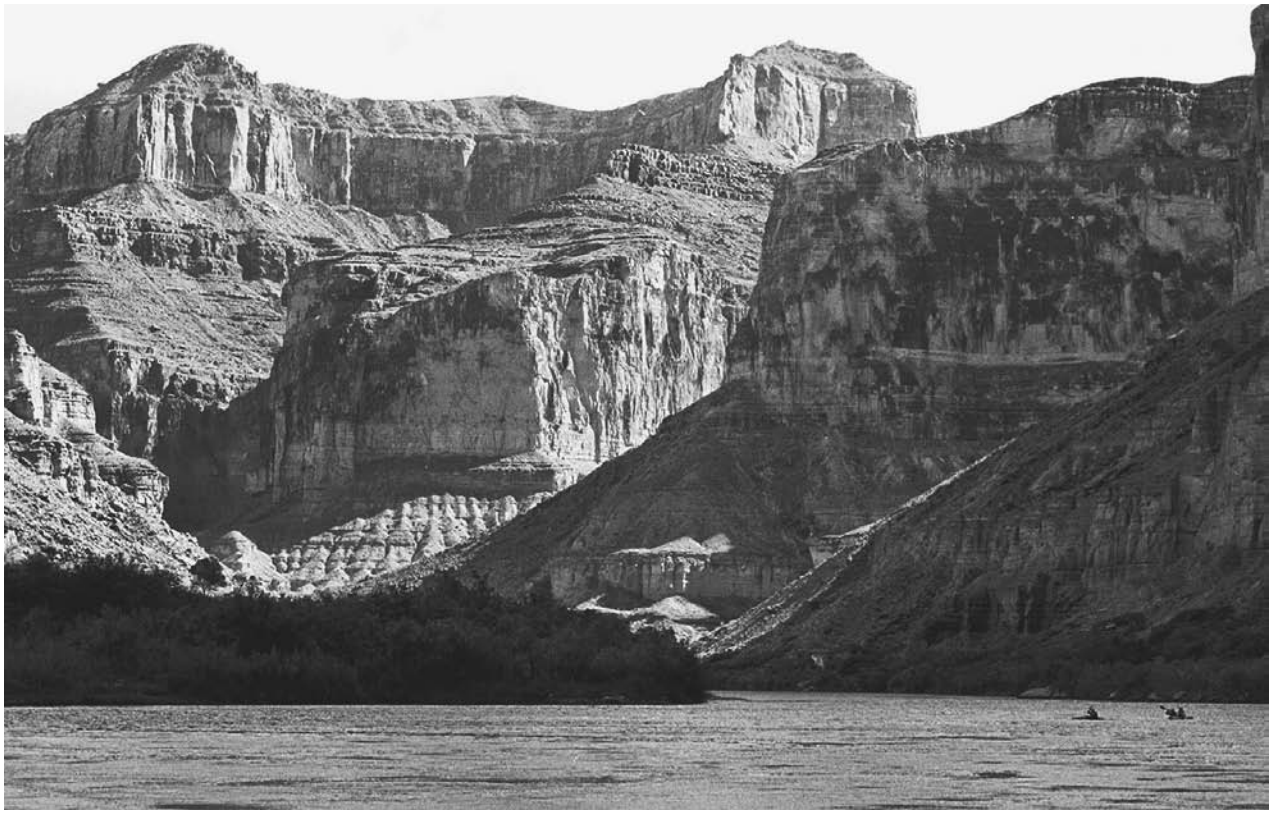
CAM is as much about managing learning as it is about managing the environment. Learning occurs at two levels. Mundane but essential learning results from the success and failure of management actions. Each intervention is an experiment that improves understanding of the biocultural systems being managed and refines the management techniques used to manipulate these systems.

Social learning, the second level of learning enabled by CAM, occurs by engaging and motivating society in the task of sustainability. The planning process situates people in the unfolding trajectory of history, giving them roles, defining settings, and giving direction. It thereby motivates and engages people in creating that future. By articulating desired future conditions, people identify and refine their values. As the plans become realized, people learn about whether their values and hopes were appropriate. With a view toward the future and achieving the good life, people can understand the changes and sacrifices being asked of them today.

Planning goals are hypotheses about values that are just as refutable as hypotheses about ecological functions and management techniques. Stakeholders invested in a planning effort can, and often should, change their goals in response to what they learn. For example, a community may seek to maximize wealth and freedom through real estate development. After years of pursuing this goal, residents may become frustrated by traffic congestion, fossil fuel dependence, and the loss of local foods, open space, and ecosystem services. Another goal might emerge, one that concentrates real estate development into pedestrian-oriented clusters containing shopping and employment opportunities and connected to other clusters by mass transit and surrounded by working farms and forests that, in addition to providing food and fiber, offer scenery, solace, and biodiversity.

Adaptive management can facilitate such social learning. It is forward-looking, believing that truth lies in the future, as the outcome of countless experiments that reveal which conditions are desirable and resilient and thus sustainable. It forces us to engage the future. It attempts to balance visions of the good life, practices of earning and living, and the environmental capacity to sustain these visions and practices.

The social learning agenda of CAM requires protracted engagement among community members rather than infrequent information exchanges between decision makers and affected publics. Public hearings, opinion surveys, and other episodic, one-way public-participation



Adaptive Management Techniques in the Grand Canyon. *Colorado River kayakers, lower right, glide through the Grand Canyon National Park, in Arizona. The construction and operation of Glen Canyon Dam fundamentally altered the Colorado River ecosystem. The Glen Canyon Dam Adaptive Management Program was established to provide for long-term research and monitoring of resources.* **AP IMAGES.**

procedures that solicit public input (or worse, announce and defend decisions) fail to help society grow in its understanding and expectations of environmental stewardship. A longer-term and more collaborative commitment is required so that stakeholders learn from one another and find ways in which to match their private interests and share common goals. Collaboration through participation builds tolerance and respect among participants, as well as ecological literacy. It also helps build trust and support for managers and planners, making possible informed and deliberate action instead of paralysis and polarization.

CHALLENGES

CAM, like any management process, requires investing significant resources. Planners must be trained and employed to nurture collaborative relationships among vested stakeholders with diverse backgrounds and values. They must encourage a common language and develop and share knowledge relevant to the social and environmental dimensions of the management problem. They must build trust among parties by encouraging evidence of commitment and understanding. Both managers and participants may need to be replaced if they become overtaxed by this process, potentially negating established trust, learning, and momentum.

CAM requires full participation by managers and scientists, but both may be reluctant to offer it. Scientists may lack the incentives to invest the time needed to monitor ecological change, which can often take years to effect, and to develop valid tests of management prescriptions if results are slower to emerge and more mundane than those in other ecological-research opportunities that might offer faster publication of results and thus quicker professional advancement. Managers are understandably cautious about losing control to a stakeholder-driven process and worry about reducing efficiencies as management prescriptions get modified to address scientific requirements of hypothesis testing, which seeks to minimize confounding factors and alternative explanations. Managers also face real budgetary limitations and feel heavy political pressure to deliver goods and services to constituents who may not appreciate the purpose and process of CAM. Moreover, it is difficult for managers

and scientists to secure and maintain the resources essential for monitoring and learning because these resources are scarce and are often quickly redirected to the next crisis. Absent a mechanism to ensure that experiments are carried through, they can be abandoned or altered in ways that forego learning opportunities and waste the investments of time and money that went into designing an adaptive management process.

CAM has also been criticized as compromising conservation goals because too much emphasis gets placed on stakeholder participation, development, and equity. CAM occurs locally, and it respects the nuances and idiosyncrasies of local conditions, which include ecological as well as social systems. Thus, efforts to conserve flora, fauna, and ecosystem services get balanced against local community and economic-development needs. Local interests need not dominate the process, but they typically are significant.

A major premise of CAM is that democratic control over environmental management and development will produce greater justice and sustainability. This may be true in principle; in practice, the degree of justice and sustainability achieved depends upon who participates and has power to influence the goals set by CAM. Centering CAM locally does not ensure democratic control. CAM could fall into the "local trap" and empower stakeholders who benefit from social oppression and environmental exploitation. Individuals and organizations can strategically attempt to manipulate collaborative efforts in ways that do not serve the public good or any conservation goal.

CAM also may fail because institutional barriers and inertia resist the adaptations CAM reveals and recommends. CAM encourages the acknowledgment of failure and the flexibility to adapt—two things institutions and professionals do not do well. Organizations and individuals who benefit from the status quo lack an incentive to respond to feedback that calls for alternative practices to remediate previous errors. Professional identities and agency budgets may be threatened by admitting failure or discontinuing established practices. Institutional change—change in goals and practices—is critical to the success of adaptive management, and that may not be possible without considerable political will and power. This challenge is particularly problematic for federal and state agencies that lack a legal mandate to employ adaptive management strategies. Many agencies with responsibilities for environmental planning are constrained by the National Environmental Policy Act and related legislation, which is grounded in the principles of now-obsolete equilibrium ecology (the old "balance-of-nature" and rational management precepts that CAM rejects).

CONCLUSION

CAM is a humble, experimental, and deliberative method of management and learning that attempts to grope toward sustainability under variable and unpredictable circumstances. In theory, CAM seems noble and straightforward. It encourages managers, scientists, local experts, and other stakeholders to negotiate an outcome that is acceptable to all parties. It requires crafting a management plan using the best available information. The plan gets implemented with the expectation that it will fail in two important ways: First, it will fail to produce the intended outcomes because the complexity of the biocultural system thwarts efforts at understanding and prediction, and because there are usually insufficient resources to perfectly control and implement even the best-laid plans. Second, the plan will fail because society will reevaluate its goals and refine its vision of a desired future. Because failure is anticipated, CAM develops and deploys monitoring strategies that track progress toward desired conditions. Tracking progress offers lessons in how to manipulate the biocultural system, encouraging flexibility in management techniques, the clarification of goals, and the adaptation of expectations to experience. Implementing CAM presents considerable challenges that require vigilance, political power, and perhaps new legislation.

SEE ALSO *Resource Management.*

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R. Bruce Hull

AFRICA, NORTHWEST

Northwest Africa consists of ecological regions that range from Mediterranean forests, woodlands, and shrubs between the Mediterranean Sea and the Atlas Mountains to the conifers and mixed forests of the Atlas Mountains, the juniper steppe of the High Atlas, seasonally flooded halophytic (salt-adapted) plant communities in saline depressions, northern Saharan steppe and woodlands, and the Atlantic coastal and Sahara deserts. The plants and animals found between the Mediterranean and the Atlas Mountains are similar to those in much of the Mediterranean basin, including commercially grown olives, grapes, citrus fruits, and dates. Libya, Algeria, and Morocco grow wheat and barley, whereas Tunisia has more beef and dairy production. Major halophytic communities include Tunisia's greatest salt lakes Chott el Fedjedji, Chott el Djerid, and Chott el Gharasa and Algeria's Chott Melghir. Salt lakes are dry pans for much of the year but may hold a meter or more of water during the winter rains. They lie in a region of past volcanic activity, and although they once may have been inlets of the Mediterranean Sea, it is likely that human activities have contributed to their high salinity levels.

The northern Sahara steppe and woodlands form an ecological transition zone between the better-watered Mediterranean region to the north and the hyperarid Sahara to the south. The Atlantic coastal desert consists of a narrow strip of land in Morocco-occupied Western Sahara and extends southward into Mauritania, where the cool Canary Current provides enough moisture through fog to support a variety of shrubs, lichen, and succulents. Libya experiences more sandstorms and dust storms than its neighbors do and is home to scorching, hot, dry, sand-laden winds known as *ghibli* that can raise the temperature within hours to 40 or 50 degrees Celsius and last for days. Natural hazards in Morocco include earthquakes throughout its geologically unstable mountainous region and periodic drought. Severe earthquakes affect Algeria's mountains; other hazards include mudslides and flooding during the rainy season.

ARABLE LAND AND WATER SUPPLIES

The proportion of arable land in the region ranges from 1 to 3 percent in Libya and Algeria, respectively, to 17 to 19 percent in Tunisia and Morocco. Accordingly, Libya and Algeria have permanent crops on less than 0.5 percent of their land, and their economies rely heavily on petroleum reserves.

Libya has attempted to increase its proportion of arable land through the largest water development project in the world, the Great Man-Made River, which taps vast freshwater aquifers in rock strata beneath the Sahara. Libya hopes to use the project to showcase its engineering prowess, achieve food self-sufficiency in part through improved livestock production, and offer its coastal citizens inexpensive, high-quality fresh water relative to what had been available through its desalinization plants. The massive project was conceived in the late 1960s, and feasibility studies were undertaken in the 1970s. Work started in the 1980s, and the first phase of the project, including a 1,200-kilometer pipeline, was completed in 1991. The network of pipes (some as much as four meters wide), pumps, wells, and other infrastructure is expected to reach completion, including 3,500 to 4,000 kilometers of pipeline and two aqueducts stretching 1,000 kilometers, around 2030. Water is expected to flow through the 2050s, possibly to 2100, but skeptics wonder whether Libya plans to use the large pipes for military purposes such as storing chemical weapons, whether the removal of such large volumes of underground water will shift the course of the Nile toward Libya, whether Libya is tapping aquifers to which Egypt or Tunisia may have claims, and what compensation may go to those whose homes stand in the path of the giant project. Among Libyans the project has widespread support and is a source of pride for its sheer size, with popular media describing it as the Eighth Wonder of the World for its size and the fiscal restraint demonstrated by the project's investment-based and largely locally derived funding such as taxes on luxury goods, as opposed to amassing debt in the form of World Bank loans. Libya's longtime leader, Colonel Muammar al-Qaddafi, points to the project as evidence that Libya is a peaceful nation seeking development, not a terror state as it is portrayed in the West. Economic sanctions from the West have slowed progress on the Great Man-Made River, but Libyans are determined to achieve food self-sufficiency and technological proficiency despite those impediments.

Algeria struggles to provide adequate supplies of potable water to its citizens. Water supplies in Algeria, Morocco, and Tunisia are contaminated by the dumping of raw sewage. Regional environmental issues include desertification and soil erosion from overgrazing, farming in marginal areas, and vegetation destruction and/or deforestation. In Tunisia threats to health are posed by ineffective disposal of toxic and hazardous wastes. The coastal waters off Morocco and Algeria are polluted with raw sewage, fertilizer runoff, wastes from petroleum refining, and other industrial effluents. Algeria's rivers are similarly polluted. The Mediterranean is also a major oil transportation route into which up to a million tons of crude oil are discharged annually through accidental spills, illegal tank cleaning, and inadequate harbor facilities. Pollution of coastal waters has implications for tourism and Moroccan fish exports. With reference to other resources, Tunisia, unlike Libya, is heavily invested in extractive industries

The Great Man-Made River, in Southern Libya. *The son of Libyan leader Moamer Kadhafi Saif al-Islam, center, attends a ceremony to mark the arrival of water from the Great Man-Made River. The river is a huge network of pipes that supplies water from under the Sahara desert to various cities throughout Libya. The percent of arable land in Libya is between one and three percent, and the hope is that this project will increase self-sufficiency and availability of higher-quality freshwater in the country.* **MAHMUD TURKIA/ AFP/GETTY IMAGES.**

and, with Morocco and Algeria, has reserves of iron ore, lead, and zinc, whereas Tunisia and Morocco mine salt and Morocco and Algeria extract phosphates.

HISTORY AND RELIGION

Culturally, much of the population in Northwest Africa shares a French colonial history and an Arab and Islamic identity. The Berbers are the region's most significant non-Arab population. During the colonial period traditional use and cultivation of the land were assailed and suppressed by the colonizers; for instance, French scientists' and administrators' environmental narratives focused on indigenous people's destruction of the natural world through rampant deforestation and desertification. Pastoralists and farmers who used fire for land management were portrayed as destroyers of formerly lush green Northwest African lands. The French suppressed the practice of clearing land with fire and restricted the movement of pastoralists. The need for environmental control was used as a rationale for imperial expansion and served as a means of a social control; sedentary populations could be taxed. However, the scientific basis of French colonial environmental narratives was questionable (Davis 2007) and at odds with local perceptions of human-environment relations.

In the Islamic worldview shared by the majority of people in Libya, Morocco, Tunisia, and Algeria, the natural world as presented and described in the Islamic holy book, the *Qur'an,* is a living, holistic, orderly, and perfect world populated by angels, spirits, humans, and animals. Practitioners of Islam share many beliefs with Christianity and Judaism with regard to attitudes toward the natural world. Each of these monotheistic religions espouses a worldview in which humans are portrayed as God's stewards of the natural world. An important aspect of the Islamic worldview is *Tauhid* (also transliterated as *Tawhid* or *Tawheed*), or the oneness of God. *Tauhid* is the point of origin of a theological doctrine of ecology in

which all things, even those not seen, are God's signs (*aya* or *ayat*) and act as witnesses to God's existence. All things in the universe are from God and manifestations of God.

Islamic law, or *Sharia,* provides a framework through which Muslims can set limits on and establish guidelines for behavior to avoid ecological crises. Humans should behave toward the natural world as just rulers behave toward their subjects. People have the power to dominate nature, but in dominating it they are misusing God's trust in humans as intelligent and able to care for divine bounty. The anticipated depletion of Libya's aquifers caused by the Great Man-Made River project might be viewed as humans expressing their dominion over rather than stewardship of the natural world and could make the project controversial rather than a source of Arab Islamic pride.

ENVIRONMENTALISM

Environmentalism is not a strong movement in the predominantly Muslim countries of Northwest Africa or in much of the broader Islamic community, although Muslims in Western countries are beginning to form green groups such as the London Islamic Network for the Environment (LINE). Fazlun Khalid is the founder and director of the Islamic Foundation for Ecology and Environmental Sciences (IFEES) based in the United Kingdom. He has written widely on the Islamic approach to environmental protection (Khalid 1999) and hosted environmental ethics workshops, but Islamic environmental ethics and environmental law remain in their infancy. The Iranian environmental philosopher Seyyed Hossein Nasr pointed out that many Muslims believe that their countries should focus on development and at a later date consider the environment; they view environmentalism as form of European and North American control intended to keep Muslims from realizing their economic potential.

Environmental activism in Northwest Africa is fragmented, often limited to protests by small groups or individual protests such as Najib Bachiri's opposition to Morocco's megaresort Mediterranea, which may threaten turtles, ducks, lizards, and trees, and Algerian environmental activists' protest of a road linking Tunisia, Algeria, and Morocco that may reduce biodiversity in wetlands. Governments allow the dumping of waste into the Mediterranean and other environmental abuses in part because few citizens voice opposition in those authoritarian states. Progress and development often come before environmental considerations. Government-supported conservation efforts include eleven and fourteen national parks in Algeria and Morocco, respectively, and seven national parks each in Libya and Tunisia. Tunisia's parks protect several endangered species, including the Barbary hyena, the Barbary leopard, Cuvier's gazelle and the slender-horned gazelle, the Mediterranean monk seal, the oryx, and the Moroccan dorcas gazelle. Northwest African countries frequently are thwarted in the development of sustainable marine fisheries by fishing boats from Spain, Japan, Korea, and other countries that operate illegally in their waters. In Morocco the public and private sectors are working to reduce the country's reliance on oil and increase the use of renewable energy sources.

Morocco, Algeria, and Tunisia, often with Libya and Mauritania and sometimes with Western Sahara and Chad, are considered part of the Maghreb, and Algeria, Libya, Mauritania, Morocco, and Tunisia formed the Arab Maghreb Union in 1989. The economic union has had limited success in setting environmental policy because of disputes between Algeria and Morocco over the sovereignty of Western Sahara. Economic priorities have slowed environmental initiatives throughout the region, although several Northwest African countries are working with the World Conservation Union (IUCN) and the Food and Agriculture Organization (FAO) to protect medicinal plants, promote ecotourism, and enhance community involvement, especially among women, in conservation projects. The FAO also works to curb locust swarms in West Africa, which can spread to Northwest Africa, contributing to reduced harvests and ultimately famine. Fair trade, recycling, and other environmental issues that have been gaining interest in Southwest Asia (the Middle East) have not made notable inroads into Northwest African societies. Although Northwest African countries have started to host conferences on biodiversity and sustainable tourism, even relatively westernized universities such as Al Akhawayn in Morocco offer little in the way of environmental studies. Some courses include the study of resource use, but the focus is on development, not the environment.

Academic courses in the United States in which Northwest Africa is studied generally place it in the context of regional studies. These programs, often geared toward training students for the foreign service and other forms of employment, focus on understanding the culture, history, politics, English-language literature, and economic development of Northwest African countries but rarely center on the physical environment, biodiversity, or conservation.

FUTURE CONCERNS

In the future, meeting people's freshwater needs will remain a shared concern for Northwest African countries, as will curbing the activities of Islamic groups associated with terrorism and furthering socioeconomic development. Both the rate of development and the degree to which these issues have been addressed have varied in the region. Morocco's rural population struggles to gain access to clean water, Algeria and Libya have curbed the politicized Islam of the 1990s and encouraged Western investment, and Tunisia's considerable post-mid-1990s economic success has enabled

the implementation of national-level environmental programs. Economic improvement probably will be necessary in Algeria, Libya, and Morocco before their governments pay more attention to long-term environmental planning, including national environmental action plans and university-level environmental studies programs.

SEE ALSO *Africa, Sub-Saharan; Islam; Water.*

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AFRICA, SUB-SAHARAN

Sub-Saharan Africa covers a landmass larger than North America and includes over a dozen nations and hundreds of cultural groups. African worldviews are neither wholly monotheistic nor completely anthropocentric. They involve environmentally friendly beliefs and laws that have encouraged or enforced limits to the exploitation of biological resources. The worldview of most indigenous African communities promotes a unitary conception of reality. In that cosmology human beings are seen as a distinct but completely embedded part of nature. Human existence is integral and is part of the flow of the universe. Balance is seen as the ideal relationship between humans and the natural environment.

The expansion of modern education and of religions such as Christianity and Islam has threatened the existence of African belief systems. The colonial legacy, the introduction of a money economy with a capitalist mode of production, the global economic system, the expansion of transnational corporations and the commercialization and privatization of knowledge, state control of natural resources, and the appropriation of sacred lands by governments favor Western knowledge and civilization over the indigenous variety. The expansion of HIV/AIDS, poverty, climate change, and injustice have exacerbated the threat to the existence and development of indigenous environmental ethics.

ENVIRONMENTAL IMPACTS OF THE COLONIAL PERIOD

The Portuguese and later other Europeans who arrived on the west coast of Central Africa after 1400 tried to control African natural and human resources. They participated in a slave trade for plantations and mines in the Americas. Intermittent drought and food shortages contributed to the engagement of southwest central Africa with the Atlantic slave trade. According to Joseph Miller (1982), periodic drought and famine increased slave raiding in southwest central Africa and increased the death rates of people enslaved during times of ecological crisis.

An industrializing Europe further penetrated equatorial Africa in the nineteenth century to satisfy its demand for African raw materials to produce textiles, steel, and other products. Some Africans in the Congo River basin participated in that international trade by trading manioc, palm oil, wine, slaves, and ivory for firearms, beads, and cloth. Western Africa also participated in that trade. International resource exploitation led to the decline of forests and wild animals. Also, the trans-Saharan slave and ivory trade in the northern savanna led to the creation of large trading posts and thus the introduction of new diseases, including smallpox, syphilis, and measles.

Some European colonizers believed that Africans were devoid of reason and did not qualify as human beings. Although they represented their mission in terms of civilizing Africans, they saw Africans as a servant class in their own colonized countries. However, European colonization caused the underdevelopment of the continent in many ways.

Colonial powers introduced formal conservation during the late nineteenth and early twentieth centuries without paying attention to the dynamics of indigenous farming and livestock management practices. Colonial authorities reserved land for national parks, forest reserves, and hunting reserves and thus restructured land-use traditions. European game laws and the tradition of hunting preserves were used as wildlife protection laws and the bases of national parks. Hunting reserves primarily served the interests of European sport hunters, with little regard for the subsistence needs of local people. Many colonial governments considered indigenous Africans degraders of the environment and restricted their access to natural resources such as woodlands and forests. In addition, they set aside

Trapping a Giraffe, South Africa. *In many parts of Africa, the relocation of wildlife has replaced natural migration as human development has closed the ancient paths African animals normally follow. Predators, antelope, giraffe and even elephants are captured and moved for commercial or scientific reasons.* **ADRIAN BAILEY/AURORA/GETTY IMAGES.**

land for the protection of endangered species and habitats, following the conservation ethic of the North. Peasant farmers and nomads were forced to overuse resources because of restrictions on their movement and the concentration of people and animals around new high-capacity water sources. Moreover, colonial forestry and agriculture officers forced local people to grow exotic species for export to Europe and the United States, using cultivation methods inappropriate to local ecosystems. Monocultural cash crops often displaced indigenous crops.

African peasant farmers and pastoralists resisted those policies and abandoned foreign conservation measures immediately after the end of colonialism. However, the conservation policies of some postcolonial African governments were similar to those of the colonial powers as they continued growing cash crops, mining, logging, and other activities of the colonial era. The great majority of Africans active in conservation were trained in traditional Western methods of wildlife management and have hindered the growth of an indigenous conservation ethic by promoting European management systems. Thus, the policies of postcolonial African governments have not reduced the destruction of forests and wildlife.

However, some colonial policies have had a positive influence on conservation initiatives. In the first decade of the twenty-first century the South African and Zimbabwean governments used wildlife reserves established by British colonial governments and settler states as sites for wildlife preservation and tourism.

ENVIRONMENTAL PROBLEMS AND CONTROVERSIES IN AFRICA

Deforestation Large-scale clearing of forests, the burning of biomass, and charcoal burning have led to the depletion of forests in Africa and have contributed to global climate change. Seventy-six percent of the African population relies on solid fuels, and only 24 percent has access to electricity. Africa is experiencing the gradual extinction of hundreds of species of plants and animals because of the destruction of forests and other habitats. However, several studies have found that the density of trees is increasing in parts of the West African savanna despite annual burning.

Soil Erosion, Drought, and Desertification The decline of intercropping, overcultivation, lack of fallowing, overgrazing, deforestation, the use of chemical fertilizers, and poor irrigation practices have caused soil erosion in Africa. Some studies have shown that El Niño–Southern Oscillation (ENSO) has had a negative impact on climate in Africa. The ENSO phenomenon and the temperature of the Indian Ocean affect the climate of eastern and southern Africa, whereas the conditions in the Atlantic Ocean affect that of West Africa.

Vegetation productivity and desertification in sub-Saharan Africa may be influenced by global climate variability attributable to the North Atlantic oscillation (NAO) as well as to ENSO. According to Gufu Oba and his co-authors, "[f]ully 75% of the interannual variation in the area covered by the Sahara Desert was accounted for by the combined effects of NAO and ENSO" (Oba, Post, and Stenseth 2001, p. 343), with most of the variance caused by NAO. Continuous climatic variability in the North Atlantic may explain the expansion and contraction of the Sahara. Atmospheric pressure variability related to NAO appears to affect aridity and atmospheric export of dust from the Sahara directly and to influence the spatial dynamics of the Sahara through variation in the 200-millimeter rainfall isocline. Natural climatic fluctuation may be largely responsible for vegetation dynamics in sub-Saharan Africa. Much of the interannual variability in vegetation productivity in the Sahelian zone and southern Africa is the outcome of the combined effects of NAO and ENSO, implying that both may be useful for monitoring the effects of global climate change in sub-Saharan Africa.

Drought is a recurrent feature in most parts of southern Africa, with five major episodes since 1980. The entire sub-Saharan region was affected during the 1982–1985 drought.

Desertification increases with each drought cycle. Environmental insecurity in the African drylands led to famines and food shortages in the 1970s and 1980s that resulted in mass starvation, death, and disease and the exodus of millions of environmental refugees.

Mediterranean Africa, the Sudano-Sahelian region, and the Kalahari-Namib region in southern Africa are at the highest risk of desertification; thus, desertification has affected one-third of the continent. The direct causes of desertification include human-related activities such as deforestation, cultivation, rangeland grazing, and inappropriate use of irrigation technology, which can result in soil salinization; the indirect causes include population pressure, poverty, landlessness, history (colonialism and the erosion of traditional systems of pastoral resource management), the new global economic order (declining commodity prices and unfavorable trade terms), and inequitable distribution of resources (Smith and Koala 2003, Darkoh 2003a). However, global climate patterns are responsible for desertification more than is local farming.

Water Pollution and Sanitation Africa has experienced increasing scarcity of clean water because of long spells of drought and water pollution caused by industry, agricultural chemicals and fertilizers, and raw sewage. This persistent shortage of clean water will be aggravated by climate change. The regional report by Working Group II of the Intergovernmental Panel on Climate Change (IPCC) predicted that because of continued increases in greenhouse gases, 75 to 250 million people in Africa will be at risk of increased water shortage with a one-degree-Centigrade rise in global temperature by the 2020s, 350 to 600 million people with a two-degree climb by the 2050s, and up to 1.8 billion people if global temperature rises by three degrees, which could happen by around 2080 (Boko, Niang, Nyong et al. 2007). According to United Nations Environmental Program (UNEP), as of 1999, "14 countries in Africa are subject to water stress or water scarcity" and a "further 11 countries will join them in the next 25 years" (quoted in New Economic Foundation 2005, p. 13). The decline of rainfall will lead to the deterioration of water as sewage and industrial effluents are more concentrated and become a breeding ground for water-borne diseases. Africa increasingly will experience climate- or water-related diseases, both vector- and water-borne, such as cholera, typhoid, diarrhea, dysentery, yellow fever, river blindness, bilharzia, malaria, and tuberculosis, according to the regional report by Working Group II of IPCC. It is estimated that an additional 80 million people will be at risk from malaria epidemics in the twenty-first century. Although large parts of the western Sahel and much of southern and central Africa will become unsuitable for malaria, the highlands of Ethiopia, Kenya, Rwanda, and Burundi may become highly suitable for malaria mosquitoes by the 2080s. Malaria is also likely to rise in Zimbabwe, the highland areas of Angola, and Somalia.

HIV/AIDS HIV/AIDS is the single most important threat not only to the health-care system but also to development and environmental protection in Africa. It can accelerate environmental degradation by decimating the most productive members of a society. The expansion of HIV/AIDS has discouraged some people from making long-term investments in or conserving their natural resources; they spend their funds on AIDS patients rather than on conservation and wildlife preservation. African economies that have been crippled by poverty, debt, and unfair trade policies are being compromised by the epidemic.

Poverty Rural poverty has aggravated environmental degradation. Much of sub-Saharan Africa not only has failed to become part of the global economy but has become

Haboob Dust Cloud Advances Over Khartoum, Sudan, 2007. *The gigantic dust cloud known as "haboob" is a seasonal type of monsoon, which can reach a height of 3000 feet. Global climate change is an environmental issue of particular concern in the sub-saharan Africa region, due to its likely influence on vegetation productivity and desertification.* **STR/AFP/GETTY IMAGES.**

poorer than it was in the late twentieth century. Poverty in the South is structurally rooted in the prevalent North-South relationship. However, rural poverty is not the major cause of environmental degradation but its effect. Although people are aware of the consequences of their actions, lacking alternatives for subsistence, they are unable to stop degrading their land.

Environmental deterioration has exacerbated the paucity of resources and forced people to adopt survival strategies that are harmful to the environment. Rapid population growth, inadequate food production, inappropriate land tenure systems, poor access to social services, ill-defined or nonexistent property rights, poor marketing systems and price incentives for farmers, inadequate safety nets in times of stress or disaster, lack of participation in decision making, and global environmental trends such as climate change have forced Africans to put more pressure on the land. This has led to increasing encroachment on marginal lands, forests, and other natural resources, which has resulted in further environmental degradation.

The relationship between poverty and environment is complex. In some cases environmental degradation increases poverty by reducing the stock of natural capital and increasing economic vulnerability. In other cases poverty increases risk aversion, leads to ill health, and reduces the capacity to invest. Moreover, protecting the environment may reduce or increase poverty, just as reducing poverty may help or hurt the environment. Although there is a poverty–environmental degradation spiral in some instances, in other cases another cause increases both poverty and environmental degradation.

Migration Environmental refugees are people who have been forced to leave their homelands temporarily or permanently because of environmental disruption (natural and/or triggered by people) that has had a negative impact on their lives (El-Hinnawi 1985, Myers 2005). Environmental degradation and competition for natural resources have caused massive internal and external migration and put new pressures on host countries in different parts of Africa.

Population Growth Some writers consider population growth one of the major causes of environmental degradation. However, some studies have shown that in certain cases population growth has had a positive impact on the environment (Boserup 1965, Fairhead and Leach 1996, Tiffen, Mortimore, and Gichuki 1994). Although population growth could be a factor in environmental degradation in the region, it is not the major cause.

Conflict and Civil War Many countries in Africa frequently experience civil wars and other forms of social unrest. Civil war has led to transboundary migration, immigration, deforestation, and other environmental problems. The lawlessness associated with war has led to the poaching of protected animals and uncontrolled harvesting of bush meat, in some cases threatening species with extinction. There have been conflicts over river basin resources in African drylands. For instance, there were conflicts between Senegal and Mauritania in the 1980s over the utilization of resources in the Senegal basin, between Niger and Nigeria over the two dams on the Lamido and Maggiya rivers, and between Nigeria and Cameroon over the Ladoo Dam on the Benue River.

GLOBALIZATION AND GLOBAL CAPITALISM IN THE CONTEMPORARY PERIOD

Colonization facilitated the proliferation of private companies in the late nineteenth and early twentieth centuries. Those companies exploited forests, wild animals, diamonds, gold, and cash crops in different parts of the continent. The environmental challenges to African natural resources continue to accelerate as a result of world trade liberalization, the expansion of transnational corporations, and global capitalism. The World Bank, the International Monetary Fund (IMF), and individual Western aid donors have promoted structural adjustment programs under which states do not regulate the activities of transnational corporations or guarantee social and environmental protection for their citizens.

Many studies have shown that international trade and Western corporations have contributed to the escalation of conflicts and the exploitation of environmental resources in Africa. The strategic importance of Congo-Kinshasa geographically and economically attracted the attention of countries such as the United States, France, and Belgium and transnational corporations such as Executive Outcomes and American Minerals Fields Inc. (AMFI) (Nzongola-Ntalaja 1999, Yengo 2002). Those external forces aggravated the exploitation of natural resources and industrial pollution in Congo and other countries.

Experiences in Sierra Leone, Angola, Nigeria, and other countries show that there have been strong ties between state officials, rulers, and warlords and foreign commercial interests and investors. African governments often side with international capital intent on the exploitation of local resources. For instance, multinational oil companies and the Nigerian government have been exploiting the people of the Niger Delta (particularly the Ogoni people) by destroying their environment and undermining local economic activities (Ibeh 2003, Steyn 2004).

Industrialized countries have transported and dumped toxic and hazardous wastes in many African countries, including Egypt and western African countries such as Nigeria, Equatorial Guinea, the Republic of Benin, and Guinea Bissau (Dimah 2001). The governments of some countries have let their lands be used as dumping sites to get income and aid from industrialized countries.

INDIGENOUS ENVIRONMENTAL ETHICS IN SUB-SAHARAN AFRICA

Limited by preconceived notions, European travelers, missionaries, colonial powers, colonial anthropologists, and some Western philosophers portrayed the African people and their beliefs and practices as barbaric or uncivilized, irrational, unscientific, and prelogical. They considered Africans as devoid of morality, religion, and political philosophy. The lack of documentation before modern times and the variety of peoples in Africa hindered an appreciation of African ethical teachings.

African peoples have had their own religions and moral principles for as long as any other peoples. Belief in a God and an afterlife existed among Africans long before the arrival of European Christian missionaries and Muslims. Although each community has its own religious beliefs, several doctrines, practices, and rituals are prevalent, justifying the concept of a generic African worldview. These commonalities include a belief in the existence of a supreme being, the return of the human soul to God after death, and the absence of eschatological statements such as those found in Christianity and Islam regarding divine judgement, heaven and hell, the segregation of bad from good souls, bodily resurrection, and the hope of a joyful life in heaven or paradise.

African worldviews embody both anthropocentric and nonanthropocentric attitudes toward the environment. Africans protect their environment for utilitarian reasons; that is, the African worldview is characterized by an ethical anthropocentrism that distinguishes humans from the environment while fostering a cooperative relationship. Rural people, whether pastoral or agricultural, have acquired experience as a result of working the land from childhood and have developed sustainable modes of environmental management and exploitation. They have developed detailed knowledge of the celestial sphere, the earth, the weather, animals, vegetation, water, soil, crops,

insects, and the environmental and nutritional requirements of people and animals. They have preserved the biodiversity of the continent for millennia and have succeeded in mitigating environmental degradation through traditional conservation practices and in coping with climatic and environmental changes.

The bonds between the environment and the people are considered not only material but spiritual and moral. Many African peoples envision a kinship relationship between themselves and the natural world. They have developed an organic conception of nature that promotes an ecological interdependency among human, plant, and animal life. Nature is an integral part of their day-to-day existence. In many sub-Saharan countries environmental knowledge relies on the relationships between both humans and nature and the visible world and the invisible world. Accordingly, in the traditional African worldview the visible and the invisible dimensions of the world are inseparable. Africans in traditional cultures adopted a sense of self extended in time to include all their ancestors, the unborn, the entire community, and all of nature. Reality includes not only what is observable or what makes cognitive sense but also the invisible, the emotional, the sentimental, and the magical.

The pan-African worldview emphasizes the dynamic unity and interdependence of all things. Examples from different parts of sub-Saharan Africa illustrate this fact. The Oromo of Ethiopia, the San of south-central Africa, the Nso' of the grassy highlands of Bamenda in Cameroon, and other groups recognize the coexistence of nature and the rest of creation. The Oromo, the largest ethnic group in Ethiopia, believe that *Waaqa* (God), *Lafa* (Earth), and all other created things are interconnected. *Waaqa* is the creator of all things. *Ayyaana* (spirit) is a manifestation of the one *Waaqa*. The spirits act as intermediaries between human beings and *Waaqa.* The Oromo regard *Waaqa* as the father and Earth as the caring mother of all. Human beings are not above other creatures and cannot despoil them as they wish. They are part of the natural world and are given a special place in the diversity of the cosmos; they are endowed with intelligence that enables them to understand cosmic events. Thus, *Waaqa* expects them to care for other creatures and all of creation by acting in harmony with the cosmic whole. The relationship between *Waaqa* and other things is governed by *saffuu* or *ceeraa fokko*. *Saffuu* is a moral concept that serves as the ethical basis for regulating practices to ensure a high standard of conduct appropriate to different situations. *Saffuu* is a mediating category between different things (Kelbessa 2002, 2005). Human and nonhuman beings have their own place and role in the Oromo worldview, and this should be observed and respected by human beings. Thus, the Oromo conception of *saffuu* reflects a deep respect and balance between various things. The Oromo do not consider justice, integrity, and respect as human virtues applicable only to human beings but extend them to nonhuman species and the earth.

Oromo environmental ethics is based partly on *Gadaa*, a democratic egalitarian system that includes leaders who conduct the government (political, economic, social, judicial, legislative, ritual, and military affairs) of Oromo society for nonrenewable eight-year terms. It is the *Gumi* or *Ch'affe* (the national assembly, the assembled multitude) that is responsible for making and revising environmental and other laws, and the power of *Gumi* is above the power of the *Gadaa* and the *Qalluu* ritual leaders (Legesse 1973, 2000).

Unlike the Western concept of a person as rational, autonomous, individual, and separate from others, the traditional African notion of personhood is relational, communitarian, and extended. In Africa systems of ethics, relational views of the self and world, and visions of the common good are expressed through cultural concepts such as *ubuntu,* a word common to several Bantu languages. *Ubuntu* signifies that a person is a person only through another person. It enables human beings to acknowledge and appreciate unity in their humanity despite differences. According to Mogobe B. Ramose, *ubuntu* is the foundation of African philosophy: "[t]he be-ing of an African in the universe is inseparably anchored upon *ubuntu.* Similarly, the African tree of knowledge stems from *ubuntu* with which it is connected indivisibly. *Ubuntu* then is the wellspring flowing with African ontology and epistemology" (2002, p. 40). Ramose stressed that *ubuntu* is related to both human beings and the universe. This is expressed by the prefix *ubu-*, which contains being as enfolded, whereas the stem–*ntu* means its unfolding by means of an incessant continual concrete manifestation through particular forms and modes of being. Thus, the concept indicates that "the human individual is inextricably linked to the all-encompassing" physical and metaphysical universe and also to the "human universe in the sense of community" (Ramose 2002, p. 65).

Many Africans believe that land is not something that people own; rather, it belongs to God (Omari 1990). Humans are not the masters of the universe but the friends of other beings, although they are at the center of the universe (Mbiti 1996). Thus, in traditional African worldviews the earth is not a property or commodity to dispose of as people wish (Millar 1999). For most Africans, the Earth is the true source of life and commands reverence and respect (Ramose 2004), although the concept of private property is not unheard of in sub-Saharan Africa.

SPIRITUAL AGENCIES AND THE NATURAL WORLD

Many people in sub-Saharan Africa believe in spirits (Parrinder 1962, Zahan 2000, Kelbessa 2001, Kimmerle 2006). Although spirits are considered intermediaries between the human and divine realms, they also are believed to dwell in nature. Mountains, trees, animals, and human beings have their own spirits. Some spirits are connected with natural phenomena such as wind, rain, thunder, and lightning or elements on which human life depends, such as the earth, rivers, the sea, and the sun. Some people in West Africa regard the spirits in nature as nature gods and respect the natural things in which they dwell.

In some sub-Saharan countries trees, animals, and natural phenomena are thought to have intrinsic worth and attract respect. Trees around religious centers are considered sacred. The Oromo, for instance, recognize some trees as sacred on the basis of essentially spiritual values. The East African Bantu of highland Kenya do not fell giant trees because they believe spirits find safe abodes in those trees. Some Oromo clans and individuals have been so inspired by nature that they have named their clans and children after trees. The Fon of Benin believe that men and women descended from the branches of an iroko tree.

Many African societies have preserved wild animals through totemism and other religious beliefs. Totemism is the practice of using a natural species or class of objects as the symbol of a group. Totems can be animals, plants, or geographical features. Many lineages have their own totems. Totem animals have special cultural value and associations. Members of each totemic group are required to abstain from harming, killing, and eating their totem. The respect is mutual, and the totem is expected to revere the clan.

Some ethnic groups, such as the Shilluk of the Sudan (El-Mahi 1994) and the Oromo, have firm restrictions on hunting wild animals. The Oromo do not consider animals as mere resources that can be exploited at any time without exception. They are expected to respect the rights of animals given to them by the creator. Wild animals as species have the right to exist whether they are useful or not. The Oromo kill wild animals selectively to avoid depletion of breeding stocks and also believe that domestic animals should be treated humanely.

Both indigenous and imported religions have influenced environmental ethics in Africa. Some writers attribute belief in a divine origin to morality. They assert that there can be no morality without religion. Some indicate that Africans are religious in all things. For these writers there is no clear-cut distinction between the religious and secular spheres in Africa. They maintain that all Africans believe that humans receive their moral nature from God and that any event may be influenced by gods, ancestors, and spirits.

However, religion is not the only source of moral laws in Africa. Although they believe that there are divine laws, the Oromo think that laws are predominantly a product of human deliberation rather than a gift from God or heroic ancestors. In his analysis of the Akan conception of morality in Ghana, Kwasi Wiredu (1983) argued that the basis of morality in Akan society is rational reflection on human welfare. Belief in God is more a personal affair than a societal requirement. Accordingly, the rules of good conduct would be in place even if there were no belief in God.

ENVIRONMENTAL ETHICS IN SUB-SAHARAN AFRICAN UNIVERSITIES

Environmental ethics has become part of the philosophy curriculum in some African universities. It is taught in Stellenbosch University in South Africa, Nairobi and Kenyata universities in Kenya, Addis Ababa University in Ethiopia, Makerere University in Uganda, and Lomé and Kara universities in Togo. Stellenbosch University established the Unit of Environmental Ethics in 1992 as part of the Centre for Applied Ethics. In Tanzania environmental ethics is taught as a topic in courses in environmental science. Environmental philosophy is taught in the University of Lagos in Nigeria and the University of South Africa. UNISA also teaches biomedical ethics. The Cape Peninsula University of Technology offers a course in the philosophy and ethics of environmental management in its Environmental Management Program in South Africa. The universities of Yaounde 1 in Cameroon and Ibadan in Nigeria offer a postgraduate program in bioethics. Environmental ethics is an elective course in Ibadan.

SEE ALSO *Deserts and Desertification; Disease; Food; Global Climate Change; North America; Traditional Ecological Knowledge; Waste Management.*

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AFRICAN-AMERICAN ENVIRONMENTAL ETHICS

Environmental activism in African-American communities dates back to the Progressive era. Generally local in focus, it is traditionally aimed at such issues as access to green space, combating pollution, and protecting public health—concerns that continue to inform the environmental justice movement today. Indeed, African-American environmental ethics shares much common ground with the environmental justice movement; both are centrally concerned with the connection between justice and environmental stewardship. However, African-American environmental ethics extends beyond the distributive issues at the heart of the environmental justice movement; it is rooted in a broader intellectual tradition that addresses the political, economic, and cultural dimensions of humans' relationship with the land.

Some scholars would argue that this broader intellectual tradition is essentially African rather than Western. Lawrence Levine in *Black Culture and Black Consciousness* (1977) forwards the claim that African-American culture is strongly shaped by the traditional African sensibilities carried by slaves and their descendants. That African worldview, he contends, taught African Americans to see humans as part of a natural order rather than spiritually distinct from the natural world. This Afrocentric thesis could have great significance for contemporary African-American environmental ethics, but its implications have yet to receive sustained attention from scholars.

It is easier to document the effect of slavery itself, which made the relationship between social justice and environmental stewardship a key axis of African-American environmental ethics. More precisely, African-American theorists have focused on the social conditions necessary for individuals to develop an ethical relationship to the natural world, and how those social conditions have been eroded by racial injustice. For example, Frederick Douglass's 1873 speech to the Tennessee Colored Agricultural and Mechanical Association explores the effects of slavery on agriculture stewardship (concisely summing up the abolitionists' environmental critique of slave agriculture): Under slavery, he argues, those who worked the land had little incentive to improve the soil. Moreover, slavery fostered anger, hatred toward land, and a general indifference to rights that led slaves to mistreat farm animals. Good stewardship, under Douglass's view, requires that those who tend the land develop an attitude of affection and generosity toward the world, which grows out of a confidence that good care will be valued and repaid. That attitude, he contends, is hard to maintain under oppressive labor conditions.

This insight informs later environmental critiques of racial oppression, such as W. E. B. Du Bois's analysis of the post-Emancipation peonage system in *Souls of Black Folk* (1903) and the effects of racial segregation on urban neighborhoods in *The Philadelphia Negro* (1899). Both racially oppressive systems, Du Bois contends, reduce the victims' capacity and incentives to maintain the land or housing stock. As a result, African Americans suffer more acutely from a range of environmental problems, from soil erosion and exhaustion in rural areas to public health threats and reduced access to green space in urban environments.

Du Bois, Booker T. Washington, George Washington Carver, and Alain Locke were among the early African-American intellectuals concerned with the environmental problems facing their communities, and more broadly with how human communities can interact creatively, productively, and meaningfully with natural world. They typically adopted an anthropocentric perspective, beginning from the assumption that humans must exert some control over the natural world in order to make the landscape suitable for good human lives. However, they were also keenly sensitive to the fact that "mastering" nature involves mastering other humans. Thus they did not imagine a legitimate "dominion" relationship as an exercise of naked power. Carver, for example, encouraged scientists to create new strains of plants and animals, but he saw them as "copartners" with God in this work of creation. For Carver, humans' right to control the natural world was contained by a moral and spiritual framework in which nature has independent value as God's creation. For Du Bois, too, nature was not merely a material resource to be exploited. His writings on gardening and other aspects of

Activist in front of a Closed Incinerator. *Aaron Mair, a New York-based activist, poses in downtown Albany with a now closed incinerator smokestack in the background. African-American environmental ethics extends beyond the distributive issues at the heart of the environmental justice movement; it is rooted in a broader intellectual tradition that addresses the political, economic, and cultural dimensions of humans' relationship with the land.* **AP IMAGES.**

homemaking suggest that our relationship to nature is an integral part of our aesthetic and spiritual life. Interacting with nature should not be blind mastery but a creative response, attentive equally to the aesthetic, spiritual, moral, and economic dimensions of the landscape.

Creativity in fact became a central concept in African-American environmental thought during the early twentieth century, reflecting the influence of Romanticism and pragmatism on African-American intellectual life generally. Drawing on these intellectual currents, African-American theorists built on the earlier critiques of slavery to develop a broader perspective on the connection between social justice and environmental stewardship: One of the chief harms of racial oppression, they argued, is that by destroying the foundations of community and social life, it undermines its victims' capacity to interact creatively with the natural world—to give it meaning by expressing their values and perspectives in the landscape. For example, philosopher Alain Locke in the 1925 collection *The New Negro* argues that the challenge of modern, urban African Americans is to create out of their common condition a common consciousness, by giving their physical world meaning through the creative articulation of its materials. Racial oppression, Locke contends, undermines African Americans' ability to express their common ideals through creative expression. As a result, they experience their environment as a jungle, a wilderness without form or meaning.

This thesis is most compellingly developed by Richard Wright in his 1940 novel *Native Son,* which describes the sense of alienation and meaninglessness that haunts black inhabitants of an urban ghetto. The "white city" Wright describes physically embodies white Americans' perspectives and values; the black inhabitants of the city, unable to express their own understandings and values in their environment, are imprisoned in an urban wilderness they cannot make sense of or navigate safely. This vision of captivity in a degraded and degrading urban environment persists in African-American thought and plays a central role in the environmental justice movement.

If the city is a wilderness in need of regeneration through creative articulation of its materials by its black inhabitants, what of the traditional wilderness? Du Bois offers an incisive comment on the wilderness preservation movement in his essay, "Of Beauty and Death," from the 1920 collection *Darkwater*: When asked by his friends why he doesn't seek relief from racial oppression by escaping to wild and beautiful places like Acadia (one of the first national parks), he answers, "Did you ever see a 'Jim Crow' waiting room?" (p. 229). Segregation and racism have limited African Americans' opportunities to enjoy the American wilderness. Thus Du Bois, like most African-American theorists, does not conceptualize wilderness as a place of unmediated contact with nature; on the contrary, contact with nature is always mediated by social structures and practices.

But this is not to suggest that the concept of wilderness plays no role in African-American environmental thought. For African-American writers, the concept of wilderness is usually associated with Africa rather than the American West. Throughout the nineteenth century, black leaders such as Martin Delany, Edward Blyden, and Alexander Crummell urged black Americans to colonize the African wilderness. They described this project not as a return to the innocence of a primeval garden but as an attempt to regenerate a landscape degraded by centuries of oppression—and in the process to reclaim African Americans' own heritage and identity. It was a communal project, an expression of group solidarity rather than rugged individualism. For African-American theorists, a historical connection to the group's aboriginal wilderness, preserved in the group's collective memory, could serve as a source of inspiration, identity, and sense of obligation to the land. This concept of wilderness as a source of cultural creativity, a fatherland to which the artist must return (at least in memory) in order to unlock her own creative power, remains an important part of the black intellectual heritage.

In sum, the African-American tradition of environmental thought offers a distinctive perspective on environmental problems and the relationship between humans and the natural world. We can see its influence in the rhetoric of the environmental justice movement: Sociologist Robert Bullard's seminal work, *Dumping in Dixie* (2000), echoes Douglass in claiming that there is a direct link between exploitation of the land and the exploitation

of people, and that environmental activism must include efforts to rectify race relations. Indeed, environmental activism itself can be a means of liberating and empowering the oppressed. As activist Carl Anthony explains in his essay "Reflections on the Purposes and Meanings of African American Environmental History," "The knowledge of the earth, and of our place in its long evolution, can give us a sense of identity and belonging that can act as a corrective to the hubris and pride that have been weapons of our oppressors" (2006, p. 203). This tradition thus links environmental stewardship, social justice, and political activism in its conceptualization of our "common struggle": to create a "fitting home for humans" in a land cursed by injustice (Anthony 2006, p. 209).

SEE ALSO *Environmental Justice; Environmental Law; Romanticism; Stewardship; Urban Environments; Wilderness.*

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AGENDA 21

SEE *Earth Summit.*

AGRARIANISM

Agrarianism is a nonsystematic philosophy that claims variously that a sense of nurturing stewardship, deep understandings of place and labor, virtuous character developed through rooted communities, and even a spiritual relationship to nature and cosmos are normatively significant features of the practice of nonindustrialized agriculture, and perhaps even unique to agriculture. In positive terms, agrarianism maintains that farming is a virtuous human activity that provides for a special vantage point on the natural environment and the well-being of both individuals and communities. Agrarianism is a general temperament more than a fully theoretical perspective, although some agrarian writers attempt to synthesize a number of important themes. The nonsystematic character of agrarianism may be an inherent by-product of both its emphasis on historical and local experience and the fact that agrarian views are often appendages to other philosophical claims. One thing all versions of agrarianism share, however, is a conception of the land as much more than a material resource.

Only a few contemporary works attempt to develop a philosophically rigorous understanding of agrarianism (the essential philosophical survey is Montmarquet 1989; see also Thompson 1994 for an agrarian ethics; and the essays in Thompson and Hilde 2000 for a study of the relation between agrarianism and the American philosophical tradition of pragmatism). Agrarian literature, however, is broad and varied and agrarian themes often only implicit. This literature extends from the ancient Greeks and Romans (e.g., Hesiod, Xenophon, Aristotle, Cato the Elder, and Virgil) through the modern philosophers and writers (e.g., John Locke, David Hume, Georges-Louis Leclerc de Buffon, Benjamin Franklin, Thomas Jefferson, François Quesnay, Jean-Jacques Rousseau, and J. Hector St. John de Crèvecoeur), and twentieth-century groups (the Country Life Movement, and the Vanderbilt agrarians), to contemporary writers such as Wendell Berry and Barbara Kingsolver. Themes running through these works include the nobility of farming, the nature of labor and property rights, yeomanry and the family farm, political and economic rebellion, pastoralism, democratic community, nationalism and exceptionalism, the "spirit of the soil," and the relation between scientific progress and tradition.

Agriculture itself is the primordial organized technological relationship between human beings and the natural environment. Through this relationship, human beings eventually transcended wild nature and came to exert some control over their own fate as a species and ultimately over their environment. Furthermore, agriculture literally rooted people to particular places and societies. Over human history, agricultural practice developed deep

cultural roots at the intersection of human labor and wild nature. The land and the activity of farming became a fund of cultural metaphors, spirituality, basic political concepts, ethical and social norms and values, and aesthetic appreciation, as much as a source of food. Agrarians view the history of working on the land in particular places as an evolving, experimental understanding of nature and natural processes and cycles as well as a locus of human values, traditions, and community. Since the Industrial Revolution, agrarians have often extolled the virtues of a rich culture of small farming and bemoaned its gradual erosion by modern forms of agricultural production. In a modern age in which the primordial agricultural exit from the hunter-gatherer life in wild nature is often presumed to be a fully ontological distinction (culture/nature), agrarianism has come to represent a philosophical attitude that is critical of the cultural and environmental losses sustained by industrial economic progress and its valuation of the natural environment as purely instrumental. It is thus easy to see why agrarianism is sometimes a form of romanticism, perhaps culminating in the antimodernism of the Vanderbilt agrarians' *I'll Take My Stand* collection (Ransom et al. 1930). Cultural agrarianism is in many ways based on at least implicit recognition of loss of the practical life and social bonds of agrarian community and stewardship. Today, agrarianism retains its critique of industrial production and resource use, but this critique has gained greater variety and urgency in a context of widespread environmental, social, and health problems. Three agrarian themes are of particular, although not exclusive, interest for contemporary environmental thought: virtuous character, community, and environmental stewardship.

CHARACTER AND VIRTUE

Much of the earliest agrarian works emphasized the development of masculine virtues through working on the land, a theme continued in the work of Victor Davis Hanson (1995). Xenophon's version of Socrates and the Roman statesman Cato believed the farmer made for a good soldier, partially because of the physical prowess of the farmer, but partially also because the farmer would seek most ardently to defend his own land from invaders. Later agrarian writers emphasized an analogy between the farmer and God's work as the original husbandryman, suggesting a spiritual, if not divine, relation between arduous work and the land in which abundant harvests reveal God's blessings (see Miller 1956; see also Charles Taliaferro's chapter in Thompson and Hilde 2000). Henry David Thoreau extolled the "poetic farmer" who united both material labor and a respect for spiritual nature. Thoreau maintained, however, that virtues had to be cultivated and nurtured as much as the famous bean field of *Walden*. For Wendell Berry, the farmer explicitly takes on the role of the naturalist.

In *Notes on the State of Virginia*, Thomas Jefferson maintained that "corruption of morals in the mass of cultivators is a phenomenon of which no age or nation has furnished an example." Agrarians commonly suggest that certain individual character traits result from the practice of farming. These traits include discipline, self-reliance, prudence, industriousness, patience, humility, and cooperativeness, and are elevated to the status of virtues. As such, the heart of agrarianism as an ethics may be viewed as a virtue ethics, focusing on the habits of character that produce virtuous persons.

Agrarian virtues, however, have often been intertwined with received notions of class divisions and exploitation, with some exalting the aristocratic nobility of the propertied farmer (see Montmarquet 1989). Furthermore, emphasis on personal virtues gained through farming often overlooks historical problems of severe poverty, lack of education, and unjust social roles in agricultural life. New agrarians such as Eric Freyfogle thus raise the challenge of articulating a contemporary agrarianism that can nurture important individual virtues while encouraging agrarian families, healthy communities, and economies not based on unfair social arrangements (2001). The development of virtues in individuals is, of course, a function of the health of contexts in which they may flourish. Today, a composite vision of the values and virtues of the environmental steward and the social importance of rebuilding communities motivates many new developments of post-industrial farming.

COMMUNITY

Agriculture, in contrast with commercial trade, is a practice that is necessarily bound to specific places. Traditional agrarianism has centered on the economic, social, and political dimensions of small farms, often revolving around conceptions of property ownership. Locke's labor theory of value contributed a core concept to this version of agrarianism: The adaptation of the land through labor created new forms of value and was the very source of private property. The Physiocrats of the eighteenth century, especially Quesnay, took this further and argued that only agriculture produced new value not already located in nature for the taking (through mining, for example), nor possible in commerce. Berry makes a similar distinction: that agriculture is *reproductive*, not merely *productive* (1977). For Quesnay, the fertile soil generated new wealth, while the broader economy only circulated it (see Montmarquet 2000, pp. 46–50). The Physiocrats focused on how to maximize and manage such wealth. Rhetoric about the magical nature of fertile soil, however, has two facets: The unique land has been a powerful source of cultural symbols and national

identity, but it can also become a predominant feature in nationalistic and racist elements of political culture.

There are other articulations of agrarian communitarianism not centered solely on the creation and management of property. Jefferson commented on the economy of agricultural life and small land ownership as a means of securing greater democratic community and equality in the early United States (Jefferson 1984). A. Whitney Griswold likewise focuses on farming's importance to democracy (Griswold 1948).

The most influential contemporary agrarian, Berry develops a rich critique of modern society, environmental devastation, the dissolution of community through the "predation" of modern economic ideology and "internal disaffection," and the concomitant loss of virtues associated with small farming. Earlier echoes of this loss are found in Oliver Goldsmith's 1770 poem (and evocative image), *The Deserted Village*. Berry writes that, "food is a cultural product; it cannot be produced by technology alone" (1977, p. 43). The basic community for Berry is the family and farm neighbors, a community that survives through the production and reproduction of not only food but the historical continuity of shared practices and narratives. The healthy community resides at the intersection of virtuous beings and good environmental stewardship.

AGRARIAN ENVIRONMENTAL STEWARDSHIP

People must eat. Making use of the land through agriculture is thus a basic necessity. Agrarians seek to harmonize human productive practices on the land. They lean away from environmental concerns about the intrinsic or instrumental value of nature or ecocentrism and anthropocentrism. Agriculture is a necessary practice involving the human use of land and resources. Whether through the lens of self-interest or appreciation of a parcel of land's intrinsic properties, the farmer must understand the long-term effects of any given practice on the land for the sake of both the farmer's livelihood and the health of the land. Means and ends are intertwined in environmentalist agrarianism.

Aldo Leopold maintained that management of healthy land is a function of preserving the integrity, stability, and beauty of the ecosystem (1949). To "think like a mountain," in Leopold's evocative phrase, is to recognize the land as an interconnected biotic community in which the balance of an ecosystem can be broken by unreflective human activity that considers the environment only in terms of short-term scales of economic production rather than the long-term scales of ecosystem health and reproduction.

A similar holistic sense of the land runs throughout Berry's agrarian writings. Berry and Wes Jackson (1985) articulate the idea that small farms are ultimately more sustainable in environmental and communitarian terms. Both have emphasized what they consider the destructive effects of specialization in agricultural and social sciences in which an ecosystemic and interdependent understanding of nature and community is replaced by isolated scientific languages. There are, of course, better or worse farm techniques. Overuse of pesticides, monocultural planting, and tilling practices that deteriorate the soil have costs that outweigh any benefits. Proper environmental stewardship explores new techniques of farming consistent with the well-being of the land. Only a holistic understanding of the land, however, can improve knowledge of its management.

THE FUTURE OF AGRARIANISM

As long as agriculture is practiced, agrarianism will likely survive in some form, even if solely as an idealized critical stance on modern food production practices. Most people today are very distant in space and understanding from the sources of their food. Furthermore, food production systems no longer depend exclusively on even the heavily industrialized large farm. It is conceivable today that all food could eventually be produced in biotechnology laboratories. The future of agrarianism depends on society choosing at least sometimes not to develop and implement technologies based solely on considerations of productivity or efficiency or free markets.

This future looks unlikely at present but has intellectual resources in agrarian thought. Agrarian values appear today in a number of different practices: community-supported organic agriculture, urban gardens to individual efforts, "return to the land," the reappearance of "heirloom" varieties of fruit and vegetables, sophisticated restoration projects such as Jackson's Land Institute in Salina, Kansas, and social and political thought that focuses on the moral significance of the small community.

Even if the economic and material conditions for the family farm and agrarian thought to flourish are disappearing, agrarianism may yet make its greatest contribution to environmental thought indirectly. As Paul Thompson writes, "a virtuous community produces virtuous citizens vicariously, even when it does not actually exist. Its moral importance extends far beyond its borders in space and time" (in Lockeretz 1997, p. 27). Whence derive agrarian virtues today? They derive from an idealized, critical example of the farmer as the environmental steward, understanding the limiting resistance of nature to human endeavor, working with the reproductive cycles and longer time-scales of natural processes, and living interdependently with ecosystems as well as the endeavors of other people. This ideal farmer thinks like a mountain.

SEE ALSO *Agriculture; Berry, Wendell; Communitarianism; Farms; Jackson, Wes; Land Ethic; Leopold, Aldo; Stewardship; Thoreau, Henry David; Virtue Ethics.*

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Thomas C. Hilde

AGRICULTURAL ETHICS

Agricultural ethics is concerned with the values and moral issues involved in food production and farming practices. It explores a wide range of issues, including the proper use of land, the value of rural life, the impact of agriculture on the environment, the sustainability of agricultural systems, the well-being of farmers, the welfare of farm animals, the improvement of crops, and the safety and integrity of the food supply. By the turn of the twenty-first century this range of issues had taken on added urgency because of advanced technological manipulations such as genetic engineering of plants and animals and animal cloning.

THE DEVELOPMENT OF AGRICULTURAL ETHICS AS A SUBFIELD OF PHILOSOPHY

Although agricultural ethics did not become a distinct academic discipline until the 1980s, its concerns extend back as far as ancient works such as the *Oeconomicus* of Xenophon and the Bible, with its attention to the stewardship of the earth's resources. The virtues of rural life figure prominently in the works of prominent European and American intellectuals of the eighteenth and nineteenth centuries such as Leo Tolstoy, Thomas Jefferson, and Ralph Waldo Emerson. Scholars trace the contemporary debate on agricultural values to the pioneering works of twentieth-century agricultural scientists, novelists, and intellectuals such as Liberty Hyde Bailey, Richard M. Weaver, Wendell Berry, Louis Bromfield, and Glenn Johnson.

The growing interest in the ethical aspects of agriculture led to the introduction of courses, curricula, and programs in agricultural ethics in a number of U.S. universities and research centers during 1980s and the 1990s. Subsequently, topics in agricultural ethics were incorporated into the curriculum of life-sciences programs across United States and Europe. The evolution of agricultural ethics into a full-fledged academic discipline in the field of philosophy is linked to the contributions of international scholars such as Ben Mepham of the United Kingdom; Bernard Rollin, Paul Thompson, Jeffrey Burkhardt, and Gary Comstock of the United States; Michiel Korthals of the Netherlands; and Peter Sandøe of Denmark.

Agricultural ethics is a growing interdisciplinary area within applied ethics. It draws scholars from diverse backgrounds such as philosophy, sociology, political science, agronomy, animal science, ecology, biotechnology, and science and technology studies. The discipline has developed specialized periodicals such as the *Agriculture and Human Values* and the *Journal of Agricultural and Environmental Values* along with growing professional societies such as the Agriculture, Food and Human

Values Society (AFHVS) and the European Society of Agricultural and Food Ethics (EurSAFE).

AGRICULTURE, ENVIRONMENTAL PHILOSOPHY, AND ETHICS

Agriculture is one of the oldest and most fundamental ways in which human beings interact with the environment. It involves the cultivation of land, crops, and animals for food production; these activities cause profound and irreversible changes in humans' natural surroundings and often lead to the destruction of ecosystems. Therein lies the apparent conflict between agriculture and environmental concern: The need to produce more food to meet the demands of an increasing human population requires the expansion of farmland and the modification of crops and animals to better meet human needs. Farmland growth means less land for wild plants and animals. Modifying crops and animals often decreases genetic diversity, thereby resulting in a lower quality of life for the animals. Intensive farming expends large amounts of energy, erodes the soil, and pollutes the waters with eroded sediments, fertilizers, and pesticides containing toxic chemicals. Agricultural practices have therefore come under scrutiny by those concerned with environmental ethics and the preservation of nature.

Modern agricultural practices are responsible for numerous environmental crises worldwide—deforestation, desertification, destruction of wetlands, the salinization and siltation of rivers—and for such industrial disasters as the release of toxic gas in Bhopal, India, and the drying of Aral Sea. On a general philosophical level agriculture and environmental concerns seem counterposed: Whereas the former is driven by human-centered concerns (providing sufficient quantity and variety of food for human consumption, securing the livelihood of farmers, and preserving the rural way of life), the latter emphasize the well-being of the natural environment, nonhuman animals, ecosystems, and nature as a whole. In some respects the goals of agriculture and environmentalism overlap because the success of agriculture depends on the functional integrity and stability of earth's biosphere. Hence striking a balance between human needs and ecosystem health is a shared goal of both environmentalism and agriculture.

CONTROVERSIES IN AGRICULTURAL ETHICS

Agricultural practices are complex, and their parts are interrelated, so they cannot be understood or debated in isolation. In tackling complex problems, agricultural ethics draws on three distinct sources: (1) the classical ethical theories of utilitarianism, deontology (the theory or study of moral obligation), virtue ethics, and contractarianism; (2) the newly emergent subfields of ethics such as environmental ethics, animal and research ethics, food ethics, and biotechnology ethics; and (3) the ethical tools developed expressly for application to agricultural ethics, such as the ethical matrix devised by Mepham (2000) to guide ethical evaluation in agriculture by considering its major components: the biota (flora and fauna), producers, consumers, and the treated organisms. Three representative issues in the ethics of agriculture—the family farm, farm-animal welfare, and genetically modified foods—exemplify the complexity of agricultural practices and the moral and theoretical issues they raise.

The Family Farm Some of the most persistent debates in agricultural ethics and policy concern the preservation and value of the family farm. Traditionally the small family-run farm has been the central unit of rural life and agricultural production. This unit has undergone a precipitous decline because of the combined impacts of industrialization and agriculture (Burkhardt 2000, Zimdahl 2006). Some liken the disappearance of the family farm to the waning of other technically superseded forms of production and livelihood such as blacksmithing; in this view the consolidation of farms into large corporate entities is a byproduct of an inexorable march of economic, social, and technological forces. From this perspective there is no ethical obligation to protect or preserve the family farm because of its supposed lack of economic efficiency. This narrowly economic view of the endangered family farm is rejected by a school of agricultural ethicists called agrarians, who argue that family farms have important socioeconomic, cultural, political and/or moral value that is irreducible. Because of those considerations, they argue, there is a moral obligation to protect and preserve small artisan farms.

Agrarianism is divisible into two distinct types: populist and traditionalist. Each offers a distinct vision of the significance of the family farm and a corresponding set of arguments for its protection (Thompson at al. 1994). Agrarian populism—as articulated by Thomas Jefferson and, in the twentieth century, by Harold Breimeyer and Jim Hightower—stresses the importance of the family farm to the social and political well-being of society. Jefferson praised the value of the farmer as a citizen whose ties to the land guarantee social stability because his or her private interest is linked to the prosperity of society. Breimeyer argues that small farms are viable and important social institutions because they guarantee the right of poorer and less educated people to self-employment and economic independence, thereby contributing to individual freedom and political liberty. Hightower views the small farmer as an independent entrepreneur whose interests must be protected by the government as a matter of social justice. The agrarian traditionalism

articulated by Wendell Berry emphasizes the intrinsic value of the small farm and the agrarian way of life. Berry offers virtue-based arguments in defense of the family farm. He argues that farming develops a sense of unity with nature, shared community values, loyalty and responsibility within the family, and care and concern for the land. These qualities, he holds, are valuable for their own sake: They give a holistic meaning to life and act as an antidote to the alienation inherent in specialized activities such as intensive farming and manufacturing. For agrarian traditionalists, then, the family farm becomes "a metaphor for the good life, ethically conceived, rather than a profession or an occupation" (Burkhardt 2000, p. 13).

Traditionalist arguments about the intrinsic value of the family farm, with their ethical imperatives to preserve and sustain it as a way of life, provide a yardstick for evaluating moral issues in agriculture such as social justice, the impact of industrialization and biotechnology on agricultural practices, the environmental effects of agriculture, and responsibilities to the future generations (Burkhardt 2000). Champions of family farming argue that it fosters a concern for the land and a willingness to forgo short-term gains in order to preserve the land for future generations. This approach stands in contrast to industrialized agriculture, with its emphasis on productive efficiency; its intensive use of energy, water, and synthetic chemicals; and its contribution to erosion, the depletion soil fertility, and other adverse environmental effects. Because of those problems, the family farm has gained additional support from environmentalists, who see in that way of life an example of a sustainable relationship with the land that respects the needs of the environment and the interests of future generations.

Farm-Animal Welfare The development of industrialized agriculture in the twentieth century resulted in the transformation of animal agriculture from extensive, decentralized pasturing and cooping to intensive, concentrated factory farming. Whereas traditional, extensive farming relied on fewer animals that could move freely in large spaces and received individual care and attention, intensive farming involves the confinement of very large numbers of animals in very small spaces and barren environments, with the emphasis on economic efficiency, low cost, and high productivity. The care and handling of animals is highly mechanized and entrusted to a small number of unskilled workers. The change from extensive to intensive farming has transformed the human-animal relations, adversely affecting both animals and the environment. The introduction of cloning and genetic engineering has added more fuel to the fires of controversy surrounding industrial agriculture.

Confinement operations often restrict animals to isolated, small stalls or cages, making it impossible for them to move, turn around, scratch, or stretch their legs. In addition to physical discomfort, this enclosure leads to psychological and social deprivation that results in aggressive and self-destructive behavior patterns (e.g., bar biting in sows, tail biting in pigs, feather pecking in hens) and production diseases (e.g., liver abscesses in cattle) that foster the widespread use of antibiotics and vaccines. Branding and castration without anesthesia, dehorning and tail-docking of cattle, the confinement of sows into very small stalls, debeaking, toe trimming, forced molting of hens, and hormone injections are other ethically controversial practices associated with factory farming (Rollin 1995a).

In traditional extensive (as opposed to intensive) farming, there is an overlap in the interests of human and beast: The well-being of the farmer depends on the productivity and health of fewer animals, each of which has a high monetary value. This circumstance encourages humane husbandry that provides animals with a stress-free environment; adequate food, water, and shelter, and individual medical care as needed. In contrast, the structure and goals of industrial farming create a conflict between the interests of the farmer and the good of the animals. Intensive farming is an economy of scale. In the drive for profit maximization and efficiency, the care of animals is transferred to machines or low-paid workers without adequate knowledge and experience. Rollin (2006) notes that, from a purely economic point of view, it may be more efficient to kill a sick animal or let it suffer rather than spend time, money, and labor on veterinary care. Factory-farm animals, he argues, are objectified and treated as things whose only value is in the profit derived from satisfying humans' food needs. This cold economic calculus contrasts sharply with the humane techniques and goals of traditional husbandry and farming. As Roger Scruton (1996) observes, a major casualty of industrialized farming is the quality of the relation between the farmer and his animals.

Factory farming uses large amounts of natural resources (fossil fuel, water) and generates huge amounts of solid and liquid animal waste that contaminates the soil and groundwater, and gaseous waste that pollutes the air and contributes to global climate change and acid rain. Two proposed solutions to the environmental toll of intensive farming are organic livestock farming and the genetic modification of animals to reduce their environmental impact. Each alternative, however, generates further dilemmas. Organic livestock production is a form of extensive farming. It improves animal welfare but cannot eliminate the animal-waste problem; moreover, because it is less productive, organic farming cannot satisfy the nutritional needs of a growing world population. From

an environmental perspective, the genetic modification of farm animals may be a better solution, but it raises concerns about the welfare and integrity of the animals and about human safety.

Which of the competing interests—human, animal, or environmental—ought to take priority? Can the amount of animal suffering in industrial farming be morally justified by appeals to human needs and interests? Can these seemingly conflicting interests be harmonized for the benefit of all? The need to answer such pressing questions led to the development of farm-animal ethics as a subfield of agricultural ethics. Farm-animal ethics emerged as a response to the growing public awareness of the suffering of farm animals in the 1970s and 1980s, the expansion of the scope of traditional ethics to include nonhuman entities such as animals (most notably in the works of Peter Singer, Tom Regan, and S. R. L. Clark) and the environment (most notably in the writings of Aldo Leopold and Holmes Rolston III). The recognition of animals as subjects of moral standing led to greater recognition of the suffering of farm animals and to efforts to formulate an ethic of livestock production, most notably in the works of Bernard Rollin (1995) in the United States and Peter Sandøe (1999) and Michiel Korthals (2004) in Europe.

There are five distinct ethical approaches to the issue of reconciling the welfare of farm animals with the needs of humans and the protection of the environment (Korthals 2004). The most radical among them is the abolitionist approach based on Regan's animal rights view. In this view animals have intrinsic value because they are subjects of a life. Regan argues against the use of animals as mere means to human ends. He rejects commercial agriculture, animal experimentation, and hunting as irredeemably immoral. He leaves it unclear, however, what should be done with the already domesticated animals that depend on humans for their existence.

The animal-integrity approach is grounded in Holmes Rolston's view of species integrity, which appeals to the genetic integrity of animals as a basis for moral evaluation. It prohibits any manipulations or destruction of the genetic code of animals, thus condemning genetic engineering and certain kinds of breeding. This view, however, does not address welfare issues from the perspective of the individual animal. Rolston also ascribes intrinsic value to entire ecosystems. He criticizes the animal-liberation view and allows for animal agriculture as long as it does not encroach upon the environment. Rolston, however, fails to specify the criteria for defining an ecosystem and offers little help in resolving dilemmas raised by animal agriculture.

The animal-welfare view is perhaps the most influential and widely accepted approach to farm-animal ethics. It has been advanced by Rollin and Sandøe (1999), whose leading concern is the welfare of the individual animal. In this view humans have a moral obligation to maintain and promote the welfare of farm animals by taking into consideration their needs and subjective experiences and their ability to express their natural patterns of behavior. These philosophers call for improving the living conditions of farm animals and for "conservation of welfare" (Rollin, 1995b). They hold that animal agriculture and biotechnology (e.g., genetic engineering and cloning) are morally acceptable as long as they do not undermine animal welfare.

Korthals has proposed a pragmatist approach to animal welfare. Drawing on the ideas of the American pragmatist John Dewey, Korthals complements Rollin's welfare view with considerations of the environmental and social aspects of animal care. Korthals calls for "differentiated treatment of animals, such that their specific function is considered, with proper partitions as it were being placed between farm animals, semi-wild animals, and pets" (Korthals 2004, p. 93). Korthals recommends broader and tighter regulations of animal welfare and further research into optimal farming techniques and possible limits on meat consumption.

In response to the growing concerns about the welfare of farm animals, governments and professional organizations across Europe and the United States have enacted regulations to change farming practices, prevent animal cruelty, and improve the welfare of farm animals. Most prominent among them are the Brambell Commission of 1965, the Five Freedoms formulated by the Farm Animal Welfare Council in 1979 in the U.K., the Swedish law of 1988 abolishing confinement operations, a series of European Conventions for the Protection of Animals issued by the Council of Europe and ratified by the member states, and the European Union (EU) legislation on farm animal welfare.

Genetically Modified Foods The introduction of genetically modified (GM) foods has triggered heated debates over issues of safety and environmental impact. GM foods are derived from microbes, plants, or animals produced through genetic engineering. The process involves the artificial manipulation of the genes of an organism or the transfer of foreign genes into its DNA. The resultant GM foods contain genes that do not exist in nature and have new qualities that are unlikely to develop otherwise. The main goal of GM foods is to alleviate world hunger and make agriculture more economically efficient and/or environmentally friendly by achieving improved crop and animal yields; increased resistance to pests, diseases, and herbicides, thereby reducing the use of chemicals; and improved nutrition, shelf life, and palatability of food (Mepham 2000).

The crops that are most commonly subject to genetic modification are soybeans, canola, corn, cotton, tomatoes, and rape seeds, and the traits most commonly introduced are herbicide and pesticide resistance. The world's largest producer of engineered crops is the United States, where more than 80 percent of soybeans and cotton are genetically modified and more than 70 percent of all foods on the market are GM foods. The amount of land used for modified crops has also been growing rapidly worldwide (ISAAA Brief 37-2007).

The production and sale of GM foods raise an array of ethical questions with far-reaching moral, social, and policy implications: Are GM foods safe? What will be their effect on environment? How might GM foods affect farmers in the local and global economy? What are the responsibilities of food manufacturers, distributors, consumers and society regarding GM foods?

Thompson divides the various moral issues raised by GM foods into substantive and procedural concerns. The substantive concerns are based on moral, religious, cultural or philosophical beliefs held by individuals or groups. The procedural concerns pertain to the policies and mechanisms for making food choices in society. On the procedural level there is a growing consensus among ethicists that, in a democratic society, substantive concerns regarding GM foods ought to be taken seriously in policy making and food practices regardless of their scientific merit if the substantive beliefs are based on reasonable cultural, religious, or moral beliefs. Respect for substantive belief is grounded in the principle of consumer sovereignty, according to which individuals should be able to make food choices based on their own beliefs and values (Thompson 1997). In this view consumers must be informed about the origin of their food to exercise their choice, but there are divergent views as to the best way to deliver the information. Some believe that the best way to facilitate consumer choice is by mandatory labeling of GM foods, which is the policy of EU. Others claim that it is better to label non-GM foods because this would be more practical and will provide equivalent information. Yet others argue that there is no moral obligation requiring producers to label GM foods, and some question the efficiency of food labels in enhancing personal autonomy.

The substantive arguments for and against GM foods can be divided into extrinsic and intrinsic concerns (Comstock 2000). Extrinsic concerns focus on the effects of GM foods, especially their safety and environmental and social impacts. Intrinsic concerns, which are grounded in principles of respect and duty, question the very process by which GM foods are produced. Those who argue against GM foods on extrinsic grounds note that their safety has not been sufficiently established. These critics point to potential allergens in GM foods, the possibility that newly created proteins may be toxic, and the risks of increased antibiotic resistance (Hopkins 2001). They also charge that GM foods pose environmental risks, such as contamination of conventional crops, the spawning of superweeds, and wiping out of innocent species such as the Monarch butterfly (Brown 2001). The proponents of GM foods counter that they are safe because they undergo rigorous testing and that no adverse health effects have been reported. The proponents claim that there is no significant difference between conventional food and GM food and that mandatory labeling is therefore unneeded. Supporters of GM foods also point to their potential in alleviating world hunger, reducing pesticide use, and promoting environmentally friendly farming.

The extrinsic objections to GM foods are contingent rather than principled. Such objections can be met by perfecting the technology for GM foods, enforcing strict safety regulations, and conclusively demonstrating that their benefits outweigh the risks. The more challenging task is to judge the moral status of GM foods without appealing to unsettled empirical claims. Would there be anything morally objectionable about GM foods even if they were proved to be safe and beneficial? Such questions lead to the intrinsic issues surrounding GM foods. Most intrinsic objections invoke the unnaturalness of GM foods; they are viewed as a sign of human arrogance and disrespect for nature. Other intrinsic critics claim that the technology is morally objectionable because it violates species boundaries and integrity. Apologists for GM foods claim that all such objections are based on religious, not scientific, principles and thus have no place in public policy. The intrinsic critics counter that the processes of Darwinian evolution have produced a wide array of species, each with its own integrity and specific boundaries. Other critics claim that GM foods represent a threat to the integrity of traditional ways of life and farming (Pascalev 2003). The policy debates about GM foods reflect broader ethical and philosophical differences about the role of technology in society, individual and social tolerance for risk, the value of nature, and the meaning of food.

CONCLUSION

Despite its young age, agricultural ethics has established itself as an important area of ethical inquiry that draws the attention of academics, policy makers, farmers and concerned citizens alike and serves as an exemplar of modern interdisciplinary discourse. It has successfully identified pressing moral issues in the practices of food production and has developed the level of awareness and the conceptual and theoretical tools for formulating ethically sound solutions to the problems it identifies. It is

safe to predict that in the years to come, agricultural ethics will enjoy even greater attention and impact on policy making and agricultural practices due to the growing import of agriculture in light of climate change and continued population growth. The rapid development of biotechnology and the need for ongoing ethical assessment of its applications will also contribute to the growing relevance of agricultural ethics to human practice. Concerns about world hunger, the impact of agriculture on nature and on the interests of future generations, developing environmentally friendly agricultural practices, the place of organic farming and alternative production modes will be among the issues of the day. The main challenge for agricultural ethics and its main contribution would be to find solutions that are practical while also withstanding philosophical scrutiny, and to build a broad consensus around them among all stakeholders.

SEE ALSO *Agriculture; Berry, Wendell; Factory Farms; Food Safety; Genetically Modified Organisms and Biotechnology; Hunger; Leopold, Aldo; Organic Farming; Pesticides; Regan, Tom; Rolston III, Holmes; Singer, Peter; Sustainable Agriculture.*

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Assya Pascalev

AGRICULTURE

Agricultural practices have a major impact on the natural environment. How these practices should best be carried out is a major concern of environmental ethics and of agricultural ethics. The word *agriculture,* like *medicine,* refers to a group of technologies or techniques that humans have developed for sustaining life. An agricultural system consists of a cultivated environment and a group of socially and economically related production units, or farms. Agricultural systems encompass diverse methods of cultivation and socioeconomic organization. One common feature of successful agricultures is the continuous renewal of their constituent elements. Thus, soils are renewed through natural events or human practices that restore the physical structure (or tilth) and nutrients critical to plant and microbial life. Plants and animals are renewed in giving rise to progeny and in maintaining a diverse gene pool that allows for flexible responses to variations in weather and climate. Human institutions are also renewed so that, in classic agricultural systems, many generations of farmers engage in stable social and exchange relationships.

THE EVOLUTION OF AGRICULTURAL TECHNIQUES

One of the first stable agricultural systems was swidden or "slash-and-burn" agriculture. In this system cultivators cut down and burn trees and other foliage, producing a very rich but temporary soil for cultivation of plants. These patches can be cultivated for three to five years before they must be abandoned to the forest to allow for renewal of soils, which may take more than fifteen years. Although sustainable when human populations are low,

Paddy Fields near Yangshou, China. *A farmer in China utilizes an old-fashioned plow, pulled by an ox, in China's Guangxi province. Modern agricultural practices, such as biotechnology, raise many ethical concerns, especially concerning the environment.* **PETER PARKS/AFP/GETTY IMAGES.**

swidden agriculture is not suitable for expanding populations, which require faster soil-recovery periods. Hence slash-and-burn farming is unsustainable in most parts of the contemporary world.

Swidden systems were succeeded in most parts of the world by systems that restore fertility—either by frequent flooding, as in the Nile Valley of Egypt, or by combining various forms of animal production with cultivation of crops. Systems that emerged in Europe approximately 1,000 years ago used a cycle whereby crops such as wheat or barley would be cultivated in a rotation with long periods when fields would be left fallow so that animals could graze on grasses that were planted following the main food crop. Fallow periods often exceeded eighteen months, meaning that the rotation took a number of years to complete. Beginning in the 1500s this system was gradually replaced with the production of forage crops such as hay and oats, and manual redistribution of animal wastes to recover soil fertility. Only then did farming begin to resemble the annual cycle of cropping in stable fields with which we associate the word *agriculture* today.

AGRICULTURE, SCIENCE, AND EDUCATION

The conversion to forage crops and the elimination of fallow periods coincided with the growth of European science. In England, especially, the idea of science was widely associated with agricultural reformers such as Jethro Tull (1674–1741) and Arthur Young (1741–1820). By the nineteenth century the German chemist Justus von Leibig (1803–1873) was laying the foundations for yet another agricultural revolution: the use of synthetic fertilizers and scientifically developed plant and animal varieties. Cyrus McCormick (1809–1884) was perfecting a horse-drawn mechanical harvester. In the twentieth century these technologies became commonplace, along with steam, gasoline, and diesel-powered tractors and mechanized equipment.

Viewed from a governmental or scientific perspective, agriculture encompasses a wide array of renewable-resource production activities, including fisheries or aquaculture, forest management, and the production of managed outdoor recreational areas such as golf courses. Most national governments have a ministry or department of agriculture that is also responsible for these additional activities. Agricultural colleges (in the United States, land-grant colleges) also include departments and programs for wildlife and fisheries management, recreation and parks, and forestry. Their research, development, and extension agenda emphasizes increasing "production efficiency." Agricultural science has helped to reduce the number of farmers in the United States from 85 percent of the population to less than 5 percent while increasing the output of agricultural goods produced. This success caused the land grants to replace traditional

clientele (farmers) with new clientele. Many have changed their names from "The College of Agriculture" to "The College of Natural Resources and Life Sciences" to include concerns such as food and environmental safety, human health and nutrition, and conservation of resources.

Linkages between agricultural colleges and medical-research colleges have strengthened. Many agricultural disciplines now conduct research sponsored by the National Institutes of Health. These linkages also have ethical implications. For example, the notion of health presupposed by medical research remains unexamined, as does the notion of agriculture. The questions "What is agriculture?" and "What is health?" are important topics of investigation for bioethics, and the meaning of the term *ecosystem health* is an important issue for environmental ethics.

Critical reflection on agricultural practices in the United States came to the public's attention through books by Rachel Carson (1962), Jim Hightower (1979), and Wendell Berry (1977). These authors challenged the vision of agriculture promoted by public-sector science. Carson questioned the environmental impact of chemical farming. Hightower raised questions about the clientele of the land-grant complex that promoted this type of farming. Berry viewed modern agriculture as symptomatic of the fragmentation of modern culture, a trend that he believes is creating irresponsible specialists who are ignorant about the impact of their activities because they do not live where they work. These works have stimulated a growing body of "critical" and "ethical" literature questioning standard assumptions underlying "scientific agriculture" or "agribusiness" and the costs and benefits of agricultural research and farming practices for humans and the natural environment.

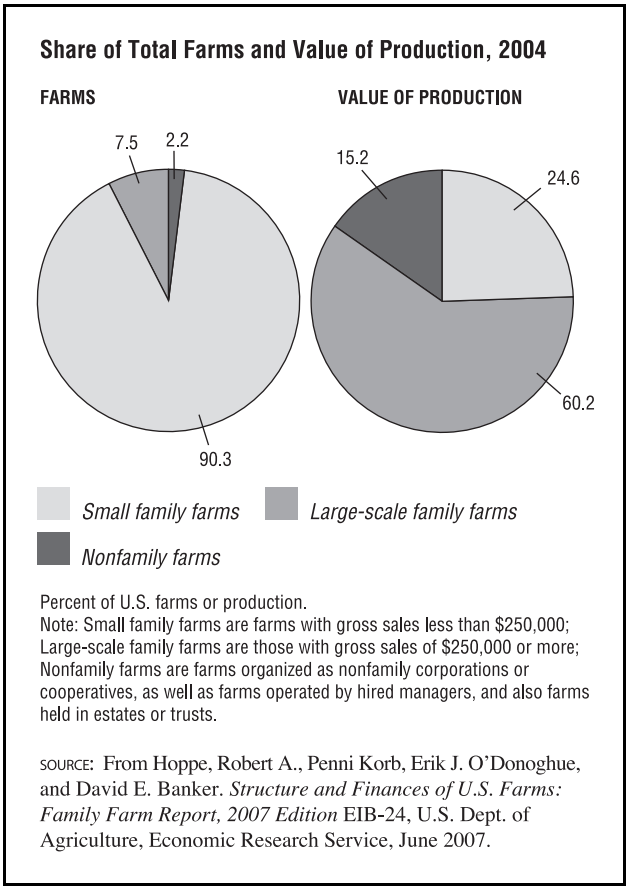

Figure 1. CENGAGE LEARNING, GALE.

THE MEANINGS OF AGRICULTURE

Ethical questions about the appropriate use of agricultural technologies are about the responsible use of power. Do technologies benefit their users and justify their costs? Are they efficient? Critics of the instrumental notion of agricultural technology raise other issues. What is the assumed end that agricultural technologies are designed to serve? Critics argue that there are other considerations besides increased productive efficiency, such as food quality, the way in which the costs and benefits of the production system are distributed among the population, and the impact of the system on the nonhuman environment. Regarding agriculture merely as a morally neutral instrument ignores other values. A more fundamental criticism focuses on the metaphysical status of the practice of agriculture.

Through the intensive management of natural systems, humans "re-create" nature, an idea that seems questionable. But only the more modern version of management by domination may be misguided. The idea of "man's dominion over nature" is symptomatic of patriarchy, which dominates the nonhuman environment, women, and other groups. But not all agricultural systems are equally dominating. Different conceptions of agriculture thus reflect different metaphysical or religious conceptions of the human condition and the human relationship to "creation," or nature. For Wendell Berry (1977) agriculture signifies the margin between wilderness and civilization—between nature and the products of human labor. The separation of agricultural production from other activities marks our loss of a sense of the natural and the ways in which human activities have changed it. Agriculture can be viewed as an experiment in the creation of new forms of the natural. Berry does not see scientific agriculture in this way because it does not perform experiments in creating new forms of nature and does not measure them against old forms. It merely seeks an increase in the human power to change nature.

Opposition to a "productionistic" conception of agriculture can be linked to an agrarian tradition that

values farming as a way of life and sees in it social and personal values that transcend its products (Montmarquet 1989). If agriculture allows farmers to have more fulfilling lives or to be more dependable citizens, if it creates the basis for more stable communities or allows its practitioners to experience a cooperative relationship with the natural world, as in organic farming, then technologies should be developed to help secure these practices, and government policies should increase the opportunities to engage in them. This is a different issue from whether the opportunity to benefit economically or nutritionally from agriculture is distributed equitably.

In addition to encompassing issues of who farms and how, agriculture now includes the industries that produce farming inputs (fertilizers, pesticides, farm machinery) and those that process and market farm commodities. It also includes policymaking, administration, government, research, and education. This expanded notion of agriculture broadens the area of agricultural ethics to include practices involved in business, science and technology, professions, the environment, and policy making.

THE QUESTION OF EQUITY: WHOM SHOULD AGRICULTURE SERVE AND HOW?

Who are the beneficiaries of conventional agriculture? Are its costs and benefits distributed equitably? Benefits in agriculture include access to goods produced on farms (food and fiber), the revenues derived from agricultural activities, and other, less tangible advantages such as status, pleasure, and virtue. Costs include loss of opportunities to practice agriculture or to have access to farm products, loss of nonagricultural resources (e.g., potable water), loss of wildlife habitat and other important features of the natural environment, and the unethical treatment of farm animals.

Carson's criticism of "chemical farming" is that it is harmful to the environment, a criticism acknowledged by the National Research Council's (NRC) report on alternative agriculture (NRC 1989). Industrial agriculture can have serious negative impacts on and beyond the sites of production. The scientific research agenda that supports these practices has not adequately included a study of these impacts and how to avoid them (Busch and Lacy 1983, NRC 1989). Negative effects include loss of soil fertility; contamination of ground waters by pesticides (these endanger wildlife and make the water unfit for human consumption) and by high levels of nitrates from fertilizer runoffs; excessive tapping of groundwater; destruction of wildlife habitats; and loss of genetic diversity. Agriculture is the largest source of nonpoint water pollution (NRC 1989.) Pesticides pose threats to on-farm safety, consumer safety, and wildlife (NRC 1989). Highly managed agricultural systems reduce genetic diversity and increase ecological vulnerability. Industrial agriculture has social costs that are external to the production system and that are borne unwillingly by those who pay for them (externalities) or who will pay for them later (future generations).

Hightower's criticism is that the research clientele of public-sector science has been highly capitalized producers. Access to conventional agriculture has been systematically denied to farmers with low access to capital, nonprogressive farmers, African Americans and other oppressed ethnic groups, and women. These groups have been excluded because U.S. policies have promoted productionism, encouraging producers to adopt expensive technologies that favor capital-rich early adopters. Others must either adopt or quit, creating "the treadmill effect" (Cochrane 1979). Producers who are more risk-averse or who do not have access to capital are thus at a strong disadvantage. Neither women nor African Americans have had access to capital to the degree that white males have. Women have also been excluded from farming and from the agricultural professions because of male biases against female participation in these fields. (In many third world countries, European and North American development agents ignore women, who constitute the majority of subsistence producers in many regions.) Those so excluded lose access to the goods they once produced for themselves or to the income needed to purchase goods produced by others. Many of the costs and benefits of industrial agriculture are not distributed equitably.

Public-sector research and development have contributed to these inequities by promoting capital-intensive technologies (Perkins 1982). These technologies have other costs: to consumers, to farm labor displaced by machinery (Friedland and Barton 1975), to the general public, to other producers who cannot stay on the treadmill, and to future generations. These technologies include farm machinery, inputs like soil amendments and pesticides, irrigation equipment, and new life forms. Nevertheless, public-sector agricultural science has begun to explore alternatives to the system that is used as a model for agricultural development around the globe because of the growing realization that transferring conventional technologies to low-resource producers does not enhance production. There is also an increasing awareness that older forms of agricultural knowledge can foster practices that are more sustainable ecologically. The exploration and critical evaluation of alternative models for agriculture is part of a growing body of literature on the concept of sustainable agricultural development.

SUSTAINABLE AGRICULTURAL DEVELOPMENT

Agricultural practices become unsustainable when they fail to meet the demands placed on them. Conventional agriculture has stretched the productivity of farming by importing materials from other locales and by introducing management techniques that substitute for in situ biological relationships. These practices require the use of nonrenewable resources, the supply of which has become inadequate to meet an increasing demand. Scarce resources include soil and water, petro-based chemicals (pesticides and fertilizers), and soil amendments (phosphate). Inadequate technologies include petroleum-dependent machinery, chemical pesticides, and monocropping. Genetic diversity—a potential resource for new plant varieties—is being threatened as well (NRC 1989)

The loss of topsoil through erosion is a major problem in many parts of the world (NRC 1989, Worster 1985). Hyams (1976) traces the rise and fall of civilizations to the need to shift production sites because of soil erosion. Jackson (1980) suggests as a remedy the adoption of perennial crops that do not depend on soil tillage, a primary cause of soil erosion. Jackson's recommendation is part of a wider movement to adopt more ecologically friendly practices.

Conventional agriculture's effect on water quality is another serious impediment to sustainability. Soil deposition, nutrient loading, and contamination by pesticides are major sources of water pollution. The excessive use of irrigation technology, which causes the serious depletion of aquifers in many areas, and the expanding competition for urban water sources raise doubts about the sustainability of current practices.

Contamination of water by pesticides poses threats to wildlife and humans. Pesticide use can be harmful to farmworkers. Residues pose risks to the safety of food (NCR 1989). Pesticide technology is rapidly becoming ineffective; insects develop resistance faster than new pesticides can be developed (Metcalf 1987). The use of antibiotics in animal feed is another concern. The emergence of antibiotic-resistant strains of bacteria caused by the use of antibiotics in animal feed may be a source of meat contamination (NRC 1989).

Many of the unsustainable features of conventional agriculture were introduced as replacements in systems

Harvesting Corn, Springfield, Illinois. *Industrial agriculture is a controversial practice in terms of environmental ethics. Critics of U.S. agricultural practices argue that such practices produce more harm than good; for example, by releasing chemicals and pesticides into the ecosystem, destroying wild habitats, and reducing genetic diversity. Some believe that the solution is to turn to more sustainable agricultural systems, such as the use of biotechnology.* **AP IMAGES.**

that had become underutilized. The replacement of one system with another is sometimes referred to as a "revolution" (e.g., the "green revolution") (Danbom 1979, Richards 1985, Pretty 1991, Merchant 1989) and sometimes as "development." The notion of "agricultural development" has its roots in the rationalization of European territorial expansion from the late fifteenth century to the end of World War I. Many regions of the world were considered underutilized. These regions became the source of raw materials for manufacturing and the location of new markets for European products. Many indigenous production systems were converted to plantation agriculture by colonizers. The imposed systems—mixes of the indigenous and the exogenous—soon became unsustainable and were replaced with more "progressive" forms of farming (Merchant 1989). After many of these European colonies achieved independence after World War II, "development" became synonymous with nation building, the creation of urban industrial centers, producing cheap food for urbanites, and promoting marketable export goods to bring in needed capital. "Agricultural development" meant increasing productive efficiency. The assumption was that such development would foster rural development—rural producers would benefit, presumably, through increased incomes and a higher standard of living, or through opportunities in urban labor markets. Frequently the opposite occurred. The more productive systems that displaced the older ones were unsustainable and inequitable, thus producing a demand for more sustainable agricultural systems worldwide.

Sustainability means different things to different people (Douglass 1984, Lockridge 1988). Advocates of sustainability propose greater use of biotechnology to break dependence on pesticides and nonorganic fertilizers, readoption (with some modern adaptations) of agricultural techniques from earlier local systems (Warren 1991), adoption of organic or reclamation production techniques, the development of systems that accord greater recognition to the environmental and social characteristics of the regions where production takes place (Sale 1985, Altieri 1987, Harwood 1992), and the return to more decentralized production systems that are based on local, independent producers who keep capital in their rural communities (Strange 1988). The use of biotechnology to correct the failures of conventional agriculture has received the greatest amount of attention and research funding.

BIOTECHNOLOGY

Biotechnology is the term most often applied to the development of new life forms through sophisticated biochemical techniques. Biotechnology has been hailed by many as a major advance that will help develop sustainable agricultural systems; its use in agriculture includes the development of "improved" plant and animal strains, biological controls for pests, and biochemicals that stimulate plant and animal growth and productivity. Safety and equity questions have arisen about all of these techniques.

Plant improvement is a prominent example of biotechnology. Hybridization is not a new process, but its successful application to seed corn in the 1930s by Henry Wallace (Kirkendall 1987) led to increased corn yields and marked the beginning of research efforts to develop other high-yielding grain varieties. The justification for developing and disseminating these new plants was the alleviation of hunger. A geometrically increasing world population requires that yields from farming continue to increase (Borlaug 1986, Perkins 1990). This technology, however, has had only limited success in preventing malnutrition. Capital-intensive, it favors highly capitalized farmers and drives poorer farmers out of production, diminishing their opportunities for producing or purchasing food. Some hybrid varieties that replace more traditional varieties are more vulnerable to adverse growing conditions, more costly to produce (farmers cannot produce their own seeds), and more reliant on other purchased inputs.

Proponents of biotechnology—especially the techniques of genetic modification that have evolved since the 1990s—claim that it can produce new life forms that can tolerate many of the adverse conditions that other developed varieties cannot because traits from hearty local weed plants can now be introduced into unrelated crop species. Through recombinant DNA genetic engineering, plants can be "designed" to resist pests, to use nutrients more efficiently, or to produce their own nutrients, thus eliminating much of the need to depend on other inputs such as fertilizers or pesticides. Genetic engineering can also be used to develop microorganisms that can produce biologically useful materials such as animal growth hormones.

Although biotechnology may hold great promise for sustainable agriculture, it has generated controversies about the health consequences of many of its products. Bovine growth hormone (bGH) has been the target of health and safety concerns, for example. Many of the new life forms will be patented by their developers. If they replace more traditional nonpatented varieties, farmers' dependence on the patent-holding seed producers will increase.

The environmental consequences of genetic manipulation are unknown (Weaver and Morris 2005). Many critics fear a host of unanticipated risks to both wild and tame ecosystems from the spread of genetically modified organisms that were generated in a laboratory. Finding suitable traits to introduce into crop plants may mean the

mining of the genetic resources of third world countries (Silva 1988). Moreover, biotechnology may just substitute inputs, not eliminate them. For example, herbicide resistance has been genetically engineered into tobacco. Although this technology allows the use of herbicides to replace tillage, it would require the purchase of a product whose environmental impact is largely unknown.

Critics of biotechnology see this approach as not very different from the conventional fix of high-tech global agriculture (Burkhardt 1992), an approach that often does not take into account the physical and social systems in which agriculture operates. As agricultural-development research becomes more interdisciplinary and includes a wider range of social science and humanities perspectives, there is a growing agreement that considerations of economic, social, and environmental justice should inform development models. Given the diversity of social and biological systems throughout the world, no single model of sustainable development can satisfy all these criteria. Considering the conflicting demands that will be placed on agriculture in the next century, some critics now argue, in Harwood's words, that the "key to success will be the recognition and structuring of appropriate patterns of diversity. No single pattern is acceptable. No one type can meet the diverse social, economic, and resources-availability conditions of even a single country" (1992). Included in the social resources of many regions are traditional knowledge systems that do not rely on purchased inputs and rely on more sustainable techniques of cultivation.

Research to aid smaller producers through "farmer participation" is in vogue. There remain some fundamental conflicts between environmental interests and agricultural-development interests, even if the concept of ecological agriculture becomes the dominant one. Incursions into pristine ecological systems on a global scale are likely to persist even in the face of widespread efforts to preserve wilderness areas because it is impossible to demarcate impenetrable boundaries between these areas and systems of cultivation. The interactions at the margins will inevitably modify wilderness areas.

The conflicts between environmental concerns and agricultural development have started to become an important focus for those seeking recognition of the need for equitable access to food and opportunities and the need to preserve precious global environmental resources. There is a clearer recognition of the role that the social sciences and the humanities must play in this research. Indeed, agriculture needs a greater integration not only with nonhuman nature but also with other areas of human concern that it has previously neglected—especially health and nutrition. (Engel and Engel 1990, Clancy 1992).

SEE ALSO *Agrarianism; Agricultural Ethics; Factory Farms; Farms; Food; Food Safety; Genetically Modified Organisms and Biotechnology; Hunger; Organic Farming; Pesticides; Soils; Sustainability; Sustainable Agriculture.*

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Richard Haynes

ALTERNATIVE TECHNOLOGY

"Mechanization and regimentation … dominate every aspect of our existence," Lewis Mumford wrote in *Technics and Civilization* (1934, p. 4). During the protest movements of the late 1960s, large numbers of academics, artists and musicians, and political activists took up the call for more democratic and environmentally responsible forms of technology. Civil rights advocates, anti-war protesters, back-to-the-landers, feminists, and adherents of the counter-culture had diverse concerns, but many criticized an increasingly technologized society threatening ecological systems while operating at a scale difficult for most people to understand or influence (Ellul 1964, Roszak 1969, McRobie 1981). Although scarcely a threat to what was then called the military-industrial complex, the opposition did lead to increased interest in organic foods, toxics reductions, pollution prevention, alternative energy, and other facets of the contemporary environmental movement.

ORIGINS OF THE CONCEPT OF ALTERNATIVE TECHNOLOGY

The concept of alternative technology was popularized in the 1970s by E. F. Schumacher's *Small Is Beautiful* (1973), which advocated meaningful work, local agriculture, human-scale manufacturing, and renewable energy. Murray Bookchin (1971), David Dickson (1974), Amory Lovins (1977), and others helped develop the general idea of fitting technologies to people, ecosystems, and cultures—instead of the other way around. Alternative technologies such as improved charcoal cook stoves that conserve wood and protect habitat while reducing women's labor have been considered especially important for less affluent societies. But questions about how to shape technologies wisely are of universal relevance, and some political philosophers of technology envision an affluent "alternative modernity" with non-toxic chemicals and other public-regarding technologies (Winner 1986; Feenberg 1995; Woodhouse and Breyman 2005). The terms *appropriate* and *intermediate* sometimes are used as synonyms for alternative technology. "*Appropriate" technology* is the most widely used term, despite the fact that no technology can be equally appropriate in every respect given inevitable tradeoffs trade-offs among ease of use, effectiveness, environmental sustainability, aesthetics, price, and durability. Moreover, the suitability of any artifact or system varies among different users, cultures, and eras (Winner 1980, Bhalla 1996). Some technologists who focused on non-Western cultures adopted the term "*intermediate*" to indicate technologies complex enough to require engineering expertise but operating closer to traditional than to high-tech ways of life. Examples include more efficient plows, sanitary latrines, biogas generators, and rolling devices to ease the task of carrying water (Smithsonian Institution 2007). In contrast, "alternative" technologies such as wind power and fuel cells are visualized as competing with mainstream technologies in affluent settings. Although the nuances matter for some purposes, for brevity we henceforth refer to the entire endeavor simply as "AT."

COMPLEXITY OF THE ISSUE

AT as a philosophical perspective and everyday practice is more complex than initially appears. It is not clear that alternative technologists can identify technologies that unambiguously promote their goals, or point to alternative

Indian Village Girl Uses a Mobile Phone. *Indian nongovernmental organizations and other groups have distributed mobile phones to a select number of villages. The owners of the phone charge other villagers for making calls. Programs like this can be seen as forms of alternative technology, and as increasing the global telecommunications market.*

technologies in wide use that are incompatible with dominant political and economic regimes (Winner 1980). For example, the "Village Phone" program operated through India's Grameen Bank provides small loans to women to initiate community cell phone service; the women gain much needed income and improved social status, while villagers obtain otherwise inaccessible communication at an affordable rate price (Aminuzzaman, Baldersheim, and Jamil 2003). Does this qualify as an alternative technology, or is it mostly an extension of the global telecommunications market? The same question can be asked about video recorders used by indigenous groups to revive or protect their traditional cultures: However laudable the effort in some respects, are not such technological transfers also a form of cultural intrusion?

Perhaps even more of a conundrum is a proposed cassava plant genetically modified to resist the mosaic virus that can destroy much of a crop on which several hundred million people in sub-Saharan Africa depend for a substantial fraction of their calories. The Cassava Plus plant is also designed to have bioavailable zinc and iron, high-quality protein, vitamins A and E, as well as improved post-harvest storage (Danforth Foundation 2007). Moreover, little cultural disruption would result from planting and growing Cassava Plus. Does that make it "appropriate," or are the benefits overwhelmed by the fact that the genetically modified seeds would be based on an environmentally controversial technology commercialized primarily by U.S. multinational corporations?

CRITICISMS OF ALTERNATIVE TECHNOLOGY

Along with the interpretive complexities are outright criticisms of AT. Denying the need for it altogether are market ideologues who assume that businesses already produce the technology that customers "demand." Others "wonder if Appropriate Technology is a way to discourage the Third World from industrializing and becoming competitors" (Hazeltine and Bull 1999, p. 11); they see it as hypocritical for the affluent to decide whether the poor should be allowed to emulate "advanced" technologies. With nearly three billion Chinese, southeast Asians, and Indians avidly pursuing consumer culture, the AT movement could be construed as dead except perhaps in Africa (Anderson et al., 1999; Gustavsson 2007).

A slightly more sanguine view would be that low-tech AT innovation (e.g., inexpensive water filtration and storage) and higher-tech AT innovation (e.g., bioplastics from corn) are becoming part of mainstream innovation, "a manifestation of an increasing tendency towards diversity and pluralism.... AT will occupy an increasing number of ecological niches in the global technological system ... where it is adapted to its environment" (Brooks 1980, p. 55). Although it has some validity, that interpretation comes close to depicting innovation as a more or less automatic process in which buyers, sellers, and technical experts proceed straightforwardly to "improve" technological artifacts and systems. Omitted is the key lesson of AT theory and practice: Technologies are inherently political in the broad sense of that term because each artifact or service is oriented toward certain social and environmental objectives and away from others. Hence, designing or redesigning a technology thoughtfully would require a deliberate choice among possible objectives such as whether to use corn for ethanol fuel, even if the result is to increase food prices or build high densities in newly constructed residential areas to facilitate mass transit, even if home buyers prefer suburban sprawl. Because the capacity to discuss such tensions and make thoughtful choices is not built into the contemporary innovation system, most technologists (and their bosses and customers) at least implicitly work against the ideals of the alternative technologists.

WAYS TO IMPLEMENT ALTERNATIVE TECHNOLOGY

What would it take to choose more deliberately among possible social futures as designers, entrepreneurs, customers, government officials, and citizens negotiate alternative technological paths? One common prescription among experts on technology policy is to bring more diverse stakeholders into the decision-making process so that no

small group of insiders can run away with the process (Sclove 1995). To ensure that technoscientists consider the public implications of their work before becoming irrevocably committed to a trajectory, there should be early, "real-time" rather than after-the-fact technology assessment (Guston and Sarewitz 2002). Getting public values onto the negotiating table (Bozeman and Sarewitz 2005) through these and other political innovations would help bring technological innovation into better alignment with democratic principles and practices.

Regardless of whether one champions low or high technology, then, the AT tradition offers a lesson for wise shaping of technological innovation. Rather than relying on the hope that business executives, their technical employees, and their customers will make private decisions that work well for public purposes, an obvious alternative is to institute governance mechanisms to promote deliberate choice concerning public facets of innovation. Among many other options would be the following:

1. Act in a precautionary way to safeguard public values, for example by requiring premanufacture testing and authorization of innovations potentially harmful to environment and health (as governments do for pharmaceuticals).
2. For epochal technologies such as human cloning and androids, create new international deliberation and regulatory mechanisms as a public counterbalance to technologists' enthusiasms, entrepreneurs' quest for sales, and nation-state government officials' desires to beat the international competition.
3. Create a global taxation system designed to shift purchasing power toward those who lack the resources to maintain local ecosystems, use sustainable agricultural practices, and obtain safe sanitation and clean drinking water.
4. Create a chemical trust fund to tax persistent toxic chemicals, using the proceeds to subsidize the trillion-dollar process of moving toward a benign-by-design chemical industry.
5. Institute tort liability penalties and white collar criminal laws to prosecute individual executives and technologists, not just corporations, when technologies turn out to be unacceptably damaging.

Even those who accept the basic spirit of alternative technology obviously will disagree about which, if any, of these or other practices merit experimentation and a gradual phasing in.

QUESTIONS FOR THE FUTURE

Although it has contributed in the near term to simple, affordable technologies for less-affluent people and cultures, the AT movement has placed on the longer-term human agenda the possibility of shaping technologies to serve more thoughtfully deliberated purposes. Questions with enduring import for technological civilization include the following:

1. How can future technologies enhance the quality of work life, counteracting the twentieth-century tendency to privilege machines, hierarchical organizations, and affluent consumers?
2. How can technologies be shaped so that their users experience a balance among task accomplishment, price, physical effort, personal satisfaction, family, community life, and protection of the environment?
3. How can each technological activity be structured so that it does not undermine other valuable activities (for example, television and computer gaming have encouraged many children to spend less time playing outdoors)?
4. What changes in social norms, laws, and monetary incentives can help assure that one person's or group's technology does not interfere unduly with other people's rights and liberties?

Although no one can conclusively answer these and other fundamental questions about technological shaping, the fact that the questions are even arising is due in part to the AT movement. It no longer is unthinkable to ask about alternative technological trajectories that could be more appropriate environmentally and socially than those now prevailing.

SEE ALSO *Energy; Scandinavia: Denmark and Sweden; Schumacher, Ernest Friedrich; Technology.*

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AMERICAN INDIANS

SEE *Native Americans.*

ANARCHISM

The word *anarchism* derives from the ancient Greek term *anarchos,* meaning "without ruler." Anarchism is a political philosophy that views the ideal society as noncoercive, nonauthoritarian, and nonhierarchical, lacking the existence of a compulsory government or state. Anarchists advocate libertarian political strategies for advancing toward those goals.

Anarchism assumes a variety of forms: individualist, mutualist, collectivist, and syndicalist. These variants of anarchism express diverse views on issues such as the proper or necessary roles of violence, the free market, technology, property, organized labor, and religion and spirituality. Ecological or green anarchism finds close connections between the idea or practice of controlling the natural world and the social domination of humans by one another; it commonly challenges reformist, narrowly anthropocentric ideas and institutions, including those of mainstream environmentalism. Ecoanarchism envisions a harmonious relationship between humans and nature, fostered by nonpolluting ecological technologies and human-scale practices. With its emphasis on community, ecoanarchism stresses the importance of small-scale, local human interactions, voluntarism, decentralism, and direct political action. Like most anarchist philosophies, it combines utopian aspirations with prescriptions for political and social practice.

HISTORY AND KEY FIGURES

Anarchism has a long history rooted in opposition to government, especially to what it considers to be illegitimate or oppressive forms of political authority. Anarchist luminaries have come from a wide variety of fields: revolutionary activists such as Michel Bakunin (1814–1876) (who battled Marx and Marxists) and Emma Goldman (1869–1940) (feminist and defender of free love), writers and novelists such as Leo Tolstoy (1828–1910) and Oscar Wilde (1854–1900), and academics such as Noam Chomsky (1928–). Anarchists have combated what they perceive as unjust social and political power and have sought to establish counterinstitutions, subcultures, and communities that are egalitarian, libertarian, and/or ecologically sensitive.

Daoism is among the most ancient philosophical forebears of anarchism. It arose in southern China in the sixth century B.C.E. and anticipates several themes of later anarchist thought, especially ecoanarchism. Daoists believe in following the Dao, the true way of nature as opposed to the artificial rules and conventions of human society, which can generate social conflict and personal tensions. Lao-tzu (flourished in the sixth century B.C.E.), the reputed author of the *Tao De Ching*, perceived a harmony and organic wholeness in the natural world—

sometimes represented by the symbol of the yin and yang—that suggested the possibility of a peaceful, nondomineering relationship with the social and cosmic order. Rejecting traditional philosophical dichotomies and legal and political structures, Daoists endeavor to follow the natural flow of the social and physical worlds—like water running gently to the sea—and to practice *wu-wei* (literally "nonaction"), a nonforcing, flexible way of life.

Some forms of Buddhism like Zen echo Daoism in their deep love of nature and their strong opposition to coercive power. Such themes clearly influenced the thought and practice of the Indian political and spiritual leader Mohandas Gandhi (1869–1948), who practiced and taught the Hindu concepts of *ahimsa* (nonviolence and nonharm) and *satyagraha* (passive resistance or truth-force) in helping to liberate India from colonial rule.

The French geographer Élisée Reclus (1830–1905) was one of the first anarchists to advocate a holistic view of the environment; he espoused a form of nature mysticism that embraced ethical vegetarianism. In Germany Gustav Landauer (1870–1919) also advanced a pantheist variant of nonviolent ethical anarchism. The Russian geographer, field naturalist, and revolutionary Peter Kropotkin (1842–1921) emerged as one of the most significant anarchist theorists by linking a lasting vision of the natural world with a new political framework for human society. Kropotkin stressed the mutualistic, altruistic, and cooperative aspects of animal and human communities and argued that mutual aid—not just ruthless struggle and competition—is a vital aspect of evolutionary change, a point later supported by many biologists. He tried to provide a naturalistic foundation for ethics by showing that humans can derive moral ideas and social ideals from the patterns of the natural world. By vocally criticizing capitalism and the state as unjust, outlining a garden model for agriculture, proposing the medieval commune as a normative exemplar for culture, and using the sciences of biology and ethology for social analysis, Kropotkin creatively united evolutionary and revolutionary orientations into a coherent environmental worldview.

Henry David Thoreau (1817–1862), the American writer, naturalist, and transcendentalist, has exercised a profound and enduring influence on environmental thought. Thoreau was an individualistic anarchist who celebrated nature and was deeply skeptical of the government, especially insofar as it imposed slavery and waged war. "I heartily accept the motto,—'That government is best which governs least,'" he wrote, adding, "I also believe 'That government is best which governs not at all'" (1937, p. 635). Through his experiences living and writing at Walden Pond and his journeys into the wilderness, Thoreau found in the complex workings of the natural world inspiration for an environmental ethic that involves compassion for animals, respect for the wild, a commitment to place, and the virtue of living simply, self-sufficiently, and sustainably.

Strongly influenced by Kropotkin, the American Murray Bookchin (1921–2006) explicitly wed anarchist philosophy with environmental concerns in developing Social Ecology into an important school of thought. In essays like "Ecology and Revolutionary Thought" and books such as *Toward an Ecological Society* and *Ecology of Freedom*, Bookchin held that ecological problems originate in the social sphere, especially in hierarchical political systems. Social Ecology articulates a developmental view of nature and extols the merits of ecological communities and what Bookchin called "libertarian muncipalism" as alternatives to the nation-state. Toward the end of his life, however, Bookchin grew increasingly critical of anarchists and anarchism, describing himself as a communalist instead. Other prominent American writers and thinkers whose ideas fit broadly within the ecoanarchist tradition include the historian and urban planner Lewis Mumford, the poet Gary Snyder, the political theorist John Clark, the ecopsychologist Theodore Roszak, the historian Peter Marshall, the writer Edward Abbey, and the technological critic David Watson.

ANARCHISM AND ENVIRONMENTAL THOUGHT

Kirkpatrick Sale once remarked, "What better understanding of the liberatory possibilities of humankind could the ecologist get than from the anarchist; what better understanding of the liberatory character of the natural world could the anarchist get from the ecologist?" (1985, p. 23). This comment underscores the convictions of many green anarchists, who find in nature a model, a measure, or a mentor for their political practice and thought. Ecological anarchism has close ties not only with Social Ecology but also with bioregionalism, a perspective built around the notion of "life places" that serve as alternatives to established political territories. Bioregionalists stress the importance of geographical areas that provide natural local frameworks for human communities. Bioregions are defined by their biota and topography—including soil, climate, and watersheds—instead of by human conventions; they can be divided into ecoregions, georegions, and morphoregions that nest in one another like Chinese boxes. According to its proponents, bioregional awareness encourages a respect for the earth and its inhabitants and offers an environmental, economic, and political paradigm of local self-sufficiency and mutual aid that resonates with, draws upon, and expands the basic tenets of ecological anarchism.

Also associated with such forms of ecocommunalism is ecomonasticism, a perennial environmental current that calls for individuals and groups to secede, disengage, or withdraw from unsustainable institutions and cultural practices. This outlook has antecedents in intentional communities, utopian experiments, and monastic orders in which members attempt to cultivate ways of life that are ecologically friendly, nonauthoritarian, and nonconformist.

Another significant variant of ecoanarchism is anarchoprimitivism, a viewpoint kindred in some ways to Deep Ecology. This current has issued an ecological and political critique of the very origins and historical development of civilization itself, including what it claims to be the deleterious effects of technology, agriculture, domestication, population growth, science, industry, and the division of labor. Anarchoprimitivists hold that with the rapid rise of civilization over the last 10,000 years, humans have disembedded themselves from the ecological web of life and have thereby surrendered leisure time, social equality, and physical health while falling prey to a destructive relation to the land, organized violence, new and dangerous diseases, the subjugation of women, and meaningless or repetitive work. One such theorist, John Zerzan, traces some of these changes to the advent of symbolic language, numbers and agriculture. Anarchoprimitivists such as Paul Shepard look toward hunter-gatherer societies and tribal groupings for more balanced relations with the environment and for more livable "future primitive" models of community, advocating "re-wilding" the earth along with the active use of simple tools as opposed to the passive utilization of complex or opaque technological systems, which, he argues, sacrifice resources, time, and important human values.

Many, though not all, ecoanarchists support vegetarianism and animal rights or animal liberation. Some work with direct-action groups like Earth First!, the Animal Liberation Front, or Earth Liberation Front in order to promote environmental goals through property destruction, creative protest, theft, or other illegal activities when these efforts are deemed necessary or beneficial.

Critics of ecological anarchism have noted its penchant for utopian or romantic views of nature, politics, or human nature; its opposition to all forms of the nation-state, an institution that some environmentalists deem necessary to address large-scale, complex, international ecological problems; and its emphasis on voluntaristic solutions or decentralist forms of organization, which critics judge to be ineffective or unworkable. Ecoanarchists counter such critiques by arguing that the urgency of ecological and political crises necessitate radical ethical and social changes in order to adequately mitigate or vanquish the sources of these predicaments.

Anarchism clearly exerted an early influence on the nascent environmental movement. In the very radicality of its analyses and ideals, it poses a bracing challenge to any misplaced complacency about the depth and gravity of the contemporary environmental crisis and the extent of the measures needed to address it.

SEE ALSO *Abbey, Edward; Bookchin, Murray; Daoism; Deep Ecology; Earth First!; Regionalism; Snyder, Gary; Social Ecology; Thoreau, Henry David.*

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David Macauley

ANIMAL CLONING

Since Ian Wilmut and his colleagues presented the Dorset ewe Dolly to the world in 1997, the notion of cloning has captured the public imagination and provoked discussions about the ethical implications of the technology. Initially, the most prominent concern was whether the technology could be applied to humans as well. Later,

there was a growing focus on possible applications of the technology to animals and their ethical implications. Thus, the initial worries that animal cloning would lead to human cloning are less widespread in 2008. To some extent those worries have been replaced by the view that the two applications of the technology can be separated and that the possibilities of animal cloning can be explored without its leading to reproductive human cloning. In the beginning, the hopes regarding the potential applications of animal cloning were high. In 2008, more than ten years after Dolly, those hopes have given way to a more nuanced understanding of the difficulties in mastering the technology and applying it in different areas.

THE SCIENCE

In nature there are many examples of cloning, understood as the production of organisms that are genetically almost the same (like identical twins) or that procreate by cloning (like potatoes). Cloning can also be achieved by splitting the early embryo into separate cells, which will each develop into a whole individual. What is usually discussed when referring to cloning is somatic-cell nuclear transfer. In this process the nucleus of a cell from an adult individual is inserted into an oocyte that has had its original genetic material removed. The oocyte is then manipulated into behaving as if it had been fertilized by a sperm cell and thus begins to divide. The key point is that the genome in the new organism is almost the same as that of the original adult animal.

There is much discussion about the degree to which a clone can be said to be a genetic copy of the "parent" animal. In total, 99.9 percent of the genetic material in the cloned egg originates from the cell of the animal being cloned. But the last 0.1 percent of the clone's deoxyribonucleic acid (DNA) comes from the mitochondrial DNA of the unfertilized egg cell (i.e., the cell into which the nucleus is inserted). This is unavoidable, but it raises serious questions about the possibility of creating a genetic copy. It is not that 0.1 percent of the DNA is a lot, but rather that even the limited knowledge we have about the function of mitochondrial DNA suggests that it plays an important role both in the formation of the early embryo and in influencing which genes in the organism will be activated.

In addition, it is as yet only poorly understood what role the various nongenetic influences in the Petri dish, the womb, and the postnatal environment play in the organism's development. These epigenetic factors and the mitochondrial DNA might explain the low success rates and welfare problems associated with cloning. These problems also raise questions about a range of applications often presented as benefits of the technology, especially when it comes to using cloning as a tool within the agricultural-breeding industry (Vajta and Gjerris 2006).

APPLICATIONS

The emerging picture is that in the foreseeable future cloning will likely play its greatest role in basic research and medicine. Here it can serve as a source of information about fetal development, cell biology, epigenetics, and the like. Furthermore, in biomedical research, cloning can help produce genetically modified disease models to further our understanding of human diseases. For example, researchers may genetically modify pigs to resemble humans with Alzheimer's disease or mice to have diabetes. Animals can also be engineered to produce in their milk, blood, or eggs valuable medical substances such as human proteins, so-called bioreactors.

Also suggested are more exotic applications, for instance, using cloning to save endangered species, such as giant pandas and tigers, or to re-create extinct species, such as the gaur or the mammoth. None of the attempts made in these areas have shown any promising results, and even if the technology becomes developed enough to be used in these contexts, such development will most likely come only in very specific and limited areas. The idea of cloning pets has also been explored, but its economic feasibility has yet to be proven.

Between these extremes lies the possible use of cloning technology in the agricultural sector. At first cloning technology was welcomed as a new and exciting tool to use in animal breeding (Di Berardino 2001), but as the limitations of the technology became apparent, the possible usefulness of cloning in agriculture has been drawn into question. The main idea would be to clone elite breeding animals to use in breeding schemes. This would allow spreading useful genes more quickly, but breeders have questioned the value of this tool (Gjerris and Sandøe 2007).

In many instances, cloning will prove useful as an enabling technology together with genetic modification of animals. Genetically modifying animals is very difficult, and the possibility of cloning cells that have been successfully modified, or even grown animals that have the acquired characteristics, is perhaps the area where cloning will be most useful in the years to come.

ETHICAL CONCERNS

Basically, the ethical concerns regarding animal cloning can be divided into two large subsets: risks to humans and risks to animals. With regard to humans, concerns center on three aspects: risks to human health, socioeconomic risks, and risks to the fundamental relationship between humans and animals.

In the area of risks to human health, the question is whether products from cloned animals or their progeny could have adverse and unwanted effects on humans and/or the environment. The research so far shows that this is not the case (U.S. Food and Drug Administration 2008, European Food Safety Agency 2008). The socioeconomic concerns relate especially to agricultural applications of animal cloning and typically focus on the risk that animal cloning could further trends within agriculture toward fewer players in the market, greater specialization, and a deeper divide between rich and poor countries. Finally, there are concerns that our increasing utilization of animals will reduce our ability to relate to them as anything other than providers for human needs. We will thereby lose a sense of kinship and responsibility toward other living beings—features deemed essential to the development of a sound human psyche (Gjerris and Sandøe 2007).

The ethical concerns regarding risks to animals can be divided into two aspects: risks to animal welfare and risks to animal integrity and naturalness. The low success rates tell a story of huge welfare problems related to the technology. Many animals are stillborn or born with health defects. Two things should be noted, though. First, the animal-welfare problems related to cloning are not special to cloning. They are the same as experienced with other reproductive technologies. It is just that they occur more often in cloning. Second, most of the problems seem to be related to the first generation of animals. Once cloned animals have reached a certain age, they seem to develop like conventional animals. Similarly, the welfare problems do not occur in animals sexually bred from cloned animals (Vajta and Gjerris 2006). Still, the welfare problems in cloning are serious enough that the ethical advisory committee for the European Union has suggested that animal cloning is justified only in research and medical applications (European Group on Ethics in Science and New Technologies to the European Commission 2008).

Some people experience the technology as unnatural and as violating the integrity of the animals. This concern does not relate specially to cloning but rather is closely connected to more general concerns about animal biotechnology and human use of animals. Basically, this concern relates to the dignity of animals and can be interpreted as a longing for a less exploitive relationship between humans and animals (Gjerris and Sandøe 2007).

SEE ALSO *Genetically Modified Organisms and Biotechnology; Transgenic Animals.*

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Mickey Gjerris
Peter Sandøe

ANIMAL ETHICS

Animal ethics is a field of study within environmental philosophy. Animals often have been classified as beings of nature, and in contemporary terminology they form an integral part of concepts central to environmental philosophy, such as ecosystems, biodiversity, species, and environments. However, the link between animal ethics and environmental philosophy is complex: Animal ethics concentrates on individual animals and their value, whereas environmental philosophy traditionally has had more comprehensive (soils, waters, and plants as well as animals) and holistic (species, not specimens; biotic communities; ecosystems) concerns. Many animal ethicists, by contrast, maintain that animals should not be valued only as members of species or communities.

HISTORICAL BACKGROUND

Philosophical discussion of the moral status of animals has a long history. Many ancient Greeks, including Pythagoras and Plutarch, were vegetarians on primarily ethical grounds, and many later philosophers, such as Michel de Montaigne, Jean-Jacques Rousseau, and John Stuart Mill, contemplated the normative dimensions of the human-animal relationship. In the nineteenth century Henry Salt published a thesis on that topic in which he defended moral vegetarianism. In addition, serious discussion of the moral status of animals and the normative elements of the human-animal relationship long existed on the margins of philosophy.

The discussion about animals became more central and direct in the 1970s, when animal ethics in its contemporary form took shape. The general interest in animal issues can be traced to various factors, such as growing concern for the environment and the ensuing criticism of anthropocentric values, along with new trends in political and moral thinking that underlined nonviolence together with equality and the rights of all human beings regardless of race, sex, religion, or other incidental characteristics. Because the cultural climate was filled with criticism of inherited values and with advocacy of tolerance and equality, it is not surprising that the moral status of animals was reinvestigated. If the human-centered worldview had produced an environmental crisis and if all equal human interests should be given equal consideration regardless of their holders' differences, perhaps the equal interests of animals should be given equal consideration rather than being ignored. Perhaps species might be as irrelevant as a moral criterion as sex or race. Further, as more people moved to cities distant from agriculture and animal production, questions about the moral status of animals became less uncomfortable, as a growing number of people no longer gained livelihood from animal husbandry.

A work often cited as a groundbreaker in animal ethics is *Animal Liberation* by Peter Singer. Published in 1975, it combined detailed descriptions of animal production and experimentation with moral analyses. On a practical level it had an impact on the popularity of vegetarianism and animal advocacy. On a theoretical level it provoked more philosophical investigation into the moral status of animals. Tom Regan published *The Case for Animal Rights* in 1983, and the next year saw the publication of *Animals and Why They Matter* by Mary Midgley. The moral status of nonhuman animals and the normative nature of the human-animal relationship have become mainstream topics in academic philosophy. Not only philosophers working specifically within animal ethics but also philosophers in other fields of philosophy, such as Martha Nussbaum (2004), Alasdair MacIntyre, and Jacques Derrida (2004), have looked into animal ethics. Some philosophers—Singer is the most notable example—with a background in animal ethics have become prominent contributors to philosophical discussion of other, more mainstream ethical issues, such as world hunger and health care.

Animal Experimentation. *Animal ethics is a relatively new topic relating to environmental philosophy, and is concerned with the moral status of animals, among other things. Issues such as the use of animals in research (like the lab rat shown here), education, for food production, and as companions have all been hotly debated.* © IMAGEBROKER/ALAMY

GENERAL TRENDS

Animal ethics can be divided into three categories: the analytical school, the postmodern school, and the pragmatic school. Members of the analytical school investigate the relevant issues by reference to the familiar ethical theories and methods of modern Western philosophy. Standard moral theories such as utilitarianism, deontology (rights theory), social-contract ethics, and virtue ethics have been applied to the animal issue to see if they could be extended to include nonhuman animals. The familiar commitments of modern Western moral philosophy to neutrality, universality, and consistency are honored. Neutrality requires suspending a bias favoring fellow humans, universality requires that morality remain the same in all contexts, and consistency requires giving equal consideration to similar interests. The most common approach is to take a moral theory and apply it to other animals, often simultaneously amending the theory to make it more comprehensive. Tom Regan, for example, amended Immanuel Kant's deontology, substituting a robust subjective or conscious life for Kant's rationality criterion for moral rights. Just as theoretical backgrounds in the analytical school differ greatly, so do various

theories in animal ethics. Perhaps the most common example is the conflict between orthodox utilitarianism, championed by Peter Singer, and modified Kantian deontology, championed by Tom Regan, as forms of animal ethics.

The majority of philosophical approaches to animal ethics are of the analytical school. Philosophers who have used this approach include Peter Singer, Tom Regan, Mark Rowlands, Dale Jamieson, Bernard Rollin, Stephen Clark, Paola Cavalieri, Evelyn Pluhar, James Rachels, Steve Sapontzis, and David DeGrazia.

The postmodern school approaches animal ethics by reference to Continental and poststructural philosophy. In many ways this school is the opposite of the analytical school in that its proponents view neutrality, universality, and consistency with suspicion. The divide is meta-ethical in nature and can be traced back to the general divide that emerged in twentieth-century philosophy between Anglo-American philosophy and Continental philosophy. Postmodernists think that neutrality and objectivity are impossible to achieve because humans are inextricably embedded in their specific epistemologies and perspectives. It also is maintained that values are not universal but socially constructed. In practice this means that emphasis should be placed on explorations of various human perspectives; those explorations include how gender, ethnic identities, biologies, bodily situatedness, and contexts affect values and understandings of animals. For instance, attention has been focused on reevaluating human identity from the animal perspective. Instead of concentrating on how humans view animals, emphasis is placed on how animals may view humans and the possible normative implications of such interspecific points of view. Also, postmodernists maintain that instead of reason and logic, emphasis should be placed on emotions such as awe, care, feelings of being bound, and other affective and intuitive responses.

The postmodern school is highly diverse, and not all its proponents share all of these characteristics. Philosophers who have used this approach include Gilles Deleuze and Jacques Derrida. More specific to animal ethics, philosophers who use the postmodern and continental approaches include Cary Wolfe, David Wood, Matthew Calarco, Giorgio Agamben, and Ralph R. Acampora. Some ecofeminist approaches to animal ethics are similar in eschewing rationality, neutrality, universality, and consistency and embracing emotion, difference, context, and partiality. The most notable postmodern-leaning ecofeminists who have contributed to animal ethics include Val Plumwood (1993), Carol Adams (1990), Marti Kheel, Josephine Donovan (1990), and Greta Gaard; Vandana Shiva and Karen Warren also have touched on the animal issue. Many philosophers who have contributed to animal ethics deploy the insights and methods of both the analytical and postmodern schools by taking part in both, combining the two (e.g., taking an analytical approach to postmodern works), or developing entirely new approaches. Those philosophers include Mary Midgley (1984), Clare Palmer (2001), and Steve Best.

Despite the meta-ethical differences, the analytical and postmodern schools share many basic premises and conclusions. In regard to shared premises, both resist anthropocentric assumptions and thus seek to explore the value of nonhuman animals from a viewpoint that is not biased toward human beings. In practice this means that the value of nonhuman animals is not derived from instrumentality; the value of a pig, for example, is not derived from bacon. Although humans are tied to the human viewpoint in an epistemological sense (all human valuing originates in the human perspective), they do not have to be tied to a human viewpoint in a moral sense (privileging humans over all other beings). The origin and content of values need to be separated. Although human sensibilities create aesthetic values, it is not true that only humans are of aesthetic value, that only humans are beautiful. Analogously, although human ethical sensibilities create moral value, it is not necessarily true that only humans are of moral value. It is important to acknowledge that other-than-human beings are also valuing beings aesthetically and possibly morally. Therefore, avoiding anthropocentrism is not a logical impossibility, as some have claimed.

Another shared premise is the rejection of dualism. Historically the human-animal dichotomy was one of many forms of dualism. In Plumwood's (1991) analysis, privilege, difference, and homogeneity are fundamental to dualism. One of the two terms of the dualism is privileged and regarded as superior to the other: Classically, men were supposed to be superior to women and whites were supposed to be superior to people of color. The two terms of the dualism are marked by mutually exclusive difference, and those of the other category are regarded as being all the same (white people in the South used to say of blacks, "They all look alike to me"). In the classical human-animal dualism, humans are defined by culture, rationality, and morality and animals are defined by biology, emotion, and instinct.

The classical human-animal dualism, however, is plagued with problems. Proponents of animal ethics often draw from cognitive ethology to point out that many capacities traditionally thought of as exclusive to humans are found among other animals. Many animals, animal ethicists argue, can form beliefs and even abstract concepts, behave intentionally, have consciousness in the phenomenal sense (are capable of experience), and even have social and physical forms of self-understanding.

This problematizes dualistic notions because it posits that animals are not merely instinctual but also cognitive beings. Humans are biological creatures and one species among other animals. People do not exist outside nature and do not have special value because they somehow have stepped outside animality. Many animal ethicists refer to the theory of evolution and its insistence that humans are not at the top of a biological ladder but are a part of an evolutionary tree and an ecological web within which no species is objectively more valuable than another. To remind their readers of this fact, animal ethicists use terms such as *nonhuman animals* or *other animals.*

Another shared element is an emphasis on the animal itself. It is the moral status of and the norms concerning animals, independent of human beings, that are of interest. Animals are not passive objects and a tabula rasa on which humans can write different conceptions but active beings with their own independent abilities and interests. A common conclusion is that the capacity to experience (consciousness in the phenomenal sense) is the basis for individual or inherent value both in humans and in other animals. The value of other animals implies that many current practices, from animal production to hunting and animal experimentation, are morally problematic.

The pragmatic school concentrates on specific practical issues such as particular aspects of animal experimentation or agriculture. The work often is carried out by nonphilosophers such as veterinarians, biologists, and others interested in specific moral problems that arise in conventional interactions between humans and animals. The theoretical input of this school is small, and its relevance in philosophy is minor in comparison to the other two schools. Whereas the analytical and postmodern schools have come to similar conclusions about animals, the pragmatic school often is guided by a different set of principles. For instance, whereas most analytical and postmodern animal ethicists consider meat production morally unjustifiable, those working in the practical sector may ignore that conclusion and investigate specific criteria for the acceptability of various methods of production and slaughter. Often the philosophical reflection among pragmatic animal ethicists is comparatively limited because their interest lies in the details of specific practices rather than the overall moral nature of those practices. A typical example of the pragmatic school can be found in interdisciplinary approaches to welfare studies in which, for instance, agronomists seek to construct ethical guidelines to matters such as dairy farming by taking into account specific welfare issues brought to light by ethologists. The development of the pragmatic school is one of the key challenges for the future of animal ethics. From the point of view of the pragmatic school, analytic and continental animal ethicists do animals a disservice if they simply dismiss animal agriculture because for the foreseeable future animal agriculture will continue despite the condemnation of animal ethicists. In the meantime paying more heed to present practical issues concerning animals could greatly improve their lot and doing so might encourage more philosophical rigor within the pragmatic school. The case typifies the conflict between an animal rights/liberation stance and an animal welfare stance, both of which have their merits, but the first one has thus far been theoretically stronger.

In academia animal ethics also is discussed in disciplines other than philosophy. The analytical and postmodern approaches have coexisted with works in cultural studies that have attempted to locate normative understandings of animals in historical and contemporary cultural perspectives and create critical theories that would question anthropocentric views of animals. Authors who have worked within cultural studies, often with an emphasis on philosophy, biology, and women's studies, include Donna Haraway (2003), Lynda Birke, Joan Dunayer (2004), Eileen Crist (1999), and Barbara Noske. Themes relevant to animal ethics also have been explored outside academia, with one example being the work of the novelist J. M. Coetzee.

THE WORKS OF SINGER, REGAN, AND ADAMS

The most influential or at least the most widely discussed works in animal ethics are those of Peter Singer, Tom Regan, and Carol Adams.

Peter Singer Peter Singer is a utilitarian theorist who has applied that standard moral paradigm to animals. Singer's work is a version of preference utilitarianism, named for its emphasis on the satisfaction of interests.

Singer takes as his starting point two claims central to utilitarianism: maximization of aggregate utility and equality. Under the first principle people should favor the action that produces the greatest utility, which in Singer's framework means the greatest satisfaction of the interests of all those affected by that action. Under the second principle people should consider similar interests equally irrespective of gender, race, class, intelligence quotient, and species. Traditionally, utilitarianism has maintained that gender, race, class, and cognitive abilities are morally irrelevant. Singer adds to the argument the idea that species should be among the peculiarities considered irrelevant to moral decision making. People should not overlook the interests of animals just because of their species; that would be a naked prejudice—speciesism—that is analogous to racism. Furthermore, limited intellectual capacities or a complete lack of those capacities should not be used as a reason for excluding the interests of animals from equal consideration. The fundamental

ANIMAL EXPERIMENTATION

Animal experimentation is one of the most controversial areas of animal use. Politically, it gained attention at the dawn of the contemporary animal welfare movement as the United Kingdom in the nineteenth century witnessed heated debates about the justification of what was called vivisection. The trend continues in the beginning of the twenty-first century, and the animal rights movement has launched many campaigns against pharmaceutical industries and universities that take part in animal research. Experimentation has been a common point of debate in philosophy and more specifically in animal ethics. For instance the book often cited as the groundbreaking work in animal ethics, *Animal Liberation* (1975) by Peter Singer, draws examples from the animal experimentation industry.

The emphasis placed on experimentation is understandable for three reasons. First, experimentation can cause severe harm and suffering to the animals involved. Vivisection refers to the practice of cutting open live animals and reminds people of the suffering that took place before anesthesia was developed. In the contemporary context suffering is arguably still commonplace in areas such as toxicology (testing of chemicals such as medicines, household cleaners, cosmetics, and pesticides for their toxic effects), cancer research (in which cancers are induced artificially in animals by means of genetic modification or chemical stimulation), neurological research (in which brain damage may be inflicted on animals by mechanical or chemical means), and bone and joint research (in which fractures and other injuries are induced to the bones, or animals are made ill with conditions such as arthritis). Second, experimentation is a constantly evolving industry and thus merits ongoing moral discussion. It includes possibilities that test the human imagination, ranging from genetic modification, cloning, and the creation of animal bioreactors to the creation of hybrids between species. Third, experimentation is more complicated from a moral point of view than, for instance, meat eating. It can be argued that meat eating, if done purely for reasons of taste or custom, is difficult to justify; however, because experimentation may save human lives, its moral nature is more complex.

There are three basic criticisms of animal experimentation. The argument from marginal cases rests on comparison. The claim is that in the name of consistency, people cannot kill nonhuman animals for the benefit of humans as long as they do not condone using humans of similar or less mental ability in experiments. The argument from benefit concentrates on the possible benefits of experimentation. It is argued that because meta-analyses of experimentation show that the benefits are statistically very small, experimentation cannot be justified. The cost-benefit analyses go against experimentation: It is wrong to cause actual harm for a hypothetical benefit. This argument often is accompanied by claims according to which experimentation is scientifically problematic (animals are not strong models for human physiology) and politically misguided (experiments are concentrated on common Western ailments that in most cases could be prevented by changes in lifestyle and are motivated by the economic gains of the pharmaceutical industries). The argument from value rests on the value of animals regardless of any comparison or benefit. People cannot use a being of individual value as an instrument to benefit another, and this makes animal experimentation morally unjustified.

Critics have argued that even if one accepts all these claims, it still is possible to imagine extreme circumstances in which people would sacrifice a small number of animals to benefit a large group of people. However, it has been maintained that this argument from extreme cases does not justify experimentation as an everyday practice. First, in a lifeboat situation in which it is necessary to choose whether to throw overboard a human or an animal, many people would choose to save the human. However, altering the choice to concern an elderly person and a child or a person similar to oneself and a person very different from oneself points out that it is difficult to draw general moral principles from such preferences. Extreme situations may say little about general principles and the justification of everyday practices; they only describe difficult choices made in extreme circumstances. It also has been argued that as opposed to thinking of ethics as a matter of conflict between two sets of beings (humans and animals), it would be better to concentrate on taking both into account. One would not use other human beings in a similar situation because of their individual value: They are included in the moral sphere and are thus exempt from being used as instruments. The argument here is that perhaps also animals should be included in the moral sphere.

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utilitarian principle of equality requires that the interests of animals be taken into account equally with the interests of humans.

This makes Singer's argument radical in the contemporary moral climate. A self-consistent utilitarian cannot overlook the interests of other animals when making moral decisions, and in fact those interests must be taken account of to the same degrees as the interests of human beings. What matters in relation to the moral status of both animals and humans is whether a being has interests; no other factors are relevant. Cognitive abilities may have a bearing, but only when they are tied directly to interests. Thus, the interests of rabbits do not have to be taken into account in discussing freedom of religion, for rabbits do not have cognitive abilities that would give them an interest in participating in that freedom. Similarly, cognitive abilities may heighten or lessen interests, such as the interest not to feel pain or be killed. However, when it comes to interests of equal measure had by both humans and animals, a consistent utilitarianism requires that they be taken equally into account.

Singer presents a clear, consistent approach to animal ethics. If one accepts utilitarianism as the most persuasive moral theory, it is difficult to avoid his conclusion. However, those conclusions, though theoretically straightforward, are radical in practice. A consistent utilitarian would have to denounce most practices involving animals in European and North American societies, such as meat eating, hunting, fur farming, and animal experimentation.

Singer has been criticized for overlooking the difference between passive (objective) and active (subjective) interests. R. G. Frey (1980) maintained that inanimate objects such as tractors also may have interests in the passive sense (it is in their interest to be oiled). It is not passive interests but active interests that are morally relevant, and if an animal lacks cognitive abilities that enable it to formulate active interests, its interests do not have to be taken into account in moral choices.

Singer has responded to this criticism by maintaining that both active and passive interests are relevant and by arguing that inanimate objects do not have interests in anything more than a metaphorical sense. The basis of having morally relevant interests is the capacity to experience. Only when a being experiences the satisfaction or dissatisfaction of its interests do those interests become morally significant; whether the interests are passive or active does not matter. Thus, a cow does not have to conceptualize or be introspective about its interest to avoid pain; all that matters is that it will or will not experience the satisfaction of that interest. People take into account the interests of humans even if the human whose interests they are cannot conceptualize them (and thus have them in an active sense), and the same thing applies to animals. Further, in many cases passive interests have more moral significance than active interests. For instance, an addict may have an active interest in shooting heroin and a passive interest in remaining healthy. In this case the satisfaction of the passive interest generates more utility. Thus, there is little reason to exclude the interests of animals from the moral sphere merely because many of their interests are passive, for many of the most important human interests are passive.

It has been claimed that some of the conclusions drawn by Singer do not by necessity apply within utilitarianism. Experiments on animals that lead to greater aggregate utility would appear morally justifiable, at least in some cases. Singer has responded with a version of the argument from marginal cases: If people believe it wrong to use, as subjects of painful medical experiments, human beings with similar or less mental ability than that of the animal subjects of those experiments, they also should believe that it is equally wrong to use the animal subjects in those experiments. If, more particularly, people believe that it is wrong to kill ten mentally unable humans to find cures for ten thousand mentally able humans, they should believe that it is just as wrong to kill ten dogs to achieve that goal. Here Singer appears to emphasize equality—the principle that people should take equal interests equally into account—more than aggregate utility. However, the conundrum of sacrificing a few for the benefit of many is a problem often cited in relation to utilitarianism per se apart from its extension to animals. Deontologists seize on the intuitive repugnance of deliberately sacrificing a few for the benefit of many as evidence that utilitarianism must be supplemented by the acknowledgment that individuals have rights or intrinsic value that protects them against being used as instruments for others.

Utilitarianism also may be inadequate in another way. If an animal has no comprehension of the future or the possibility of its own death, it may lack the interest to live, and that would make its painless killing a morally neutral act. Singer has maintained that because animal production usually leads to at least some suffering (and, as he emphasizes, often severe suffering), such a situation would be merely hypothetical; that is, animal production cannot be justified by claiming that animals have no active interest to remain alive because in practice it ignores other interests that such animals have. Another possible rejoinder is that even if a cow does not have an active interest in continuing to live, it does have a passive interest in doing so and thus cannot be killed justifiably. Hence, even if a cow cannot conceptualize an interest in remaining alive, it is in its interest to remain alive because remaining alive is the prerequisite for the fulfillment of all of a cow's other interests.

THE GREAT APE PROJECT

The Great Ape Project (GAP) is an attempt to extend fundamental protections enjoyed by humans to individuals of four nonhuman species (gorillas, bonobos, orangutans, and chimpanzees) and their habitats. This concept originated with the philosophers Peter Singer and Paola Cavalieri in the early 1990s. In 1993 Cavalieri and Singer published *The Great Ape Project: Equality beyond Humanity*, a collection of thirty-one essays by prominent scientists, philosophers, educators, and activists. The editors stated in the Preface, "We seek an extension of equality that will embrace not only our own species, but also the species that are our closest relatives and that most resemble us in their capacities and their ways of living" (p. 1). The founders' vision of a "community of equals" thus included humans and the other four great-ape species.

As set out in the organization's foundational document, "The Declaration on Great Apes," GAP seeks to offer three specific protections to these closest biological cousins: protection of life, protection of liberty, and freedom from torture. Reasoning that individuals who have these fundamental protections are entitled to "equal respect and concern," GAP advocates that these nonhuman animals be protected by such social mechanisms as legal and moral rights.

GAP's materials emphasize that modern scientific findings about the nonhuman great apes establish that they are complex beings with unique personalities, demonstrable intelligence of several kinds, communication abilities that exceed those of virtually all other animals, profound social needs, and true emotions that humans can easily recognize. According to GAP, these features of the nonhuman great apes clearly justify extending fundamental protections beyond the human species to not only the individual animals but also their native habitats.

In general, GAP's reasoning follows two different paths. One path focuses on the cognitive and other psychological complexities of nonhuman great apes as individuals and as members of families and societies. These features in and of themselves are sufficient to merit fundamental protections for these animals. A second path of reasoning is that since these animals are demonstrably complex and since some humans with lesser abilities are protected, it is only fair to protect the nonhuman great apes as well.

GAP's ideas have been advanced by national organizations in numerous countries, including Australia, Brazil, Britain, Canada, France, Germany, Italy, Portugal, and the United States. The furthest penetration into public policy has come in three countries: New Zealand, where the national GAP group successfully advocated legally enshrining basic protections for nonhuman great apes in 1999; Spain, where in 2006 the national organization succeeded in scheduling Parliament-level votes on adoption of GAP's basic premises as national policy; and the Balearic Islands, where the government in 2007 officially adopted GAP's recommendations as national policy. Other countries, including Austria and Britain, have enacted GAP-inspired legislation or administrative bans on experiments on nonhuman great apes.

GAP's theme of "equality beyond the species line" has also appeared in philosophical discussions, the recently emerged field of animal law, and other scholarly discussions and publications in various areas of human and animal studies. Some universities have even adopted GAP's central ideas as an educational theme for interdisciplinary courses.

Criticisms of GAP's ideas have varied. Some have suggested that the emphasis on cognition is a covert way of affirming a human paradigm for measuring moral worth (individuals similar to humans may qualify, while dissimilar individuals, no matter how complex in their own right, do not). Some have argued that GAP relies on an overstated view of nonhuman ape minds. Another criticism sometimes heard is based on the fear that extending fundamental protections to some nonhumans risks sliding down a slippery slope and extending rights to all animals.

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However, as in the case of painful experiments on animal subjects, this consideration leads to another. If people should cease raising cows for slaughter and consumption, only a few cows would be raised as museum pieces that illustrate a bygone period in human civilization. If being alive is a prerequisite for the fulfillment of

all of a cow's other interests, the many interests of the many cows that thus would not exist would fail to be satisfied and thus diminish aggregate utility, at least of the bovine variety. Therefore, if animal production satisfied the interests of animals more than it dissatisfied those interests, a utilitarian might have to agree with it. Singer holds that contemporary farming practices lead to a greater dissatisfaction than satisfaction of interests and therefore argues for moral vegetarianism. However, if the situation were to change, a strict utilitarian would have to reconsider the case. Such considerations again point toward the problems that emerge when all the emphasis is on aggregated satisfaction of interests and the value and rights of individuals are sidelined. Although Singer provides a valuable take on ethics concerning animals, it can be argued that more attention needs to be placed on the individual.

Tom Regan Tom Regan has taken an entirely different theoretical approach to animal ethics. He espouses deontology, or a duty-oriented ethical theory, and especially rights theory. Whereas utilitarianism emphasizes the consequences of actions, deontology emphasizes the conformity of actions to the practical law of universalization and the logical law of noncontradiction. For example, if everyone always lied—if lying were practiced universally—no one would believe anything anyone said, and thus it would be impossible to lie effectively. It is possible to lie only if telling the truth is the norm, the rule, the moral law. Because universal lying is self-contradictory and one's actions should pass the test of universalization, from a deontological point of view it is wrong to lie regardless of the consequences. A particular lie may lead to felicitous consequences but still be morally unsound; certain acts are wrong in principle regardless of their outcomes.

Deontology, which largely derives from the moral philosophy of Kant, also emphasizes the inherent value of individual moral patients. Whereas utilitarianism underlines utility, deontology underlines the value of the individual regardless of utility. What is inherently valuable is the individual being, not the satisfaction of its preferences. Regan explicitly endorses rights theory as opposed to utilitarianism because only rights theory takes the individual directly into account.

Regan starts by maintaining that certain types of beings have inherent value, which is distinguished from instrumental value. According to Kant, every person is an end in himself or herself as opposed to a means to another person's ends. That inherent value is categorical and hence equal: All beings that have it have it to an equal degree. A person's inherent value is the foundation of his or her moral rights. Those with inherent value should be treated with respect for their rights, which are universal, equal, and self-sufficient. Therefore, rights exist regardless of the context, are equal for all beings that have inherent value, and are not dependent on the vagaries of politics; they may or may not be recognized politically, but they are neither created nor destroyed by political fiat. Regan further characterizes rights as justified claims that are made on moral agents. Thus, one cannot have a right against a flood, but one can have a right against a prospective murderer; one can, however, have a right against an agent who causes a harmful flood. Regan argues that the value of an individual is independent of gender, race, intellectual ability, or social class. He also places a great deal of emphasis on moral principles such as the respect principle, according to which beings of inherent value are to be treated respectfully.

Up to this point Regan endorses the familiar modern understanding of human rights: All people universally have the same value and basic rights regardless of gender, race, culture, social class, or intelligence. However, like Singer, he makes a radical claim: Species must, if people are to be consistent, also be irrelevant. Therefore, some animals may have the same basic value and rights as humans. Again, the consequences are clear: Animal production and experimentation and other practices that instrumentalize animals should be stopped. Kant made rationality the criterion for inherent value and thus rights, but here again the argument from marginal cases may be deployed. Not all humans are rational: The marginal cases include prerational infants, subrational mentally disabled persons, and postrational senile persons. By Kant's criterion they have no inherent value and thus no rights and therefore may be treated just as people treat other animals: experimented on in medical research, hunted for sport, made into dog food. Because such treatment of the marginal cases would be intuitively repugnant, the criterion for inherent worth and thus for having rights must be made more inclusive so that it includes those cases.

The criterion for inherent value that Regan proposes is being a subject of a life. That subjectivity, according to Regan, consists of the ability to have beliefs, emotions, intentionality, and lasting psychophysical identity and memory, among other things. However, the fundamental criterion that Regan uses is the capacity to experience. Whereas for Kant only moral agents can be moral patients, Regan is careful to emphasize that the class of moral agents is only a subset of the class of moral patients. As the argument from marginal cases shows, people commonly give equal value and rights to human beings who are not moral agents; by parity of reasoning, therefore, animal subjects of a life cannot be excluded on the basis of their assumed lack of agency. In relation to rights he also maintains that moral patients do not have to be able to make a claim; it is enough that they have a

Concentrated Animal Feeding Operation (CAFO), Midwestern U.S. *Hundreds of chickens are seen at a large-scale egg producing facility in the midwest known as a CAFO. These are massive, sprawling facilities where hundreds of thousands of animals are housed, often releasing enormous amounts of liquid sewage into the local water tables and even infecting drinking water. Such facilities have been criticized by environmental groups like the Sierra Club.* **DANIEL PEPPER/GETTY IMAGES.**

claim. Hence, the moral agents toward whom the claim is directed have the responsibility to ensure that that right is respected regardless of one's capacity to insist upon that right.

Against Regan, Carl Cohen (Cohen and Regan 2001) has argued that being a moral agent is necessary for a being to have inherent value and rights. He emphasizes active liberty rights: Rights are liberties to do something, with an example being the right to vote. Such rights, it is argued, presuppose agency; thus, nonhuman animals, or at least nonhuman animals incapable of agency, are excluded. However, this criticism does not pay enough attention to passive rights such as the right to life, which one does not necessarily act upon intentionally and which primarily rest on corresponding duties that fall on others. Like marginal cases, animals seem to be capable of having passive rights and also could have active rights understood in a broad sense, for instance, the right to follow species-specific traits. Moreover, Regan advocates a correspondence theory between duties and rights: Any right had by one can be translated into a corresponding duty falling on others. Therefore, animals do not have to be able either to assert their rights intentionally or to act upon them; it is enough that people as moral agents recognize their duty to respect those rights.

Another criticism concerns the enforcement of rights by humans among other animals. It has been argued that if some animals have a right to life, that right must be protected not only from violation by moral agents but from any violation. Thus, people must prevent predators from attacking prey. Regan has replied that because predators are not moral agents, they can assume no duties and thus cannot violate the corresponding rights of their prey. Critics have responded by pointing out that the issue may concern those in a position to help rather than the predators themselves: As people would have a duty to help those who are drowning, they may have a duty to help those who are attacked by moral agents (whether animals, small children, deranged people, etc.). Thus, one could argue that animal rights means that people

should prevent predators from attacking their subjects-of-a-life prey by, for example, rounding them up, incarcerating them comfortably in large enclosures, and feeding them soy products until they die a natural death. Some animal rights proponents have argued that this view overlooks the rights of the predators: People cannot prevent predation, for to do so would go against the rights of predators. Small children and deranged serial killers do not have a right to kill, whereas predators, whose survival depends on killing, are in a different position. Moreover, it has been pointed out that preventing predation would lead to ecological destruction, which would lead to large-scale violation of the welfare and rights of animals. If humans prevented predation, they would be directly responsible for an environmental catastrophe and thus guilty of violating the rights of countless animals. Perhaps most important, respecting the inherent value of animals requires respecting the inherent nature of animals; preventing the manifestation of species-specific behaviors clearly would go against any such respect.

Therefore, the animal rights view does not by necessity imply that predation should be abolished. However, it does lead to some dilemmas in the context of environmental issues. A holistic approach can be in conflict with an animal rights approach. The topic has raised a lot of debate, and animal rights proponents have tended to claim that the two approaches are compatible: An emphasis on the value of individuals does not mean that species and ecosystems have no value. The links between the two have become especially evident in the context of climate change because animal industries have been named as one of the key factors contributing to global climate change. Thus, respect for animal individuals may have environmental benefits.

Carol Adams Carol Adams has offered an ecofeminist approach to animal ethics that follows some themes from the postmodern school. She seeks to locate animals within cultural discourses and brings together the oppression of women and that of animals. By doing this she presents an animal ethics that is based on awareness of cultural history, vegetarian literature and voices, and what she terms the vegetarian body.

Her basic claim is that animals are made into ''absent referents'' in the contemporary culture. People constantly are met with cultural texts that involve the animal—most notably dead body parts (meat)—but the referent of those texts, the living animal, is absent. Adams argues that the most common referents concerning animals have nothing to do with an animal itself as a living, experiencing being. The absence of animals is emphasized by objectification (the animal body becomes pure biological matter devoid of subjectivity), fragmentation (the body is fragmented into different edible parts and into euphemisms such as *beef* and *bacon*), and consumption (the animal is valued only in terms of money and flavor). Contemporary discourses deny not only animals' intrinsic value but animal presence and by doing the latter avoid questions about the former.

Adams maintains that there is a link between different types of oppression because they tend to involve similar structures, such as violence, absent referencing, marginalization, and belittling. Not comprehending the connections leads to a type of oppressive ethics that excludes *y* instead of *x*, a fault Adams finds with mainstream feminism, which excludes animals. One way to fight oppressive ethics is to bring to light the multiple absent referents in the culture and make animals present once more. This can happen through different types of texts, whether fiction, vegetarian voices, or the vegetarian body, which refuses to eat meat and thus leaves the animal intact.

Adams takes part in the ecofeminist tradition that emphasizes emotion, narratives, shared experience, and critical theory. Rather than concentrating only on reason, the ecofeminist tradition in regard to ethics also takes emotion into account; rather than abstract theory, it should take local and personal narratives into account in which the lives of animals are acknowledged and shared experiences between species are recognized; finally, ethics should give more consideration to the impact that cultural discourses have on people's ethical understandings and, when necessary, assume a critical stance in relation to those understandings.

CRITICISM

Proanimal arguments in animal ethics have been criticized from several different viewpoints. Among those viewpoints are the human species, perfectionist capacities, emotive ties, and cultural meanings.

It often is argued that human species is a morally relevant factor. However, the argument faces difficulties because the moral relevance of a purely biological identity is unclear. Perhaps because of this, the argument tends to turn to perfectionist capacities (rationality, moral agency, etc.): Only humans have individual value, for only humans have specific perfectionist capacities. As has been pointed out here, this claim faces the challenge of the argument from marginal cases. Some have suggested that such cases some day will be normal adults or have been such adults in the past and thus have equal value. However, this claim also has various difficulties. Potentiality or past capacity cannot be used as the criterion for value at the present moment (a person will be dead some day but should not be valued or treated as a dead person at the present time). Moreover, making normal adults the source of value is prejudiced and gives

only indirect value to marginal cases. Also, there are human beings who never will be and never have been moral agents or otherwise intellectually able but who still are considered to have equal value. In general, it is important to emphasize the difference between the value of a capacity and the value of an individual. People may rate a particular capacity, such as rationality, highly, but this does not by necessity mean that rationality is the basis of the value of individuals.

In relation to emotive ties, it often is maintained that the special value of humans is based on the intrahuman tendency to have stronger attachments to other human beings. However, this argument requires more premises to justify its conclusion. If people followed this line of thought, they quickly would come to the conclusion that middle-class white women have more value if one is a middle-class white woman; value would become entirely relative to the context. In that case if one happened to have more emotive attachment to pinecones than to humans, one would be entitled to sacrifice the latter for the former. Emotions are an important part of life, but values cannot be reduced to emotions without facing issues such as bias (Westerners favoring Westerners) and relativism. Another variation of this argument maintains that each species has a biological tendency to favor its own kind and that humans therefore have special value from the human point of view. This claim also faces difficulties because one could seek to justify sexism or even racism on similar grounds. The most fundamental problem is derived from the naturalistic fallacy, which differentiates facts from values and norms: The way people factually tend to value is a different matter from how they *should* value. Thus, tendencies cannot be the sole basis of ethics.

It has been argued that the special value of humans is a basic cultural meaning—part of human language games—and requires no further justification. This argument also faces the naturalistic fallacy because the factual existence of a particular meaning is taken to be the normative justification of that meaning. One has to scrutinize existing cultural meanings from a moral point of view or there would be little room for criticizing sexism and racism. This leads to the problem of relativism: If one lived in a culture with predominantly racist meanings, according to this argument, one would have little reason to criticize its practices. On a more fundamental level proponents of the argument seem to forget that meanings change, come in the plural form, and are often in conflict with one another. It is precisely because of these aspects that people must engage in moral exploration: The change within meanings and resolution of conflicts between meanings ought to be guided partly by morality. Thus, in a time when meanings concerning animals are going through a rapid change, critical thinking in the domain of animal ethics is needed more than ever.

CONCLUSION

Animal ethics is a relatively new discipline that consists of three broad schools (analytical, postmodern, and practical). It emphasizes freedom from anthropocentric bias and wishes to investigate the value of and norms concerning animals in a direct sense by taking the animal itself as the object of study. Proanimal arguments in animal ethics have been met with some criticism, but often that criticism faces problems such as the naturalistic fallacy. It can be argued that animal ethics has presented important approaches to the study of human-animal relations and offered strong reasons to rethink the human understanding of the value of animals and current practices of using animals.

SEE ALSO *Biocentrism; Consciousness; Ecological Feminism; Factory Farms; Midgley, Mary; Plumwood, Val; Pragmatism; Regan, Tom; Singer, Peter; Species; Speciesism; Utilitarianism; Vegetarianism; Virtue Ethics.*

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ANTARCTICA

Antarctica, the seventh continent, is anomalous, compared with the six inhabited continents. The usual concerns of environmental ethics on other continents fail without sustainable development, or ecosystems for a "land ethic," or even familiar terrestrial fauna and flora. A political Antarctic regime developed policy with a deepening ethical sensitivity over the second half of the twentieth century, remarkably exemplified in the Protocol on Environmental Protection to the Antarctic Treaty (Madrid Protocol) at the end of the twentieth century, protecting "the intrinsic value of Antarctica," though puzzles remain about how to value Antarctica.

Without inhabitants, claims of sovereignty are problematic. Antarctica is a continent for scientists and, more recently, tourists. Both focus on wild nature. Relatively lifeless, in Antarctica life is driven to extremes. Antarctica as common heritage has come to be viewed as Antarctic wilderness. An appropriate ethics for the seventh continent has proved to differ radically from that for the other six: in some ways more eccentric, in other ways more intense.

THE ANTARCTIC TREATY REGIME

Antarctica is governed by the Antarctic Treaty of 1959, entered into force in 1961. Originally there were twelve consultative parties (ATCPs); in 2008 there were twenty-eight. On the second tier are acceding states (ACSs), which support the treaty but do not vote. In total, some forty-four nations are involved. For the nations that can vote, decisions must be authorized by consensus. The last of the treaty's five goals is the "preservation and conservation of living resources in Antarctica." But the main concerns originally were military, shaped then by the Cold War: Antarctica will be used for peace; there will be no nuclear detonation or wastes dumped there; scientists are to exchange findings about Antarctica.

The treaty was followed in 1964 by the first of a series of annexes, the Agreed Measures for the Conservation of Antarctic Fauna and Flora, which entered into force later, in 1980. The Convention for the Conservation of Antarctic Seals (CCAS—pronounced C-cass), followed in 1972, entered into force in 1978, and was concerned about seals' "vulnerability … to commercial exploitation" and seeking the "protection, scientific study, and rational use of Antarctic seals." Sled dogs have

been banned in Antarctica since the mid-1990s, for fear of contaminating seals with distemper.

Since 1994, the International Whaling Commission has designated Antarctica the Southern Ocean Whale Sanctuary, banning all whaling, including scientific whaling, below forty degrees south latitude. Japan, objecting, has continued to kill hundreds of minke whales a year there, claiming scientific study but also eating the whales. In 1980, entering into force in 1982, came the Convention on the Conservation of Antarctic Marine Living Resources (CCAMLR—pronounced Cam-lar). The interest, more specifically, is fish and krill. Krill, shrimp-like animals, feeding on the phytoplankton, are the basis of the oceanic food chain in Antarctic waters. Millions of tons have been harvested for food for fish or cattle or fertilizer. CCAMLR sets quotas.

The Convention for the Regulation of Antarctic Mineral Resource Activities (CRAMRA—pronounced Cram-rah), adopted in 1988, proposed rules and procedures for regulating mineral extraction. The Convention failed to enter into force, with a surprising turn. Australia and France balked at ratifying it, and, given the consensus requirement, they had veto power. Several environmental activist groups were active in opposition. The outcome, surprisingly, was the Protocol on Environmental Protection to the Antarctic Treaty (Madrid Protocol), 1991, though not entering into force until 1998, when the United States and Japan ratified it. ''The Parties commit themselves to the comprehensive protection of the Antarctic environment and dependent associated ecosystems and hereby designate Antarctica as a natural reserve, devoted to peace and science.'' There is a ''50 year moratorium'' on mineral exploitation in the Antarctic. There are strict sections on conservation of fauna and flora and the protection of special areas. The nations seek to keep the continent as pristine as possible.

After fourteen years of further negotiation, sometimes intense, the parties in 2005 at Stockholm adopted an annex on Liability Arising from Environmental Emergencies (Johnson 2006). This annex imposes liability for mere damage to the environment, even where there is no economic loss or damage, something novel in environmental law. This annex is viewed as a first step toward further, more comprehensive agreements about liability for environmental damages in Antarctica.

TERRITORIAL CLAIMS ON THE UNINHABITED CONTINENT

Seven nations have made territorial claims—Argentina, Australia, Chile, France, New Zealand, Norway, and the United Kingdom. Notably both the United States and the Soviet Union (now Russia) have made no territorial claims. Six of the seven claims are as sectors, pie-shaped pieces widest at the coast and diminishing to a point at the Pole. The claims overlap; Britain's claims include all of Argentina's and most of Chile's. Argentina has always objected to British claims. Argentina and Chile also dispute the border between their own territories. Norway has claimed only a coastline area on which it placed huts and bases, mostly infrequently used. Though supporting the Protocol, Australia has claimed, under the United Nations Convention on the Law of the Sea, offshore rights to subsea minerals adjacent to its sector (off their 5,000 kilometer coast for 200 nautical miles).

The grounds of classical territorial claims were the colonial discovery and occupation of unoccupied lands (with Europeans typically overlooking indigenous peoples). Antarctica has been anomalously ''discovered'' (coastlines or ice sheets seen from ships, much of the interior seldom visited). Antarctica is only marginally land, 2 percent at the edges, or vertical rock cliffs, or bare, dry valleys, and then mostly in short summer. The continent is barely occupied. Argentina has sent women and children, families of military or scientific personnel, to a station on the Antarctic Peninsula to establish its territorial claim. The U.S. position has typically been that these lands are unsuitable for effective occupation. There is darkness much of the year; in Antarctic summer, there is continual light but the sun is never high in the sky.

Many dispute such territorial claims, arguing that Antarctica should be international. The Antarctic Treaty has held in abeyance all further territorial claims. Territorial claims can be ''administrative'' claims, ''spheres of influence'' or ''stewardship jurisdictions.'' One way of reading what happened with the Madrid Protocol is that the environmentalists persuaded the politicians to concede that, at least for purposes of minerals extraction, nobody owns the Antarctic. Some nations have proposed United Nations administration, but this is resisted by most of the treaty regime nations. The United Nations has enough problems on the other continents and no expertise on the seventh.

ANTARCTIC SCIENCE AND TOURISM

Antarctic politics mixes closely with Antarctic science. A Scientific Committee on Antarctic Research (SCAR), with a secretary at the Scott Polar Research Institute, Cambridge, existed even before the Antarctic Treaty, and has since continued, regularly advising the treaty parties. Antarctic science often deals with natural phenomena found in extremes: the coldest temperatures on Earth; the most unusual environments; strange diatoms, algae, lichens. Icefish, which have no hemoglobin. Life in the Dry Valleys is embedded in rocks. Such science might reveal knowledge helpful elsewhere, particularly with regard to global climate change. Antarctic scientists

Tourists Disembarking from Ship in Antarctica. *The highest population of people in Antarctica are tourists; during the 2006–2007 season, over 29,000 people visited the continent. The growing tourism industry has introduced both regulatory and environmental issues. The multi-nation Madrid Protocol of 1991 seeks to preserve the unique flora and fauna of Antarctica's ecosystems.* **ZELFA SILVA/ ANTARCTICA EXPEDITION/AFP/GETTY IMAGES.**

have been among its keenest conservationists. Science as such does not, however, produce an ethic—regarding whaling, or mineral exploitation, or territorial claims.

The largest groups of persons in Antarctica are the tourists, although they do not often actually set foot on the continent. Scheduled tourism started in 1966, and by 2000 included more than 14,000 persons per year. Almost all visit only the Peninsula by ship. Regulating tourism has proved difficult. The consultative treaty parties have attempted to address this issue off and on over twenty years but never acted. It was not clear whether or from whom tourists might need to get permission. Do they need passports? Visas?

Nothing in the Antarctic Treaty or international law requires asking permission of anybody. None of the territorial claimants requires visas to the Antarctic. Even if they did, these claims are disputed, even among the claimants, and the tourists remain mostly on their ships, there presumably under the law of the nation whose flag the ships are flying, or under the Convention on the Law of the Sea. Generally tourist companies get permission from the government of the country where the company is based, or, sometimes, the country from which most of the tourists come.

Such uncertainties might as easily avoid regulation as enforce it. U.S. nationals are the largest component of tourists (about half), but of some fifteen ships cruising there, two-thirds travel under flags of convenience. The U.S. Environmental Protection Agency has ruled that U.S. commercial operators must submit environmental documentation for review. Increasing numbers of tourists visiting Antarctica find a no man's land, no immigration officials, no customs authorities, reinforcing the idea that Antarctica is stateless.

The International Association of Antarctica Tour Operators (IAATO) released their own "code of conduct" for visitors, evidently sensitive to respect for wildlife, a do-not-interrupt-and-leave-no-trace ethic. "Antarctica, the world's last great wilderness, is particularly vulnerable to human presence. Life in Antarctica must contend with one of the harshest environments on earth, and we must take

care that our presence does not add more stress to this fragile and unique ecosystem." "Do not disturb, harass or interfere with wildlife." "Give animals right of way." At the 2007 Antarctic Treaty Consultative Meeting (ACTM) the treaty parties essentially adopted IAATO's operating strategy after sixteen years, as ATCM Resolution A (2007), though this resolution is less stringent than IAATO's bylaws and the code of conduct there.

Many argue that tourism should remain ship-based. Tourism ought never to move on land, except for transient expeditions. Project Antarctic Conservation, a research team from the Scott Polar Research Institute, was formerly monitoring Antarctica tourism (Stonehouse 2000, pp. 264–267). The Madrid Protocol indicates that any citizen of a country that has ratified the protocol should have, or be traveling with a tour operator that has, a permit based on an environmental impact assessment filed with their home Antarctic authority. The U.S. Congress and courts have held that the National Environmental Policy Act applies to Antarctica.

ANTARCTIC WILDERNESS, COMMON HERITAGE, WORLD PARK

Environmental ethics for Antarctica—so the argument is increasingly developing—is about Antarctic wilderness. Antarctica is not a political place, and it is a mistake to try to make it one. On the uninhabited continent, one should not apply criteria from other continents. We are not seeking sustainable development, a land ethic, one of people in harmony with their landscape, or protecting natural capital, or ensuring that future generations have as much opportunity for development as do we.

Subantarctic islands have noticeable human interruptions, even human habitations. But a typical square hectare of the continent has seldom, if ever, had a human set foot on it. There is science, but what the scientists are studying is wild nature. There is tourism, but the tourists take pleasure in seeing, again, wild nature. On the seas, the shores, on the Peninsula, one needs an ethic for wildlife, for penguins and seals, lichens and mosses. But fauna and flora go into a bigger, wilder picture. Antarctic wilderness features the desolate and empty. When NASA wanted to simulate the surface of Mars, they went to the Dry Valleys. The expanses of the continental interior, even after being mapped, are little more than white spaces on the map.

The ethic needs to respect where life is found, but beyond that, is more like that for canyons, mountains, rivers, or caves. One conserves Mount Everest as the highest point on Earth, although the highest thousand meters is lifeless and has no ecosystem. The lowest point on Earth, the Dead Sea, also a difficult place to live, seems less commanding. The Barwick Valley in Victoria Land is protected from nearly all visits because it is one of the most nearly sterile areas on Earth. On Antarctica there are also places designated for particular protection, Sites of Special Scientific Interest (SSSIs) and Specially Protected Areas (SPAs), the latter isolated even from scientific activities. In 2002, such areas were grouped together as Antarctic Specially Protected Areas (ASPAs).

Humans ought to conserve the geysers in Yellowstone National Park, though we usually do not think that we have duties directly to non-living natural phenomena (geysers, waterfalls, cliffs, clouds), so much as to people who enjoy them. There are no duties directly to glaciers or icebergs. But Antarctic places, some of them at least, have site integrity; something makes them special, notable. Mount Erebus in Antarctica is majestic. We respect the Delicate Arch in Utah, the crystals in Mammoth Cave in Kentucky, unusual achievements in nature. Once we move past respect for life, environmental ethics needs some further account of where the values lie that command our respect.

Perhaps the ethic will be mostly directed to life in Antarctica. This will be as much toward life in extremes as toward any biodiversity hotspots, as might be the case elsewhere. On the Subantarctic islands, fauna and flora can be abundant. But on the Southern continent itself one is first struck by the barrenness of the land and ice contrasted with the teeming waters of the Southern Ocean. What wildlife there is is really marine life that uses the coastal edges for nesting or resting, typically not for feeding.

There are no native land animals, not at least as characterize other continents. Antarctica's native terrestrial animals are all invertebrates, mostly arthropods, such as mites, lice, springtails, and midges, many of which are parasites of seals and birds. Much is microscopic: protozoans, rotifers, nematodes, tardigrades, bacteria. The largest animal that really dwells on the land is a wingless midge (*Belgica antarctica*), only two to six millimeters long, which spends all but two months of its two-year life cycle encased in ice and mostly frozen. Animal welfare or rights ethics will be needed mostly only in the waters, for the whales and seals. Although there is life in the nooks and crannies of the continent, there are almost no higher flora, two species on the Peninsula (a grass, *Deschampsia antarctica,* and a pearlwort, *Colobanthus quitensis*), and none south of the Antarctic circle. Mostly the flora is lichens, 350 species, 100 species of mosses, and hundreds of species of algae.

An ecosystemic ethic will find rather simple ecosystems in terms of food-webs, stratification of organisms, mineral cycling, and primary productivity. There is rather little predation, but some: a mite eating a nematode worm. Food chains are short. Decomposition and nutrient turnover are slow. The terrestrial/ice system is

not productive enough to support higher animals. Such ecosystems are fragile, easily stressed, disturbed by introduced exotics or wastes, and slow to recover from human interruptions. That means that scientists and tourists will need to take extra care.

Some argue that the most plausible answer is to go back to people. The best model is that of World Park Antarctica. This is not Yellowstone or Yosemite; this would have to be an atypical park, but maybe the "park" idea is moving in the right direction. Since 1972, the World Conservation Union (IUCN) has advocated designating Antarctica some kind of World Park, as have the Antarctic and Southern Ocean Coalition, Greenpeace, the Jacques Cousteau Society, and other non-governmental organizations. The World Wilderness Congress in 1987 called for a World Park. A wilderness park will involve the idea that people do not remain and that the landscape displays primarily the processes of spontaneous nature, but it does connect up with people, who must visit for Antarctica to be a park. Antarctica does have surprising aesthetic value.

ENVIRONMENTAL ETHICS AT EXTREMES

In Antarctic wilderness, people get let in on nature's show, whether icebergs or penguins, and that happens with particular intensity on this uninhabited continent, a continent of extremes. Another way to think of this is that environmental ethics, like the life there, is also driven to extremes. The further south one goes, the more life disappears; even lichens and algae cannot survive. On land and in ice, life at its edges challenges the ultimate limits—down in rocks in the Dry Valleys, with microbial colonies 200,000 years old (a hundred times older than a redwood tree), on a landscape where no rain has fallen in two million years, and it is now too dry to retain snow. "Endolithic life," as the biologists term it, is algae, bacteria, and fungi inhabiting the spaces between grains in rocks. There are microbes at the South Pole. There is life in the deep freshwater lakes, perhaps even in Lake Vostok, under two miles of ice and not exposed to the atmosphere for a million years, since before *Homo sapiens* appeared on Earth. Recent research has found that forms of both plant and animal life there have survived glacial cycles over millions of years.

Respect for life is not gone; rather, respect goes to extremes with these achievements. The really exciting science here is about nature irrelevant for people—microbes at the Pole or hemoglobin-less fish. Such science might bring us a deeper respect for life, more resolution to leave no human imprint. This life is "untrammeled by man"; that is fact of the matter. Problematic though the transition from *is* to *ought* is, scientists, policymakers, and environmental ethicists have been forming a consensus that in Antarctica humans ought to let life already at the limits continue untrammeled. The wonder of life at the limits of possibility commands our respect.

Here is nature revealed in the wildest: the southernmost penguin colonies, the densest feathers, penguins that live on ice and need never touch land. We respect remote oceanic islands or desert canyons, with odd forms of life, or little life at all. Life pushing into those extremes does deserve human respect when we encounter it, and demands more vigilance, lest we disturb it. Antarctica is a "wonderland."

GLOBAL ANTARCTICA

Antarctica is at once unique and global, combining both particular and universal dimensions. Antarctica will not solve the population problem; it holds no answers to global warming (although this may be monitored there), or to the loss of biodiversity, escalating consumerism, or sustainable development. But this stateless continent could be a pace setter for an ethic of the common heritage of humankind, rather slowly developing on the other continents, with some 170 nation states. Typically the nations presently in control in Antarctica have denied that the common heritage principle applies here, but this denial seems increasingly implausible with the resolution not to develop the continent.

The protocol states: "The development of a comprehensive regime for the protection of the Antarctic environment and dependent and associated ecosystems is in the interest of mankind as a whole." One way of reading that is that this continent belongs to nobody because it belongs to everybody. But other interpreters wish to turn that idea on its head and take "belonging to nobody" to mean more precisely what it says: no humans, individually, nationally, or internationally, own this place. Human ownership is not the relevant category. The Madrid Protocol seeks to protect "the intrinsic value of Antarctica, including its wilderness and aesthetic values." It is impressive to have a consensus of several dozen nations resolved to protect what they call the intrinsic value of Antarctica. In Antarctica, in the protocol, the nations have reached a transcultural, even a global ethic. If this is still a pragmatic ethic, Antarctica for science, tourists, and future generations, this pragmatism has convictions about Antarctic nature independently of the human presence.

Antarctica is particularly challenging because here is the one continent on the home planet that is not, cannot, and ought not be our home.

SEE ALSO *Ecotourism; Environmental Law; Global Climate Change; Oceans; World Wide Fund for Nature.*

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Holmes Rolston III

ANTHROPOCENTRISM

Literally defined as "human-centeredness," anthropocentrism is for many environmental philosophers the ethical attitude the field was created to overcome. The critique of anthropocentric assumptions and moral judgments and their supplementation with nonanthropocentric (i.e., biocentric or ecocentric) commitments have driven much environmental ethical theorizing since the academic founding of the field in the 1970s. The critique of anthropocentrism, however, is not seen as a purely intellectual task by environmental philosophers. Most theorists identify the militantly and exclusively anthropocentric worldview as the root cause of environmental problems such as species extinction, the loss of natural areas and wilderness, and the general decline of environmental quality. As a consequence, the rejection of anthropocentrism has become the hallmark of environmental ethics since the 1980s, although not all environmental philosophers believe that an exclusively anthropocentric orientation necessarily leads to the destruction of wild species and ecosystems. For these dissenting voices in the field, a sufficiently reformed and enlightened anthropocentrism not only is capable of motivating a strong, effective environmental ethic, it is defensible as a superior approach to moral, ontological, and policy questions. With global climate change eclipsing all other environmental concerns, anthropocentrism became ascendant in environmental ethics early in the twenty-first century.

Philosophically, anthropocentrism may be understood in ethical, ontological, and epistemological terms. As an ethical view anthropocentrism refers to the explicitly stated or implied claim that only human beings have intrinsic value; all other natural beings and things have only instrumental value, and human interests thus always trump the interests of nonhumans and the environment. This is an evaluative and priority judgment that many nonanthropocentric philosophers believe reflects an arbitrary bias. As an ontological view, anthropocentrism refers to the position, sometimes identified as Aristotelian or Thomistic, in which humans are seen as the center of the universe or the ends of creation. Typically, environmental philosophers conflate the ontological and ethical positions in their critiques as well as in their positive nonanthropocentric proposals even though, as Tim Hayward (1998) pointed out, ethical anthropocentrism does not necessarily entail ontological anthropocentrism and vice versa. Indeed, most secular anthropocentric environmental philosophers, such as Bryan Norton and Andrew Light, are not ontological anthropocentrists, publicly accepting an evolutionary account of human origins in which *Homo sapiens* is not regarded as an ontologically privileged species. However, many self-identifying Christian, Jewish, and Islamic anthropocentric environmental philosophers are both ontological and ethical anthropocentists, grounding the latter type of anthropocentrism in the former. As an

epistemological view, anthropocentrism is tautological: All human values are human values, including the intrinsic value that ethical nonanthropocentrists ascribe to nature. Thus, no ethical nonanthropocentrist can be a self-consistent nonanthropocentrist, although this truism often is overlooked or denied in the heat of the anthropocentrism -nonanthropocentrism debate.

Terminologically, anthropocentrism sometimes is confused with related words that crop up in discussions about the human-nature relationship, especially the terms *anthropomorphism* and *anthropogenic*. The first term refers to the practice of ascribing uniquely human attributes to nonhuman beings or entities (e.g., the human traits given to the animal characters in the Disney film *Bambi* and in Kenneth Grahame's book *The Wind in the Willows*). The second term simply means "human-caused" rather than produced by natural forces, as in anthropogenic climate change.

Anthropocentrism as it is commonly understood in environmental ethics and philosophy refers to the view in which nonhuman nature is valued primarily for its satisfaction of human preferences and/or contribution to broader human values and interests. Another way to put this is that in the anthropocentric worldview, individual plants and animals, populations, biotic communities, and ecosystems are accorded only instrumental, not intrinsic, value; Eugene Hargrove (1992) and Ben Minteer (2001) have given alternative readings.

ENVIRONMENTAL ETHICS AS ANTIANTHROPOCENTRISM

One of the most significant influences on the rise of the antianthropocentric agenda in environmental ethics has been the 1967 essay "The Historical Roots of Our Ecologic Crisis" by the historian Lynn White, Jr., in the magazine *Science*. White's article proved controversial mostly because of its harsh assessment of the environmental ethic embedded in the Judeo-Christian tradition. According to White, the creation account in Genesis placed humans in a superior ontological position: Man was created separately from the rest of Creation, and he alone was given "dominion" over the creatures of the earth and commanded to "subdue" them and the earth. White's "despotic" reading of Genesis therefore emphasized the divine sanction of human control and mastery over nature. Furthermore, his provocative remark that except for Zoroastrianism Christianity is "the most anthropocentric religion the world has ever seen" (White 1967, p. 1205) drove home the point that the human-centered outlook of the dominant Western religion was ultimately responsible for overpopulation, species loss, air and water pollution, and other environmental ills. Such dilemmas were ultimately the product of deep cultural and religious beliefs about the proper place of humans on the earth, White concluded, and only a rethinking of the "axioms" of Western culture (i.e., an interrogation and rejection of ontological anthropocentrism) would enable humans to adopt a more harmonious relationship with the natural world.

White's argument, especially his identification of anthropocentrism as the cause of the ecological crisis, had a strong influence on the work of environmental ethicists in the subsequent decades. Indeed, nonanthropocentric environmental philosophers have focused most of their attention since the appearance of White's paper on discrediting both ontological and ethical anthropocentrism as a philosophical attitude toward nature and constructing an alternative worldview and ethical system that would recognize the intrinsic as well as the instrumental value of nature (Rolston 1975, 1986, 1988, 1994; Taylor 1986; Callicott 1989, 1999; Katz 1997). Many in the field presumably would agree with the nonanthropocentric philosopher J. Baird Callicott, who observed that White's essay is the "seminal paper in environmental ethics" and that after its publication in the late 1960s the "agenda for a future environmental philosophy thus was set" (Callicott 1999, p. 31).

The antianthropocentric (and prononanthropocentric) movement in academic environmental ethics received an early boost in 1973 when Richard Routley (later Sylvan) published the first essay on environmental ethics by an academic philosopher, "Is There a Need for a New, an Environmental Ethic?" in 1973. Just as White attacked primarily ontological anthropocentrism, Routley attacked primarily ethical anthropocentrism. Routley presented his well-known "last man" thought experiment, which became a kind of ethical litmus test separating ethical anthropocentrists from nonanthropcentrists. It was also an exercise that, at least in Routley's and many nonanthropocentrists' view, exposed the failure of conventional anthropocentric ethical systems (e.g., utilitarianism, deontological ethics) to account for environmental harm, especially harm to nonsentient parts of the environment.

Routley claimed that according to the traditional moral principles of the European and North American philosophical tradition, the last man surviving the collapse of the world system would be committing no wrong if he set about destroying every species of animal and plant on the earth that he could. Because only humans (or the satisfaction of human preferences or the fulfillment of human interests) have intrinsic value in traditional Western ethics and no other human is left to be harmed (or have his or her preferences frustrated or interests adversely affected) by the actions of the last man, that man's destructive actions would not run afoul of conventional ethical codes. In other words, if the last

man goes about destroying all nonhuman life on the planet, Western moral philosophy provides no good reason why such wanton destruction could be deemed wrong. To Routley's mind, and similar to White's arguments about the Judeo-Christian tradition, standard Western ethical theory reflects a clear ''human chauvinism.'' Routley was thus able to answer the question posed in his essay's title: A new ethics is needed if people want to be able to condemn individuals and communities morally for driving species to extinction and despoiling natural areas. In addition to a thorough rejection of ontological anthropocentrism, a critique of ethical anthropocentrism—with its exclusive emphasis on human preferences and well-being—is called for, along with the mounting of a nonanthropocentric complement.

Although a strong strain of both ontological and ethical nonanthropocentrism took hold in environmental ethics after the early essays of White and Routley and became the dominant approach in the field in the last quarter of the twentieth century, not all environmental philosophers were convinced that a new ''nature-centered'' ethic was necessary. John Passmore's *Man's Responsibility for Nature* (1974), published a year after Routley's paper, was the first book-length treatment of environmental ethics and is significant in part for its rejection of the emerging view that traditional Western philosophical thought is adequate for the resolution of environmental problems. The established (anthropocentric) ethical tradition, Passmore claimed, with its sensitivity to the consequences of human actions and its array of moral principles directing the promotion of genuine and enduring human interests (i.e., those beyond immediate physical and material enjoyment), had far more ethical resources at its disposal than the new environmental ''mystics'' and ''primitivists'' understood or appreciated. Among other things, Passmore's early work in the field suggested that environmental ethics might not be synonymous with nonanthropocentrism.

WEAK ANTHROPOCENTRISM AND ENVIRONMENTAL PRAGMATISM

Passmore's denial of the need to inject nonanthropocentric principles into the ethical discussion of human-nature relations would gain further play in the field over the ensuing decades. In the 1980s the philosopher Bryan Norton introduced to the discussion what he termed weak anthropocentrism, a broadly humanistic project that distinguished between strong anthropocentrism and a weaker (i.e., less consumptive) variant of instrumentalism. In Norton's project human contact with nature (e.g., outdoor recreation, environmental education, ecotourism) could prompt individuals to question their own and others' ecologically irrational commitments and shape normative ideals affirming human harmony with the environment (Norton 1984). Although a strong anthropocentrist would regard the biological richness of a forest as little more than a storehouse of raw materials to be harvested and measured only in commercial terms, in Norton's view a weak anthropocentrist would value that landscape differently, recognizing its present and future beauty, cultural expressiveness, therapeutic and recreational value, and ability to inspire individuals and communities to care for and protect nature (Norton 1987).

The philosopher Eugene Hargrove (1992) also proposed a version of weak anthropocentrism, though it differed from Norton's in a critical respect. Like Norton, Hargrove acknowledged that environmental value necessarily originates from a human valuer. In effect, Hargrove brought attention to epistemological anthropocentrism and to its logical necessity. Unlike Norton's weak anthropocentrism, however, Hargrove's version included recognition of the intrinsic value of natural objects. Grounding his approach in the naturalistic traditions of nineteenth-century landscape painting and field naturalism, Hargrove wrote that people may ascribe intrinsic value to the elements of nature they judge to be beautiful or scientifically interesting—just as one might ascribe intrinsic value to a priceless work of art such as the *Mona Lisa*—even though that ascription is made from a distinctly human point of view and is intimately related to a complex suite of human values (Hargrove 1989).

The anthropocentric approach in environmental ethics received a boost with the emergence of environmental pragmatism in the mid-1990s, a philosophical movement drawing from both the substance and the spirit of classical American philosophy, particularly the work of Charles Sanders Peirce, William James, and John Dewey, who adamantly opposed the notion of intrinsic value whether ascribed to nature or to anything else (Light and Katz 1996). Ben Minteer (2001), however, has argued that Dewey did recognize a form of non-instrumental value (if not exactly intrinsic or final value) in his overall logic of moral inquiry. Pragmatists in environmental ethics for the most part retain the anthropocentric orientation of the historical American pragmatists and endorse a broad instrumentalism in which nonhuman nature is valued for its contribution to a wide range of human interests, such as those described above in Norton's work. Many environmental pragmatists argue that this reformed or liberal anthropocentrism not only is a more philosophically sound approach to environmental ethics but has greater political and policy appeal inasmuch as most people are unreflectively anthropocentric—indeed, many are unreflectively egocentric and ethnocentric—regarding the value of nature

and its direct and indirect uses, including nonconsumptive ones, exclusively in terms of human interests (Norton 1995, Minteer and Manning 1999, Light 2002).

THE DEBATE CONTINUES

Despite the growing number of anthropocentric approaches in environmental ethics and the sobering prospect of the impact on humans and human interests of global climate change, nonanthropocentrism is still the dominant philosophical position in the field. Moreover, nonanthropocentric philosophers remain committed to complementing anthropocentric arguments in ethical and policy discourse with nonanthropocentric arguments. Some seem to take an even more extreme view that anthropocentric arguments for nature preservation should be replaced altogether by nobler (as they see it) nonanthropocentric arguments. For example, Holmes Rolston III, one of the founders of academic environmental ethics, has asserted, "Both anthropocentric and anthropogenic values have to come to an end before we can be the best persons. We have to discover intrinsic natural values" (Rolston 1994, p. 166). Similarly, the philosopher Eric Katz has argued that apparently ontological anthropocentric approaches are not only philosophically suspect, they are "imperialistic" and ultimately devastating to the goals of environmental protection. "An anthropocentric worldview," Katz stated, "leads logically to the destruction of the nonhuman natural world" (Katz 1997, p. 183). J. Baird Callicott, in contrast, also a founder of the field and a staunch defender of the nonanthropocentric approach, recognizes that nonanthropocentric values are also human values—that is, he recognizes that there is no alternative to epistemological anthropocentrism—and that the intrinsic value nonanthropocentrists ascribe to nature often must compete with as well as complement the various instrumental values in nature.

In response to the extreme nonanthropocentrism of Katz, anthropocentrists argue that there is no necessary or inevitable linkage between ethical anthropocentrism and ecological destruction. Instead, they claim that it is human arrogance toward nature and a related myopic view of the effects of human actions and their consequences on a broad range of human interests and values that are the culprit, not human-centered values per se. This distinction, which in essence restates the division between strong and weak anthropocentrism, is implicit in White's "Historical Roots" essay but often is neglected by nonanthropocentric environmental ethicists who have chosen to focus on the perceived philosophical flaws of anthropocentrism as a general theory of value (Norton and Minteer 2002). Although the anthropocentric-nonanthropocentric debate continues to divide many philosophers, Norton (1991) has proposed that the most defensible forms of weak anthropocentric and nonanthropocentric arguments actually "converge" on a similar policy agenda, an argument that would seem to lower the practical stakes of the dispute, if not its philosophical import (Minteer forthcoming). Norton's convergence hypothesis, however, remains contested by nonanhropocentrists, and the debate continues.

SEE ALSO *Anthropomorphism; Callicott, J. Baird; Hargrove, Eugene; Judaism; Norton, Bryan; Passmore, John Arthur; Sylvan, Richard; White, Lynn, Jr.*

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Ben A. Minteer

ANTHROPOMORPHISM

The straightforward definition of "anthropomorphism" is the attribution of human qualities or characteristics to nonhuman entities. While correct, this definition does little to express the significance of the term to environmental ethics. Most often, anthropomorphism (personification) has served as a common literary device. For example, in William Blake's "To Autumn," autumn is portrayed as a man who is enjoined to sit, rest, and sing "the lusty song of fruits and flowers." Anthropomorphism is also strongly associated with religion and mythology, notably in the tales of the ancient Greeks, where, for example, the personification of the earth is the goddess Gaia and the renewal of spring is Persephone. Predictably, literary and religious uses of anthropomorphism impact environmental ethics, both directly and indirectly, culminating in contemporary critiques not only of anthropomorphism per se, but also of how anthropomorphism is linked with racism and sexism.

Within a religious context, anthropomorphism has had currency in both the East and West. The God of the ancient Jews was often described in physically human terms as engaging in human activities, for example, wrestling with Jacob in the book of Genesis. The God of Israel was also characterized as expressing very human emotions, such as anger and vengefulness. Sometimes called "anthropotheism," this attribution of human characteristics to divine figures has been controversial. Significantly, Islam generally forbids such images, regarding them as tantamount to idolatry.

Within Hinduism, anthropomorphism is complex. The conception of Saguna Brahman (the Absolute with qualities) suggests the existence of a supreme being with describable humanlike characteristics. According to this version of Brahman, it makes sense that Hindu gods, such as Vishnu and Shiva, and goddesses, such as Durga and Parvati, would be depicted in human form. Interestingly, much drama alludes to the notion that Hindu gods and goddesses are not to be understood as ultimately human. Durga, for example, may be presented in the form of a woman, but with eight arms. Ganeshe has the body and posture of a human, but the head of an elephant and also many arms. Krishna is often depicted as a young man, but his skin is blue. By contrast, the conception Nirguna Brahman (the Absolute without qualities) emphasizes the Absolute not as a god per se, but as ineffable ultimate reality, the ground of all being uncapturable by any words or images, human or otherwise.

Another aspect of anthropomorphism can be discerned in Hinduism's understanding of reincarnation. This familiar doctrine allows that one may be reborn in the form of various sorts of animals or even insects. It has often been suggested as an explanation for Hindu vegetarianism and injunctions against harming cows and other animals. One may be discouraged from eating animals or even harming insects on the grounds that, despite appearances, such creatures may be the actual or potential reincarnations of human beings. This reasoning is loosely anthropomorphic in the sense that spiritual potential, the human soul or atman, seems to be projected onto the animal or insect. This anthropomorphism may be merely apparent, because the Hindu perspective includes a more nuanced explanation. One is enjoined from harming animals not so much because animals are thought of as being previous or potential humans, but because humans, animals, insects, indeed all beings, are aspects of one and the same undifferentiated ultimate reality (Brahman).

Anthropomorphism has also figured in Western scientific contexts. The eighteenth-century taxonomist Carl Linnaeus, for example, relied heavily on anthropomorphic metaphors in his elaborate classification schemes for plants, overtly basing his system on human reproductive organs and the language of heterosexual intercourse. Also in the eighteenth century, Anton von Leeuwenhoek adopted the view of preformationism and insisted that the human sperm contained a fully formed human in miniature. This sort of anthropomorphism involves projecting a human form onto a substance emitted by a human being.

Within primatology, not surprisingly, anthropomorphic descriptions have been especially common and the subject of much critique, notably from feminists, who objected, for example, to the use of the word "harem" to describe a group of female gorillas (Haraway 1990). In contrast, humans are often unwilling to see human qualities in animals, a kind of opposite of anthropomorphism.

For this tendency, the primatologist Franz de Waal (2002) coined the term "anthropodenial."

Within the early environmental movement, anthropomorphism received seminal expression in the work of the twentieth-century writer Aldo Leopold. Most obvious is Leopold's penchant for referring to particular nonhuman creatures in human terms. For example, in his well-known work *A Sand County Almanac*, Leopold writes that, after a night of hunting, an owl, "in his trisyllabic commentary, plays down the story of the night's murders" (1949, p. 61). Similarly, a goose "speaks with the authority of all the far hills and sea." This strategy not only reflects Leopold's own deep kinship with such creatures, but also brings the reader into sympathetic union with nature, as Leopold's "land ethic" espouses.

At the heart of this land ethic is Leopold's conviction that nature ought to be regarded not merely as a human resource, but as an extension of our community. As Leopold expresses it, the land ethic "changes the role of *Homo sapiens* from conqueror of the land-community to plain member and citizen of it" (1949, p. 220). While less clearly anthropomorphic than the obvious references to particular animals as personlike, the idea that nature and natural creatures should be regarded as an extension of the human community may also be considered to involve projection of humanlike traits or values onto the nonhuman. Indeed, the suggestion is that other creatures are members of our community, and that we can better appreciate their value by emphasizing their similarity to us.

While Leopold's anthropomorphisms may be a clear improvement over an utter disregard for nature and over conceptions of nature in solely economic terms (as a mere resource, for example), they have hardly been regarded as wholly positive or even innocuous. In fact, it has been argued that such anthropomorphic strategies reveal the anthropocentric character of much of early environmental theorizing. Why must we frame the natural world in human terms to appreciate its worth? The lineage of this anthropocentric view can be traced to the philosophy of Kant (1963), who, for example, was careful to emphasize that nonhuman creatures ought not be mistreated, not for their own sake, but rather because of the pernicious effect that their mistreatment tended to have on human beings.

Jeremy Bentham's utilitarian theory challenges views that devalued animals because of their supposed lack of rationality. Anthropocentric, rationalistic approaches such as Kant's might be seen as negatively anthropomorphic. That is, supposedly uniquely human capacities are valued, and their lack or absence is projected onto animals. By contrast, Bentham insists on emphasizing our shared nature as animals. As he puts it, "The question is not, Can they *reason*? Nor Can they *talk*? but, Can they *suffer*?" (1948, p. 311). Thus began a line of ethical theorizing that has received its most famous contemporary expression in the work of Peter Singer.

The shift from early anthropocentric regard for the natural world to valuing nature in its own terms is part of what distinguishes the contemporary environmental movement from the early stages of environmental consciousness. Contemporary philosophical debates in environmental ethics seem to assume that obviously anthropocentric and/or anthropomorphic characterizations of nature are problematic. Yet questions about more subtle forms of anthropomorphism still abound. For example, some of the controversy about whether it is appropriate to speak of animal *rights* can be understood as a question about whether this involves inappropriate projection of human qualities associated with rights theory onto animals.

Other critics of anthropomorphism have pointed out that since human qualities also include factors such as race and gender, then to the extent that the natural world is conceived of as human, it will also be regarded in ways shaped by sexism and racism. For example, while Leopold revered so-called natural animals, those connected to the romantic and perhaps macho values associated with the wilderness, he bestowed no such regard on agricultural animals (Davis 1995). While some animals are often regarded as masculine (bears, wolves), others are considered feminine (notably cows and chickens), and all are valued according to a hierarchy that privileges male over female (Dunayer 1995). An especially influential critic in this vein is Carol J. Adams, whose book *The Sexual Politics of Meat* (1991) draws vivid comparisons between the use and literal consumption of animals to the objectification and more figurative consumption of women. In short, since prejudices enter into the equation of what particular qualities are associated with which particular humans, it is to be expected that the study of anthropomorphic tendencies in animal ethics will also involve the study of issues associated with race, sex, and other factors.

SEE ALSO *Animal Ethics; Christianity; Ecological Feminism; Environmental Philosophy: V. Contemporary Philosophy; Gaia Hypothesis; Hinduism; Judaism; Land Ethic; Leopold, Aldo; Singer, Peter.*

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Cathryn Bailey

APPROPRIATE TECHNOLOGY

SEE *Alternative Technology.*

AQUIFERS

An *aquifer* consists of an underground body of permeable rock (e.g., limestone or sandstone) or unconsolidated materials (e.g., gravel or sand) from which water can be extracted. Of all the water on earth, 97.5 percent is salt water. Of the remaining 2.5 percent that is freshwater, 70 percent is contained in the Antarctic (where the ice is up to 2 miles in thickness) and the Greenland ice sheet; there is also a negligible amount at the North Pole, where the ice is only a few feet thick. Lakes, rivers, and wetlands contain only a small percentage (around 0.01 percent) of the world's freshwater. Groundwater makes up about 20 percent of the world's freshwater supply.

SOURCES AND USES OF AQUIFERS

The study of aquifers is called hydrogeology. To hold water an aquifer requires an aquitard, an impermeable layer alongside an aquifer, as well as an aquiclude, an impermeable barrier beneath the aquifer. The surface level of the saturated rock or gravel forms the aquifer's water table. The water-bearing rock then provides water to wells and/or springs in the surrounding region. Contrary to common belief, groundwater exists only rarely in underground rivers or lakes. Although varying from season to season, groundwater rates of movement range from a half inch to tens of feet per year.

Aquifers are a limited and precious natural resource that must be carefully husbanded. While it is possible for aquifers to be replenished through rainfall or deliberate recapture, aquifers recharge at different rates through differences in precipitation, storage characteristics, and use, and are generally in decline worldwide. Pumping out water at rates greater than recharge results in lower flows, poorer water quality, and higher prices. (Changes in the amount of groundwater can also affect the lubrication of geologic faults, thereby causing earthquakes.) Through overuse the well eventually runs dry. In many cases around the world societies are, in effect, mining fossil water that, once used up, will be gone until the next Ice Age.

Figure 1. CENGAGE LEARNING, GALE.

Aquifers occur at various depths all around the world. Notable aquifers occur in Australia (in the Great Artesian Basin), South America (the Guarani Aquifer, shared by a number of countries), Lebanon and Israel, North Africa (in the Atlas Mountains), and in North America. In North America the best known aquifers are the Ogallala and the Edwards aquifers.

Aquifers are crucial for a variety of human uses from industry to drinking and washing, and agriculture (by far the largest use). Many towns and cities can be reliant on aquifers for their water supply. One example of this is the Edwards Aquifer, which provides drinking water for 2 million people in Central Texas, including the city of San Antonio. While this aquifer is being adequately recharged, the aquifer is threatened by development in the recharge areas surrounding Austin and San Antonio.

A second example of fundamental societal reliance on groundwater is the Ogallala or High Plains Aquifer, a

huge (and hugely important) source of water across the Great Plains of the United States. Underlying portions of eight states (Nebraska, South Dakota, Colorado, Kansas, Wyoming, Oklahoma, Texas, and New Mexico), the Ogallala provides potable water for eight out of ten people living above the aquifer and supplies 30 percent of the groundwater used for irrigation in what is one of the most productive agricultural regions in the world (see Figure 1). Because the Ogallala recharges much more slowly than it is being depleted, the economy of the U.S. High Plains is critically dependent on a finite resource.

ETHICAL AND POLICY DIMENSIONS

Since its creation in the 1970s, the field of environmental ethics has typically sought to identify arguments that focus on the intrinsic value of the entity under consideration. Although there have been arguments within the field directed toward the intrinsic value of animals, species, ecosystems, and even rocks, no one appears to have argued that aquifers should be preserved in part or in whole because of their intrinsic value. Perhaps because they are too out of sight; they appear to be out of mind. Aquifers seem to be distinctive in that they are an entity toward which everyone takes an instrumentalist view.

Surrogates for the intrinsic value of aquifers are the endangered species that inhabit the springs they feed. The Edwards Aquifer feeds a number of springs in south-central Texas, the most notable of which are Barton Springs in Austin and San Marcos Springs in San Marcos. The Barton Springs salamander is listed as an endangered species under the Endangered Species Act of 1973. Protecting its habitat and that of other similar endemic species in the springs fed by the aquifer requires municipalities, such as Austin and San Antonio, and regional irrigation districts to cooperate in maintaining sufficient in-stream flow in these springs to avoid a prohibited "taking" of the protected species. Perhaps protecting such endemic species, while important, is also a means that conservationists, who valuing the Edwards Aquifer intrinsically, have devised for protecting the aquifer itself.

The fate of the Ogallala Aquifer is a useful case study in the environmental-ethical and policy dimensions of the use of aquifers. The sustainability of the Ogallala has been a policy issue since it became apparent in the 1970s that this aquifer was running dry. Since then ethical and policy questions have turned on issues of equity, for both current users and for future generations (i.e., sustainability).

Across the High Plains, withdrawals from the Ogallala are controlled by the "rule of capture." Under this rule individuals only need pay the cost of pumping the resource, not for the value of the water removed from the ground. This approach externalizes the social costs of pumping water, with the inevitable result of excessive exploitation of the resource. As Garret Hardin showed in his famous 1968 article on the tragedy of the commons, common pool resources are usually overused if left unregulated. In the case of the Ogallala, regulation is difficult: Although some states in the High Plains can deny new water permits if local groundwater-management districts deem it likely that new wells will be reduced, the Supreme Court in the state of Texas has ruled that "the owner of the land is the absolute owner of the soil and percolating water" (*Houston & T. C. Ry. Co. v. East*).

Questions of equity and sustainability concern the distribution of water resources both within and across generations of users. In the case of the Ogallala, the floor (or aquiclude) of the aquifer is uneven, meaning that landowners drilling into the aquifer might be able to reach water at the same time that the wells of nearby neighbors are running dry. Under such conditions conservation becomes crucial; if a high water table is maintained, water access will be preserved across the region.

On the other hand, equity across generations (or sustainability, defined by the Brundtland Commission as "meeting the needs of the present without compromising the ability of future generations to meet their own needs") turns on questions of what if any responsibility current generations have to preserve the capacity of aquifers for future generations. As in all cases of cross-generational equity, questions arise concerning possible technological innovation (e.g., novel irrigation systems or new crop varieties that might lessen water requirements) and the proper discount rate to apply to the concerns of future generations.

SEE ALSO *Agriculture; Rivers; Water.*

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Robert Frodeman

ARCTIC

The Arctic is the region delimited by the Arctic Circle, at 66.6° latitude north; it marks the southernmost position of the polar day and night, where twenty-four hours of daylight and twenty-four hours of night occur once a year. It contains the North Pole and encompasses the Arctic Ocean.

CHARACTER OF THE REGION

Ecologically the Arctic is the area that extends north beyond the border between boreal forest and northern tundra; it often includes the interdependent sub-Arctic environments. In the popular imagination it is any area of the far north. Politically the Arctic comprises parts of eight nations: Norway, Sweden, Finland, Denmark, Iceland, Canada, Russia, and the United States, with the Inuit homeland of Nunavik anticipated as the ninth. The Arctic Region has a sparse human population of approximately 4 million, 10 percent of whom are indigenous.

The terrestrial ecology of the Arctic is primarily tundra, with a permanently frozen subsoil known as permafrost. The Arctic region is home to more than thirty-six kinds of mammals, including marine mammals such as the beluga and bowhead whales, and land mammals such as the polar bear and caribou. There are more than 130 bird species in the area, which is an important migratory center in the spring. Although the Arctic region has a short growing season and is treeless, it has a number of small shrubs and flowering plants, with mosses, lichens, and grasses being the most common type of vegetation. Coastal marine life abounds with fresh and sea water algae, more than a hundred phytoplankton species, copepods, amphipods, jellyfish, kelp, and various benthic invertebrates. There are more than thirty-one species of freshwater fish, including Arctic char, trout, grayling, whitefish, and sturgeon, as well as three species of salmon in their spawning stage. The largest marine fish is the Greenland shark, which averages 6.5 meters in length and weighs up to 1,980 pounds.

RESOURCE DEVELOPMENT AND THE ENVIRONMENT

There has long been intense interest in the Arctic region's large deposits of fossil fuels—oil, gas, and coal—as well as minerals such as nickel, copper, gold, uranium, tungsten, and diamonds. There are significant deposits of oil and natural gas in the Beaufort Sea and Chukchi Sea coast in the North Slope of Alaska, the Nunavut area of Canada, northwest Russia, and the Barents Sea. Oil fields in the North Slope of Alaska have produced more than 14 billion barrels of crude oil through 2002 and have averaged about 20 percent of U.S. domestic production since 1977. Coal deposits, strongly in demand in Asia, have been found in the eastern Canadian Arctic Archipelago, the Svalbard Archipelago in Norway, and near Point Lay in Alaska. The last area is thought to have nearly one-tenth of the world's sub-bituminous and bituminous coal.

The ethical issues concerning the development of such nonrenewable resources pertain mainly to two areas: (1) the utility of the resources versus the value of preservation of natural ecologies; and (2) the social justice of resource extraction, especially as it affects indigenous peoples.

By some estimates 80 percent of the world's energy supply comes from fossil fuels. With the amount of nonrenewable resources dwindling, demand growing (especially in China and India), the price of oil rising, and investments in alternative sources of energy languishing, the economic value of nonrenewable resources and the profitability of their extraction have increased. This upswing has intensified pressure for further development and exploration in the Arctic, especially as extraction technologies have advanced. Furthermore, governments in this region encourage such development because the resulting taxes and profit generate a large percentage of their revenue. Moreover, the end of the cold war and moves toward a globalized economy have fostered greater possibilities for extraction partnerships: for example, the Russian-Norwegian cooperation in off-shore natural gas development in the Barents Sea and the Russian–British Petroleum partnership in the development of the Samotlor oil field in Siberia.

These pressures for development have led to increased concerns about the fragile ecologies of the Arctic. The rapid industrialization of the Kola Peninsula in northwest Russia during the Soviet period is a good example of the effects of reckless development of the region. Because the large deposits of nickel and copper on the peninsula occur naturally in sulfur compounds, when the deposits are smelted, they cause significant sulfur dioxide pollution. The 1980s saw the emission of an estimated 937,000 tons of noxious substances that caused vegetation damage and forest dieback over a region of nearly 3,100 square miles.

Even with environmental controls in place, as they are in the North Slope of Alaska, there are significant ecological risks in the development of the region, as a 2003 report from the U.S. National Academies of Science has documented (Orians 2003). The ecological health of the tundra has been adversely affected by industrial activity, which has mushroomed from one field to a complex of fields with the accompanying network of pipelines, pads, roads, seismic exploration trails, and other elements of infrastructure. These industrial incursions have affected patterns of habitat behavior, including migrations of whales and caribou. The increasing industrialization of the eastern coastal plain will likely interfere with the reproductive success of the Central Arctic caribou herd, because the area provides insect relief during calving. In addition, the transportation of oil from

the North Slope poses the risk of spills. Not only is the 800-mile trans-Alaska pipeline vulnerable, but there are also risks from tankers plying Prince William Sound out of the Valdez terminal—as the infamous *Exxon Valdez* oil spill in 1989 showed. Feeder pipeline leaks at the North Slope facilities in 2007, arising from negligent preventive maintenance for corrosion, are reminiscent of the poor past performance of pipeline services; there are similar problems at the Samotlor fields, where oil has contaminated groundwater.

ETHICAL VALUES AND ENVIRONMENTAL DECISION MAKING

Despite any merits of *ecocentric ethical theories*, the reality of decision-making in resource management among democratically oriented countries in the Arctic is usually couched in the anthropocentric language of *cost-benefit analysis*, primarily through permitting processes, environmental impact statements, public testimony, and public-political venues, all of which fall within the mandates of environmental laws and administrative procedures. The basic algorithm of cost-benefit analysis is relatively simple: Identify all costs and benefits associated with a targeted action, convert these into a common value system (usually monetary), and determine whether benefits outweigh costs. The technique's deficiency as an ethical tool lies in its difficulty in translating incommensurable values into quantifiable money terms. Thus, although it may be easy to calculate the economic value of resources extracted from an area, it is not so easy to assess the area's other use values, such as health and recreation, and its nonuse or passive values, such as aesthetics and legacy. More sophisticated analyses attempt to address this difficulty by techniques such as contingent valuation, which elicits what people would be willing to pay for loss or degradation, or replacement valuation, where the loss of animals is calculated by what animal brokers would pay to replace or rehabilitate them in zoo environments. Studies calculating the costs of the *Exxon Valdez* spill may serve as a model.

A well-known case of the tension between use values and existence or passive values of the land is the controversy surrounding the opening of the Arctic National Wildlife Refuge (ANWR) to development. The establishment of ANWR by the Alaska National Interest Lands Conservation Act (ANILCA) in 1980 left the future development of 1.5 million acres coastal plain uncertain. The United States Geographical Survey (USGS) in 1998 estimated the presence of 4.3 to 11.8 billion barrels of recoverable oil in the region. Yet, despite pressures to develop the region and support for that development by a large majority of Alaskan citizens with a powerful legislative delegation, by 2008 most Americans continued to oppose development of the region. Interestingly, the same division is found within the Alaska Native community: Most of the Inuit support the development of ANWR, whereas the inland Gwich'in are strongly against it. The coastal Inuit are more interested in the protection of marine environments as their source of subsistence hunting and find some economic benefit to the oil development that has occurred on their lands; the Gwich'in, by contrast, depend on the Porcupine caribou herd whose calving grounds are in ANWR and so have sought strong protections for the area. Because of the guesswork concerning the amount of oil in the refuge, for some people the risks to the environment associated with development may outweigh any prospective gains.

The Chukchi Sea lease sale of 2008 is another case that illustrates the tensions between the value of resources and the value of preservation. The Department of Interior's Minerals Management Service opened 29.7 million acres to oil and gas exploration. It is anticipated that the thinning ice in the Arctic Ocean may open up shipping opportunities across the region and facilitate offshore oil exploration and extraction. This was the reason that the sale was the most successful in Alaska's history, with bids totaling $3.4 billion. The thinning ice, however, is projected to gravely affect the polar bear and ice-dependent seal populations, and the lease sale area overlaps their critical habitat. The lease sale came just days before the U.S. Fish and Wildlife Service was due to decide if the polar bear should be listed under the Endangered Species Act. Because of a delay in that decision, several environmental organizations filed suit. On May 15, 2008, the U.S. Fish and Wildlife Service finally listed the polar bear as a threatened species. Shortly after that action, the State of Alaska announced that it planned to take legal action against the agency for that listing, while environmental groups planned to take legal action despite the favorable ruling, since the U.S. Fish and Wildlife Service had no specific plan for addressing threats to the critical habitat of the polar bears.

RESOURCE EXTRACTION: ETHICS AND SOCIAL JUSTICE

There is a second problem with the ethics of cost-benefit analysis. The mere quantity of benefits versus costs does not provide a sound basis for judging issues of social justice. For example, even if the overall benefits exceed costs in a given case, there should be scrutiny of the kinds of costs and who must endure them. *Pareto-based principles* justify a distribution of benefits to some if it does not worsen the condition of others. Modified versions may permit those harms if they are compensated by those who benefit. By this criterion resource extraction that would yield large benefits to nonlocal people would be acceptable if it did not significantly harm the environment of local inhabitants or if local inhabitants were compensated

Arctic National Wildlife Refuge, Alaska. *With the dwindling supply and rising demand of fossil fuels, many are pushing for increased exploration and development in the Arctic region as a source of these materials. It has been estimated that the Arctic National Wildlife Refuge, or Area 1002, holds between 4.3 to 11.8 billion barrels of recoverable oil. However, the cost to the ecological health of the region may not be worth the economic benefit.* **AP IMAGES.**

through revenues or other means to a degree that would not leave them worse off.

A *utilitarian principle*, on the other hand, might have a different result. Gifford Pinchot (1865–1946), the first chief of the U.S. Forest Service and one of the staunchest utilitarians among conservationist thinkers, characterized utilitarianism as the greatest good to the greatest number for the longest time (Pinchot 1910). Under reasonable interpretations of the principle, it might be morally justifiable to extract resources that will benefit a large portion of a population, even if degrading the local environment for a few, so long as that benefit far outweighs the harm for the entire population.

A third issue to consider is the *difference principle* propounded by the twentieth-century philosopher John Rawls. According to this principle, social injustice and unfairness occur when the benefits and costs of some practice are inequitably distributed through a population—unless it can be shown that the inequity benefits the least advantaged in the population. If most of the costs of resource development are endured by the indigenous, least-advantaged population in a region but the benefits accrue to privileged nonlocals, then such a policy violates Rawls's basic principle of justice (1971).

Pragmatic ethics suggests that public discourse tends to result in normatively correct outcomes so long as the institutions and practices that constitute it are open, inclusive, and fair. When confronted with the reality of effects from pollution over the years, public norms in democratic societies have drifted toward advocacy of more protections for the environment. On this view what matters most, then, is not the use of an ethical formula for decision making but ensuring open, fair, and inclusive deliberative practices among stakeholders. Australia and British Columbia have attempted to apply this model, emphasizing consensus-based practices among businesses, scientists, government managers, and native groups. These processes aim at affording greater control over natural resources to local communities and giving increased attention to indigenous ecological knowledge and realistically sustainable practices.

Traditionally viewed as a remote hinterland, sparsely populated by indigenous peoples who have often been subjected to racist disdain, the Arctic has been vulnerable to exploitation and colonization: for example—the development of Kola Peninsula and the amazing story of Edward Teller's attempt to experiment with hydrogen bombs in blasting a cold-water port near Point Hope, Alaska. Later development projects by national and international

extraction companies have shown greater ethical cognizance of the dignity and interests of indigenous peoples. There are growing expectations that governments, and national and international extraction companies, will ensure proper ethical treatment of indigenous peoples. The history of the development of the North Slope in Alaska illustrates how some of these ethical concerns have been addressed. With the discovery of oil in this region in 1968 came the realization that a pipeline would be needed to transport the oil to an accessible port. Because the proposed pipeline route would traverse native-owned lands, the Alaska Native Claims Settlement Act (ANSCA), was proposed and passed in 1971. Although still considered controversial, ANSCA granted aboriginal Alaskans title to 44 million acres of public lands of their choice and conferred a $962,000,000 cash settlement in exchange for a waiver of existing land claims. ANSCA also established twelve regional native corporations to manage the lands. Since then the native corporations have become significant economic and political forces in the state and have, ironically, been responsible for the development of some ecologically sensitive lands in a way that has undermined subsistence hunting among some native shareholders.

ENVIRONMENTAL ISSUES AND CLIMATE CHANGE

Pollution from mineral extraction and fossil fuel emissions has long been a matter of serious concern; there is increasing alarm over the contribution of those activities to climate change. If, as the evidence suggests, fossil fuels contribute to global climate change through the greenhouse-gas effect, then the costs of resource extraction are considerable, particularly because their use weakens incentives for developing alternative energy sources. Nowhere on the globe are the effects of climate change more palpable than in the Arctic. Obvious signs include air temperatures that have risen at twice the global average and rapidly melting, retreating glaciers. The Greenland Ice Sheet, the second-largest such formation in the world at 1 million square miles, has melted at a rate of 17 percent from 1972 to 2002. The catalogue of environmental impacts on the Arctic are quite large: the effects of thinning ice on the habitats of polar bears and other species; changes in vegetation patterns that will disrupt food sources for animals; the drying of freshwater lakes; an increase in invasive species; increased insect impacts on vegetation; greater likelihood of forest fires; and the acidification of ocean waters, which will significantly affect plankton life in the sea. Changes in weather patterns have increased storm activity along the coast, affecting human coastal communities such as Shishmaref, located on a barrier island on the Chukchi Sea in Alaska. Because of erosion from sea storms and melting permafrost, the village must be relocated. The melting of the permafrost will compromise road infrastructure and building stability. Ultraviolet radiation from the thinning ozone will interfere with photosynthesis processes and affect the health of vegetation.

Changes in climate in the Arctic will have repercussions beyond that region, including an increase in global air and ocean temperatures because of the loss of sunlight-reflective ice and snow. As the permafrost melts, the release of methane gas will increase the amount of greenhouse gases in the atmosphere. Rising ocean levels from glacial melt will threaten coastal communities around the world and will affect temperatures globally.

Climate change in the arctic raises two interconnected issues of *intergenerational justice*. Assuming anthropogenic causes of global climate change, one issue concerns how much responsibility the current generation should accept for the existing state of the environment, given the cumulative actions of previous generations. Assuming we accept some of that responsibility—and there are feasible ways to lessen the effects of global climate change—a second issue concerns what it is we owe future generations in that respect (see Beckerman and Pasik 2001; Page 2006). A 2007 study by the Intergovernmental Panel on Climate Change provided evidence that there are anthropogenic causes of global climate change and that there are feasible ways to improve the state of the environment (IPCC 2007). Thus, a resolution to these ethical issues of intergenerational justice is needed and has a special urgency for the arctic, the region of the world most glaringly affected by global climate change.

SEE ALSO *Cost-Benefit Analysis; Endangered Species Act; Energy; Environmental Law; Future Generations; Global Climate Change; Intergenerational Justice; Intergovernmental Panel on Climate Change; Pinchot, Gifford; Pollution; Preservation; Resource Management; Traditional Ecological Knowledge; U.S. Fish and Wildlife Service; Utilitarianism.*

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James Jakób Liszka

ASIAN PHILOSOPHY

Asian philosophy, like Western philosophy, includes a great deal in terms of both method and content. Through the centuries Asian philosophers have defended an immense variety of theses, including almost any position—metaphysical, epistemological, or ethical—with which Western readers will be familiar. Asian philosophical traditions can be divided into two very broad categories: those originating in India and those originating in China. This distinction is not merely geographical: Indic traditions are, on the whole, very different from Chinese traditions, and for this reason are treated separately below. These two categories are, in turn, conventionally subdivided on the basis of religion, the Indic philosophical traditions being classified as Brahmanical-Hindu, Jain, or Buddhist, and the Chinese philosophical traditions as Confucian or Daoist.

As these subdivisions indicate, Asian philosophy is closely related to Asian religion. This is not to endorse the popular notion that the former is essentially mystical and nonrational. Rather, it is to suggest that in Asia, philosophy has usually been thought to have a soteriological function. That is, within Asia, philosophy has been regarded not merely as an intellectual pursuit, but also as an activity essential to attaining the proper ends of human life.

SAMSARA

For many Indic philosophical traditions, the ultimate end of human life is to realize *moksha* (for Buddhists, nirvana)—an awakening from the ignorance and craving that mark ordinary existence. From a cosmic perspective, the aim is to escape from samsara, the realm in which sentient (experiencing) beings undergo a recurring cycle of rebirth from one form to another. This cycle is said to be driven by the law of karma, according to which one's past actions, morally good or morally bad, affect the form of one's rebirth. Good karma is thought to make for a favorable rebirth; bad karma for a less desirable rebirth.

This view of the world might, in some respects, appear to be ecological, or green. For one thing, the spiritual predicament of human beings is portrayed as being in certain fundamental respects like that of nonhuman animals: neither I nor my dog has attained *moksha*, and so we are both caught up in samsara. For another, since any individual has been reborn countless times in countless forms, any particular human has undoubtedly been reborn many times as an animal. The opposite holds true for animals as well. My dog would not once have been me, to be sure, but she could have been my parent, mate, or child in some former life. On this basis the Mahayana Buddhist *Lankavatara-sutra* endorses vegetarianism, for how, it is asked, could one consider eating a being that had once been one's mother?

If in these respects Indic cosmology might seem attractively green, in others it might seem thoroughly anthropocentric and quite at odds with the concerns of modern environmental thinkers. For one thing, the cosmic order (*Dharma*) is conceived of as a strict hierarchy. Just as, according to traditional Brahman-Hindu conceptions of caste, it is better to be reborn as a Brahman (priest) than as a Sudra (servant), so rebirth as a human is considered superior to rebirth as an animal. For another, samsara itself is not portrayed as a pleasant place. On the contrary, it is a realm of desire, frustration, and anxiety (*duhkha*), a bad

dream from which the wise individual will seek to awaken. What is more, in Indic traditions such as Samkhya and Advaita Vedanta, this awakening is achieved in a way that would make contemporary environmental thinkers blanch, namely, by distinguishing one's true self (*purusha*, *atman*) from the mundane, empirical world.

On the basis of these observations, some writers have concluded that Indic philosophy is world-negating and so inherently at odds with the efforts of environmentalists. Such assessments must be balanced, however, against other aspects of Indic thought. Here some writers emphasize the world-sacralizing aspects of Indic thought, as present in the panentheism (all-in-God system of belief) of Ramanuja (1017–1137), for example (see Mumme 1998). Others contend that to achieve *moksha* is not to escape the world, but merely to free oneself from the craving and ignorance that bind one to the cycle of rebirth. Indeed, in many Indic texts—the Buddhist *Theragatha* verses, for instance—contemplation of the natural world is recommended as an exemplary practice for those seeking to cultivate such nonattachment.

SELFLESSNESS AND NONVIOLENCE

In Indic traditions, the primary vices, those dispositions of character that bind one to the cycle of rebirth, are craving and ignorance. The unawakened accept worldly appearances and so are led to crave worldly things. Hence they condemn themselves to the suffering of continuing rebirths.

Indic thinkers tend to focus on one manifestation of this ignorance: the inveterate tendency to identify a part of the world as one's self. This delusion is the primary component of the self-centered anxiety characteristic of unawakened existence. Accordingly, to be liberated from samsara is to become selfless. This selflessness need not translate into a moral concern for others. The hero of the *Bhagavad Gita*, for example, manages to reconcile one kind of selflessness with his duty, as a warrior, to slaughter his own kinsmen. Nonetheless, selflessness, in combination with other virtues, is often considered an integral part of such moral concern.

Especially important here is ahimsa (nonviolence), a virtue thought to bear, not just upon interhuman relations, but also upon the treatment of all sentient beings. A commitment to ahimsa is evident in much Indic thought: in the Buddha's objections to the ancient Brahmanical practice of sacrificing animals; in the famous edicts issued by Aśoka, the environmentally conscious king of the third century BCE; in the *Upanishads*, the *Laws of Manu*, and the epic poem *Mahabharata*; and, in the twentieth century, in Mahatma Gandhi's advocacy of vegetarianism and Ernst Friedrich Schumacher's "Buddhist economics." For Jains in particular, the imperative not to harm any living thing, even plants, is sacrosanct. Even when accidentally caused, such harm is regarded as morally wrong and as a source of bad karma.

It must be stressed that justice is not the model here, and the rhetoric of animal rights is inappropriate. References to ahimsa often seem to appeal instead to an empathic sense of kinship with nonhuman beings. All sentient beings, it is said, are like us in desiring an end to suffering, and we should therefore treat them as fellow sufferers, rather than as enemies or resources. Such views are particularly important in Buddhist traditions—in accounts of compassion, for instance, or of *maitri*, the wish that all sentient beings, human and nonhuman, be content.

FORMING ONE BODY WITH HEAVEN AND EARTH

To understand Chinese philosophical traditions, it is important at the outset to note that the idea of a creator-god is alien to such traditions, as is the notion of a God's-eye perspective from which the world may be regarded with flawless objectivity. Instead, Chinese thinkers tend to regard the world as an inhabited realm, imbued with living meaning and significance. In line with this broad conception, the soteriological thrust of Chinese philosophy is to determine how best to inhabit the world. And the general answer to this question is that one should live in harmony with the Way (*Dao*) of things.

What, then, did Chinese thinkers have to say about the natural world? The classical Confucian sages, including Confucius (551–479 BCE), had little to say, being more concerned with human self-development and politics. More of interest can be found in the writings of Neo-Confucian thinkers, such as Wang Yangming (1472–1529), who sought to use the rather fragmentary remarks of Confucius and other classical thinkers as the basis for a systematic philosophical system. A central theme of Neo-Confucian thinkers is metaphysical holism. For them, the cosmos is a dynamic, organismic whole, unified by *qi*, a psychophysical element generated in the cosmic struggle between two all-embracing principles: yin (symbolizing passivity, darkness, coolness, wetness, etc.) and yang (symbolizing activity, brightness, heat, dryness, etc.).

The concepts of *qi* and *yin-yang* indicate a commonality between humanity and nature, one so intimate that a *yin-yang* imbalance in a person's mind could, it was said, reverberate, by a *qi*-mediated cosmic resonance, in the natural world. This provided the metaphysical basis for the many tales of wicked rulers inadvertently triggering natural disasters, and also for Chinese geomancy (*fengshui*) and beliefs in the miraculous powers of animal parts.

Chinese conceptions of the unity of humans and nature also find expression in the key Chinese idea that living a good life involves assuming an appropriate relation

to the cosmos as a whole. Thus Wang Yangming maintains that to cultivate the key virtue of humaneness (*jen*) is at once to develop fellow feeling for animals and even plants. Similarly, if rather more grandly, Mencius (c. 371–c. 289 BCE) claims that the superior person, free from material desires, cultivates a "flood-like" *qi* within himself, and so fills the space between Heaven and Earth. Heaven and Earth are obscure concepts and cannot be explained here. Suffice it to say that for Mencius the ideal of human existence is to effect a kind of unity between oneself and the rest of the cosmos, to "form one body with Heaven and Earth." Modern scholars have looked to such ideas to develop a specifically Confucian model of environmental concern (see, for example, many of the essays in Tucker and Berthrong 1998). Such are the green, or environmental, tendencies in Confucian philosophy.

NATURAL HARMONIES

These tendencies are even more pronounced in another major tradition of Chinese thought: Daoism. Like Confucians, Daoists emphasize the practical benefits of living one's life in harmony with the Way, but whereas classical Confucians tended to conceive of the Way on the model of a strict social hierarchy, Daoists regard it as spontaneous, free, and inherently opposed to any sort of regimentation. Hence the hidebound Confucian sage is popularly (if somewhat unfairly) contrasted with the freewheeling Daoist, the former at home in the civil service, the latter at home on some mist-enshrouded crag, removed, both literally and metaphorically, from the straitjacket of social convention.

The exact nature of the Way is hard to describe (impossible, according to the opening line of the *Daodejing*). Provisionally, it may be conceived of as a mysterious force that is the source of all things and yet intimately related to them, not transcendent and Godlike. It is said to be flexible and malleable, like water, making its way by taking the path of least resistance. In the *Daodejing*, one in tune with the Way is said to go with the flow, his action being "nonaction" (*wuwei*)—selfless, malleable, unforced, and so on. This is the action of the woodcarver working with the grain of the wood or of the gardener sensitively responding to the turning of the seasons. Such a person is said to be unburdened by material concerns and so able selflessly to appreciate things, to "let them be," as Martin Heidegger, a twentieth-century admirer of Daoism, put it.

Such claims remind one of Buddhist ideals, and indeed there are similarities between the two traditions. Nonetheless, Indic and Chinese traditions remained, in many respects, quite different—so different, in fact, that Chinese Buddhism, which took root in the first centuries of the Common Era, grew in ways that arguably would have been unthinkable in an Indic context.

One of the main differences between Indic and Chinese Buddhist philosophy concern the spiritual significance of the natural world. As we saw, Indian Buddhist teachings tended to portray the natural world as the realm of *duhkha*; it might provide a fitting object for meditation, but it had little value in itself. Chinese Buddhists, by contrast, have traditionally regarded nature in a more positive light. This was due in part to the influence of Daoist and Neo-Daoist thought and in part to the East Asian attraction to (and adaptation of) certain Buddhist teachings. So in time the claim of the Indian *Mahaparinirvana-sutra* that all sentient beings have the potential to realize nirvana was transformed into the more radical teaching that even mountains, rivers, and streams are manifestations of the Buddha nature (see LaFleur 1989). Likewise, if, as the great Indian philosopher Nagarjuna (150 CE–c. 250) claimed, there is not a hair's breadth between samsara and nirvana, then, Chinese thinkers noted, there is no need to seek awakening in some other realm. As Zen teachers say, whatever one seeks is here in this world.

These ideas fostered a climate in which nature could be regarded as aesthetically valuable. To be sure, the green credentials of East Asian thought have often been exaggerated, and it is true that nature as revealed through East Asian art tends to be insufficiently wild for the tastes of Western environmental thinkers. However, there can be no doubting the power and importance of nature motifs in the *haiku* poetry of Bashō (Matsuo Munefusa, 1644–1694) or the ink and wash landscapes of Sesshū (1420–1506).

CONTEMPORARY WORK

Deep ecologists and other radical environmental thinkers have lauded the virtues of such Asian philosophical traditions as Advaita Vedanta, Daoism, and Zen. And their work has been joined by a deluge of books from environmentally minded apologists for Asian religions. There is no shortage of books extolling the green credentials of Buddhism, Daoism, and (more rarely) Confucianism and Hinduism.

Some of this work is well argued and compelling, but much, unfortunately, is of poor quality. All too often one comes across claims to the effect that a particular Asian tradition (Daoism, say) endorses some form of metaphysical holism (typically, the notion that all things are interconnected), and that it should therefore be regarded as a precursor of modern environmental thought. Such arguments should be treated with caution. On the one hand, they tend to rest on untenable interpretations of the tradition in question, interpretations that reflect little more than the author's own philosophical commitments and peculiarly romantic conception of Eastern thought. On the other hand, they tend to presume that the possession of certain features automatically

qualifies a particular view as green or environmental. Why, for instance, should seeing everything as interconnected necessarily engender environmental concern? And what, moreover, is meant by "environmental concern"? A concern for the welfare of individual sentient beings? For species? For the environment as a whole? Clarification is needed, but rarely provided.

The best writers in the field, by contrast, presume neither that Asian philosophical traditions are environmentally friendly, nor that they are not. Instead, they seek to foster dialogue: to learn from Asian philosophical traditions, but also to engage critically with them. In such work there is much of value for philosophers and environmental thinkers alike.

SEE ALSO *Buddhism; China; Confucianism; Daoism; Deep Ecology; Environmental Philosophy: V. Contemporary Philosophy; Hinduism; India and South Asia; Islam; Jainism.*

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Simon P. James

ATMOSPHERE

Along with earth, fire, and water, the ancient Greeks considered air one of the four elementary substances in the universe. It is known that air, or, more accurately, the Earth's atmosphere, is not an element but a mixture of gases that has changed in chemical composition over time in a way that has made human beings and other forms of life dependent on it for their existence. Scientific knowledge of the atmosphere helps inform environmental ethicists in their analyses of the moral consequences of human activities that cause global climate change, acid precipitation, and depletion of the ozone layer.

HISTORY OF THE ATMOSPHERE

Over the course of the approximately 4.6 billion years of the history of the Earth the chemical composition of the atmosphere has changed as a result of both planetary geology and the evolution of life. During its initial formation the atmosphere consisted primarily of helium (He) and hydrogen (H). Later in the development of the Earth extensive volcanic activity released gases such as water vapor (H_2O), carbon dioxide (CO_2), carbon monoxide (CO), sulfur dioxide (SO_2), ammonia (NH_3), chlorine (Cl), and hydrogen into the atmosphere. At that time, there was no free oxygen (O_2) in the atmosphere and thus no life as it is known today.

Beginning over three billion years ago, cyanobacteria (blue-green algae) evolved; that led to changes in the Earth's atmosphere because the bacteria were able to use the relatively high levels of carbon dioxide and water in the early atmosphere in the presence of sunlight to manufacture glucose (sugar), which they used for their metabolic needs. As a by-product (or pollutant), oxygen was released into the atmosphere, and over time its increasing levels enabled the evolution of organisms that used oxygen to break down glucose and provide for their energy needs. Consequently, the increasing levels of oxygen were critical to the evolution of oxygen-breathing life.

To understand how human actions change the atmosphere and affect environmental and human well-being, it is necessary to know something about the current chemical composition and layers of the atmosphere. The atmosphere consists of nitrogen (N_2) (78 percent), oxygen (21 percent), water vapor (0.0–4 percent), carbon dioxide (0.0003 percent), methane (CH_4) (trace levels), sulfur dioxide (trace

Boxberg Lignite-Power Station, Germany. *The Boxberg station, run by Swedish energy giant Vattenfall, uses lignite, or brown coal, as a power source. By burning fossil fuels, among other things, human industry is drastically changing the chemial composition of Earth's atmosphere.* **JOHN MACDOUGALL/AFP/GETTY IMAGES.**

levels), ozone (O_3) (trace levels), nitrogen oxides (NO and NO_2) (trace levels), and other gases that are present in trace levels. Atmospheric layers consist of the troposphere (up to about 18 kilometers [km] from the surface of the Earth), which is where the weather experienced on the planetary surface takes place; the stratosphere (about 18–38 km); the mesosphere (about 38–80 km); and the thermosphere (about 80–120 km). Within the stratosphere at an altitude of about 20 to 50 km is an ozone layer. The concentrations of the various chemicals vary with the different atmospheric layers.

EFFECTS OF HUMAN ACTIONS

With respect to human actions on the atmosphere that affect environmental and human well-being, it is the changes in the chemicals other than nitrogen and oxygen that are the most important, as can be seen in the following three examples.

Largely as a result of human activities such as the combustion of fossil fuels and, secondarily, changes in land use, humans are changing the global climate system. These activities result in emissions of carbon dioxide, methane, nitrous oxides, and other gases into the atmosphere that alter the balance of heat stored in the Earth-atmosphere system. Most visible sunlight passes through the atmosphere without being absorbed by it and hence warms the surface of the Earth. The surface emits infrared radiation (heat energy) back to the atmosphere, some of which is absorbed by those gases and some of which is reradiated into space. The balance between incoming solar radiation and outgoing infrared radiation is a primary factor in the Earth-atmosphere temperature. The gases that absorb heat energy in the atmosphere that has been reradiated from the planetary surface are known as greenhouse gases because their buildup in the atmosphere causes a warming of the Earth-atmosphere system, similar to the way the glass roof of a greenhouse admits light and traps heat. In turn, human-induced warming from activities that emit greenhouse gases causes adverse impacts on natural resources and processes on which humans depend and on human health and welfare.

Examples include changes in temperature, precipitation, the distribution and productivity of agricultural crops and forestry products, increased flooding, the distribution and productivity of fisheries, rising sea levels, species extinction, and the incidence of human diseases.

Some chemicals from human activities decrease the amount of ozone in the stratosphere, primarily over the Antarctic but increasingly over the Arctic as well (the "ozone hole"). The most common examples of ozone-depleting chemicals are the chlorofluorocarbons that were used in refrigeration systems and air conditioners, the production of plastic foams, and the manufacture of solvents for cleaning electronic components. One of the major problems caused by stratospheric ozone depletion results from the fact that this ozone absorbs ultraviolet light from space and therefore helps protect humans and other forms of life from skin cancer induced by ultraviolet light.

Chemicals such as sulfur and nitrogen oxides released into the atmosphere can be converted by chemical reactions into sulfuric (H_2SO_4) and nitric acids (HNO_3), respectively. By far, most of the elevated atmospheric levels of sulfur and nitrogen oxides are the result of human activities such as the combustion of oil, coal, and gas. Environmental problems caused by releases of sulfur and nitrogen oxides include a lowering of pH (increased acidity) in some aquatic ecosystems, which affects the reproduction and survival of fish and other aquatic organisms, as well as causing releases of toxic metals into water that otherwise would be chemically bound to soil particles and hence can accumulate to toxic levels in organisms. Human health problems caused by releases of sulfur and nitrogen oxides result primarily from the fact that the oxides form small particles that are transported long distances by wind and, when inhaled into deep lung tissue, cause increased illness and premature death from heart and lung disorders such as asthma and bronchitis.

Human activities that cause global climate change, stratospheric ozone depletion, and releases of sulfur and nitrogen oxides create ethical problems for several reasons. Relevant to any discussion of atmospheric changes caused by human activities is the fact that developed nations historically and currently emit the vast majority of chemicals causing such changes. For example, with about 5 percent of the world's population, the United States emits about one-fourth of the annual emissions of greenhouse gases, although that proportion is dropping as other nations industrialize. Many impacts will not be uniform across the Earth; regions in high latitudes are projected to incur disproportionate impacts. Further, poor nations and individuals that are the least responsible for emissions of the chemicals that have adverse impacts are less able to adapt to those impacts. Finally, global climate change will affect future generations to a greater degree than the present generation.

SEE ALSO *Gaia Hypothesis; Global Climate Change; Outer Space; Ozone Depletion.*

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John Lemons

AUDUBON SOCIETY

Sometimes referred to as the "gray lady" of the conservation movement, the National Audubon Society is one of the oldest and most influential environmental organizations in the United States. Founded in 1905 by a group of citizen-activists intent on preventing the killing of birds, the society has since expanded its mission to include the conservation and restoration of natural ecosystems. Although its members have not always agreed on how best to achieve that mission, its programs have usually reflected a broad consensus that nature has aesthetic, cultural, and scientific value to humans as well as some form of intrinsic value.

The early Audubon movement emerged when a network of scientists, hunters, homemakers, businessmen, and government employees became concerned about the declining populations of birds in the last decades of the nineteenth century. Although bird losses were the result of many factors—including habitat destruction, sport hunting, subsistence hunting, and egg collecting—early bird protectionists channeled most of their energy into eliminating market hunting, which was both the principal cause of bird deaths and the easiest to address. Market hunters shot birds to sell to restaurants, hotels, and wholesalers as food and to sell to the fashion

George Grinnell. *George Bird Grinnell (1849–1938), an American naturalist, founded the Audubon Society in 1886, after the famous painter of birds, John James Audubon. Within a year the society had approximately 39,000 members.*
THE LIBRARY OF CONGRESS.

industry as ornaments for women's hats. (The plumes of herons and egrets were especially valued as decorations.)

Scientists were among the first to take up the cause, forming the American Ornithologists' Union (AOU) in 1883 and quickly creating a bird protection committee. In 1886 the naturalist and writer George Bird Grinnell (1849–1938) founded an auxiliary to this committee for the general public, and he called this new group the Audubon Society, naming it after the American ornithologist John James Audubon (1785–1851), whose anthropomorphic bird paintings helped viewers see individual birds as worthy of respect. Although Grinnell's society folded in 1888, its closing was a portent of future success—Grinnell was unable to keep up with the nearly 50,000 requests for membership he received in less than three years.

In 1896 the Audubon movement was revived by Harriet Hemenway (1858–1960), a prominent Bostonian, and her cousin Minna Hall (1851–1941), who founded the Massachusetts Audubon Society to deter their fellow socialites from wearing plumes. Their concerns were quickly taken up by upper-class women in other states, who formed their own societies in collaboration with male ornithologists and sportsmen. By 1905, by which time thirty-six state Audubon societies had formed, the groups had joined together to become the National Association of Audubon Societies, and in 1940 this association became the National Audubon Society. (For complicated reasons, many state Audubon societies remain unaffiliated with the national organization, including those in Massachusetts, New Hampshire, Rhode Island, Connecticut, Maine, New Jersey, and Washington, D.C.)

Early advocates of reform pursued a dual strategy of legislation and education that proved remarkably effective. On the legislative front Audubon members lobbied for passage by the states of a "Model Law" drafted by the AOU that forbade the shooting of nongame birds. They also pushed for federal legislation that made such prohibitions uniform throughout the nation, a goal they achieved in part with the passage of the Lacey Act of 1900 and in full with the Migratory Bird Treaty Act of 1918. Although these legislative successes were largely the work of men, Audubon women were at the forefront of the movement's educational efforts, publishing pamphlets, developing slide lectures, sponsoring contests, creating circulating libraries, and organizing junior Audubon clubs. Women also provided much of the content for *Bird-Lore* (which later became *Audubon*), the bimonthly magazine begun by the ornithologist Frank M. Chapman (1864–1945).

Another major component of Audubon's efforts was the preservation of habitats, which, the society recognized, were critical to the protection of birds themselves. After President Theodore Roosevelt established Pelican Island, a four-acre island near Vero Beach, Florida, as the first federal wildlife refuge in 1903, Audubon leaders paid the salaries of the refuge's first wardens. Two years later, when Guy Bradley, an Audubon warden on patrol in the Everglades, was murdered by a plume hunter, the need for such refuges became even more apparent. The society eventually created its own network of sanctuaries and community-based nature centers, beginning with the Paul J. Rainey Sanctuary in Louisiana and the Theodore Roosevelt Sanctuary on Long Island, both established in the 1920s. In addition, beginning in 1930s, Audubon began to fund research into particular species, including the ivory-billed woodpecker, the California condor, the roseate spoonbill, and the whooping crane.

After World War II the society experienced a period of rapid growth that was due in part to the transformation of *Audubon* into a glossy bimonthly under its editor, Les Line. Membership grew by some 300,000 in the late 1960s and early 1970s, and the society's mission

expanded as well. It helped to create the Environmental Defense Fund in 1967, enact a ban on DDT in 1972, and halt a plan to build the world's largest international jetport in the middle of the Florida Everglades. It also moved into television with *The World of Audubon* series and returned to children's programming with *Audubon Adventures.* As it continued to expand, the society became involved in most of the major environmental campaigns of the late twentieth century, including helping to save the California condor, lobbying for the preservation of the Arctic National Wildlife Refuge, and publicizing the plight of the northern spotted owl.

Audubon's growth has not been without controversy, particularly during the 1990s, when the society began to distance itself from its traditional focus on birds and their habitats and devote more of its energy to human concerns. Like the Sierra Club and other large environmental organizations, Audubon has also been criticized for taking corporate donations, neglecting issues of environmental justice, and centralizing programming at the expense of chapter involvement. After a period of upheaval, however, in 2001 the society revised its strategic plan to sharpen its focus on birds, reinvest in its grassroots structure, and recommit itself to education and advocacy. In 2008 the society had some 500,000 members in more than 500 chapters around the United States.

SEE ALSO *Environmental Education; Environmental Law; Forests; Global Climate Change; Habitat Loss; Nongovernmental Organizations; Preservation; Rivers; Roosevelt, Theodore.*

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Daniel J. Philippon

AUSTRALIA AND NEW ZEALAND

Environmental philosophy (EP) made a vigorous debut in Australasia in the early 1970s, when it began to emerge as environmental ethics in Europe and the United States. Initially the debates turned on value theory and on what came to be known as the deep/shallow divide: Does ethical concern pertain to nonhumans or humans? These alternatives have often been assumed—mistakenly—to be mutually exclusive rather than intersecting.

ATTRACTION AND EMERGENCE

Australian environmental philosophers have contributed in major ways on both the deep and shallow sides of this argument. Richard Routley, from the Australian National University (ANU), initiated the deep or radical side at the World Congress of Philosophy in Bulgaria in 1973, challenging European and North American traditions that accorded purely instrumental status to nonhumans. Arne Naess's "Deep Ecology" and Richard Routley's "Deep Green Theory" emerged as major brand names for this kind of "deep" position in the 1970s (Routley 1973).

In his 1974 classic, *Man's Responsibility for Nature,* John Passmore (also from the ANU), a leading historian of philosophy, argued in favor of the European–North American tradition, which he identified with rationality and science. In his view the primary moral community is confined to humans, with other species' welfare necessarily consigned to secondary, derived status at best. Passmore believed that a position considering only human interests could deal adequately with the environmental crisis; if instrumentalism, albeit in a more refined version, is all that is required, he considered it neither necessary nor desirable to challenge that tradition.

Instrumentalism was just what the radical social movements of that era questioned. If nonhumans, including rocks and trees, were of intrinsic value, directly and in their own right, then "human chauvinism" was no better than other forms of discrimination based on race of gender. Others, such as Don Mannison (1980), William Grey (1993), and Janna Thompson (1990), agreed with Passmore, finding metaphysical fault with the concept of intrinsic value and defending instrumentalism.

The concept and terminology of intrinsic value conflicted with the popular idea that values are entirely subjective and hence, many invalidly concluded, instrumental. Richard Routley and Val Routley (1979, 1980) and Plumwood (1991) argued that the idea that all value must be instrumental was logically incoherent and involved an infinite regress, because every instrumental position must assume a "base class" with noninstrumental (intrinsic or initial) value as the direct bearer of value. If every value position assumes a base class, the analysis and viability of intrinsic value itself cannot be the main issue.

The real problem turns on the assumption that the primary "base class," however analyzed, is limited to the human. Routley and Routley (1979, 1980) showed that the common argument for the assumption that the "base

class'' for ethical concern coincided with the human—that humans could consider only human interests—is a fallacy based on extending to species interest the same kinds of fallacious arguments traditionally advanced for the inevitability of egoism. There is no logical barrier to moving beyond human exclusivity and exceptionalism to the direct ethical consideration of nonhumans and their needs in sharing the earth. What really needs discussion is the ethical character and conception of the human and nonhuman (or ''nature'') as the contrast has been traditionally drawn.

A growing band of Australian and New Zealand philosophers argued against the instrumental tradition and for an expansion of ethics to a larger ethical community that includes at least some nonhumans (most notably, Eliot 1985, 1989; Eckersley 1992, 1998; Fox 1990; Johnson 1991; and Singer 1974). But they had diverse views about the extent and nature of that community. Peter Singer, in *Animal Liberation* (1974), argued for extending the ethical community to animals as sentient beings—an easy extension for utilitarianism, with its emphasis on pleasure and pain as the key variables. Singer's concept of ''speciesism'' drew a parallel to racism and sexism. But other antispeciesists (Routley and Routley 1980) found this approach too limiting for an environmental ethic, objecting that focusing ethical attention on just those nonhumans most resembling the human (e.g., in consciousness) implicitly concedes and extends the ethically privileged status of humans. Singer's utilitarianism makes sentience the basis for an absolute ethical positioning of all species within a hierarchy, based on humanoid consciousness norms. Consciousness is seen in singular and cut-off terms, in a way that discounts the great variety of forms of sentience and mind—hence Singer's repeated assertions that trees have no form of sentience or awareness and thus warrant no ethical concern. A position that regards forests and rivers as devoid of primary value is of limited help for environmental issues, except for those few that are reducible to human or animal welfare.

Other philosophers who rejected instrumentalism (e.g., Plumwood 1993, 2002) aimed not for a Singerian *extension* based on human norms but for an ethical *expansion* that recognizes a much larger, less humanized earth community, with an ethic of respect, reciprocity, and attention that rests on foundations that extend beyond sentience or even life. Consciousness is just one among many relevant differences among species, differences that are largely incommensurable with respect to value and not hierarchically ordered by degree of resemblance to the human.

DEEP SUSTAINABILITY: BEYOND THE DEEP/SHALLOW ARGUMENT

Deep Ecologists themselves were not without their own internal dissensions and critiques. Mathews (1991), Fox (1990), and Naess (1973) eschewed ethics as uninteresting and unviable, emphasizing instead concepts of identification and realization. Deep Ecologists saw anthropocentrism as a major problem, and, with the concept of ''ecocentrism,'' advanced an alternative ideal (Eckersley 1992) that was not, however, well elucidated or thought through. Critiques of hegemonic (or dominating) centrisms—for example, egocentrism, eurocentrism, androcentrism, and ethnocentrism—supply useful lessons for the critique of anthropocentrism (Plumwood 1996), but it is unclear how ecocentrism should situate itself as an ideal within or in opposition to these patterns of domination.

For ''deep'' pioneers of EP during the 1970s, the main issue was not human and biospheric sustainability but rather nonhuman biodiversity loss. Everything else, including concern with human sustainability, was considered ''shallow.'' Of course, the role of humans in the mass extinctions and ecological outrages must be high on agendas for ''the examined life.'' From the perspective of later ecological politics, however, the conventional deep/shallow dichotomy of early EP looks like a false choice. Human and nonhuman concerns are not exclusive; it seems essential to consider both in a deeper, more philosophical way that questions connections and basic assumptions.

A broader analysis of human-centeredness shows how the human and nonhuman problems are linked. Human-centeredness (analyzed in Plumwood 1993, 1996, and 2002) is a complex syndrome that includes the hyperseparation of humans as an exceptional, supreme species and the reduction of nonhumans to their usefulness to humans. Countering such traditions that deny human continuity with, immersion in, and radical dependency on the nonhuman world involves *both* situating nonhuman life ethically *and* situating human life ecologically—the concern of sustainability. Traditions of human hyperseparation and exceptionalism present problems for both sustainability and ethics, because they do not conduce to an understanding of how nature supports human life. Exceptionalist delusions of being ecologically invulnerable, beyond animality and ''outside nature,'' result in ''human communities [that] have lost any sense of their ecological foundations'' (Dryzek 1997).

''Deep'' analyses that challenge human-centeredness are relevant to the issue of human sustainability; they stress the limitations of human beings, regarding them as constrained both ethically and ecologically by the needs of the larger biospheric community. Humans' deep ethical failures toward other species and their ''shallow'' prudential failures of sustainability are not opposed considerations but are closely linked.

RECENT ECOPHILOSOPHY: CONTRACTION AND CONVERGENCE

The prestige of EP and the extent of the issues it addresses have both expanded considerably since the germinal years of the 1970s. EP now encompasses such areas as political philosophy, ethics (including social-justice ethics), the history of philosophy, moral epistemology, and metaphysics. Australasian philosophy has contributed notably in all these areas since the 1970s. Nevertheless, Australian environmental philosophy no longer holds the premier place it held globally in the 1970s and 1980s among new nonscience disciplines. It has faced neglect or hostility from conventional Australian philosophy and has lost disciplinary attention and priority. In the humanities its important projects of cultural critique have been picked up by emerging disciplinary stars: ecopolitics; ecoanthropology; and, in literature, ecocriticism.

Nevertheless, important EP contributions continue to emerge from Australasia, especially in moral epistemology, metaphysics, the philosophy of mind, and political philosophy (Eckerseley 1992, 1995; Dryzek 1997; Gare 1995; and Mathews 1991). The focus on sustainability entails the need to view humans as limited and responsible beings in the biosphere, and challenges the modernist reduction of the world that underlies the framework of excessive commodity consumption. Since the mid-1990s work in moral epistemology, philosophy of mind, and metaphysics has begun to converge with indigenous philosophy and ecoanthropology. Australian indigenous philosophy posits a meaningful, mindful, communicative land, and relations with it are at the center, not the margins of life. Indigenous concepts of place and time direct attention away from the future-directed, human-exceptionalist progress narratives of European and North American thought and toward origins and ancestors, human and nonhuman. This philosophical orientation opposes the reductive, materialist philosophy of mind that has dominated European and North American philosophy and science since the Enlightenment.

Plumwood (1993, 1998, and 2002) argues against reductive materialism and for an ecological, animist concept of materiality that legitimates a richly intentional description of the world of the sort found in indigenous thought. Plumwood (1993) has distinguished between weak and strong forms of panpsychism, where the strong (deist) form assumed a humanlike, singularistic consciousness permeating the world, and the weak or animist form saw a world of multiple, dispersed intentionalities (traditionally the mark of the mental) expressing great diversity in forms and kinds of mind.

Freya Mathews (2003, 2005) also challenges this reductionism, which treats the world as an inert backdrop to the human presence rather than as a communicative presence in its own right. Mathews (2005) links the environmental crisis to a metaphysical crisis, exploring the disasters of the reductionist worldview in situated reflections on self and world, land and place. From a Spinozist position Mathews rejects materialism and embraces panpsychism as an expanded concept of mind that applies to the nonhuman world. Mathews distinguishes encounter from knowledge, viewing the former as a dialogical project that calls for response from the latter and that requires recognition of the interior or subjective dimension of matter; on this view, rationalist knowledge is materialist, reductive, instrumental, and oriented to prediction and control.

In contrast, Plumwood (1993, 2002) situates her thought within a reformed materialist tradition, dismissing traditional spirit/mind concepts as freighted with dualistic baggage. She distinguishes an ecological, animist materialism that recognizes creative, intentional matter from a reductive materialism that minimizes material creativity and denies narrative agency and intentional description to the nonhuman world. For Plumwood (1993, 2002) understanding the logic of dualism or binary opposition makes another materialism visible. Reductionism involves a reversal that assumes an original dichotomy between spirit and matter in which the "higher" side, the driver (mind, spirit, deity) is eradicated and the "lower" side, the driven (body, materiality) is affirmed instead—without, however, the fuller rethinking of materiality required for a proper resolution of the original binary antinomy. To the extent that the materialism of modernity involves negating agency and narrative, it is not a bold new beginning, as it claims, but is haunted by its lost former half. For an ecological, intentional, animist materialism, the material world is always already full of mindful nonhuman agents and narratives. For Plumwood, as for Mathews, the task of human rationality is not the instrumental one of reduction but the dialogical one of recognition and communication.

SEE ALSO *Deep Ecology; Naess, Arne; Passmore, John Arthur; Plumwood, Val; Singer, Peter; Speciesism; Sylvan, Richard; Utilitarianism.*

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Val Plumwood

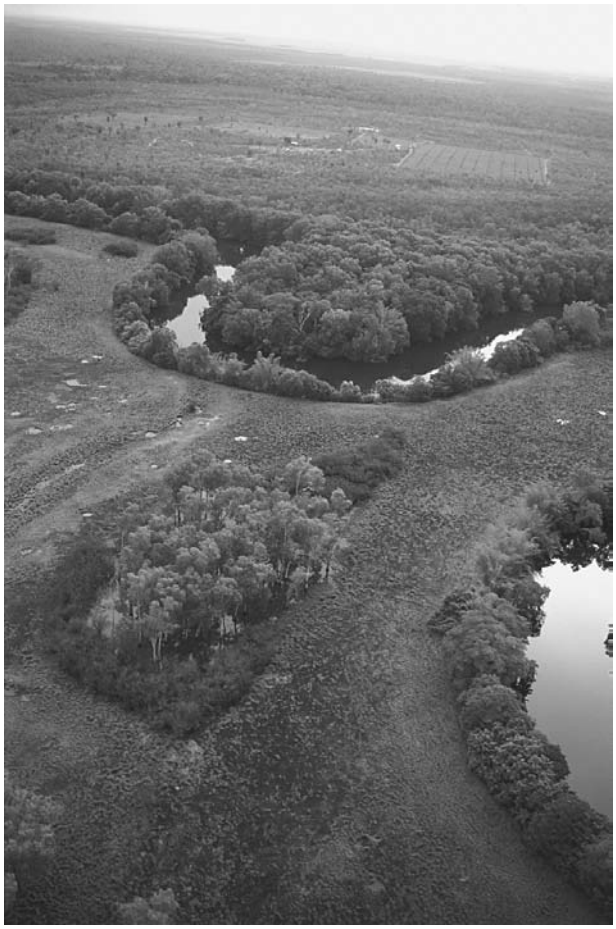
AUSTRALIAN ABORIGINES

Human beings have inhabited the continent of Australia for at least forty thousand years and perhaps for as long as sixty thousand. Anglo-Celtic settlers began arriving at the start of the nineteenth century, and since that time the population of newcomers has diversified and expanded greatly. Colonization entailed dispossession for most Aboriginal Australians, but there are many indigenous people who continue to live on or near their homelands and still hold to the ecocosmology of their forebears as well as, wherever possible, working with it in their country. Knowledge of Aboriginal environmental philosophy is the product of dialogue between indigenous people and settlers. The essence of indigenous philosophy is captured in the phrase "taking care of country." Care of country is an ecocosmology that encompasses ethics, philosophy, religion, a way of life, a set of practices, and a system of ecological knowledge.

Australia is the driest inhabited continent. Throughout the ice ages and during the warmer periods between them, in the face of the rising and falling of sea levels and increasing aridity and wind, people remained. There were no ice caps to force people away, and during the driest periods people remained even in the inland deserts. The contemporary climate is one of the most unpredictable in the world. Aboriginal Australians lived by hunting and gathering; this was a continent of foragers.

ABORIGINAL LIFE WAYS AND TECHNOLOGY

Australian Aboriginal people were nomadic, traveling regularly through their territory (known as country), following the water, the maturation of plants, and the movement of animals. Their material technology was kept to a minimum, with an emphasis on multipurpose tools. The *coolamon*, for example, is a large, shallow, oval wooden bowl. It was and is used as a baby cradle, for carrying food and other items, for winnowing and sorting



Finniss River and Paperbark Trees. *Bends in the Finniss River are the track of the Rainbow Serpent, one of the major Dreamings in this area. The habitat mosaic so evident in this photo is in part the result of Indigenous fire ecology. Country in the foreground is Aboriginal Freehold; in the distance is Settler Freehold with its grids for industrial agriculture.* **© SHARON D'AMICO/D'AMICO PHOTOGRAPHY LLC.**

seeds, and in food preparation. It is symbolic of women and figures in creation stories and songs, and in ceremonies. Populations were kept in balance with the resources of country. The major technology for living in those demanding habitats was knowledge. Carried in the mind, performed in ritual, and taught in song, story, design, and sacred objects, knowledge was the major means by which people achieved their long-term ecological, intellectual, emotional, and spiritual adaptation to country.

TOTEMISM: THE POETICS OF CONNECTIVITY

The term *Dreaming* has several referents. It includes the original creators and their actions, and the Law they established, including ecological organization, human groups, languages, territories, songs, rituals and totemic (multi-species) groups. Creation takes place both in the past and in the present. W. E. H. Stanner (1979, p. 24) coined the term *everywhen* in relation to the temporal aspect of Dreaming. Creation stories vary across the continent, but in general they concern the travels and actions of the Dreamings who walked the earth, making the places, countries, living beings, and cultures and ecosystems. All across the land the Dreamings made a world of form and difference. Countries, languages, peoples, species, cultures, landforms, plant communities, and sources of fresh water were all organized by Dreamings.

Dreamings created countries that are the homes for human groups, distinctive plant and animal communities, and the landforms that sustain their lives. A country is small enough to be known intimately and large enough to support its people. It is separate from other countries and is never subservient to another country. Countries are connected to one another through numerous relationships; none is isolated. Dreamings were the ancestors of kin groups that include both human and nonhuman descendants. For example, the kangaroo Dreaming ancestor founded groups of kin (clans) made up of kangaroo people and kangaroos, and the emu Dreaming ancestor founded emu groups of kin. People's primary responsibilities are to their country and their human and nonhuman kin.

Aboriginal Australian ecological poetics are sensuous and are embedded in specific localized knowledge. People say that their country calls them to action: They know the messages; they listen, smell, see, understand, and respond. Many people have an encyclopedic knowledge of the plants and animals of their country, the habitat requirements of the plants, the food and other habitat requirements of the animals, ways to interpret the animal and other tracks and traces of life in the land, and the symbiotic communities that enable many forms of life to flourish over time.

The care and nurturing of ecosystems express two major propositions about the flourishing of life in this created world. The first is that a country and its living beings take care of one another. This proposition asserts that relationships of care are reciprocal. To take care of one's country is to take care of the conditions by which that country can continue to provide sustenance for living things, including the people who belong to and care for the place.

The second proposition, which follows directly from the first, is that those who destroy their country ultimately destroy themselves. Attentiveness to the needs of living things pervades this ethic of care. The foods, habits, breeding requirements, behavior, and signs of stress of other living things are known, observed, and

responded to. For example, hunters look inside a dead animal to see what the animal has been eating, for this is a significant sign of the well-being of both individuals and species in the country, and people adjust their hunting accordingly.

Ecological knowledge is coded into iconography, song, and story; a great deal of myth and ritual articulates ecological knowledge for a particular country. The conventional Western division between practical action and religious action breaks down in practices of care. One of the best documented examples of the convergence of practical and religious action is the Dreaming track demarcating the travels of the red kangaroo in central Australia. This track traverses some of the most forbidding desert country in the world, and the sacred sites coincide with favored areas for kangaroos. The Dreaming sites are protected by numerous restrictions on human activity, and kangaroos also are protected at those sites. These are places to which kangaroos retreat during periods of stress where they are safe from human predation and from which they expand outward again during periods of abundance (Newsome 1980). Such ties combine ecological refugia with restrictions on human hunting, thus preventing overhunting.

FIRESTICK ECOLOGY

During much of the nineteenth and twentieth centuries, when European peoples were colonizing and settling Australia, the predominant view was that Aboriginal people were parasites on nature. For several decades that view was put forward explicitly by A. P. Elkin (1954, p. 15), one of the most respected and widely read anthropologists of the day. That view has been overturned. The evidence shows that Aboriginal people were active participants within the ecological systems that were their homes. Research into how Aboriginal people care for country, including fire ecology, dates from the 1960s (Jones 1969). Looking at the continent as a whole, it is evident that Aboriginal people's fire ecology is responsible for the open grasslands that covered much of the continent, the preservation of specific stands of fire-sensitive vegetation such as acacia and cypress and remnant rain forests, and the maintenance of a mosaic of microecological niches that enable a wide diversity of life-forms to flourish. Burning, along with a variety of other methods, is responsible for the protection of refuges, including breeding sanctuaries, and the preservation of permanent sources of water in arid environments. In addition, Aboriginal people's actions are directly responsible for the distribution of many plants and probably for the distribution of some fauna, such as freshwater crayfish.

Research into Aboriginal life is in an early stage; it has been assimilated unevenly and sometimes crudely. Not long ago there was debate about whether Aboriginal people actually engaged in firestick ecology; today it generally is accepted that they consciously managed large portions of the continent through the use of fire. Indeed, some of their principles have been incorporated into Anglo-Australian land management. Scholars continue to discuss the exact purposes that Aboriginal people have in mind when they are caring for country, but on the evidence of Aboriginal people, one of the most frequently expressed motives for burning is to "make things good for everybody" (April Bright, quoted in Rose 2002, p. 51).

All over Australia, when Aboriginal people speak English, they describe their burning practices as "cleaning up the country." There is a well-defined aesthetic:

Setting Fire to the Land. *Margaret Daiyi, White Eagle Clan (Rak Mak Mak) Elder, is lighting a fire to take care of an area of paperbark (*melaleuca sp*). As the smoke rose the firebirds came circling around looking for the animals and insects that would run from the fire; following the fire, the small swamp continued to hum with the life of insects and lizards, and with the undergrowth cleaned up, the herbivores could travel easily into the area and were enticed by the new green growth.*

Country that has been burned looks cared for and clean. According to April Bright, whose home country is in the floodplains of tropical Australia, "If we don't burn our country every year, we are not looking after our country." Not all country in Australia requires burning every year, but the underlying logic is widespread: "It is part of our responsibility in looking after our country. If you don't look after country, country won't look after you . . . The country tells you when and where to burn. To carry out this task you must know your country. You wouldn't, you just would not attempt to burn someone else's country" (Bright, quoted in Rose 2002, p. 51).

The timing of fires varied across the continent, depending on local factors, including terrains, vulnerable species, weather patterns, and patterns of regrowth. In light of the diversity of ecological niches, from the temperate rain forests of the southeast to the arid deserts of the interior and the monsoon savannas and floodplains of the north, the outstanding fact of Aboriginal firestick ecology is that everywhere people attempted to sustain a similar landscape pattern. The desired pattern was a mosaic of vegetation in various stages of recovery from fires, a reduction of combustible material that could fuel wildfires, and, where possible, sufficient stands of tall vegetation for hunters to hide behind. In ecological terms, Aboriginal burning produced habitat diversity with numerous edge zones and thus sustained conditions that were extremely favorable to biodiversity.

PHILOSOPHY

In 1999 the Aboriginal philosopher Mary Graham wrote about the "Philosophical Underpinnings of Aboriginal Worldviews." She identified two basic precepts that are both simple and complex: "The Land is the law" and "You are not alone in the world."

These two precepts can be understood as an indigenous ethic of connectivity. The second precept situates humans as participants in a larger living system. The first requires humanity to recognize and submit to the law of the living world.

Graham uses the term *land*—much as did Aldo Leopold—in a way that includes water, plants, animals, indeed the whole of what people tend to call the natural world. Her precepts are not human-centric. She explained her ideas more deeply, writing: "The two most important kinds of relationships in life are, firstly, those between land and people and, secondly, those amongst people themselves, the second being contingent upon the first. . . . [A]ll meaning comes from the land" (Graham 1999, p. 106).

Many of the mental, emotional, and spiritual values of home country are expressed in reference to flora and fauna that are of localized distribution, are common enough to sustain life, and have become synonymous with love, memory, longing, and hope. The daily practices of nurturance, sharing, and kinship, along with songs, designs, rituals, and connections with Dreamings and more immediate ancestors, all speak to an emotional and spiritual domain called home.

As the global climate system shifts into greater levels of uncertainty and as human beings in the developed world struggle to find an ethic of connectivity and accountability, Aboriginal philosophy refers to important truths. The archaeological record in Australia shows long periods of human stability sustained against an environmental history of change and exceptional uncertainty. Aboriginal languages do not have a term equivalent to *sustainability*, but Dreaming comes close in one respect. Dreaming creation was meant to endure, and lives lived according to the precepts Graham discussed promote abiding values and flourishing ecosystems.

The late David Burrumarra, a senior figure in Arnhem Land (north Australia), attempted to bring Aboriginal ecocosmology into Anglo-Australian thinking. In a paper titled "The Totemic Embrace" he sought to impress on all people, not only Aboriginal people, the idea that they must live for the totem, not just make a living from it. To live for others in the knowledge that that kind of life becomes a life that nurtures both self and others constitutes the heart of Aboriginal ecocosmology.

SEE ALSO *Australia and New Zealand; Fire; Land Ethic; Traditional Ecological Knowledge.*

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Deborah Bird Rose

AUTOMOBILES

Since their invention in the late nineteenth century, automobiles have come to play a pivotal role in the everyday lives of people and have gone on to shape nations and their economies. In 2000 one in nine of the world's 6.1 billion people owned an automobile, and this statistic is growing annually. Until the first decade of the twenty-first century, automobiles have been perceived as a largely benevolent and positive influence on society, bringing independence, convenience, and speed to those who owned and used them. As such they became a sign of economic growth in the societies where they prevailed.

Most people see automobile use not as a matter of good or bad, but as an indispensable aspect of everyday life. However, the environmental, social, and economic costs of automobile use have become more obvious and acute since the 1960s, and the moral problems relating to their use need to be considered on the individual and collective levels.

Hybrid Automobile in Japan, 2007. *As automobile use continues to increase, along with knowledge of its detrimental effects on the environment, manufacturers are looking for ways to reduce negative impact. On a test course in Tokyo, individuals can drive a prototype of a Toyota Motor plug-in hybrid, which runs on chargeable batteries.* **TORU YAMANAKA/AFP/GETTY IMAGES.**

ENVIRONMENTAL IMPACTS

Automobiles cause environmental problems from their manufacture, use, and disposal. The construction of automobiles requires large amounts of raw materials, including metal, glass, plastic, and rubber, and their actual assembly involves large-scale energy use, with considerable pollution as a byproduct.

During use, automobiles consume oil, and this stimulates demand for oil drilling, extraction, refining, and transportation. The geographical distribution of oil gives rise to international disputes over territory and access. Questions over the future availability of oil could escalate such tensions. Peak oil, the point at which half of all the oil that has ever existed in the world has been extracted (the most accessible half), is thought to have occurred between 2000 and 2008. As oil becomes scarcer, prices will rise, and more intense international political skirmishes are likely to follow. This raises significant ethical issues as well as practical problems for an oil-based global economy.

Once in use, automobiles produce over 1,000 pollutants, including carbon monoxide, sulfur oxides, nitrogen oxides, and particulates, all of which damage the local environment and people's health. Asthma, bronchitis, and cancer are the main diseases associated with these types of pollution.

The issue of climate change and the contribution of transportation to greenhouse gases, particularly carbon dioxide, have come to dominate discussions about transport-related pollution. Since light-duty vehicles account for half the global transport sector's emissions of carbon dioxide, automobile use is clearly an important factor in this worldwide problem. Even at the end of their lives, automobiles continue to pollute, with each discarded vehicle containing an estimated 6 quarts of oil, 3 quarts of fuel, 5 quarts of cooling fluid, and 3 quarts of sulfuric acid.

In Los Angeles, over two-thirds of land space is primarily for automobile use. American suburbia exemplifies the interdependence of urban development and automobile ownership, and represents a way of life that promotes and depends on universal car ownership. Even this pro-automobile infrastructure struggles to cope, and traffic congestion in the United States is estimated to cost $60 billion a year.

Although the landscapes of European countries are less dominated by the automobile, the years since 1995 have seen many road-expansion schemes being targeted by environmental protesters, with land take, habitat destruction, traffic growth, noise, and air and water pollution being the key concerns. John Pucher and colleagues (2007) describe motorization rates in China and India as skyrocketing, with a fivefold increase in private-car ownership in China between 1991 and 2003 and a doubling during the same period in India. This growth has been matched by parallel increases in traffic-related deaths and injuries, as well as in noise and air pollution. Since these ownership figures still represent a rate of only 10 and 7 cars per 1,000 population respectively (compared to 745 per 1,000 in the United States and between 500 and 650 per 1,000 in European countries), the potential for further growth is huge, and the threat to the global environment immense.

DEATHS AND INJURIES

Each year 1.2 million people die, and 50 million people are injured, in road accidents. Moreover, 500 million people

are either directly or indirectly affected by road accidents at an annual global cost of $500 billion. The inequity of the distribution of these deaths and injuries is also an issue. Around 90 percent of these deaths are in developing countries, and most deaths and injuries are inflicted on pedestrians, cyclists, poor people, and children (Grayling et al. 2002). Automobile use, it would seem, can no longer be regarded as a benign aspect of society and must be seen as an activity that causes damage and destruction in many different ways across the globe. Because of the number of negative externalities and their inequitable distribution and impact, automobile use likely cannot continue to be regarded as a private matter.

As public awareness of these environmental and social impacts has grown, more debates on the ethics of automobile use have emerged. Many of these center on the tradeoff between private gain and public harm, perhaps most famously expressed by Garrett Hardin in his classic paper "The Tragedy of the Commons" (1968). Using the concept of Anglo-Saxon grazing commons, he argued that social welfare cannot be maximized by individuals looking after their own interests, because it is not possible for individuals to maximize their own interests without reference to the actions of others. Individuals freely pursuing their own interests will inevitably act in competition with each other, and the total effect of everyone's actions is that social welfare is reduced rather than maintained or enhanced. On the basis of this effect, Hardin made the case for social controls over the use of resources belonging to the commons.

The issue of personal freedom is at the core of many of these arguments, particularly since private-car use is typically seen as a symbol of this freedom. Julia Meaton and David Morrice (2001) used John Stuart Mill's theory of freedom to explore the ethics of private-automobile use. On the basis of Mill's distinction between self harm (activities that harm only oneself and therefore are not subject to societal control) and other harm (activities that harm other people and therefore are subject to societal control), they argued that a ban on private-car use is morally justified, although they concede that this is likely to be impractical.

Other ethical discussions center on the issue of choice. In a discussion on the case against the sport utility vehicle (SUV), Steve Vanderheiden (2006) argues that people can be held morally responsible for the negative consequences of their acts only if those acts are voluntary, informed, and avoidable. This adds to the confusion, since it is possible to argue that in an automobile-dominated society it is necessary to have a car and hence that the choice to own a car is neither voluntary nor avoidable, yet on the other side of the ledger it is difficult to argue that people are unaware of the ills associated with that behavior.

Religious leaders have become involved in the debate. In the United States the Evangelical Environmental Movement Network focused on the growing movement against special purpose vehicles and framed the choice of transport as a moral issue best resolved by asking, "What would Jesus drive?"—although that arguably might be better phrased as "Would Jesus drive?" In 2007 the Pope confirmed the issue of motoring as a moral issue and penned ten commandments for motorists, though these dicta focused on societal rather than environmental issues.

While widely differing opinions exist on the rights and wrongs of automobile use and on the responsibilities of governments and individuals, there is a growing consensus that more responsible behavior is a moral and environmental imperative. Examples of good individual behaviors include driving less, using public transport and nonmotorized forms of transport, and sharing cars. When automobiles are used, models with lower environmental impacts should be favored, and drivers should drive so as to be socially and environmentally responsible. Governments should institute policies that encourage such choices.

SEE ALSO *Alternative Technology; Land Ethic; Tragedy of the Commons; Transportation; Urban Environments.*

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Julia Meaton

B

BACON, FRANCIS
1561–1626

Francis Bacon was born in London on January 22, 1561, and died of bronchitis on April 9, 1626. He attended Trinity College, Cambridge University, from 1573 to 1575—only two years, because of poor health. He was a lawyer, philosopher, statesman, essayist, and above all, master of the English language.

Bacon was unquestionably the most eloquent voice of Western modernity at the birth of the age of science, technology, and a quantitative economy. Galileo Galilei (1564–1642) asserted that the "book of nature" is written in the mathematical language of circles, squares, and triangles, and René Descartes (1596–1650) sought "clear and distinct ideas" based on a Galilean mathematization of nature. Bacon, in contrast, was a thoroughgoing empiricist. He advocated practical and efficacious applications of science for the sake of what he called the "love of humanity" (*philanthropia*), rather than scientific knowledge for knowledge's sake. Though Descartes and Bacon may have differed in scientific method, Descartes's view of humans as "masters" over inert, material, and mechanistic nature converges with Bacon's notion of *philanthropia*. The anthropocentrism of these two founders of modern science and technology has governed the spirit of Western science and technology and is now a dominant theme throughout the modern world. If anywhere, it is here that the intellectual and practical roots of the environmental crisis may be found.

Bacon master-minded and spearheaded an industrial civilization grounded firmly on scientific and technological advancement. In this he was an intellectual harbinger of the making of the modern world. He lauded the modern experimental and inductive method of science, and he advocated the convergence of theory and practice, the unity of knowledge and utility, and the inseparability of knowing and making—all for the sake of *philanthropia*. To create and apply technology, there must first be a knowledge of the world, obtained by what he called "the inquisition of nature." Nature must be "tortured" to reveal her secrets. Experiment is the essence of the natural sciences, because it is the only way of discovering the secrets of nature. By increasing knowledge through experiment, humans extend their dominion over inert nature. By positing utility as the end of knowledge, Bacon laid the foundation of humans' ability to "subdue and overcome the necessities and miseries of humanity." The framework of modern technology is set forth and justified when he insists on the meeting of human knowledge and power and discovers "in the womb of nature many secrets of excellent use." As Bacon himself emphasizes, the fruits of science do not grow in books.

In *The Advancement of Learning* (2000 [1605]), Bacon scorns the idea of studying words rather than matter, for "words are but the images of matter; and except [that] they have life of reason and invention, to fall in love with them is . . . to fall in love with a picture." In regard to the "degenerate learning" of the medieval Scholastics, he felt that they had "sharp and strong wits" and "abundance of leisure" in the "cells of monasteries and colleges," but that they knew little history of nature or "no great quantity of matter," and for that reason their "cobwebs of learning" produced "no substance of profit."

The idea of *philanthropia* is central to Bacon's philosophy of natural science. His short posthumous work

The Masculine Birth of Time (*Temporis Partus Masculus*; Farrington 1964), written in 1603 with the subtitle *The Great Restoration of Man over the Universe* (*Instauratio Magna Imperii Humani in Universum*), is fascinating and revealing. Bacon's conception of *philanthropia* is what contemporary environmental philosophers call anthropocentrism, pure and simple. This conception is predicated upon masculine humanity's absolute knowledge and mastery of nature, justified in terms of the Biblical mandate. The Bible mandates that nature, with "all her children," be bound and enslaved to serve humanity, to achieve "the fructifying and begetting of good" for humanity. The inquisition of nature leads to knowledge, and knowledge to technological power in the service of *philanthropia*. *Philanthropia* results from putting into action Christian duty and charity and proceeds to the worship of God. Bacon faults intellectuals who are indifferent to "the plight of mankind" and calls them "unholy" and "unclean." He wages a holy polemic in the name of Biblical religion in "Jerusalem" against allegedly wrong-headed philosophers in "Athens," whom he believes to be unholy "talkers." His Biblical call for *philanthropia* sacralizes humans at the apex of God's creation, while it desacralizes nature as a mass of inert matter. Carolyn Merchant (1980) criticizes Bacon's philosophy, especially its brazen sexism, as well as its anthropocentrism. The ecopoet Loren Eiseley puts it judiciously: Bacon's Christianity "took God out of nature and elevated man above nature."

SEE ALSO *Bible; Christianity; Descartes, Rene; Environmental Philosophy: V. Contemporary Philosophy; Environmental Philosophy: II. Medieval Philosophy; Environmental Philosophy: III. Early Modern Philosophy.*

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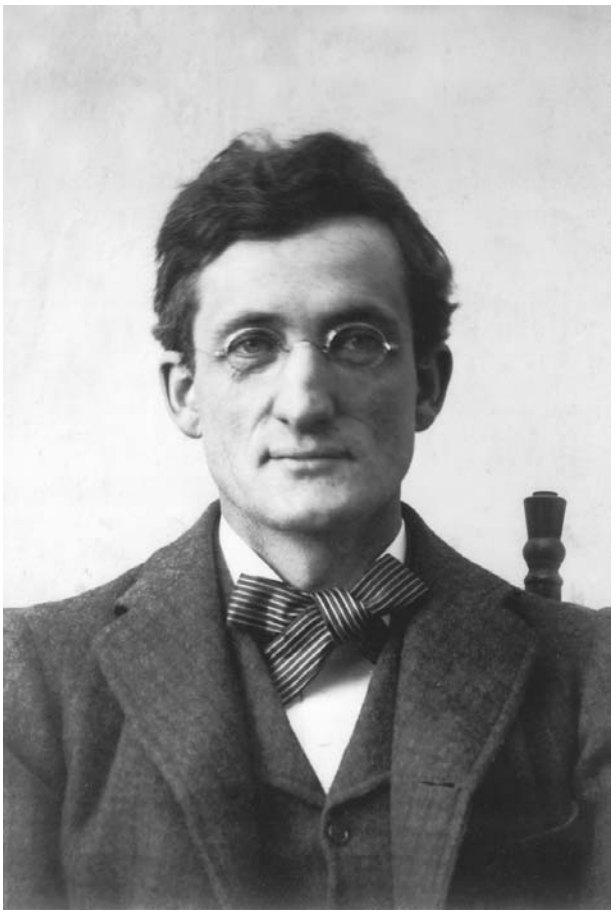
Hwa Yol Jung

BAILEY, LIBERTY HYDE
1858–1954

An American scientist, educator, and philosopher of country life, Liberty Hyde Bailey was born in South Haven, Michigan, on March 15, 1858. In *The Holy Earth* (1980 [1915]) and other works, Bailey developed the radical implications of the theory of evolution for humanity's relationship to the planet, yielding a nonanthropocentric environmental outlook that integrated agrarian, preservationist, and conservationist thought.

A childhood spent immersed in nature and in the works of Asa Gray and Charles Darwin propelled Bailey to Michigan Agricultural College (later Michigan State University), where in 1882 he received a bachelor of science in botany. From 1883 to 1884 he served as an assistant to Asa Gray at Harvard University's herbarium. This was followed by a brief period as a professor at his alma mater.



Liberty Hyde Bailey, 1900. *Bailey is best known for his influence on environmental agrarianism and philosophy. As dean of Cornell University, Bailey worked to establish agriculture and horticulture as scientifically respectable fields.* **THE LIBRARY OF CONGRESS.**

In 1888 Bailey began a career as a professor of horticulture at Cornell University, and from 1903 to 1913 he was dean of its College of Agriculture. His most focused investigation of humanity's relationship to the planet came during his long and productive retirement years, especially in the series titled The Background Books.

Bailey's philosophy emerged from the sense of environmental crisis before and after the turn of the twentieth century. He linked species extinctions and resource depletion to outdated human attitudes of fear and antagonism toward the planet. In *The Outlook to Nature* (1905), Bailey argued for an attitude of sympathy with nature primarily because he believed it was the only condition in which one could live a happy life. The same thinking guided his philosophical leadership of the nature-study movement. Bailey's objective in *The Nature-Study Idea* (1903) was to distinguish elementary science education from nature study, which he insisted should encourage children to sympathize with their surroundings and not seek to make scientific experts of them. He thus envisioned a developmental, evolutionary approach to environmental ethics, the foundation of which was neither fear nor exaltation of nature, but rather a clear-eyed appreciation of nature's intrinsic value.

Though there are romantic elements in Bailey's writings, his absolute faith in science marks him as a distinctly modern environmental thinker. In his early years at Cornell University, Bailey labored to establish horticulture and agriculture as scientifically respectable fields of study. While he served as dean, his outlook broadened, and his field became the whole of country life. During this period Bailey's public association with Theodore Roosevelt, as the chair of the latter's 1908 Commission on Country Life and a participant in the Conservation Congresses, give the appearance of a more mainstream utilitarian conservationism. Yet Bailey's writings reveal a man with broad vision and prophetic voice focused on the meaning of scientific discovery, especially evolution, and not just on its ability to increase production and conserve resources.

Bailey's years of reflection culminated in *The Holy Earth*, his most succinct and influential work of environmental philosophy. Here his objective was to extend moral and ethical consideration to the earth itself, and he did this by first locating humankind's "habit of destruction" in a faulty understanding of dominion. Bailey believed that Darwin's theory of evolution made it possible and necessary to reinterpret dominion. His result was a radical challenge to anthropocentrism and the introduction of a new concept: "We are parts in a living sensitive creation. The theme of evolution has overturned our attitude toward this creation. The living creation is not exclusively man-centered: it is biocentric" (1980 [1915], p. 23). Bailey concluded that as conscious members of the community of life, humans have a responsibility to participate in the unfolding of life and to view all of creation, including the earth, as holy. Bailey thus charted a third way beyond the debate between preservationists and conservationists. He affirmed the intrinsic value of the planet, but counseled learning from nature how farmers and others could use the land responsibly and permanently. Ultimately, Bailey's diagnosis of humanity's destructive relationship toward the planet led him beyond the goals of conservation to the prophecy of a new worldview, or what he called the "New Hold."

Bailey's influence is most evident in environmental agrarianism, and it also extends to Aldo Leopold, who cited *The Holy Earth* in his text *Game Management* (1933). *The Holy Earth* was followed by six more books in a series titled The Background Books, where Bailey explored other facets of his outlook, including a book of poetry, *Wind and Weather* (1916), and volumes exploring social and spiritual themes, *What Is Democracy?* (1918) and *The Seven Stars* (1923).

SEE ALSO *Agricultural Ethics; Agriculture; Biocentrism; Conservation; Darwin, Charles; Environmental Education; Preservation.*

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Paul A. Morgan

BERRY, WENDELL
1934–

Wendell Berry (born August 5, 1934, in Henry County, Kentucky) is a principal architect of the philosophy underlying the contemporary American sustainable agriculture movement. Since the mid-1960s, he has published more than thirty books of essays, poetry, and fiction. The range, complexity, and tenor of his thought invite comparisons to Thomas Jefferson. Berry shares Jefferson's vision of an agrarian republic: a community

of laborers pursuing a modest life of virtue, seeking peace, commerce, and friendship with other nations. Both envision the decentralization of political power and economic policies that favor farmers and small-scale enterprises over large corporations; both would encourage a watchful and active citizenry to form the first guard of freedom. But the intellectual currents informing the twentieth-century environmental and peace movements also shape Berry's vision. He is, for example, a more thorough-going pacifist than was Jefferson, and his agrarianism is more profoundly shaped by his concern for sustainability and environmental integrity. Jefferson hoped a republic of yeomen farmers could avoid the political corruption stemming from concentration of wealth. Berry hopes that a republic of *good* farmers will sustain the environmental conditions necessary for a fully human life.

Indeed, Berry's ideas, which bear some resemblance to social ecology and ecofeminism, are best seen as the maturation of the strain of Jeffersonian agrarianism that inspired the Populist movement and influenced the tradition of African-American political thought. It may be contrasted with the more aristocratic agrarianism that served as a defense of slavery in the antebellum era and was later revived by the Vanderbilt Agrarians or "Twelve Southerners," a philosophical and literary group that took shape in the 1920s around the leadership of John Crowe Ransom, Donald Davidson, Allen Tate, and Robert Penn Warren. While Berry endorses the Vanderbilt Agrarians' critique of industrial capitalism as a threat to stable communities and to the tradition of civic humanism, he rejects the aristocratic ethos that pervades their writings. He focuses instead on the dangers of economic inequality and the concentration of wealth, the erosion of civic virtue, and (especially in its antislavery guise) the impact of such social injustices on environmental stewardship. Berry explores this connection between social justice and stewardship in two early works: *The Long-Legged House* (1969), a collection of essays on the exploitation of Appalachian farmers and their land by coal-mining corporations, and *The Hidden Wound* (1970), an essay exploring the effects of slave agriculture on white Americans' relationship to the land. Both works argue that effective land stewardship requires those who tend the land to have civic equality and equal economic opportunity. A degraded work force leads to a general contempt for the work of stewardship—a contempt that he believes pervades American culture.

Berry's most famous work, *The Unsettling of America* (1977), develops this social theory in conjunction with his emerging virtue ethics. Berry's ethical teaching centers on Odysseus's story as it is recounted in *The Iliad*, which Berry reads as an account of the transition from the virtues of the warrior to the virtues of the good husbandman. He emphasizes in particular the Greek virtue of *sophrosyne*, which may be translated as prudence, self-control, or more broadly the ability to know and keep one's place in the cosmic order. It is the counterpart to the classical vice of hubris, which Berry considers to be at the heart of our contemporary environmental problems. He contends that our desire to control the conditions of our own existence—to be god-like in our autonomy and power—leads to reliance on powerful, dangerous technologies and a corresponding social isolation as we replace conscious dependence on particular people with unconscious dependence on machines and the impersonal social networks that support our technology. Moreover, because reliance on powerful machines masks our interdependencies, it creates an illusion of independence, which in turns weakens our sense of responsibility to the environment and community.

Berry's answer to this failure of responsibility is to emphasize our human condition of vulnerability and dependence, and the virtues we need to live gracefully: *sophrosyne*, fidelity, and the reasonableness of a "sympathetic mind"—an embodied, responsive mind that understands the limits of human knowledge and the proper place of both reason and sentiment in decision making. These virtues constitute the core of his place-based ethics: He envisions the good life as a life rooted in place, where responsibility to particular things and people can be enacted in a meaningful way. Living in place, by relying on local foods, markets, and services, allows us to develop our consciousness of our interdependencies and should enhance our sense of responsibility, thus developing our environmental virtues.

At the center of Berry's agrarianism is a robust conception of the human condition as one of interdependence and vulnerability. Out of that understanding grows his vision of the good life: a life of stewardship in community with co-equal citizens, constrained but not diminished by our biological and intellectual limits, and oriented toward preserving the environmental and social conditions necessary for us to lead fully human lives.

SEE ALSO *Agrarianism; Agricultural Ethics; Agriculture; Ecological Feminism; Shiva, Vandana; Social Ecology; Stewardship; Sustainable Agriculture; Virtue Ethics.*

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Kimberly K. Smith

BHOPAL

On December 2, 1984, a pesticide plant in Bhopal, India, built by Union Carbide Corporation and run at that time by Union Carbide India Limited sustained a huge explosion. Forty tons of methyl isocyanate (MIC) gas was released into the air around the plant, forming a lethal mixture of MIC, hydrogen cyanide, monomethyl amine, and carbon monoxide, among other chemicals. The figures are in dispute, but an estimate by Union Carbide put the dead at 3,800 while Amnesty International put the number at more than 7,000 killed within days of the explosion and more than 100,000 suffering from chronic illness related to gas exposure.

The company whose gas exploded into a lethal cloud was largely Indian-owned and completely Indian-operated. It had been founded as a branch of the American corporation in 1934 to provide pesticides for India's agricultural green revolution; the plant at Bhopal dated back to 1969.

THE EXPLOSION AND ITS TOXIC PRODUCTS

There was nothing extraordinarily dangerous in the operation of the plants; the most common kind of pesticide produced in them was carbaryl, an ester of carbamic acid, a reliable and relatively safe product that is marketed in the United States under the brand name Sevin. However, some of the chemicals employed in the process of making the pesticide are dangerous, including phosgene, the deadly gas briefly used in World War I on the battlefield, and hydrogen cyanide. Methyl isocyanate (CH_3NCO) is a member of the cyanide group, of which the highly poisonous hydrogen cyanide (HCN) is the most infamous. MIC is extremely unstable and dangerous and ordinarily is not studied in a laboratory situation. Its boiling point is 39 degrees Centigrade (102.2 degrees Fahrenheit). Lighter than water in liquid form but heavier than air in gaseous form, it hugs the ground when released; that is why it did so much damage to the people in the surrounding neighborhoods. It reacts violently with water (producing breakdown products and high temperatures) whether it is the water that entered the MIC storage tanks or the water in human tissue. Therefore, it is an extremely dangerous human poison, and there is no antidote. No one measured the concentration of the escaped gas at Bhopal, but as 50,000 pounds of it escaped, the heart of the cloud must have exceeded safe limits.

PLANT LOCATION AND DIVIDED RESPONSIBILITY

It made sense to put pesticide plants in India instead of manufacturing the Sevin in the United States and exporting it: Transportation costs and dangers were eliminated, and labor costs were much lower in India, making the whole operation safer and more profitable for Union Carbide. It also provided tax revenues and very good jobs in a chronically depressed economy, in consideration for which the Indian government sought, welcomed, and catered to American companies that were willing to locate plants in their country. The land on which the plant was built was given to Union Carbide by the Indian government for an annual rent of $40 per acre as part of a plan to bring industry into Madhya Pradesh, the largest and one of the poorest Indian states.

The divided ownership and consequent division of responsibility for the safety of the plant—the Americans responsible for the design, the Indians responsible for implementation—fostered an attitude of complacency and lack of concern for the details of safety arrangements and mutual suspicion in regard to decision-making authority. Those attitudes explain the lack of attention to safety lapses before the explosion and the chain of events that followed: recriminations, litigation, political hyperbole, threats of further litigation, no relief for the actual sufferers, and no success in restoring the environment.

INVESTIGATIONS AND AFTERMATH

What is the obligation of an American corporation in such situations? Bhopal is an example of everything that can go wrong in an industrial catastrophe. For over a year the Indian government would not allow industry investigators to examine the scene of the accident or analyze the residues in the wrecked tank. When they finally examined the remains of the plant, they found contaminants in the residue that might have accounted for the violence of the reaction within the tank. None of the safety devices had worked, and the emptying of the huge tank—and the resulting devastation—was inevitable.

Victims of Bhopal Tragedy Protest in New Delhi, 2006. *The explosion of the Union Carbide pesticide plant in Bhopal, India, in 1984 is often used as an example of a worst-case, scenario of the effects of chemical plants. The incident resulted in the loss of several thousand human lives, approximately 200,000 injured, and severe damages to the local environment. Despite concessions offered by the American-based Union Carbide company and various other organizations, the victims of the Bhopal tragedy continue to demand justice for the losses they have suffered.* **MANAN VATSYAYANA/AFP/GETTY IMAGES.**

Early in the investigation they found confirmation for the explanation they had deduced from the core samples. An instrument supervisor from the plant who otherwise was not involved in the explosion had surveyed the area of the tank on the morning after the explosion and had found that a pressure gauge had been unscrewed from the tank and was missing. That would explain how water got into the tank. A hose normally used for cleaning still was attached to the faucet not far from the tank, and water was running out of it. That would account for the source of the water. Further investigation uncovered the name of the employee who had performed the senseless act of sabotage. He recently had been, or was about to be, demoted, and he was angry. He surely had no intention of causing that kind of explosion, and his family probably lived nearby. However, he knew water would ruin the batch, and that was his intention. Union Carbide investigators turned their information over to the local authorities, but the political atmosphere was so violent that the Indian authorities did nothing about the findings.

Many of the victims had suffered horribly. Union Carbide as a corporation and Americans as a nation took immediate action to provide relief: The chief executive officer, Warren Anderson, went to India the day after the explosion, authorized to spend a million dollars immediately to care for the victims; the employees in all of Carbide's locations took up a collection to help the victims, especially the children; others donated medical supplies; and the University of Arizona, responding to information about the limited employment opportunities for the poor, built a vocational and technical college in Bhopal. By March 1985 Union Carbide had placed $7 million in an account for relief of the victims; a year later it proposed $350 million as a settlement for the victims and offered to build a hospital.

No one has been able to explain the reaction of the Indian government to those initiatives. Anderson's money was not accepted; he was jailed and then sent back to the United States without being permitted to talk to anyone. The employees' collection was turned back. Medical supplies were ignored, and in March 1987 the Indian government closed and razed the vocational and technical college when it found out that Union Carbide money had helped build it. Not until February 1989 were any funds transferred, when the Supreme Court of India ordered a final settlement of $470 million, which Union Carbide paid within ten days. Since that time activists have been trying to overturn the settlement and bring criminal charges against Anderson.

The incident that goes under the name of Bhopal has taken on a symbolic importance that is out of line with the actual events. It is interpreted as an example of Western imperialism or colonialism in the placement of the plant;

the fact that India eagerly sought the high-employment industrial works is forgotten. It is considered an example of the callousness of Western industrialism to the suffering of the Third World even though the errors that resulted in nonfunctioning safety equipment and triggered the explosion were under the control of the Indian managers.

The effect of the incident on American business abroad has been significant: No longer do multinational corporations plant their facilities and company flags in the developing world; instead, they work from export platforms or special trade zones or deal with native-owned companies through a series of insulating contracts. No one wants another Bhopal, and safety regulations are taken more seriously. For the same reason, to the extent that they can, American companies keep a safe legal and moral distance from the operation of dangerous plants abroad.

SEE ALSO *Environmental Law; Environmental Policy; India and South Asia; Nuclear Power; Pesticides; Pollution; Precautionary Principle; Technology.*

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Lisa H. Newton

BIBLE

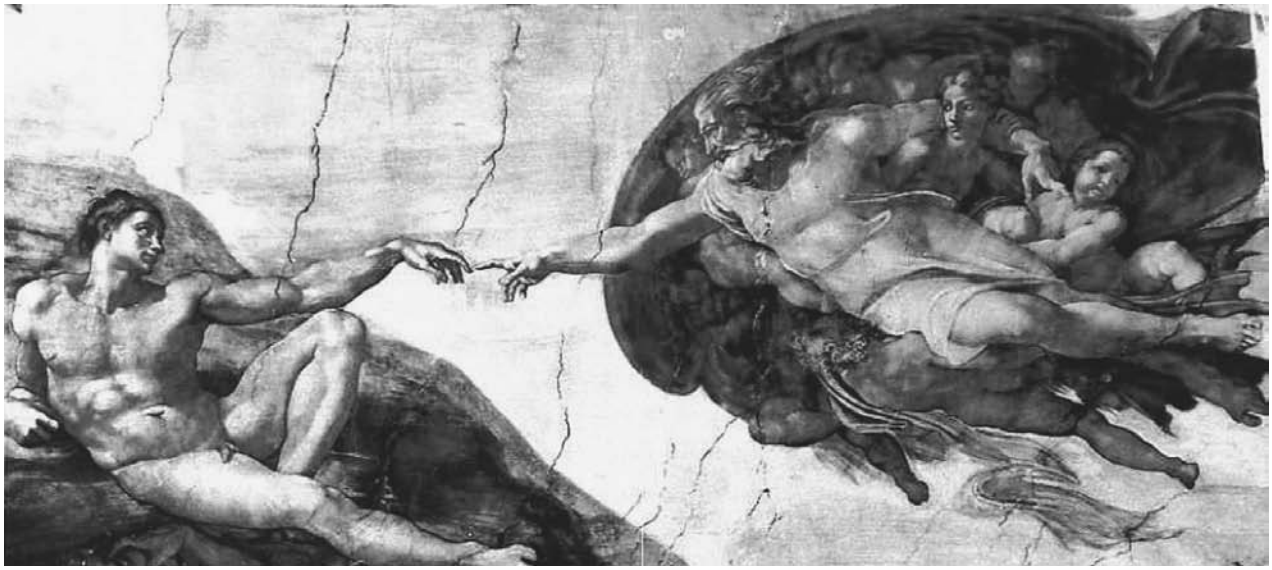
As a fundamental source of doctrine and authority in the Christian and Jewish religions, the Bible has profoundly influenced attitudes toward the environment among cultures shaped by these faith traditions. Whether this legacy has been good or bad in terms of positive concern for the environment is an issue of debate.

What counts as the Bible varies according to religious tradition, with the Jewish scriptures corresponding roughly to what Christians traditionally call the Old Testament (here referred to as the Hebrew Bible). The Catholic Church defines its canon of scripture differently from the Protestant churches, including in the Bible what the Protestant tradition refers to as the Apocrypha. Each of these various forms of the Bible contains a diverse collection of writings spanning a long period of time and reflecting different contexts and points of view. The earliest portions of the Hebrew Bible may date from around the eighth century BCE, while the latest writings of the New Testament probably come from near the end of the first century CE. A good deal of the discussion and debate about the Bible and the environment focuses on biblical interpretation in the Protestant (and especially evangelical) tradition, for two main reasons: First, it is in this tradition that the greatest weight is placed on the status of the Bible as the word of God, understood in evangelicalism to imply that it is infallible. Second, evangelicalism in various forms, some described as fundamentalist, is particularly influential in the United States, which, out of proportion to its size and population, exerts a powerful impact on the global environment and on world politics.

A CRITIQUE OF THE BIBLICAL TRADITION AND ITS IMPACT

Discussion of the impact of biblical texts and the Christian tradition on contemporary environmental attitudes and practices has been hugely influenced by "The Historical Roots of Our Ecologic Crisis," published in 1967 by the medieval historian Lynn White. White argued that the (Western) Christian worldview, rooted in the creation stories and the notion of humanity made in God's image, introduced a dualism between humanity and nature, and established the notion that it was God's will that humanity exploit nature to serve human interests. Thus Christianity, according to White (1967, p. 1206), bears "a huge burden of guilt" for introducing the Western anthropocentric worldview, which has permitted and promoted the active and aggressive conquest of nature to serve human ends. White, giving only a composite overview of the biblical creation stories, does not explicitly cite biblical texts, and his arguments concentrate much more on the historical development of Christian thought and early science during the medieval era, the period of his expertise. Nonetheless, White's forceful critique of the impact of the biblical tradition, especially the creation story of Genesis 1, has stimulated a range of often defensive responses from biblical scholars.

White's critique has helped to focus considerable reflection on the meaning and impact of the Bible's creation stories and especially the mandate given to humanity to subdue and rule the earth (Genesis 1:26–28). Also crucial to consider is the influence of biblical eschatology, that is, the view of the "end-times" (Greek *eschata*, means "last things") presented in various biblical books. A number of biblical texts (Joel 1:15, Amos 5:18–20, 1 Thessalonians 5:2) appear to present images of cosmic destruction in their depictions of what will



Creation of Adam. *Michelangelo's iconic depiction of the creation of Adam, from the ceiling of the Sistine Chapel, highlights the uniqueness of humanity, "made in the image of God" (Genesis 1.27).* **AP IMAGES.**

happen on "the day of the Lord," a biblical label for the coming day of God's judgment and salvation. Some texts suggest that earthly catastrophes will precede this final day of salvation (e.g., Mark 13); others depict Christians as taken up to meet the returning Lord in the air (1 Thessalonians 4:16–17). From such texts various eschatological expectations have developed. For example, some evangelical Christians anticipate a "rapture," an assumption of Christians from the earth into Heaven, prior to a time of great tribulation; some urge that Christ will return suddenly and perhaps soon. Such visions of the future have been popularized in hugely successful books such as Hal Lindsay's *The Late, Great Planet Earth* (1971) and the Left Behind series of the 1990s by Tim LaHaye and Jerry B. Jenkins. It is not hard to see that such beliefs could engender the view that preserving and caring for the earth is not a priority for Christians, and there is some evidence that this set of priorities has influenced decisions and policies at the government as well as individual level. Indeed, a few fundamentalist writers have explicitly opposed environmentalism, depicting it as part of a (satanic) neopagan New Age movement, and as promoting an unbiblical and un-Christian pantheism. These views raise critical questions about the kind of environmental attitudes that the Bible stimulates and supports.

READING THE BIBLE ECOLOGICALLY

Responses to such critical evaluations of the Bible's impact on attitudes toward the environment have taken various forms. Among those committed to environmental care, some, like Matthew Fox, have insisted that the Christian tradition requires radical reconstruction if it is to develop a spirituality appropriate for an ecologically conscious age. Evangelicals and others committed to the authority of the Bible, but also committed to environmental care, have sought to defend the Bible against the charges leveled by White and have tried to show how the Bible can undergird a positive view of the nonhuman world and of humanity's responsibilities toward creation.

A different approach to interpreting the Bible in the light of contemporary environmental issues has been developed by the Earth Bible Team, based in Adelaide, Australia, and published between 2000 and 2002 in the Earth Bible series under the general editorship of Norman C. Habel. In contrast to the approach of many green evangelicals, members of the Earth Bible Team are skeptical of attempts to portray the Bible as consistently supportive of an environmental agenda. They do not deny that there is ecologically valuable and instructive material in the Bible, but they insist that in engaging the Bible, one must be critical, ready also to expose and resist material that is anthropocentric and negative toward the earth. Their approach is guided by a series of "ecojustice principles" that express the value, interconnectedness, and purpose of the whole-earth community (for example, "the principle of intrinsic worth" [Habel 2000, p. 24]). These principles provide a basis for the critical evaluation of biblical texts from the perspective of a commitment to ecological justice. The following sections survey briefly a range of the biblical texts most commonly discussed in relation to the environment in order to examine both the

potential contribution of the Bible to environmental ethics and some of the different ways in which the texts are interpreted.

THE HEBREW BIBLE

As has already become clear in the discussion above of White's article, the creation story of Genesis 1 is a particular focus of debate. Responding to White's critique, some have sought to show that the mandate given to humanity to subdue and rule the earth (Genesis 1:26–28; see also Psalm 8:6) does not legitimate aggressive technological exploitation of creation to serve human ends. A positive proposal is that this text, along with others, is best understood as placing humanity into the role of "stewards" of creation. On this reading, humanity is not entitled to dominate creation for human benefit, but rather is given responsibility for careful and compassionate management of the earth. Central to a realignment of major evangelical leaders and bodies behind a more environmentally conscious vision of Christian responsibility is a focus on stewardship as the biblical image of humanity's role in the world, as expressed, for example, in "An Evangelical Declaration on the Care of Creation" (Berry 2000, pp. 17–22) and "Climate Change: An Evangelical Call to Action" (Evangelical Climate Initiative 2006). Others, such as Norman Habel, remain more skeptical about the possibility of reclaiming this text for an environmental ethic, insisting that it problematically elevates humanity over creation and gives permission for harsh and exploitative domination.

Attention may also be drawn, however, to other facets of the two creation stories placed side by side in Genesis 1 and 2. In the account of Genesis 1, the whole of creation is emphatically and repeatedly referred to as good, and both humans and animals are depicted as herbivores, feeding on green plants without the need (or divine permission) to kill other animals for food (Genesis 1:29–30). In the account presented in Genesis 2, there is no mention of humanity's being made in God's image and given a mandate to subdue and rule. Instead, the first human is made from the dust (Genesis 2:7; a wordplay in Hebrew: *adam* [human] from *adamah* [ground]), and becomes a "living being," like all other creatures (see Genesis 1:20, 24, 30; 2:19; 9:12). Adam is placed in the Garden of Eden "to till it and keep it" (Genesis 2:15), giving some basis for the idea that humanity's role is as stewards of creation.

Sometimes close attention to biblical texts in the light of environmental concerns can yield striking insights that challenge the traditionally anthropocentric character of the theological tradition, with its focus on human salvation and relationship with God. The covenant with Noah, recorded in Genesis 9:1–17, is a good example. While Noah and his descendants are indeed central to this covenant (see verses 1, 9), it is actually and explicitly a covenant made with every living creature and the earth itself (see verses 10–17). So, according to this text, the whole earth is bound in a covenant with God, not just an elect segment of humanity.

Complementing this picture are other texts, particularly in the Psalms, that have grand and poetic depictions of the whole created order as a manifestation of God's glory (e.g., Psalms 19:1–6; 104) and as called upon to praise God (e.g., Psalms 96:11–12; 148). The book of Job, a book focused on the story of a righteous man who endures great suffering, ends with a series of divine speeches in which, rather than console Job, God emphasizes Job's ignorance and insignificance, and lists the manifold wonders of creation (Job 38:1–42:6). This diverse and wondrous creation, it seems, has its own intrinsic value and relation to God, without there being any sense that it exists for the benefit or welfare of human beings. Job, apparently, gets the point, and responds to God's tirade by acknowledging his own insignificance (Job 40:4–5; 42:1–6).

Genesis 1:29–30 depicted an initially vegetarian, nonviolent creation, and it is striking that prophetic visions of the eschatological state also return to this theme. The book of Isaiah offers a vision of the messianic age in which "the wolf shall live with the lamb, the leopard shall lie down with the kid.... The cow and the bear shall graze, their young shall lie down together; and the lion shall eat straw like the ox" (Isaiah 11:6–7; see also 65:25). This, along with a promise of justice and liberation for the poor and oppressed, is what is meant by the establishment of righteousness. These visions provide biblical resources for those who argue that Jewish and Christian ethics should include a concern not only for human welfare but also for the peace and well-being of all creation. Indeed, these texts provide for some a motive for practicing vegetarianism, understood as a return to the original ideal depicted in Genesis 1 and as an anticipation of the peaceable eschatological age to come.

As already noted, however, some biblical depictions of the future also raise certain difficulties for an environmental ethic. Some prophetic visions, echoed later in various New Testament texts, portray the coming day of the Lord as a time when the earth will be shaken and the sun, moon, and stars will cease to shine (e.g., Joel 2:30–3:21). There is debate about how this imagery should be understood—whether as a depiction of real cosmic catastrophe or as a metaphorical portrayal of radical historical upheaval—but, in contrast to some of the texts mentioned above, it hardly contributes easily to a positive view of the environment. So while the Hebrew Bible offers much that might form the basis for a

theological world view and related ethic in which the environment is of central and enduring value, there are also texts that raise difficulties for such a perspective, as well as many that simply do not touch on the topic at all.

NEW TESTAMENT

When we turn to the New Testament, a similar situation pertains: Some texts offer positive resources for an environmental ethic, some raise difficulties, while many are of no direct relevance. Like the Hebrew Bible, but even more so—since the focus shifts from living in the land to salvation in Christ—the New Testament's main preoccupation is with the story of God's dealings with people rather than the value and fate of nonhuman creation. Nonetheless, there are a number of texts that have attracted the attention of ecotheologians. Probably the most cited Gospel texts are the verses in the Sermon on the Mount where Jesus refers to God's care for birds and flowers (Matthew 6:25–34 and Luke 12:22–31; see also Matthew 10:29). These are taken to indicate concern for nonhuman creation on the part of Jesus. It is also often noted that Jesus's parables frequently employ imagery of the natural world and agriculture. Whether these references offer much support for an ethic of environmental care may, however, be questioned. The rural imagery reflects the context of Jesus's life and ministry and does not necessarily say anything about the value he attached to nature, and his references to birds and flowers are primarily intended to illustrate how much more God cares for humans.

In the letters of Paul too there is only a little of obvious relevance. The most important text is undoubtedly Romans 8:19–23, where Paul strikingly depicts the whole of creation as bound up with the suffering of humanity and longing for the eschatological revelation of the sons of God, when creation "will be set free from its bondage to decay and will obtain the freedom of the glory of the children of God" (verse 21). This passage provides the most substantial support in the New Testament for the idea that God's salvation encompasses the whole creation, not just humanity. Romans 8 undergirds a sense of value—it is not merely the dispensable stage on which the drama of human redemption takes place—and declares that humanity, creation, and the Spirit are caught up together in their hopeful groaning for a glorious future. These are important foundations for an ecological theology. Also significant are a number of references in the Pauline letters to "all things" (Greek: *ta panta*, an established term for the universe in Stoic thought), which imply that the scope of God's redemption through Christ is cosmic and not merely focused on humanity. The most extensive of these references is in Colossians 1:15–20, where the writer (scholars debate whether this letter is genuinely from Paul) depicts Christ as the one through whom and for whom all things were made, the one in whom all things hold together, and the one through whom all things are reconciled.

As in the Hebrew Bible, so in the New Testament too, there are difficult texts that depict a coming time of cosmic catastrophe and the establishment of a new creation (e.g., Mark 13, Revelation 21–22). The most problematic of these from an environmental perspective is 2 Peter 3:10–13, which depicts the destruction of the elements of the world by fire, followed by an act of re-creation, and suggests that Christians should look forward to this day and even "hasten" its coming. While evangelical environmentalists struggle to remove from this text negative implications for environmental ethics, other interpreters, such as Keith Dyer (Habel and Balabanski 2002), conclude that such difficulties cannot be overcome, and that they must be critically resisted by those committed to promoting ecological justice. The ambivalence of the New Testament's vision of a new creation is also evident in the famous scenes in Revelation 21–22, with which the Christian Bible ends. Some argue for a positive reading of these texts as the culmination of the story of God's commitment to renew the whole of creation. This vision, they insist, is one of transformation, not one in which the old world is destroyed and replaced by a new one. Others note some of the difficulties in taking the depiction in Revelation as a positive model for an ecological theology, not the least being the massively urban character of the new Jerusalem (see Revelation 21:12–21).

AN AMBIVALENT LEGACY AND PROSPECTS FOR THE FUTURE

As this brief survey of the most pertinent texts shows, the Bible offers an ambivalent legacy to contemporary attempts to develop an environmental ethic. On the one hand, there is much in the biblical tradition that affirms the value of nonhuman creation and depicts the whole created order as bound up with humanity in God's redeeming purposes. As such, the Bible can challenge the traditionally anthropocentric focus of much theology and ethics and help to resource their reconfiguration. On the other hand, some biblical texts arguably depict humans as divinely appointed rulers over creation and apparently anticipate the destruction of the present cosmos, and are therefore problematic from the perspective of environmental ethics. Depending on their particular perspectives and commitments, scholars argue for various interpretations of such texts, but it is hard to conclude that the Bible offers a consistently pro-environmental perspective. Even where the texts suggest the positive value of the nonhuman creation, they give little indication as to what appropriate ethical actions are thus implied.

What is more, in the area of environmental ethics, it is especially clear that our modern, scientifically informed, globalized culture differs hugely from that of the biblical writers. Any use of the Bible in contemporary debate must pay attention to this considerable historical gap. This means that Christian environmental ethics cannot simply be based on attempts to interpret and apply what the Bible says, but, like other major developments in theological ethics, must derive from a fresh and critical reading of the Bible and tradition, shaped by the demands and insights of our contemporary context and informed by dialogue with scientists, theologians, ethicists, and others. Through such a dialog, the Bible can contribute significantly to an ecological reconfiguration of Christian theology and ethics.

SEE ALSO *Christianity; Ecotheology; Islam; Judaism; Stewardship; Vegetarianism; White, Lynn, Jr.*

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David G. Horrell

BIOCENTRISM

Biocentrism is a life-centered outlook that rejects the view that humanity alone matters in ethics and accepts the moral standing of (at least) all living creatures. It has played a formative role in the development of environmental ethics since the study of this subject became a self-conscious discipline in the 1970s; it was also influential among some key earlier thinkers, including Albert Schweitzer (with his belief in "reverence for life") and Mohandas Gandhi, who regarded even "the destruction of vegetable life as *himsa* (violence)" (Gandhi 1958, vol. 32, p. 43; Gruzalski 2007, p. 230). Not all biocentrists condemn all destruction of life, however, although they all regard the good of living creatures as a morally relevant element in decisions affecting their treatment.

KEY TENETS OF BIOCENTRISM

The common and crucial tenets of biocentrism are the following: (a) all living creatures have a good of their own and, accordingly, have moral standing (that is, they warrant moral attention or consideration for their own sake); and (b) their flourishing or attaining their good is intrinsically valuable. In representing the Deep Ecology movement as "biocentric," Arne Naess probably wanted to go further and include living systems (such as habitats and ecosystems) within the scope of biocentrism (Naess 1973), but the view that such systems have moral standing and a good of their own is nowadays more accurately classified as *ecocentrism.* Characteristically, biocentrists locate moral standing in individual creatures rather than in systems, as holists do; biocentrists respect systems not in themselves but only insofar as they protect or make possible the lives (or the flourishing lives) within them; they view such systems in much the same way that most people regard lifeboats.

EARLY BIOCENTRISTS

Naess may also have intended to embody a form of radical egalitarianism in his version of biocentrism, which endorses "biospherical egalitarianism—in principle" involving "the equal right of all creatures to live and blossom" (Naess 1973, p. 95). But many biocentrists have not endorsed this principle. Although some embrace it, others are closer to the very different egalitarianism of Peter Singer, who adheres to the "principle of equal consideration," according to which equal interests should be given equal consideration (Singer 1999); this principle is compatible with according different treatment to creatures with different interests, whether of the same species or not, thus privileging some creatures over others. Singer is not a biocentrist, because he sets the limits of moral standing at the boundaries of sentience. But there is nothing to prevent biocentrists, whose allocation of

moral standing is much less constrained, from endorsing his equal consideration principle across the broader range of creatures whose standing they recognize. Such biocentrism is not "inegalitarian," as Alan Carter has suggested (2001, 2005), but it does diverge from Schweitzer's radical egalitarianism and possibly Naess's and certainly Taylor's (1981) and Sterba's (1998) in such a way as to make biocentrism both egalitarian and more obviously defensible (Attfield 2003b, 2005).

Biocentrism was given a much clearer rationale in Kenneth Goodpaster's article "On Being Morally Considerable" (1978). To the question, which entities have moral considerability or standing? Goodpaster replies that it is those with a good of their own and that this criterion extends to all living creatures, given the centrality of the concept of beneficence in morality. Here Goodpaster diverges from Feinberg, who partly locates interests in "unconscious drives, aims, goals, latent tendencies, directions of growth and natural fulfilments" or, in summary, in "conations" (1974, p. 49–50), yet he inconsistently restricts the bearers of interests and thus moral standing to sentient creatures. Goodpaster rejects this restriction while incorporating Feinberg's understanding of interests into his biocentrism. But Goodpaster carefully distinguishes his position from belief in the sentience of all life (for he rejects both this belief and the view that sentience is necessary for moral standing) and equally from the view that all holders of moral standing, sentient or nonsentient, have the same moral significance. On that basis, he suggests, life would be unlivable.

Donald Scherer (1982) furnished crucial support for biocentrism through a thought experiment about the presence or absence of value on the imaginary planets Lifeless, Flora (which has vegetation), and Fauna (which has animals, too); he argues that it makes sense to value the states of Flora and Fauna but not of Lifeless. He also seeks to demonstrate that an ethic can be individualistic without being either egoistic or anthropocentric and can recognize independent value while remaining teleological (or consequentialist). Scherer does not entirely reject ethical holism (any more than Goodpaster does) and may actually come close to such holism when he makes values dependent on ecosystems and their value because the relevant creatures are physically dependent on ecosystems. (To this it could be replied that the dependence of the human passengers in a lifeboat on their vessel does not make their value dependent on either the lifeboat or its value.) Yet Scherer's stance shows how a largely individual-centered ethic can avoid the assumption that human concerns must be confined to human interests. An environmental ethic can value the good of all living creatures (present and future) without either making them all of equal significance or privileging the common good over the value of individuals, as ecocentrists are prone to do. Indeed, Scherer's thought experiment supplements Richard Routley's last-man thought experiment by locating intrinsic value in all self-maintaining and self-replicating organisms with a good of their own.

THE BIOCENTRISM OF ATTFIELD, TAYLOR, AND VARNER

A corresponding kind of biocentrism to Goodpaster's was upheld in two works by Robin Attfield: "The Good of Trees" (1981) and *The Ethics of Environmental Concern* (1983). In the former work, Attfield contests the prevailing theories that interests (human, sentient, or nonsentient) are a function of desires and preferences (Feinberg's eventual position) or of prescriptions (as in Hare), and develops arguments such as the last-person thought experiment in support of the good of trees having intrinsic value, thus supplying a reason independent of their instrumental value for their promotion or protection. In the latter work Attfield integrates biocentrism with a form of rule consequentialism and supplements it with a nonanthropocentric theory about which interests should be given priority in interspecies conflicts. Attfield further developed these views into a theory of interspecies priorities harnessed to practice consequentialism in *Value, Obligation and Meta-Ethics* (1995). Earlier, in the second edition of *The Ethics of Environmental Concern* (1991), Attfield replied to Janna Thompson's sentience-based argument that biocentrists have no consistent basis for denying intrinsic value to artifacts. Attfield responded that living creatures are capable of health and can be injured or harmed but that artifacts cannot be injured or harmed but merely damaged.

A different kind of biocentrism was presented in 1981 by the veteran ethicist Paul Taylor. Taylor disowns both anthropocentric and holistic positions and advocates instead a life-centered ethic of respect for nature in which agents recognize that each living thing has a good of its own, the realization of which is intrinsically valuable (or worthy of being preserved or promoted) and is to be pursued for its own sake. Respect for nature is comparable with and supplements a Kantian respect for persons. In Taylor's version of biocentrism, however, not only is human superiority denied, but each living thing is also held to be equally worthy of respect, irrespective of differences of interests, and to have the same moral significance. Accordingly, "biospherical egalitarianism" (the principle propounded, albeit with qualifications, by Naess) here reemerges. Taylor tackles the implications of such egalitarianism in his book *Respect for Nature: A Theory of Environmental Ethics* (1986). In that work he presents defensible practical principles that recognize that human needs have to be satisfied. But these principles are difficult to reconcile with—or to derive from—his

interspecies egalitarianism. A consistent and operational biocentric ethical system probably has to recognize, as Goodpaster does, differences of moral significance among the bearers of moral standing, something that is unattainable in Taylor's radical egalitarianism.

Gerald Paske (1989) later responded to Taylor's views, arguing (cogently) that nonsentient beings lack a point of view and (less cogently) that inanimate objects such as stalactites also have a good of their own, but he conceded that this is metaphorical talk, not to be taken literally in such cases. Thus Paske's claim that talk of the good of plants and of that of inanimate objects having comparable senses is unconvincing, and fails to undermine Taylor's biocentrism.

Some of the biocentrist conclusions of Attfield's "The Good of Trees" were endorsed by Gary E. Varner (1990). Varner added criticisms of Routley's thought experiment but seemed unaware that the version of this argument presented in Attfield's 1983 book was immune to several of these criticisms and that his criticisms of appeals to thought experiments had also been answered in Attfield's article "Methods of Ecological Ethics" (1983). In a later essay (2002) Varner returned to an ingenious defense of the intrinsic value of nonsentient creatures, citing further thought experiments and ably distancing his biocentrism from the versions advocated by Schweitzer, Gandhi, and Taylor. Although Varner has acknowledged problems for these thought experiments (see his 2003 review of Nicholas Agar's *Life's Intrinsic Value*), they are arguably defensible ones.

STERBA'S BIOCENTRISM

James Sterba has defended a different kind of biocentrism that involves a commitment to equality of individual creatures of whatever species (as it does for Taylor). Sterba recognizes that such a stance generates a dilemma, for our practical principles will apparently either be consistent but intolerable through forbidding human self-defense, or will allow human self-defense but will conflict with consistent biocentrism. He advances fundamental species-neutral principles that allow any species to resort to self-defense in certain circumstances. Sterba presents some quite cogent principles that authorize self-defense. But some have doubted whether his thesis coheres without a recognition of the difference made by different interests and capacities of different creatures, or whether, in the absence of a justification through the consequences of action, such principles can be reliably identified merely on a formal basis.

Besides furnishing some cogent interspecies principles (Sterba 1998, pp. 363–364), Sterba introduces a valuable discussion of the difficulties involved in extending biocentrism to ecosystems. Given the widespread abandonment of belief in the balance of nature on the part of ecologists, and a concomitant recognition that disequilibrium is as much the norm as equilibrium, nothing in particular can be recognized as good for ecosystems, even if they can be identified as such in the first place. Yet these problems for ecocentric theories leave biocentrism unscathed. Whether or not Sterba's radically egalitarian ideas are cogent enough, biocentrism in general is more defensible to the extent that it is based on equal consideration for equal interests. Such biocentrism needs to be allied to a defensible interhuman ethic such as practice consequentialism; such an ethical system has been presented and defended in *Value, Obligation and Meta-Ethics* (Attfield 1995) and in *Environmental Ethics* (Attfield 2003).

OBJECTIONS TO BIOCENTRISM

Among objections to biocentrism, Paske's observation that nonsentient creatures lack a point of view was developed by Singer (1993) into the claim that they therefore do not matter in themselves (lack moral standing); Bernard Williams has denied that their interests amount to morally relevant claims (1995). Williams's assertion is hardly an argument, however, and Singer's view accords undue importance to subjectivity as a requirement of moral standing and conflicts with the arguments of Goodpaster, with most people's responses to Goodpaster, and to the thought experiments of Routley, Scherer, and Varner.

Bryan Norton (1991) has argued that nonanthropocentric stances such as biocentrism are redundant because sophisticated anthropocentrism supports the same policies. Biocentrists counter that the recognition of nonhuman interests provides not only stronger reasons for policies of humaneness, compassion, and preservation, but also provides reasons for preserving those species that are of no current concern to humans (for example, those that have not yet been discovered).

The most common objection to objectivist biocentrism (as well as to other forms of objectivist nonanthropocentrism) is the suggestion that all judgments of value, however nonanthropocentric in content, are still anthropogenic (Callicott 1992) because they depend on human valuation, and there can be no value in the absence of valuers; this kind of biocentrism might be labeled "weak biocentrism." Even if argument were granted, it would not affect biocentrism at the normative level but only on the level of human judgments. But there is reason to doubt that things have value only because people decide that they do (Attfield 1991b, 1993a); *valuable* does not mean "valued" but applies to what there is reason to value, whether or not anyone values it; and it is implausible that nothing had value (or, in the case of pain, the

opposite of value) until humanity (or possibly until intelligent vertebrates) first appeared and began making judgments. (Could birds have lacked value in the days of archaeopteryx and acquired it only when first appreciated by primates?) Normative biocentrism claims that the good of living creatures supplies interpersonal reasons for action (some of them nonderivative); such a claim would make it reasonable to treat ethical judgements not as mere expressions of human valuing but as having truth values of the kind widely recognized as belonging both to moral and to value discourse; indeed, there is as much reason to be a realist about intrinsic value as there is for moral matters in general. Hence biocentrists can consistently and reasonably be resolute metaethical realists, even though their normative stance (biocentrism) does not hang upon this affiliation to realism.

SEE ALSO *Animal Ethics; Deep Ecology; Last Man Arguments; Naess, Arne; Norton, Bryan; Singer, Peter; Taylor, Paul.*

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Robin Attfield

BIOCULTURAL AND LINGUISTIC DIVERSITY

Three interrelated factors—human language, culture, and the inhabited ecosystems—have helped to shape the evolution of the human species. In the 1990s, numerous studies demonstrated correlations between biological and linguistic diversity, and suggested that these correlations provide evidence about the coevolution of human groups with their local ecosystems.

Humans interact with their environment, modifying it and developing specialized knowledge about it. In order to convey ecological knowledge and practices, humans have also developed specialized ways of talking about the flora, fauna, and ecosystems. The continued use of these local, coevolved languages promotes, in turn,

the continuity of local ecological knowledge and practices. Relationships between local languages and their socioecological environments are particularly apparent in indigenous communities that maintain close material and spiritual ties to their regional ecosystems (Maffi 2001).

LANGUAGE, CULTURE, AND NATURE

Biological and cultural diversity are inextricably interwoven among all peoples for at least two reasons (Rozzi 2001). First, perception and understanding of biological diversity are influenced by human language, culture, and technology. The compound term *biocultural* makes explicit the role of the "cultural lenses" of any observer (including one using academic research methods and taxonomies) in interpreting biological diversity; those interpretive "lenses" in turn influence how humans modify living organisms and processes, from molecular to global scales. For example, the indigenous Amazonian Waorani word *ömö* defines *forests* as "worlds inhabited by countless sentient beings who share with humans a home, dispositions, values, and culture." This human-forest kinship connoted by the word *ömö* gives rise to various rituals and encourages the Waorani people to oppose oil extraction in the Amazonian forests (Sawyer 2004). In contrast, the English word *woodland* implies that forest ecosystems are resources for wood for fuel or building materials. This utilitarian perception has reduced trees to objects that today can be genetically engineered without any consideration of them as integral living beings interacting with other living and non-living beings in forest ecosystems. These contrasting definitions of forests illustrate how concepts embedded in language influence both ecological knowledge (the ways in which humans perceive trees and their ecosystems) and practices (the ways in which humans transform other species and their habitats) (Rozzi 2001). By fostering an understanding of the multiple representations and classifications of biological diversity in various languages, this biocultural method can help to deconstruct the economic-mathematical approach to ecosystems that predominates in European and North American cultures, thereby bringing attention to alternative modes of ecological knowledge and practice.

Second, according to ecology and evolutionary biology, *Homo sapiens* is an animal species that, like other species, participates in the structure, processes, and composition of ecosystems (McDonnell and Pickett 1997). The human species forms part of biodiversity and, with its multiple ethnicities and cultures, generates ramifying networks of biocultural relations that interact with the heterogeneous ecosystems and landscapes in which they unfold. Novel biocultural approaches in anthropological and ecological research indicate that many landscapes previously depicted as pure, pristine expression of nature—wilderness—are in fact *cultural landscapes*, either deliberately created by humans or modified by human activities. Some remarkable cultural landscapes are found in the vast tropical areas of Amazonia, where, since the 1970s, scientists have begun to discern vegetation patterns that are the result of extensive plantations of fruit and nut trees, such as the *apêtê* "forest islands." Through the use of fire, forest management, and planting and transplanting within and between many ecological zones of Amazonia, indigenous people have created a mosaic of forest islands and corridors that attract useful animals. These discoveries within the world's most extensive forested region have obliged scientists to reevaluate these Amazonian landscapes; whereas they once labeled them as purely natural, they now apply the term *cultural forests* to these areas, which include large agricultural zones, open parklands, hills built with clay, and managed wetlands (Heckenberger et al. 2003, Mann 2005).

BIOCULTURAL DIVERSITY AND ECOLINGUISTICS

The biocultural approach contrasts with the prevailing disciplinary compartmentalization that has arisen from the specialized studies of languages, culture, and biodiversity. Despite the important role that language plays in the relationship between knowledge and the environment, the linguistic sciences have devoted scant attention to this link. Andrew Pawley (1996) attributes this neglect to the prevalence of grammar-based models that conceive of languages as autonomous systems that are independent of beliefs about and knowledge of the world. Some scholars argue that the syntactical and lexical description of a language is only a small subset of all its possible characteristics and that such anatomical studies of languages do not take into account the cultural and ecological knowledge that languages both convey and construct. On this view, then, such studies have little to contribute to documenting and conserving that knowledge. In contrast to this "classical" context-free, grammar-focused linguistic science, later subject-matter models of language have called for ecolinguistic approaches that view languages as ecologically embedded (Calvet 2006). These scholars argue that languages are not self-contained systems but are an integral part of larger ecological, social, and cultural environments.

When a human population colonizes a new environment, people have to learn from scratch about its flora and fauna, the relationships among species, and how to talk about them. Based on historical records about settlements of small populations on Polynesian and other islands, Peter Mühlhäusler (1995) has shown how drastic

environmental degradation often takes place at the beginning of human colonization. Negative environmental impacts continue until an attunement is achieved between the "contours of language and knowledge and the contours of the environment" (p. 36). Mühlhäusler's perspective might deepen insights into twenty-first-century patterns of linguistic, cultural, and ecological degradation associated with the rapid, intensive, and abrupt kinds of colonization practiced by homogenous, global, urban-industrial societies. This ecocultural-linguistic degradation has arisen from the imposition of a single cultural-linguistic model—global colonialism, it might be called—on the diverse environments of the planet. This cultural-linguistic imposition leads to the simultaneous loss of local languages and the ecological knowledge and practices embedded in them.

LOSSES OF BIOLOGICAL, CULTURAL AND LINGUISTIC DIVERSITY

Biodiversity loss is a well-known phenomenon. By some estimates, some 20 percent of the world's biological species may cease to exist during the twenty-first century. Less widely appreciated is the diversity loss in the world's languages and cultures. There were an estimated 6,912 languages spoken in the world as of 2005 (Gordon 2005). More than half of these languages, however, are spoken by very small communities of between 1,000 and 10,000 fluent speakers. On the other hand, only ten languages (Chinese, English, Spanish, Hindi, Arabic, Russian, Bengali, Portuguese, German, and French) are spoken by more than half of the world's population. Accompanying this rapidly growing predominance of a few languages is a correlative, if not proportional, loss of the diversity of the many languages that coevolved with unique ecological and cultural environments. This global "language shift" (Harmon 2002) has been accelerated by growing assimilation pressures that lead to the collective abandonment of native languages.

Many threatened languages belong to microlanguage families spoken by fewer than 100 people. For instance, the Fuegian language family in southern South America includes four languages, of which two are already extinct (Selknam and Haush); the other two are nearly extinct, spoken by fewer than ten persons among the Yahgan and Kaweshkar peoples (Rozzi 2001). Worldwide more than 10 percent of the living languages are "nearly extinct," almost 30 percent are highly threatened (there are fewer than 10,000 speakers), and as many as 90 percent of the languages may vanish during the twenty-first century (Krauss 1992, Maffi 2005).

Biocultural diversity, especially among indigenous peoples, faces three major challenges. First, more than 70 percent of the 6,912 languages in the world are endemic; hence the indigenous peoples who speak them represent most of the world's cultural diversity (WGPI 2001). Second, the populations of 5,000 indigenous groups number a mere 300 to 350 million, less than 6 percent of the world total. Third, the areas of highest biological diversity (over a wide biogeographical range from the polar regions to the deserts, from coastal areas to high-altitude zones, from savannas to tropical and temperate rainforests) are inhabited by indigenous people. More than two-thirds of the world's languages are spoken in the 238 ecoregions that the World Wide Fund has identified as the highest-priority targets for biodiversity conservation efforts (Oviedo and Maffi 2000). These three interrelated considerations underscore the fragility of biocultural diversity.

Foreseeing this scenario, Darrell Posey led the way in creating the International Society of Ethnobiology in 1988. That year the group's first international congress, held in Belém, Brazil, issued the Declaration of Belém, which called public attention to the need to better understand and conserve the "inextricable links" between biological and cultural diversity. Four years later, during the Earth Summit, another landmark international conference held in Brazil, these biocultural links were recognized by the Convention on Biological Diversity (CBD). In its preamble the CBD states, "The Contracting Parties … recogniz[e] the close and traditional dependence of many indigenous and local communities embodying traditional lifestyles on biological resources, and the desirability of sharing equitably benefits arising from the use of traditional knowledge, innovations and practices relevant to the conservation of biological diversity and sustainable use of its components. …"

The terms *traditional ecological knowledge* (TEK) and *indigenous knowledge* (IK) were first used in 1979 and 1980 (Maffi 2001). It was only under the influence of the United Nations Conference on the Environment, or Earth Summit, held in Rio de Janeiro in 1992 (Rio 1992), however, that these terms gained wide currency. Rio 1992 generated global awareness about the connections between biodiversity and indigenous knowledge. The CBD, Agenda 21, and the Global Biodiversity Strategy signed in Rio in 1992 affirmed the principle that "cultural diversity is closely linked to biodiversity. Humanity's collective knowledge of biodiversity and its use and management rests in cultural diversity; conversely conserving biodiversity often helps strengthen cultural integrity and values" (WRI, WCU, and UNEP 1992). In turn, the U.S. National Research Council (NRC) stated in 1992 that "a vast heritage about species, ecosystems, and their use exists, but does not appear in the world literature" (National Research Council 1992, p. 179). It therefore recommended that development

agencies place greater emphasis on, and assume a stronger role in, systematizing the local knowledge held by indigenous peoples as recorded in the gray literature (e.g., reports and other non-academically published documents) and in anecdotes. The NRC report declared, ''If indigenous knowledge has not been documented and compiled, doing so should be a research priority of the highest order. Indigenous knowledge is being lost at an unprecedented rate, and its preservation, preferably in data-base form, must take place as quickly as possible'' (National Research Council 1992, p. 113).

FORMAL EDUCATION AND LOSSES OF BIOCULTURAL DIVERSITY

In spite of growing conservation efforts, the juggernauts of cultural assimilation and homogenization are still charging through the global village. One of the main causes of linguistic and cultural diversity loss is formal education. Worldwide fewer than 500 languages are used and taught in formal education, leaving out more than 90 percent of the world's languages. In addition, more than half of the world's 193 sovereign states are officially monolingual. These educational policies are due not only to the dominance of colonial languages such as English and Spanish but also to internal political conflicts. For example, in Africa many states see minority languages as a threat to national unity. Home to 2,092 languages, Africa harbors more than 30 percent of the world's linguistic diversity. According to Herman Batibo (2005), unless ''unmarked bilingualism'' (in which two or more languages of unequal social prestige are treated equally) is achieved in Africa's formal education systems, minority language speakers will continue to face the dilemma of either (a) abandoning their native languages (and the ecocultural forms of knowledge that inhere in them) in order to gain access to the wider society or (b) conserving their languages, but at the price of consigning themselves to the margins of their multiethnic nations.

Languages, like biological species, have undergone extinctions before. The peak of linguistic diversity on earth may have occurred at the beginning of the Neolithic Period, 10,000 years ago, when geographically discrete societies tended to have distinct dialects, contributing to the maintenance of strong group boundaries, internal social cohesion, and coordinated environmental practices (Nettle 1999). During the last 5,000 years the colonial expansions of dominant civilizations have ridden roughshod over tribal languages and cultural traditions, with attendant losses in tribal people's sovereignty and control over their ancestral territories and resources. The temporal rate and biogeographical scale of current global cultural homogenization is, however, unprecedented. The spread of the dominant culture is proceeding by way of linguistic assimilation as the languages of the stronger groups monopolize education, the media, government, and other avenues of public discourse. Because most languages are unwritten, undocumented, and unrecorded, their disappearance will be as irreversible as that of living species (Maffi 2001).

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BIODIVERSITY

The neologism *biodiversity* was introduced as a contraction for *biological diversity* in the mid-1980s to describe the intended target of preservation efforts by conservation biologists (Takacs 1996). The new term was meant to include more than the game species, other resource species, and charismatic species that had been the targets of most earlier conservation efforts. All aspects of biological heterogeneity, whether structural, functional, or taxonomic, were to be included in its scope. There was a synergistic interaction between the growing use of the term in the 1990s and the spread of conservation biology, which emerged as an organized discipline in the 1980s (Sarkar 2005). As David Takacs observed: "In 1988, *biodiversity* did not appear as a keyword in *Biological Abstracts,* and *biological diversity* appeared once. In 1993, *biodiversity* appeared seventy-two times, and *biological diversity* nineteen times" (Takacs 1996, p. 39). The first journal with the term in its title, *Canadian Biodiversity,* began publishing in 1991 and changed its name to *Global Biodiversity* in 1993; a second, *Tropical Biodiversity,* began appearing in 1992; *Biodiversity Letters* and *Global Biodiversity* followed in 1993. The Society for Conservation Biology was founded in 1985, and its journal *Conservation Biology* started appearing in 1986. The goal of conservation biology is the preservation of biodiversity.

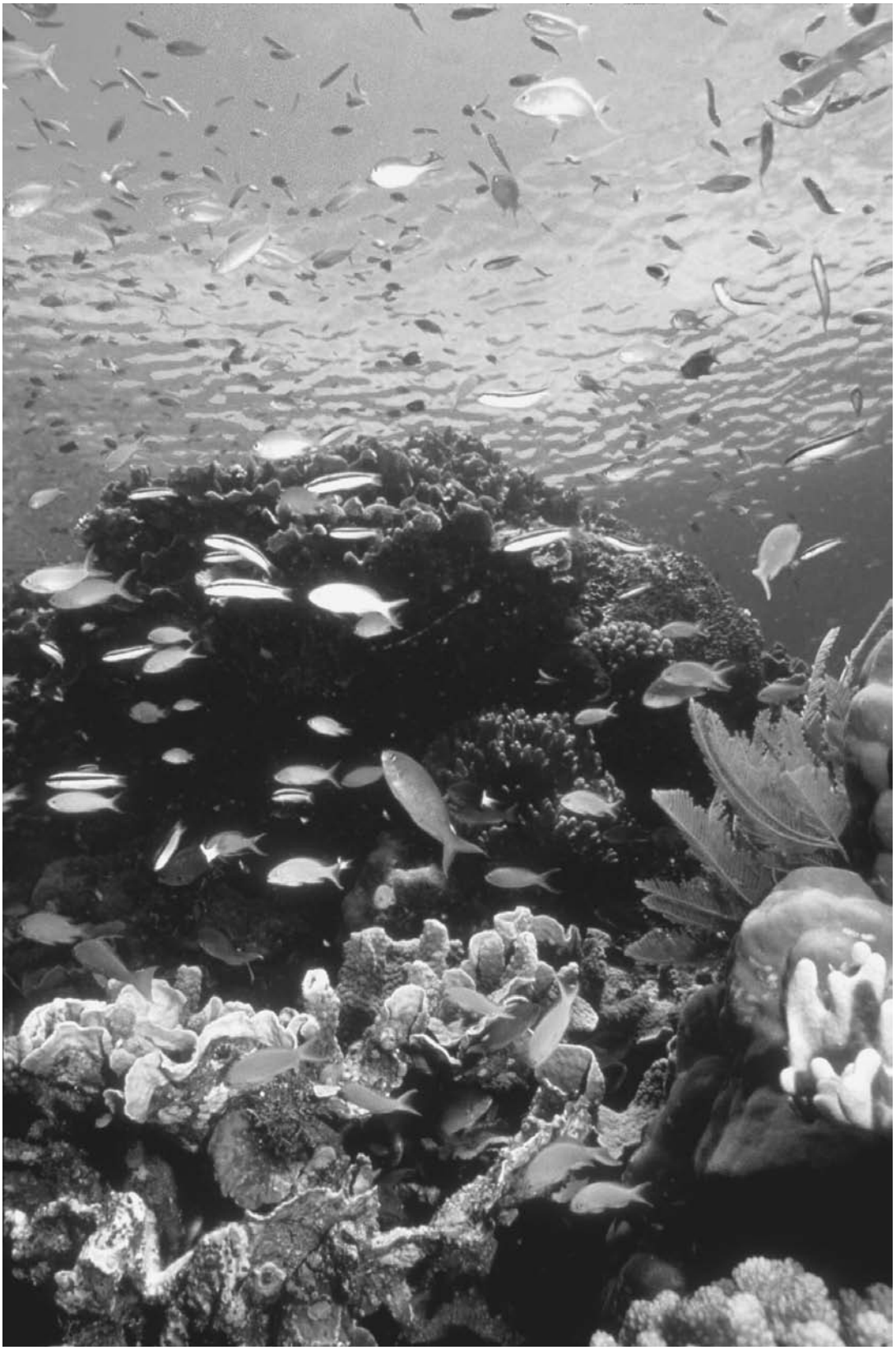
NORMATIVE CONCEPTS AND ISSUES

Because of its origin as the target of a goal-oriented enterprise, conservation biology, the concept of biodiversity has a normative component as well as a descriptive one (Norton 2003a). A useful analog is health, the goal of medicine, and Michael Soulé (1985) and other founders of conservation biology have endorsed the analogy between the two disciplines. The normative aspect of biodiversity is critical to understanding the concept and manifests itself in five ways in the context of the formulation of conservation policy.

Justification of Biodiversity The justification of the normative claim that biodiversity should be conserved remains a contentious issue that is central to environmental ethics. At one extreme are proposals that attribute intrinsic value to biodiversity, to all taxa, and sometimes even to physical features of the environment (Callicott 1986, Naess 1986, O'Neill 1992). However, those attributions are most convincing when they refer to individual organisms rather than abstract entities such as species or, especially, higher taxa. Even this is controversial; some philosophers have held that species are individuals (Hull 1978). At the other extreme is the position that biodiversity deserves protection because of its instrumental value to humans in providing resources and other services. Between those positions are more nuanced forms of anthropocentrism (Norton 1987, Sarkar 2005) that sometimes are coupled to a pragmatic multifaceted approach that admits a plurality of values (Norton 2003b). Environmental ethicists continue to debate these issues. The critical point is that, if there is no adequate normative basis for biodiversity conservation, conservation biology becomes a dubious enterprise because its explicit purpose is the conservation of biodiversity.

Definition of the Normative Basis The way the question of the normative basis for biodiversity conservation is answered influences what counts as conservation. If all individual organisms have intrinsic value, the target of conservation should be each one of them. Even controlling an invasive species to protect the habitat of an endangered endemic species becomes an ethically suspect policy. Conservation becomes a question of protecting lives rather than preventing the extinction of species. If the justification for conservation is purely instrumental, conservation consists of natural resource management and "biodiversity" is little more than a fancy new name for living natural resources. All other proposals require a much broader approach to conservation and thus a more general concept of biodiversity than individual organisms or living natural resources.

Establishment of the Normative Basis The way the normative basis for biodiversity conservation is established influences the way conservation policy is conceptualized and formulated. In particular, conservation planning, which is a central part of the practice of contemporary conservation biology, increasingly is being approached within the formal framework of decision theory and often involves the use of extensive software-based decision support tools (Sarkar et al. 2006, Margules and Sarkar 2007). The use of such a framework presumes that there is an anthropocentric basis for conservation decisions that are ultimately supposed to be evaluated through the use of expected utility functions



Great Barrier Reef, Australia. *Biodiversity is a contentious term used to describe the intended beneficiaries of conservation biology efforts. With one-third of the ecosystem off limits to commercial fishermen and tightened restrictions on shipping, the Great Barrier Reef is the most protected coral reef system on earth.* **STR/AFP/GETTY IMAGES.**

constructed from (human) preferences as elicited through a variety of methods. If biodiversity conservation must be based normatively on intrinsic values, this approach to conservation is not valid.

Characterization and Operationalization The normative component of the concept of biodiversity constrains the way it should be descriptively (scientifically) characterized and operationalized for the field. Suppose that some very eccentric definition of biodiversity gives high values to *Mus musculus* (the house mouse) and *Sturnus vulgaris* (the European starling) in North America. However, independent of this putative definition of biodiversity, there would be little normative basis to expend limited resources on the welfare of either of those species. Both are widespread invasive species whose spread probably should be controlled. Because the purpose of conservation biology is the protection of biodiversity, which is a normative goal, something must have gone wrong with the way biodiversity was defined. Thus, carefully considered normative decisions that specify what is deserving of protection must enter into the definition of biodiversity. Typically, these decisions embody cultural values. As is discussed below, those cultural values influence the selection of ''true surrogates'' for the measurement of biodiversity in the field.

Sonja Vermeulen and Izabella Koziell (2002) emphasized the importance of local cultural values in the definition of biodiversity over global values that are not culturally shared. Arguably, this would come at the cost of not allowing the use of many scientific criteria, which are supposed to reflect universal values but may not be locally appreciated. However, when global values have dictated what counts as biodiversity and how different components of biodiversity are prioritized, the result has been political conflict, sometimes leading to serious deprivation of those with the fewest resources. For instance, conservation refuges have been created throughout the developing world (the South) to protect endangered species in nature reserves because those species are highly valued by northern environmentalists (Dowie 2005). The extent and severity of this problem are contested, but there is little doubt that it is a serious issue (Bogerhoff-Mulder and Coppolillo 2005, Brockington and Igoe 2006). Such situations create troubling ethical problems besides violating every canon of distributive justice, assuming that that is acknowledged as a desired end. Many critics from the South have criticized what they call the arrogance of northern biodiversity conservationists (Guha 1997).

Role in Policy Formulation Because biodiversity is a concept of recent vintage, its role, especially in the context of policy formulation, must be negotiated with the roles of other values, in particular the more traditional natural values that may be related to it. These other natural values include wilderness (''pristine'' habitats), natural resources, ecosystem services, and ecological integrity. There has been a long and unfortunate tradition in some northern countries, especially Australia and the United States, of conflating various natural values, in particular wilderness and biodiversity (Callicott and Nelson 1998, Sarkar 1999, Nelson and Callicott 2008).

The pursuit of these other values is often consistent with biodiversity conservation but sometimes is not. For instance, in a well-known Indian example, human noninterference (wilderness preservation) led to the decline of bird diversity in Keoladeo Ghana National Park (Sarkar 2005). Thus, wilderness preservation was in conflict with biodiversity conservation. Ecological integrity has also been urged as an alternative to biodiversity (Angermeier and Karr 1994) and is a central goal of ecological restoration (Higgs 2003). Because the concept of biodiversity comes with an obligation to protect biodiversity, care must be taken that its definition does not lead to normatively unacceptable conflicts with other values and, preferably, as few practical conflicts as possible.

SCIENTIFIC ASPECTS

With respect to the scientific or descriptive aspect of the concept of biodiversity, the characterization that it includes all taxonomic, functional, and structural biological differences is unexceptionable in principle. However, it is useless in practice because it cannot be estimated in the field. Conservation also is an impractical proposal: Every biological pattern and process becomes a target of conservation. As was stated above, biodiversity must be defined so that it will be an appropriate target of conservation and be amenable to the practical needs of conservation planning. This means that it must be operationalized in such a way that: (1) what it includes is deemed appropriate as a conservation target; (2) it must be estimable from field studies; and (3) preferably, it must be quantifiable.

If biodiversity is defined as all taxonomic, functional, and structural diversity, it falls afoul of the estimability and quantifiability criteria. A standard move at this stage is to suggest that three entities capture what is important about biodiversity: genes (alleles), species, and ecosystems (Meffe and Carroll 1994). As a simplifying proposal in the face of intractable complexity, this suggestion has merit. Conserving all allelic heterogeneity takes care of much of the diversity below the level of species. Conserving all species conserves all higher taxa, though it may not conserve interspecific hybrids. Conserving all ecosystems protects most communities, and so on. However, even this proposal is too broad: In practice it is impossible to

EXOTICS

Animals and plants have natural (native) ranges, some very small (just a few hectares) and some spanning continents. These native or indigenous biota (species, communities, and ecosystems), have adapted to a place in response to a range of physical and biological challenges imposed by the local environments (Elton 1958). These assemblages of species are not constant; some arrive as others leave, spurred by both natural and human-aided causes of dispersal. The concept of exotic species is, therefore, temporally relative and somewhat paradoxical.

When species arrive at a place where they did not evolve, they are often termed exotic or nonnative, and when they become well established and have negative impacts on environmental and production values, they are often termed invasive alien species (IAS). The distinction as used here between an exotic and an IAS is based on the perceived, predicted, or known undesirable impacts of the IAS. In fact if the "tens rule" of Christopher Bright (1998) is correct, 99 percent of exotics either do not establish or do not become invasive. That is, of those species introduced only about 10 percent will become established, and of those, only about 10 percent will cause significant impacts. Consequently, some have criticized as xenophobic the idea that all exotics are "bad."

Society's views of self-introduced exotics are diverse and often lead to controversy. One view is that human-assisted introductions are negative but that natural introductions are not, even though the latter might have significant negative impacts on the invaded ecosystem (Scherer 1994). Exotics, even those that have no negative impacts, are opposed by biological nativists, and Ned Hettinger (2003) defends this stance, arguing that it supports the persistence of regional and local biodiversity in the face of global homogenization and prevents the diminution of the wildness of natural systems.

Because attempts to predict which species will become invasive have had mixed success (Mack et al. 2000), Daniel Simberloff (2003) has argued that, given the possibility of an exotic becoming invasive—and the difficult, if not impossible, task of removing such a species—a philosophy of "guilty until proven innocent" should be used instead of the more widely used policy criterion, "innocent until proven guilty." Although most national policies are based on the latter philosophy, New Zealand's Biosecurity Act of 1993 was the first national law to not presuppose innocence (Simberloff 2003).

Charles Warren (2007) has argued that the conflicts surrounding the native/exotic construct are due partly to the arbitrary spatiotemporal character of the issue. He highlights the possible irony of promoting a multicultural human society while persecuting "foreign" species. Instead he advocates an alternative framework based on a "damage criterion" rather than putative biogeographical origins. On this view, eliminating an exotic (especially a sentient species) might be considered ethically indefensible unless that species were causing some undesirable impact. If that were the case, then the species would shift from being an exotic to an IAS and could then be managed within an ethical framework suggested for IAS.

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estimate allelic and species diversity in almost any habitat. The definition also excludes biological processes.

It thus is necessary to choose surrogates for biodiversity ("true surrogates" in the terminology of Sarkar and Margules 2002). The estimability problem is solved by making sure that these are tractable sets of taxa, ecosystems, processes, and so on. The normative question of what should be conserved now plays the role of

determining which set is appropriate. In the United States, for instance, typical true surrogates are endangered and vulnerable species. Some conservation agencies, such as Conservation International, use critically endangered species as defined by the International Union for the Conservation of Nature and Natural Resources Red List along with endemic species. Others, such as the Nature Conservancy in many regions, use carefully delineated habitat types.

From a scientific perspective there is thus a conventional element in the definition of biodiversity through such surrogates in the sense that it is not based entirely on scientific facts. However, from the normative perspective these are not conventional choices. Instead, they reflect deep cultural judgments of what is worth preserving and thus require care in their exercise. For instance, all the choices of true surrogates mentioned above mark a shift in cultural values away from charismatic species to a more inclusive set of taxa.

There is also a further level of complication. In many situations even the true surrogate set (e.g., if it is something broad, such as all vertebrate species or all vascular plant species) is too difficult to measure in the field. (Measuring all species, including microbial species, is nearly impossible in any habitat unit large enough to be of potential conservation interest.) In this situation "estimator-surrogates" must be used to represent true surrogates for biodiversity, especially in biodiversity conservation planning. For instance, a set of environmental parameters (which are much easier to measure and model) may be adequate to represent many taxonomic groups (the true surrogates) in many regions (Sarkar, et al. 2005). Techniques of surrogacy analysis have been developed to quantify the extent to which there is a match between planning outcomes using true and estimator surrogates (Margules and Sarkar 2007). However, there remains the question of how biodiversity or, equivalently, the true surrogate set should be assessed quantitatively.

COMPLEMENTARITY

Since the 1960s, ecologists have distinguished between α-diversity, or the diversity within a study unit; β-diversity, or the diversity between study units; and γ-diversity, or the total diversity of a region (Whittaker 1960). A wide variety of mathematical measures were proposed to quantify each of these three concepts. Typically, the diversity referred to in those studies was diversity at the level of species. In the 1980s several groups of conservation biologists independently began to use a measure of diversity that came to be called complementarity (Vane-Wright, Humphries, and Williams 1991): If areas are being selected iteratively for conservation, the complementarity value of an area is the extent to which it includes new entities not already present in the areas previously selected (Justus and Sarkar 2002). If areas are selected to maximize complementarity, they add the most diversity to the total set of selected areas. There have been many variants of this idea, in particular, the suggestion to include broader measures of taxonomic and phylogenetic diversity than species diversity.

It can be shown that the use of complementarity typically leads to nearly optimal spatial economy in the selection of conservation area networks, that is, to the representation of a full complement of the biodiversity of a region (represented by true surrogates) in as small an area as possible (Margules and Pressey 2000). Sahotra Sarkar (2002) argued that procedures using complementarity provide an implicit quantitative measure of biodiversity that is sufficiently precise for the purposes of conservation, in which all this measure must permit is a comparative assessment of how important different areas are when some but not all of them are to be selected for conservation. Anne Magurran (2004) pointed out that complementarity is essentially a measure of β-diversity because it quantifies the extent to which a new area is different from those already selected.

The recognition that complementarity is a measure of β-diversity establishes an important conceptual link between the measurement of biodiversity in conservation planning and the older work of quantifying ecological diversity, which was not initiated with policy development as an explicit goal (Sarkar 2007). Because the practical selection and implementation of conservation area networks is the central goal of systematic conservation planning, when a (descriptive) diversity measure is used for this purpose, it is incorporated explicitly into (normative) policy formulation. However, the choice of the true surrogate set for which this diversity measure is being assessed quantitatively ultimately must be based on normative judgments about what it is important to conserve. Thus, descriptive and normative judgments are being simultaneously integrated in planning protocols rather than a descriptive judgment being adopted within the policy framework. This means that both the descriptive and the normative aspects of the concept of biodiversity remain central to its use within conservation biology, as they were when the concept was introduced.

SEE ALSO *Conservation Biology.*

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BIOFUELS

SEE *Energy.*

BIOPHILIA

The Harvard biologist Edward O. Wilson, who popularized the term *biophilia,* describes it as an "innately emotional affiliation of human beings to other living organisms" (Wilson 1993, p. 31). Two aspects of that definition are especially important. First, Wilson argues that biophilia is innate and therefore part of humans' genetic heritage and evolved nature. Second, biophilia is an emotional response that can be an end in itself (feeling a sense of pleasure and well-being), or it can stimulate emotions that motivate various kinds of behavior (interest motivates exploration).

If biophilia is an innate human characteristic, how did it evolve? There is general agreement among researchers that Homo sapiens' long history as hunters and gatherers, intimately involved with nature, has influenced how humans perceive and respond to the physical environment. There are differences among researchers, however, about the nature of the adaptation and how it manifests itself. Wilson (1986) describes biophilia as a complex of learning rules that guide adaptive response to natural stimuli. The rules are reinforced through cultural adaptations, such as myths and stories. As Wilson notes, "When human beings

remove themselves from the natural environment, the biophilic learning rules are not replaced by modern versions equally well adapted to artifacts'' (1993, p 31). Thus, the learning rules are fragile and need to be reinforced through contact with nature.

Tooby and Cosmides (1992) take a different perspective. Rather than possessing weak learning rules, the brain, in their view, is composed of thousands of modules designed to solve specific problems that have occurred regularly over the course of human evolution. In this version biophilia consists of hundreds of modules designed to solve problems regularly encountered in ancestral habitats: avoiding predators, separating toxic from nontoxic foods, using clouds to predict weather patterns, and using flowers to signal future resource availability. Each module is rich in content, with its own reasoning process and information-gathering structure. For instance, rules about selecting nutritional plant resources would be different from rules about predators because the problems posed by these two situations are very different.

At this time there is not enough research evidence to support one or the other perspective. However, there is good evidence from cross-cultural studies that the brain has an evolved intelligence that grew out of the need for detailed information about nature (Atran 1992; Mithen 1996). Mithen notes that all known cultures have notions of plant and animal ''species,'' all cultures construct taxa based on morphological patterns, and all cultures have life-form groupings for animals (fish, birds) and plants (trees, flowers, grass).

Further evidence of evolved responses to nature comes from controlled laboratory studies. A series of conditioning experiments by Öhman (1986) showed that physiological and emotional responses to fear-arousing stimuli (snakes and spiders) can occur subliminally, with subjects having no conscious recognition of having seen the stimuli. Similar responses do not occur to modern threats such as guns.

THE SAVANNAH HYPOTHESIS

Humans have gradually come to occupy diverse biomes and habitats across the globe. Gordon Orians argues that the long period of evolutionary development in the savannahs of Africa should have left a positive mark on the human psyche (Orians 1980, 1986; Orians and Heerwagen 1992; Heerwagen and Orians 1993). According to the ''savannah hypothesis,'' people should prefer to be in savannahlike environments because they once provided a better resource base than forest or desert biomes. Key characteristics of the savannah include the following:

- scattered clusters of trees that provided shelter from the sun and protection from terrestrial predators,
- long-distant views that afford surveillance for predator detection and avoidance,
- even ground cover for efficient movement across the terrain,
- a rich diversity of plant and animal species,
- rock outcroppings for surveillance or sleeping,
- seasonal variation in fresh water availability because of rain patterns.

What evidence exists for the savannah hypothesis? Do people prefer to be in landscapes that have these features? Studies in landscape planning unrelated to biophilia have consistently shown that people prefer semiopen landscapes with large trees and water to either dense forests or deserts (Ulrich 1993); people consistently dislike scruffy, dense habitats with rough ground texture. Similar results prevail across cultures.

The strongest results relate to water. Coss (2003, Coss and Moore 1990) argues that selective pressures to find sources of fresh water should have been particularly strong in the savannah habitats of Africa because of the strong seasonal variations in rain. Studies of water perception (summarized in Coss 2003) show that people respond very positively to sparkle, reflections, and surface movements of water. Early humans may have used visual sparkle in particular as a cue to the location of water because it can be seen in the distance, whereas reflections and water-surface movements can be seen only on closer inspection. Reflection and movement may have been used as indicators of water quality.

BENEFITS OF NATURE

Since the mid 1980s, research in a variety of fields has shown that contact with nature generates emotional, physiological, and social benefits. Research on this topic has been conducted in workplaces, hospitals, urban environments, and experimental laboratories. The findings point consistently to the value of features of nature such as large trees, flowers, and water. Studies also show that benefits of nature occur in many ways: through direct contact (sitting in an outdoor garden), indirect contact (through a window view), and from simulations using nature decor (such as posters or paintings).

Nature through the Window Ulrich's research (1984) was the first to focus on the links between nature, emotional functioning, and health associated with window views. His study found that hospital patients in rooms with views of trees had a better recovery from surgery than a matched group of patients whose view was a brick

wall. Patients with the nature had shorter hospital stays, needed less medication, and drew more positive reactions from the nursing staff about their recovery. Studies in office settings have also found reduced stress associated with window views of nature (Kaplan 1992).

Simulated Nature Ulrich's studies have included laboratory experiments using photos and videos in which he has consistently found that subjects recover from stress more quickly and are in more positive moods if they are shown nature scenes or urban scenes with nature rather than urban scenes devoid of natural elements (Ulrich 1993).

Others have shown that nature contact, whether real or simulated, can be beneficial. For instance, a study of windowed and windowless offices by Heerwagen and Orians (1986) found that people in windowless spaces used twice as many nature elements (posters and photos especially) to decorate their office walls than those who had views of natural areas outdoors. A laboratory study of "green exercise" tested the effects of projected scenes on the physiological and psychological outcomes of subjects on a treadmill (Pretty et al. 2005). They found that all subjects benefited similarly in physiological outcomes but that subjects who viewed pleasant nature scenes (both rural and urban) scored higher in measures of self-esteem than those viewing totally urban scenes or "unpleasant" rural scenes with destroyed landscapes.

Outdoor Nature and Gardens Urban nature also has benefits for health and well-being. For instance, a study of public housing projects in Chicago found that large trees had a significant impact on residents' social behavior (Kweon et al. 1995, Sullivan et al. 2004). Using behavioral observations and interviews, the researchers found that housing developments with large trees motivated people to be outdoors and that, once there, they talked to their neighbors and developed stronger social bonds than people in similar housing projects without green space and trees.

There is also growing evidence that both active and passive contact with gardens provides psychological, emotional, and social benefits. Cooper-Marcus and Barnes (1995) found that the benefits of gardens include better recovery from stress, having a place to escape to, and improved moods. Benefits also occur with horticulture therapy, especially in clinical settings and nursing homes. Studies described in Morris (2003) show that dementia and stroke patients who engage in gardening show improved mobility and dexterity, more confidence, and improved social skills.

Indoor Vegetation Indoor plants are commonly used in many workplaces as enhancements of the aesthetic and psychological atmosphere. Researchers in Norway found that plants also had physiological benefits. The field experiment in an office environment found that workers who had a cluster of plants near their desks showed a decrease in neurophysiological symptoms (with the greatest decrease in fatigue) and a decrease in mucous-membrane symptoms when the plants were present (Fjeld et al. 1998).

Outdoor Green Space Researchers in the Netherlands conducted a nationwide study of the benefits of green space—which they call Vitamin G—at the household, community, and regional levels (Groenewegen et al. 2006). Using national health survey data arrayed on a geographical information system, the researchers have found preliminary evidence that residents who are closer to green spaces enjoy better health than residents who are farther away. The data analysis has controlled for socioeconomic factors that have known links to health.

Cognitive Benefits In addition to the emotional and physiological benefits from nature contact, there is some evidence of a linkage to cognitive functioning. Lohr and her coauthors (1996) found that subjects working in a windowless room with plants completed a series of computerized tasks faster, had lower blood pressure readings, and felt more attentive than subjects working in the same room without plants. In study of window views, Tennessen and Cimprich (1995) found that people whose view was predominantly natural had higher scores on a survey assessing directed attention and attention recovery. Hartig and his coauthors (1991) report similar results in a field experiment. People who went for a walk in a mostly natural setting performed better on an editing task than those who walked in a predominantly built setting or who quietly read a magazine indoors. Although the mechanisms underlying the links between nature and cognitive performance are obscure, there are several hypotheses. The first, proposed by Kaplan (1995), focuses on attention. Kaplan argues that visual contact with everyday nature reduces fatigue associated with intense concentration and thereby replenishes the attention system, enabling people to refocus easily after short nature breaks.

The other leading hypothesis, proposed by Ulrich (1993), argues that contact with nature improves cognitive performance through effects on mood. He draws heavily on research by Isen (1990), whose numerous experiments show that subjects in positive moods perform better on tests of creative problem solving than those who are in neutral or negative moods. Isen speculates that positive moods increase the tendency to "break set" and to see relatedness between divergent events or appearances; because good feelings promote diffuse rather than focused attention, people in a good

mood search more broadly for solutions and alternative interpretations. Joseph LeDoux (1996), one of the nation's leading brain researchers, cites neurological evidence to support this hypothesis. He has found that positive feelings lead to heightened activity of the right parietal brain region—the section of the brain that is associated with a more global, expansive cognitive style. Thus, positive feelings directly affect brain processes related to performance on tasks requiring creativity and novel problem solving.

BIOPHILIA AND SUSTAINABILITY

The human desire for contact with pleasant natural settings has many benefits but also presents a potential dilemma for sustainable living and for urban spaces. Humans' innate attraction to water, distant views, and lush vegetation often leads to unsustainable design practices. People create water features and lush gardens in the desert; they raze hilltop forests to build hotels and houses that take advantage of panoramic views. They build expensive houses and resorts along waterfronts rather than creating public access spaces or wildlife refuge. The desire to enhance the biophilic experience is reinforced by economic benefits. Houses and commercial buildings command higher prices and rents when they are located near water and green spaces and/or have lush landscaping (Heerwagen 2006).

Urbanization also presents a dilemma for biophilia. Ironically, it is in urban environments that contact with green spaces, trees, flowers, and water would be most beneficial as an antidote to urban noise, pollution, and other stressors. Yet green spaces and vegetation are not equally distributed in urban neighborhoods. The economically advantaged live in houses and condominiums bordering parks or the water's edge, whereas poorer neighborhoods often are devoid of such amenities. To overcome this deficit, planners, health practitioners, and landscape architects in New York City have banded together to promote the Restorative Commons (Meristem 2006) to bring nature amenities to all neighborhoods. Researchers in Sweden propose a similar idea: to "design communities that balance settlement density with satisfactory access to nature experience" (van den Berg et al. 2007).

SEE ALSO *Built Environment; Landscape Architecture, Design, and Preservation; Sustainability; Sustainable Agriculture; Sustainable Development; Urban Environments; Wilson, Edward O.*

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Judith Heerwagen

BIOSECURITY

Biosecurity is a concept that bridges national security, disaster studies, and, in broader definitions, access to food and biological resources in general. After the terrorist attacks of 2001 in the United States and the subsequent mailing of letters containing anthrax spores, biosecurity increasingly was defined against the risks of premeditated attacks with biological weapons or the risks of disruptive events such as natural disasters. In some circles, such as the Food and Agriculture Organization (FAO), biosecurity continues to be used to refer to a broader array of issues that affect human health and well-being, such as food safety, animal and plant health, and environmental risks, but without mention of bioweapons or bioterrorism or environmental ethics.

DEFINITIONS AND CONSEQUENCES

The more narrow usage is still very broad, including a discourse on dual-use technologies, evaluation of state programs for biological weapons and biodefense, analysis of the capacity and motivations of terrorists, debate over the value of international law in reducing the threat through treaties such as the Biological Weapons Convention, assessment of the environmental harm that could arise from bioweapons programs, and similarities between bioattacks and natural disasters, along with the policy implications of all those issues. This discourse is saturated with ethical judgments and dilemmas, although they rarely are identified as such. Indeed, the addition of environmental impacts to the list of issues under discussion can be seen as a proxy for the trade-offs among competing values across domains that the shift to a national security discourse has entailed.

Because biotechnology is inherently dual-use—that is, it can be used for both civilian and military ends—regulation of military applications is likely to affect civilian uses. Biosecurity in this context means protection from the misuse of knowledge and technology in the life sciences, and policies to enhance biosecurity include regulation of access to pathogens, background screening of laboratory employees, possible censorship of journal articles, and the development of professional codes of conduct and education in ethics. In addition, surveillance measures to detect biological attacks have been introduced in many public places in the United States, and funds have been allocated to develop new vaccines and treatments, build high-security laboratories, and improve the ability of local communities to respond to emergencies. Although historically the main threat has come from state-sponsored programs for biological weapons, assessments since 2001 have been dominated by the risk of bioterrorism. Unfortunately, the U.S. policy responses to that risk have had the unintended consequence of multiplying the number of weapons-relevant facilities, biological agents, and trained personnel; this development may pose an increased security risk because of the increase in opportunities for diversion to weapons use.

Natural disasters may produce many of the same risks as biological attacks without the element of intentionality. Outbreaks of new virulent diseases or the spread of those diseases across national borders may pose a serious threat to human health regardless of whether they originate in an enemy attack or occur in the

aftermath of an earthquake or hurricane, and the same protective measures—surveillance, vaccines, quarantine, and the development of new treatments and response measures—apply. In both cases the threat is a global one, and an effective response requires international cooperation: Pathogens know no borders. Unlike natural disasters, however, for which there are both a large database of past events and tools for modeling risks, in the case of bioterrorism, data are few and methods for risk assessments are highly speculative.

RELATIONSHIP TO ENVIRONMENTAL ETHICS

Environmental ethics has been almost completely absent from the security-based discourse on biosecurity even though it is clear that any use or even tests of biological weapons may have substantial effects on the environment; the contamination of Vozrozhdeniye Island in the Aral Sea from a former Soviet bioweapons laboratory is a case in point. In practice, an accidental escape of pathogens or genetically engineered agents from a research laboratory has been the most frequently mentioned scenario, leading to a focus on safety regulations and the siting of the new high-security biodefense laboratories. Boston University, for example, has been criticized for placing its new laboratory in a poor South Boston neighborhood that is home to a substantial number of minorities rather than on land it owns outside the city.

Framing biosecurity as a national security issue suppresses consideration of environmental ethics because threats to national security generally are considered to trump other concerns: The national security sector was long exempt from environmental regulations and therefore paid little attention to the environment, and important aspects of biological weapons and biodefense programs have been cloaked in secrecy. Thus, the tests of biological weapons in the 1950s at Dugway Proving Ground in Utah, which surely had environmental consequences, were not publicly reported at the time. Moreover, the national security discourse is cast in instrumental terms, allowing little room for assigning intrinsic value to the environment.

A more inclusive treatment of the ethical dimensions of biosecurity would include analyses of how the threat of bioweapons resonates with environmental concerns by invoking images of a desecrated nature and of the risks to the environment of using genetic technologies to create or modify pathogens. The risk of unintended consequences, which haunts all human endeavors, would be linked to people's ethical obligations to future generations, and the specific risks that arise in each stage of a biodefense project from the laboratory, to application, to diffusion to other societies would be scrutinized for their effects on environmental justice. For example, the desire to prevent diversion of dangerous materials or knowledge to unauthorized users limits the opportunities for foreign students to receive training in U.S. laboratories that could help them address environmental problems in their own countries. Ethical analysis could contribute a missing dimension to discussions of the opportunity costs, especially for developing countries, of diverting resources to biodefense projects when immediate health needs lie elsewhere, and the relative merits of national and international approaches to enhance biosecurity in all its dimensions could be debated.

SEE ALSO *Hurricane Katrina; Russia and Eastern Europe.*

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Judith Reppy

BLACK ELK
1863–1950

Nicholas Black Elk was born in December 1863 on the Little Powder River in present-day Wyoming or Montana; he died in Manderson, South Dakota, on August 19, 1950. A member of the Oglala tribe of the Teton Sioux (Lakota), he became one of the best-known American Indians of the twentieth century through the books written from information he provided. His great visionary experience is a classic expression of Native American spirituality in opposition to the values of twentieth-century America.

Black Elk received his great vision at the age of nine. In a dream he was taken to meet the spiritual embodiments of the universe, the Six Grandfathers—the four directions, the sky, and the earth—and was offered powers to heal and to destroy. At the age of sixteen, he began to publicly enact parts of his vision, the traditional means of validating and activating vision powers. Soon he became renowned as a healer.

Although he was born during the last years of tribal freedom, when the Sioux still made their livelihood from the buffalo herds, by 1881, when he began to use his healing powers, the buffalo were extinct, and the Sioux were confined to reservations. Black Elk settled on Pine Ridge Reservation, in southwestern South Dakota. The poverty, inactivity, and disease that plagued the reservations led Black Elk to question his beliefs, and when the opportunity came in 1886 to experience the world of the white men by traveling to New York and Europe with Buffalo Bill's Wild West show, Black Elk seized it. He embraced Christian teachings, many of which seemed to him compatible with his vision experiences. When he returned to Pine Ridge in 1889, many of his people were engaged in a new religious ritual, the Ghost Dance, a millennial movement that promised a renewal of the earth and the buffalo. In this new religion Black Elk found many parallels with both his visions and with Christianity. However, the Ghost Dance among the Sioux was ended by the massacre at Wounded Knee Creek on December 31, 1890; on that day almost 200 Sioux men, women, and children were killed by the Seventh U.S. Cavalry.

In the years after Wounded Knee, Black Elk continued his traditional healing ceremonies, but in 1904 he abandoned them and joined the Roman Catholic Church, becoming a catechist and a missionary to other Plains tribes. His great vision had placed a heavy burden on him to help his people, but he had failed. By putting it aside and choosing another path, he sought to help the Lakotas adapt to reservation life by adopting the ways of the white people.

Black Elk's life changed in 1930, when John G. Neihardt (1881–1973), the poet laureate of Nebraska, sought him out to learn about Sioux religious life. In Neihardt Black Elk found someone to whom he could entrust his great vision. The next year he told the poet his life story, on the basis of which Neihardt wrote *Black Elk Speaks, Being the Life Story of a Holy Man of the Oglala Sioux* (2004 [1932]). Further interviews with Black Elk in 1944 resulted in another book, Neihardt's historical novel, *When the Tree Flowered* (1991 [1951]). Inspired by reading *Black Elk Speaks,* the scholar Joseph Epes Brown (1920–2000) spent the winter of 1947–1948 recording the material that became *The Sacred Pipe: Black Elk's Account of the Seven Rites of the Oglala Sioux* (1989 [1953]). It is the mature expression of Black Elk's religious thought, an amalgam of traditional Sioux beliefs and rituals and fundamental Christian concepts.

In his childhood vision Black Elk perceived the world as a circle bisected by two roads: the red road of life passing from north to south and the black road of death passing from west to east. Where they crossed in the center, a sacred tree bloomed, symbolizing the harmony of all living things. But for Black Elk, the sacred tree was dead; his vision was supposed to give him the power to make it flower, but, defeated by trying times of rapid change, he could not accomplish this task. The vision, however, showed him his people traveling the red road through four "ascents" (generations), at the end of which the tree bloomed again and the animals and humans lived together in harmony. *Black Elk Speaks,* in a sense, put that journey in motion. Although the book was not immediately successful, when it was reprinted in paperback in 1961, it became an immediate countercultural classic, eloquently expressing a perspective on the natural world that served to fill the spiritual void of the tumultuous 1960s.

In subsequent years scholars argued about the relationship between Black Elk's spirituality and Christianity, but from any perspective his teachings have become the quintessential expression of a North American Indian environmental ethic. Oneness and relationship are the hallmarks of Black Elk's vision. In it, the world is conceptualized as one, symbolized by a circle. All things within the circle are related to one another, and all are holy. Every form of being, such as the two-leggeds (humans), four-leggeds (animals), wingeds (birds), grasses, and stars, is a people. All are kin and bound together in their common mystery, the totality of which is Wakan Tanka (great spirit or god). This Native American ecological vision continues to speak to new generations who are concerned with the perpetuation of the life of the planet.

SEE ALSO *Christianity; Native Americans; North America.*

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Raymond J. DeMallie

BOGS

SEE *Wetlands.*

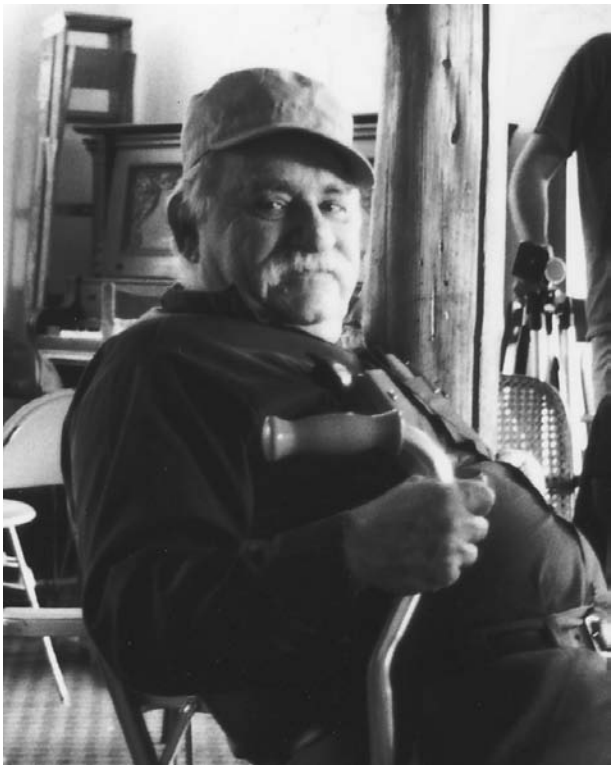
BOOKCHIN, MURRAY
1921–2006

Murray Bookchin was born on January 14, 1921, in New York City to Russian immigrant parents. A founder and ardent defender of the school of thought known as Social Ecology, he was a leading advocate of left-libertarian and anarchist ideas. Early in life he was involved with Marxist, Communist, and Trotskyist movements but broke from these associations as he embraced more antiauthoritarian, ecological, decentralized, and democratic orientations in philosophy, politics, and community organization. Through his many books and direct political action Bookchin exercised lasting influence on the green movement within the United States, introducing and interjecting ecological thought into radical politics, especially the counterculture and New Left during the 1960s and 1970s. He wrote extensively on technology, urbanization, social history, political theory, and grassroots democracy, cofounding in 1971 the Institute for Social Ecology in Plainfield, Vermont.

Bookchin's contributions to environmental philosophy center on the integration of radical social critique with a developmental view of nature and a theoretical and practical vision of ecological communities. His early work on revolutionary ideas and particularly what he called "postscarcity" anarchism provided the underpinnings for his later thought and inspired the growth of ecological anarchism—the wedding of ecological and antihierarchical perspectives.

The theory of Social Ecology stresses the graded emergence of mind from the natural world, the continuities between first (biological) and second (cultural) nature, and their possible synthesis into an ecological society. Bookchin argued that humans can find a ground for ethics and freedom within nature itself, which, in his view, develops dialectically toward ecological complexity, spontaneity, unity-in-diversity, and complementarity.

Influenced by and creatively responding to the work of Aristotle, G. W. F. Hegel, Karl Marx, Peter Kropotkin, Hans Jonas, and the Frankfurt School, Bookchin formulated the notion of dialectical naturalism, which sought to "ecologize" dialectical and historical processes and to anchor ethical judgment in a natural ontology and causality. He propounded a sophisticated theory of how the domination of nature relates to the domination of humans by one another. In so doing Bookchin focused on the ills of hierarchy (as opposed to class analysis), the benefits of freedom (as well as justice), the insights of organic cultures and the anarchist tradition, and the reconstructive and integrative contributions of the science of ecology. He advanced, too, a conception of libertarian municipalism in which free and local institutions emerging from democratic assemblies might oppose and supplant state institutions, helping to foster ecocommunities, greater civic participation, and a closer harmony between city and countryside.



Murray Bookchin. *As founder of the Institute for Social Ecology, Bookchin has had a lasting influence on various ecological movements and philosophies.* **PHOTO COURTESY OF JANET BIEHL.**

Bookchin interpreted environmental problems in terms of distinct social origins and dynamics. His first book, *Our Synthetic Environment* (1962), warned trenchantly of the dangers of chemicals in food and the environment, but it was not as widely read as Rachel Carson's seminal work *Silent Spring*, which appeared half a year later. His influential essay "Ecology and Revolutionary Thought" (1965) anticipated and articulated some of the concerns of later environmentalists and suggested constructive links between the workings of the natural and social worlds, detailing the ways in which humans are simplifying the environment and possibly undoing organic evolution. *The Ecology of Freedom* (1982), perhaps his most important theoretical contribution, explored the history of social hierarchy and proposed that the control and power exercised by humans over other humans through age, sex, politics, religion, and "epistemologies of rule" have led to the demise of organic societies and the rise of vexing ecological predicaments. In this regard, he both critiqued and reversed the view,

espoused by many Marxists and Frankfurt School theorists, that the increasing human dominion over nature had given rise to class differences and social problems.

Bookchin was critical of the market economy—which he claimed is unjust, unethical, and antiecological—contrasting it with a moral economy rooted in emancipatory institutions and community relations. He was also critical of many other philosophical perspectives on the environment. He challenged New Age greens, ecological socialists, Marxists, and even "lifestyle" anarchists while engaging in pointed and often polemical exchanges with Deep Ecologists (especially those allied with Earth First!), characterizing their positions as conceptually confused, irrational, shallow, or politically dangerous. Although Bookchin developed forms of philosophical naturalism in environmental friendly directions, some critics object to the prominence of teleology and naturalistic ethics in his thought in particular and in philosophical or ecological discourse in general. Other critics contest his focus on interpretations of decentralization, hierarchy, technology, and the anarchist or radically libertarian traditions to which he appealed.

Although Social Ecology is closely wedded to the contributions and personality of a single figure in Bookchin, it has constructively and provocatively encouraged many environmentalists—from bioregionalists to ecological feminists—to develop deeper understandings of the emancipatory potential of social and political theory. Bookchin's work, with its ambitious blend of historical analysis, utopian social vision, and ecological awareness, remains an important influence on unfolding dialogues and debates in environmental ethics, environmental philosophy, and environmental politics.

SEE ALSO *Anarchism; Environmental Activism; Environmental Philosophy: V. Contemporary Philosophy; Social Ecology.*

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David Macauley

BORLAUG, NORMAN
1914–

Norman E. Borlaug, who generally is known as the father of the Green Revolution, was born on March 25, 1914, in Cresco, Iowa. He received a bachelor of science degree in forestry and a master's and a doctorate in plant pathology from the University of Minnesota. He began working in Mexico after 1944, first as a researcher with the Rockefeller Foundation and then with the International Center for Maize and Wheat Improvement (CIMMYT), where he has held various positions, including that of a senior consultant. He also has been associated with and taught at Texas A&M University.

Borlaug's contributions to global food availability, reduced poverty and hunger, and the management of natural resources are of critical importance to environmental ethics. Because of Borlaug's work in plant breeding and advice to governments, the footprint of agriculture on the environment has become much smaller. Without his work, which dramatically increased agricultural production per unit of land and labor, millions of acres of forests and wilderness areas would have been plowed under, with disastrous implications for biodiversity, land degradation, climate change, and other environmental factors. In addition, many millions of people would not have survived what was predicted by many to become an epidemic of starvation in parts of Asia during the 1960s and 1970s.

The contributions of Borlaug and his colleagues are highly visible in the countryside of many developing countries, including China, India, Pakistan, Bangladesh, and Mexico. Poor farmers gained access to high-yielding varieties of wheat and maize that were developed under the leadership of Borlaug, which helped them double and in many cases triple production on the land they controlled while reducing the cost of producing a bushel of

grain, increasing incomes, and reducing poverty and hunger. Even bigger benefits accrued to wheat and maize consumers, who, because of the reduced costs of producing a bushel of grain, could meet their food needs at lower prices. This was particularly important for the poorest, who spend a large proportion of their incomes on food.

The Green Revolution, a term first used in 1968 by former United States Agency for International Development director William Gaud, made it possible for millions of people to feed their children, get health care for them, and send them to school; construct better houses; buy radios, bicycles, and other necessary items; and invest in income-earning activities within and outside agriculture. The work done by Borlaug and his colleagues started a self-reenforcing cycle that helped millions of people out of poverty and saved millions of children who were expected to die from hunger and malnutrition. Since the beginning of the Green Revolution, Asian food production has increased faster than the population. The Malthusian perspectives that food production would not be able to keep pace with population growth were eliminated from Asia.

Borlaug received the Nobel Peace Prize in 1970 and later was given the Presidential Medal of Freedom and the Congressional Gold Medal, the highest civilian honor that can be bestowed by the U.S. Congress. He is one of only five individuals who received all three of those honors. More than fifty universities in twenty countries bestowed honorary doctoral degrees on Borlaug, who was invited to join a large number of national academies of science and received many other awards and recognitions.

In spite of his advanced age, Borlaug continued to travel extensively in the first decade of the twenty-first century, giving lectures and seminars, advising governments, training younger scientists and agricultural development experts around the world, and, as the leader of the Sasakawa Africa Association, promoting productivity increases in African agriculture. He is a strong supporter of the use of modern science, including molecular biology, to feed future generations without damaging the environment.

SEE ALSO *Agriculture; Biodiversity; Food; Global Climate Change; Hunger; Resource Management; Shiva, Vandana.*

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Per Pinstrup-Andersen

BRITISH ECOLOGICAL SOCIETY

The origins of the British Ecological Society (BES) lie in an ad hoc group of botanists that in 1904 formed a "Committee for the Survey and Study of British Vegetation," to explore the factors determining the distribution and associations of the British flora. The members of this Vegetation Committee became in 1913 the Council of BES, the first ecological society in the world. One of the benefits of membership was to be a quarterly journal, the *Journal of Ecology*, the first number of which was printed in time for the inaugural meeting of the Society. The inspiration behind the Society was thus the British tradition of field study, which differed from the more physiological and analytical approaches prevalent at the time in the United States and continental Europe.

The first president of the BES was Sir Arthur George Tansley (1871–1955), a dominant figure in the development of ecology. In 1901 he founded the journal *New Phytologist* to provide an English language medium for botanical notes; in 1935, he propounded the concept of *ecosystem* to counteract the superorganism idea of community and succession associated particularly with Frederic Clements (1874–1945) of the Carnegie Institute in Washington, DC. Tansley chaired a BES Committee in 1942 and 1943 that recommended to the United Kingdom government the establishment of National Nature Reserves, and was then first chairman of the (statutory) Nature Conservancy set up in 1949 to manage these.

The BES membership was almost entirely botanical in its early years. The first zoologist to be elected as president was A. E. Boycott in 1932; since 1940, the presidents of the Society have tended to alternate between botanists and zoologists, each serving a term of two years. In the same year that the BES was founded, Victor Shelford of the zoology department at the University of Chicago (who became the first president of the Ecological Society of America, itself founded two years after the BES) published the first detailed study of a particular animal community. Julian Huxley (1887–1975), then at Oxford University but later to become first secretary-general of UNESCO, gave a copy of Shelford's book to one of his students, Charles Elton (1900–1991). At Huxley's instigation, Elton wrote a seminal text on *Animal Ecology* (1927) and went on to become the founding editor of the second BES journal, *Journal of Animal Ecology,* launched in 1933. In 1931, Elton met Gifford Pinchot (1865–1946), founder and head of the U.S. Forestry Service, an encounter that alerted Elton to the importance of practical conservation and Pinchot to the necessary underpinning of ecological science for conservation practice. In the same year Elton met Aldo Leopold

(1887–1948), who introduced him to the notion of a land ethic.

The Society has around 4,000 members from many countries, mostly professional ecologists. Its mission is: "Advancing ecology and making it count." Besides specialized meetings and symposia, it arranges an annual meeting with a range of sessions grouped under headings, which may include topics such as the ethical implications of particular practices or attitudes, especially as they relate to conservation. In addition to the two original journals, BES publishes a *Journal of Applied Ecology* (launched 1964), *Functional Ecology* (1987), a quarterly *Bulletin* for members, the proceedings of annual symposia, and two occasional series, *Ecological Reviews* and *Ecological Issues*.

The BES maintains an office and secretariat at 26 Blades Court, Putney, London SW15 2NU, United Kingdom. Its website is www.BritishEcologicalSociety.org.

SEE ALSO *Conservation Biology; Ecology: I. Overview; Leopold, Aldo; Nature Conservancy; Pinchot, Gifford.*

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R. J. Berry

BRUNDTLAND REPORT

In 1983 the United Nations established the World Commission on Environment and Development to create a report that would analyze global environmental challenges and make policy recommendations. The report, presented to the United Nations General Assembly in August 1987, was titled *Our Common Future*. It is also known as the Brundtland Report in honor of the committee chair, Gro Harlem Brundtland. The report analyzes issues and recommends policies related to population, food security, biodiversity, natural resources, energy, and economic growth. It suggests that human impacts on the environment should be evaluated according to the criterion of sustainability. It concludes that sustainable economic development is possible but will require extensive international cooperation and the recognition of limits imposed by natural resources and technology. The report focuses on alleviating poverty, achieving greater equity in the distribution of global resources, and sustaining the natural environment (Sneddon, Howarth, and Norgaard 2006). The report suggests that sustainability requires maintaining essential features of the earth's life-supporting systems and recognizing that there are limits to the ability of these systems and of natural resources to support human activity.

The most enduring insight of the report is its famous definition of sustainable development as a process that "meets the needs of the present without compromising the ability of future generations to meet their own needs" (Brundtland Report 1987, p. 24). Adopted by many authors and organizations, this definition has found its way into most articles and books discussing sustainability. Sneddon, Howarth, and Norgaard suggest that the Brundtland definition of sustainable development is "the most widely accepted starting point for scholars and practitioners concerned with environment and development dilemmas" (2006, p. 255).

Although the report calls for decisive action to protect the environment, in 1987 its conclusions were more palatable for many than the dire predictions in the 1972 report by the Club of Rome titled *Limits to Growth*. The Brundtland Report's characterization of sustainability as a challenge rather than a limit made the idea more acceptable to business leaders and advocates of growth. Redclift suggests, "It was also the first overview of the globe which considered the environmental aspects of development from an economic, social and political perspective" (2005, p. 212). The Brundtland Report has proved to be a seminal document, giving rise to an extensive debate and a new political discourse among groups with widely different views of sustainability (Redclift 2005; Jamieson 1998; and Sneddon, Howarth, and Norgaard 2006).

Although the definition of sustainability used in the Brundtland Report is often the starting point of discussions about sustainability, its ambiguity about what needs sustaining has led to conflicting interpretations. *Weak sustainability*, favored by most economists, means simply sustaining the growth of the market economy by maintaining the capital stock used to produce goods and services (the so-called Hartwick-Solow rule). Weak sustainability is based on the belief that what matters for future generations is per capita income, maintained by the total stock of capital—manufactured, human, and natural. The key assumptions of weak sustainability are the fungibility of the various kinds of capital, per capita economic output as the key measure of social welfare, and an abiding faith in technology's ability to overcome natural-resource scarcity (Gowdy 2000). *Strong sustainability*, favored by ecological economists, means

sustaining the earth's life-support systems and insuring a stable and equitable socioeconomic system. On this view, sustainability is not only an economic problem but also one of maintaining essential, nonreplaceable, and nonfungible features of the environment. *Environmental sustainability* recognizes that ecosystems work by rules that are different from those that govern markets. Driven by evolutionary dynamics that do not favor particular species, ecosystems are often measured in long times scales—tens of thousands of years or more. Hence, the conditions for their dynamic stability are not easily understood. Environmental sustainability also explicitly recognizes our ethical responsibility toward other species.

The discussion in the Brundtland Report seems to align most closely with the notion of strong sustainability. Critics, however, suggest that strong sustainability still focuses on perpetuating human economic activity and does not adequately recognize the extent to which human well-being depends on maintaining the biophysical conditions under which our species evolved. Others object that the report neglects cultural context (Redclift 2005) and fails to uphold an environmental ethic that values nature for its own sake. Redclift argues that the worldview of "sustainable development" presupposes that market capitalism is a recent socioeconomic dynamic that will likely be superseded by other systems. Any notion of long-term sustainability should recognize the evolution of both human institutions and the biological processes.

SEE ALSO *Future Generations; Limits to Growth; Sustainability; Sustainable Development.*

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John Gowdy
Mikko H. Manner

BUDDHISM

The Buddha was a wandering sage in northeastern India around the sixth century BCE. Little is known about him beyond the legends that accumulated around his person in the first several hundred years after his death. It is unlikely, for instance, that he was the prince that later mythology made him. However, it seems that he lived a life of moderate renunciation after his withdrawal from the life of the world.

Although an innovator in terms of doctrine and practice, the Buddha drew heavily on elements of ancient Indian religious thought. The implications of his first sermon, in which he expounded the Middle Way, the Four Noble Truths, and the Eightfold Path, are that entities in the cycle of continuous birth and death (*samsara*) lack permanency or substance. He applied that insight especially to the human sense of self (*atman*) and, realizing that nothing of enduring value can be found in the intrinsically unsatisfactory (*dukkha*) realm of rebirth, sought a path that leads beyond life and death to the state of *nirvana.* By achieving that goal he became the enlightened one, or Buddha.

The Buddhist tradition accepts the idea that the full implications of enlightenment cannot be articulated in rational speech. Therefore, *nirvana* has tended to be expressed in negative terms. However, part of the Buddha's enlightenment experience was constituted by a profound insight into a universally applicable notion of causation in which all entities are deemed to be the effects of specific causes. The corollary of this is a strong view that there are no independent entities. This doctrine is acknowledged by all schools of Buddhism and is known as the rule of dependent coarising (*pratityasamutpada*).

The Buddha lived a peripatetic life, expounding the implications of those insights for many decades before succumbing to the forces of dissolution intrinsic to all conditioned things. Most Buddhist traditions hold that he died, possibly of dysentery, at the age of eighty. The essence of his message is enshrined in his dying words: "All conditioned things are subject to decay. Strive diligently for salvation" (Digha Nikaya ii.156). The Buddha's teachings were collected by close followers soon after his death, and that oral collection is said to have provided the fundamental point of departure for the development of all the scriptural assemblages of the later Buddhist tradition. However, the elevation of Buddhism into a world-historical tradition did not occur for several centuries after the demise of its founder.

FORMS OF BUDDHISM

The Indian ruler Asoka Maurya (reigned c. 268–239 BCE) appears to have adopted Buddhism after being revolted by the war and destruction he had caused in the early part of his reign. His support for one of the eighteen ancient schools that already had developed—that school now is called the Theravada ("way of the elders")—led to the export of the tradition to neighboring regions of southern and southeastern Asia. By the early Christian centuries

Theravada Buddhism had been established in Sri Lanka, Burma, Cambodia, Thailand, and Laos. However, the championship of Asoka did not prevent other forms of Buddhism from emerging in India, particularly in the northwest, where the Mahayana ("great vehicle"), a form of Buddhism that stressed the supramundane qualities of the Buddha and his advanced disciples more than the Theravada did, eventually spread along trade routes to China, Korea, and Japan. At a later time new forms of the Mahayana, often influenced by pan-Indian currents of Tantrism, a form of practice that emphasized ritual and magic, crossed the Himalayas into Tibet and Mongolia, although by the conclusion of that process Buddhism already was in decline in India. Central Asian Muslim invasions that began in the tenth century effectively uprooted Buddhism from the land of its birth.

The beginnings of significant Western interest in Buddhism can be traced to the period immediately after the European Enlightenment. However, at that time writers as diverse as Schopenhauer and Thoreau regarded Buddhism as a purely philosophical system. It was only in the early twentieth century, largely through personal contacts with Asian culture, that some Europeans and Americans saw its potential for personal transformation and began to take an interest in its practice. This theme was amplified in the post–World War II period, and in the early twenty-first century virtually all forms of Asian Buddhism, together with some that could be said to be unique to Western circumstances, have adherents in the West.

THE NATURAL REALM AND THE CONCEPT OF REBIRTH

Part of the attraction of Buddhism, especially in the West, has been its position on the nature of divinity. Although the Buddha accepted the existence of a host of gods and minor deities, he unambiguously rejected the notion of a supreme deity. He argued strongly that the world is not the creation of a god and that human beings are not creatures. The force that sustains human existence is not supernatural but the natural effect of actions

Stone Head of Buddha. *A sculpted head of Buddha, the "enlightened one," is entangled in the roots of a Banyan tree in Ayutthaya, Thailand. Although many consider Buddhism to be a more ecological religion than the Judeo-Christian tradition, others contest that Buddhism's environmental ethic is a more recent and possibly superficial development.* **AKVA, 2008. USED UNDER LICENSE FROM SHUTTERSTOCK.**

(*karma*). His model of the universe thus precludes any suggestion of a meaning, purpose, or end (*telos*) to existence. Existence is eternally present, but it must be scrutinized for what it is, not for what people imagine it to be.

As was noted above, the Buddha both borrowed from and critiqued the religious ideas of his time. He taught that sentient beings are subject to endless rebirth within *samsara,* although in line with the antimetaphysical bias of his teachings, he repudiated the idea that this process involves the transmigration of any permanent essence, such as the soul. Buddhism accepts the possibility of rebirth in one of six destinies (*gati*): the realms of the gods, the demigods, humans, animals, ghosts, and the denizens of hell. However, there are two peculiarities of this schema as it relates to the environmentalist credentials of Buddhism. First, none of the *gati* are permanent. Second, through the performance of virtuous actions (*karma*) all beings, even animals and denizens of hell, may be reborn in more favorable future states or more unfavorable ones.

The Buddhist cosmological schema assigns a special place to humans. Although gods and demigods live long and comparatively comfortable existences, their lives inevitably end in death. Furthermore, these two *gati* do not supply the necessary stimuli to follow the Buddha's path to its conclusion. The unfavorable existences of animals, ghosts, and hell beings, by contrast, are nasty, brutish, and short, characterized by anxiety and fear. Thus, the possibilities of heeding the Buddha's teaching are restricted. Only the precious human life provides the correct balance of pain and pleasure for the Buddha's words.

ECOPOSITIVE ASPECTS OF THE BUDDHIST TRADITION: ANIMALS AND PLANTS

Buddhism, like all the renunciatory traditions of ancient India, such as Jainism and Yoga, made a great virtue of contentment. However, in line with the Buddha's teaching on the Middle Way, monks were not expected to renounce property completely. Monastic discipline permitted some possessions, but they were to be used to the fullest extent and monks were enjoined to avoid all forms of luxury and wastefulness. Robes, for example, should be repaired repeatedly. Only when they deteriorated beyond a state in which they could be worn decorously could they be cut up and reused.

The Buddha rejected the cultured surroundings of the settled life to live a peripatetic existence as a dweller in forests and other sparsely inhabited places. The defining event of his life, his enlightenment, took place while he was sitting underneath a forest tree. The arc of his life thus was from civilization to nature, and that existence became an enduring model for future generations of his followers. Although few ever attain the ideal, the notion of the wilderness- or forest-dwelling monk has deep roots in all parts of the tradition. Indeed, the joy with which some of his earliest followers embraced that existence is a leitmotif: "Forests are delightful where [ordinary] people find no delight. Those rid of desire will delight here; they are not seekers after sensual pleasures" (Theragatha 992).

However, this is not a simple romantic quest for union with nature. The poet acknowledges that the forest is a place of danger and metaphysical dread that is avoided by most. However, those who are prepared to still the mind from which fear arises and contemplate this place of continual change will gain important insights into impermanence.

The centrality of the doctrine of dependent coarising (*pratityasamutpada*) in Buddhist thought appears to provide powerful support for the modern conception of ecology. If there are no independent entities, the interdependence and interrelatedness of things are established. The doctrine of the *gati* reflects this by pointing to the radical kinship of all living beings. All people have circulated endlessly through the six destinies, and as the Buddha observed to his monks: "Bhikkhus, it is not easy to find a being who has not formerly been your mother, or your father, or your brother, your sister or your son or daughter" (Samyutta Nikaya.ii.189). People's behavior toward other beings should be illuminated by this insight, and the idea was so pervasive that it became part of the ideal of Buddhist kingship in India. The Fifth Pillar and First Rock edicts of Asoka, for example, state that the Buddha satisfied his responsibilities for the protection of animals and birds.

Interrelatedness also underlines the important practice of meditation on loving kindness (*metta*), a staged process with a basic formula that is fully visualized: "May all beings be happy and secure, may they be happy-minded. Whatever living beings there are—feeble or strong, long, stout or medium, short, small or large, seen or unseen, those dwelling far or near, those who are born or those waiting to be reborn—may all beings, without exception be happy-minded" (Anguttara Nikaya ii.129). *Metta* is in fact the first of the four divine abidings (*brahmavihara*), a series of meditative exercises said to culminate in the cultivation of equanimity (*upekkha*), "an even-minded serenity towards beings which balances concern for others with a realization that suffering is an inevitable part of being alive" (Harvey 1990, p. 209).

The first precept, an ethical injunction equally binding on monks and laypersons, has the form "I undertake the precept to abstain from taking life." Yet unlike the Jains, the Buddha adopted the Middle Path in his understanding of the important pan-Indian concept of noninjury (*ahimsa*). For Jainism the ideal of *ahimsa* has absolute

value, and because all living things, vegetables included, suffer by being consumed, the final goal of the Jain ascetic, although rarely achieved, is death by starvation. The Buddha regarded that as too extreme. His monks were allowed to eat in moderation, but their food had to be collected through begging. Almost anything placed in the begging bowl had to be consumed. That included meat, assuming that the monk had not heard or seen the animal's slaughter or suspected that it had been killed on his behalf. Early Buddhist monks were not vegetarians.

The Buddha also laid down rules that prevented the monastic order (*sangha*) from engaging in agricultural activity, for digging the soil inevitably leads to the death of many small creatures. In Indian Buddhism plants were assigned a lack of sentiency, and that meant they were not regarded as being caught up in the round of rebirth. Instead, the plant kingdom was seen as constituting part of the backdrop or scenery of *samsara,* and little thought was given to its significance. However, when Buddhism became established in China and other parts of eastern Asia, it underwent a series of transformations, some arguing for the attainment of buddhahood by nonsentient beings (Japanese: *hijō jōbutsu*) to be applied specifically to the vegetable kingdom.

Monks must not damage plants and seeds intentionally during their wanderings, but these restrictions are not possible for the lay follower who must work the land to live. Although monks can follow the eightfold noble path to the ultimate goal of liberation fully, laypersons clearly are restricted by the manner of their livelihood. They can hope for rebirth in a more favorable *gati,* but it is unlikely that they will reach *nirvana* in this life. Nevertheless, monks need to be fed, and the layperson can cancel some of the demerit associated with his actions with the merit accrued by almsgiving.

Another idea retained by popular Buddhism is that trees may be the residences of tree spirits and other minor spirits. For this reason pious Buddhists traditionally have been reluctant to cut down trees before ensuring that a rite is performed to encourage indwelling spirits to find a new home. One rite is described in the monastic rule (*vinaya*) of the ancient Mulasarvastivadin school:

> If one has to carry out some building activity for the Buddha, and if for this reason one must cut down a tree inhabited by a tree-deity, then one should present that deity with incense, flowers and other offerings and subsequently expound to the deity the wholesome forms of conduct. After that one should ask the deity to move to a different tree because its present home is required for the Buddha. If, however, the deity refuses to move then one should extol the advantages of generosity and explain the disadvantages of miserliness and greed. But if that is of no use and the deity still refuses to go . . . one is not permitted to cut [the tree] down. (Taisho Vol. 23: 776a)

These rules are binding only on monks, but they are not entirely congruent with the injunction not to damage plant and seed life. Requirements for laypersons are significantly less restrictive. One may speculate that similar ideals combined with the general Buddhist preference for contentment and moderation did restrict human exploitation of the forest, but this does not appear to be a prescription that holds sway in the contemporary Buddhist world, particularly in Southeast Asia, where large-scale and often illegal logging is endemic.

CONTRAINDICATIONS

Indian Buddhism showed sporadic awareness of issues similar to those central to the modern discourse of environmental concern, but there also is a large body of counterevidence. The Buddha taught that all conditioned things are impermanent, void of substance, and unsatisfactory (*dukkha*). The ultimate goal for Buddhism is not the better ordering of the world but escape from this realm of perpetual flux. This seems an unlikely base from which to launch a religiously informed environmental ethic. The Buddhist conception of reality is the opposite of teleological: For the Buddha the world is not evolving toward a final purpose or meaning.

This conception is expanded in the *Aggañña Sutta*, a discourse that explains how the world periodically comes into being, declines, and is extinguished before another great cycle starts up and the process is repeated. The overall process is without beginning and without end: Each world is consumed by fire, and all living things are born into an immaterial existence. However, once the ashes of that conflagration have consolidated themselves, some of those subtle beings are reborn on a new earth. However, the conditions of life swiftly begin to deteriorate, and distinctions of many kinds—between men and women, rich and poor, beautiful and ugly—start to emerge. Wars and other forms of instability ensue, and the world commences its inevitable dip down into to its next catastrophic stage. Impermanence governs the whole process. Beings suffer and are reborn. The preservation of sentience is maintained, but progress is illusory. There is no history. One cycle simply follows the next. This seems an unpromising basis on which to develop an environmental ethic.

At the most general level one must consider the applicability of the concept of nature. This multivalent concept has been subjected to far greater scrutiny in the Western philosophical and religious tradition; however it is defined, it is clear that the modern ecological definition

of nature can be understood fully only in the context of the history of Western thought. Nevertheless, because ecological concerns started to impinge on Buddhism in the late 1960s, some modern scholars have looked for Buddhist equivalents. *Samsara* and *pratityasamutpada* have been among the more common offerings, but these terms cover a very wide semantic range. For example, the term *samsara* denotes the totality of sentient beings caught in the endless cycle of birth and death. From the ecological perspective, two problems immediately arise. First, some of these beings—gods and ghosts, for example—are not recognized by the empirical method. Second and perhaps more important, the doctrine of rebirth suggests that the gradual diminution and final extinction of an animal species as a result of adverse environmental change is neither entirely good nor entirely bad. The Buddhist cosmos is a vast, unsupervised recycling plant premised on the preservation of sentiency. Extinction of life forms in any part leads to rebirth somewhere else: Black rhinos may be reborn as humans.

Dealing with *pratityasamutpada* may be more profitable. There is some overlap between this notion and the ecological concept of interdependence, a point developed by the American Buddhist environmentalist Joanna Macy (1991). In her work the idea that all entities depend on specific causes and conditions is transformed into a far more radical position in which all things are mutually interdependent, interrelated, and interpenetrating. Although this may fit with the radically holistic teachings of the East Asian Hua-Yen (Japanese: *Kegon*) schools, it has been argued (Harris 1994) that it is not consistent with the teachings of the early Buddhist texts. There is a conceptual difficulty in the doctrine as well. In the case of an endangered animal species, from Macy's perspective the rest of reality depends and indeed interpenetrates those beings. If they become extinct, that will have an impact on everything else. However, the argument is indiscriminate, applying equally to every apparently discrete entity from mountains, rivers, and fish to dangerous chemicals, cars, and nuclear waste. The consequences of this train of reasoning are deeply paradoxical. Further, in ecology all interdependencies are not equal. The extinction of an organism affects some other organisms or chemical or physical processes more than others.

ECOLOGICAL PRACTICES IN THE BUDDHIST WORLD

Lacking sufficient knowledge of their physical and economic condition before the beginning of the colonial period in the first quarter of the nineteenth century, one must hesitate to ascribe any significantly greater interest in ecological matters in early Buddhist societies than in premodern Western societies. There is evidence that some large Tang period Chinese monasteries engaged in "multifarious commercial and financial activities," including large-scale logging, that undoubtedly had a detrimental effect on the natural environment (Harris 1997, p. 386). In the modern period the evidence is not heartening, for Buddhist cultures have taken environmental concerns seriously only in the last two decades and only in a superficial manner. This may be unsurprising in underdeveloped economies such as Burma and Cambodia, but what of Korea and Japan, the most developed Asian economies with a significant Buddhist presence?

This contradicts the commonplace assumption that Buddhism is ecologically positive in marked contrast to a Judeo-Christian world order commonly assumed to be the prime culprit for the current ecological crisis. This theme became fully manifest in the historian Lynn White Jr.'s 1967 essay "The Historical Roots of Our Ecologic Crisis," but the notion can be traced back to the influential writings of Daisetz Teitaro Suzuki (1959), one of the most important popularizers of Buddhism for Western audiences.

Suzuki came to intellectual maturity in the Meiji period (1868–1912), a time when Buddhism had come under serious criticism for not promoting the ideal of the uniqueness of the Japanese character (*nihonjinron*) sufficiently. In reaction to official disapproval Japanese Buddhism began to adopt new forms that emphasized the fundamental differences between "oriental" and "occidental" ways of thinking. When Suzuki arrived in America in the early years of the twentieth century, he began to champion a "Zen naturalism" that "would assert that the Japanese are racially and/or culturally inclined to experience the world more directly than are the peoples of other nations" (Scharf 1995, p. 124). For example, Suzuki contrasted the Western and Eastern attitudes toward mountains. For Westerners mountains are there to be climbed and tamed, thus underlining the Western desire for the conquest of nature. By contrast, "we of the Orient have never conceived Nature in the form of an opposing power. On the contrary, nature has been our constant friend and companion, who is absolutely trusted.... The idea of conquest is abhorrent" (Suzuki 1959, p. 334). There is some truth here, but the assertion is puzzling in light of Japan's dismal historical record on environmental protection (Parkes 1997).

What of the Buddha's attitude toward plants and forests? It was noted above that the future Buddha was attracted to wild uncivilized surroundings after he renounced his worldly existence. In this he was following the spirit of the age, for he was copying many who had walked that path before him. Yet the evidence is far from unequivocal. In an early discourse on the rule of a

righteous king the Buddha imagines a golden age in which "villages, towns and cities will be so close to one another that a cock could fly from one to the next . . . [and] there will be 84,000 towns with the royal city at their head" (Digha Nikaya iii.75). This vision of hyper-urbanization hardly strikes an ecological note.

The Buddha's enlightenment under the *bodhi* tree provides an interesting link with archaic rites connected with sacred trees. This complex of ideas and practices has been retained by Buddhists, who continue to venerate the many trees still in existence that are believed to have grown from cuttings of that original tree. It also has been reworked as a means of engaging in environmental activism, particularly in Thailand, where the forces of modernization have contributed to massive destruction of forest cover. In its simplest form this has involved the organization of Buddhist-sponsored tree-planting ceremonies, many of which sprang up after the 1982 Bangkok bicentennial. More complex and unorthodox is the practice of tree ordaining, in which a tree endangered by a logger's saw is wrapped ceremonially in a monk's robe as a means of protection (Darlington 2007).

SEE ALSO *Asian Philosophy; Forests; Hinduism; India and South Asia; Jainism; Japan; White, Lynn, Jr.*

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Ian Harris

BUILT ENVIRONMENT

The *built environment* includes the flora, non-human fauna, human beings, air, water, soil, and other earthen elements of center-city, suburban, and fringe areas. The built environment has become the center of human settlement and population, a majority of energy use by human beings, and practices and policies responsible for destruction of nonurban habitat, consumption of green space, and other forms of environmental degradation. Philosophical responses to these realities situate the built environment in relation to three questions. First, what is—and what is the basis of—environmental value? When the built environment is factored into the equation, this question can be asked with an eye toward urban environmental values and how the built environment impacts nonurban environmental values. Likewise, one can ask how characterizations of nonurban environmental value impact understandings of environmental values in and associated with the built environment. An environmental value framework that admits of urban and nonurban environmental values problematizes the long-standing assumption that the built environment is unnatural and that human culture is separate from nature. Second, which ethical prescriptions, if any, flow from an account of environmental value? When the built environment is considered, one can ask if and how environmental ethical commitments in urban and nonurban environments are related socially, politically, economically and, most importantly, ecologically. Third, how are and how should environmental priorities be ranked in relation to other priorities? More specifically, how are and how should urban environmental priorities be ranked first in relation to other urban priorities, and second in relation to nonurban environmental priorities? This begs additional questions. For example, how are we to decide where an urban environmental priority ends and a nonurban environmental priority begins, and vice

versa? Moreover, given an ecological understanding of the built environment, are not all urban priorities also environmental priorities?

Despite the merit of exploring these questions from different angles, philosophers have adopted a *de facto* standard view of the built environment. On this view, the built environment, as the primary source of environmental degradation and center of environmentally destructive practices and policies, is that which stands most opposed to nonurban ecological ideal(s). The built environment is not viewed as capable of being a location of most types of environmental value, save anthropocentric instrumental variants. As such, the built environment is viewed as ecologically inferior to those environments thought to have greater ecosystemic value and/or intrinsic value. This standard view runs parallel to the predominant way individuals have understood and acted in relation to the built environment. When it comes to the built environment, instrumental modes of valuation routinely have produced strong anthropocentric environmental commitments. When environmental ethical commitments to the built environment are framed in this way, the actions that follow will be crudely instrumental, which consequently aligns with the negative ecological reputation of the built environment. This negative reputation partly explains why much of what has been written on built environments has been restricted to examining their shortcomings.

At the turn of the twenty-first century, scholars were engaged in a reconsideration of the built environment that challenges the standard view. New direct treatments of the built environment, many of which pick up on themes established in other fields, focus on their positive ecological potential and the need to address the negative role they continue to play in global ecological function. Some treatments address philosophical aspects of urban environmental policy, such as who bears ethical responsibility for urban environmental pollution transfers, or what drives the paradoxical inaction that accompanies urban environmental proposals. Other treatments address philosophical issues that emerge from urban ecology and conservation studies, such as how and if urban ecologies can be restored and/or how urban ecology might be part of what humans take to matter aesthetically. Finally, still other theorists address philosophical aspects of urban sustainability including how the built environment can function as a habitat and be sustained for the sakes of global ecology and future generations in an ecologically less destructive manner, while affording space for current generations' habitat needs. Reconsideration of the built environment, partly informed by the modern environmental justice movement and a renewed interest in urban preservationism prompted by Dale Jamieson (1984) and Avner de-Shalit (1994), is evidenced by the publication of several seminal papers, including those by Bill Lawson (1995), Alastair Gunn (1998), Roger J. H. King (2000), and Andrew Light (2001), the publication of scholarly anthologies (i.e., *Ethics and the Built Environment,* 2000), and the introduction of college courses that focus on philosophical aspects of the built environment.

SEE ALSO *Animal Ethics; Anthropomorphism; Darwin, Charles; Environmental Aesthetics; Environmental Justice; Evolution; Future Generations; Jamieson, Dale; Urban Environments.*

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James W. Sheppard

BUREAU OF LAND MANAGEMENT

SEE *U.S. Bureau of Land Management.*

BURROUGHS, JOHN
1837–1921

The extensive and once enormously popular writings of the naturalist John Burroughs brought him recognition and honors during his lifetime far beyond what one could foresee from his humble birth on April 3, 1837, in the small town of Roxbury, New York. Although he traveled considerably, Burroughs never wavered in his love for the Catskill Mountain region, in which Roxbury lies. The region informs and is the subject of many of his natural-history essays and books. During his long life Burroughs lived modestly in rural settings, but he was a

friend or traveling companion of some of the richest, most famous, and most powerful men of his era, including Henry Ford, E. H. Harriman, Thomas Edison, John Muir, Ralph Waldo Emerson, Walt Whitman, and Theodore Roosevelt.

In his early years Burroughs searched for his proper calling. He worked as a schoolteacher and later as a clerk for the U.S. Treasury Department in Washington, D.C. Shortly after his arrival in Washington, Burroughs met Walt Whitman, who became a close personal and literary friend until Whitman's death. Burroughs greatly admired Whitman's poetry and wrote two books discussing it and defending Whitman against his critics. Burroughs subsequently became a federal bank examiner for the region that included the Catskills and the Hudson River Valley, where he and his wife returned to settle for good. After many years of writing, Burroughs eventually gained enough notoriety and success from his publications to leave government work and write and lecture full-time.

From one perspective, Burroughs's writing about nature complemented those of John Muir, his friend and contemporary. While Muir is known for his exaltation of wild nature, much of Burroughs's attention is on more rural settings and nearby nature. He was not a champion of the wilderness. He always regarded himself as a follower of Emerson, and the latter's writings provide yet another contrast with his. The grand, more philosophical themes of Emerson's writings—the connections among nature, the human mind, and the infinite—are absent from Burroughs's work. Instead, he concentrates on more immediate, concrete aspects of nature, describing the activities of animals, the beauty of the forest, the changes of the seasons.

That interest in seeing and describing nature up close is evident in the major public controversy of Burroughs's life. At the time, there were several popular nature writers who literally invented scenes and events involving animal behavior and other aspects of nature—scenes and behaviors that could never happen in nature—and presented them as true descriptions. Burroughs lashed out, calling such authors "nature fakers." He argued that nature ought to be depicted as it is, not as writers would whimsically like it to be. To present a fictionalized nature creates misunderstanding of actual nature and thus does a disservice to both the reader and nature. The controversy raged in periodicals of the time, leading even President Theodore Roosevelt to make a public renunciation of the "nature fakers."

Although Burroughs's writings are not nearly as popular today as they were in his time, this controversy had a lasting impact. It confirmed and strengthened the expectation among readers of natural history that such works contain depictions of what actually happens in the natural world, rather than what people might like to read. Thus, his reaction helped further define the genre of nature literature.

Throughout his career, but especially in his later years, Burroughs was extremely generous with his time, offering hospitality, conversation, and hikes in the woods around his home to individuals and groups who showed up at his door hoping to meet the famous naturalist and visit the scenes of some of his writings. Those encounters, as well as his many lectures and planned visits by groups from schools and colleges, undoubtedly strengthened the concern for nature that his writings fostered.

The relative lack of attention to Burroughs's work today is regrettable, for his descriptions of the natural world are lively and vivid, conveying an interest in and intimacy with that world. In addition, his focus on immediate nature and his affirmation of agricultural and other human presence in and influences on the larger landscape make him a congenial, though unacknowledged, forbearer of bioregionalism and related approaches to environmental thought. His view of nature includes a spiritual dimension, which would resonate with yet another strand of contemporary environmentalism. He did not accept any form of organized religion, however. Nor did he view nature as leading to God so much as he viewed nature itself as divine.

To promote interest in Burroughs's contributions, the John Burroughs Association maintains his retreat in the Catskills and awards a well-known annual prize for "a distinguished book of natural history," as well as recognizing outstanding nature essays and maintaining a list of "exceptional natural history books for young readers."

SEE ALSO *Emerson, Ralph Waldo; Muir, John; Roosevelt, Theodore; Wilderness.*

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Wayne Ouderkirk

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CALLICOTT, J. BAIRD
1941–

J. Baird Callicott was born in Memphis, Tennessee, on May 9, 1941, and received a master's degree and in 1971 a doctorate from Syracuse University. After three years (1966–1969) at the University of Memphis, he joined the faculty of the University of Wisconsin–Stevens Point (UWSP), where he inaugurated the first college course titled Environmental Ethics. In 1995 he joined the faculty of the University of North Texas. He is one of the founders of academic environmental ethics.

Callicott's position at UWSP situated him in the sand counties of central Wisconsin, the landscape celebrated by Aldo Leopold in *A Sand County Almanac* (1949). Callicott is best known as an exponent and defender of Leopold's land ethic, according to which "A thing is right when it tends to preserve the integrity, stability, and beauty of the biotic community. It is wrong when it tends otherwise" (Leopold 1949, pp. 224–225). For Callicott the land ethic puts primary value on ecological wholes such as species, biotic communities, and ecosystems. In his earlier work he argued that individual interests and lives (including those of human individuals) should be sacrificed if they conflict with the holistic good of the system. That form of holism, which was defended by Callicott in the early 1980s, was criticized as "misanthropic" and "ecofascist" for subordinating the welfare of individual beings to the good of the larger community.

In response, Callicott later developed a multilayered communitarianism. An individual, he argued, is simultaneously a member of many communities, ranging from the immediate family, neighborhood, and nation to the whole human species and also ranging from different ecosystems and bioregions to the global biotic community. Membership in each community generates a distinct set of duties to protect the interests of that community and its members. For example, as members of the human species, all people have duties to maintain the continued survival of the species and also a duty to respect the rights of other people, whereas as members of the global biotic community, people have a duty to preserve its integrity, stability, and beauty. The land ethic therefore is only one of many different layers of moral codes within Callicott's larger communitarianism.

According to Callicott, his communitarianism is "monistic" and should be preferred to pluralist theories in the field. The many layers of moral codes, he has argued, are all theoretically unified under the single idea that community-based sentiments are the ultimate foundation of all values and morality. For Callicott something has intrinsic value if a community of people value it (i.e., share a positive moral sentiment toward it) as an end in itself.

Callicott's value theory is sentimentalist as much as it is communitarian: It reduces facts about values to psychological facts about people living in a community. It implies that there are no values without communities of valuers. This should not be confused with the view that people alone are intrinsically valuable. For Callicott value is anthropogenic (human-generated) without being anthropocentric (human-centered). What gives values and morality stability or even universality, he has argued, is the contingent fact that human beings across times and cultures are similar in their basic needs, affections, and aversions. In particular, he has stated that people are

evolutionarily endowed with the disposition to value the community to which they belong once they recognize that they belong to it. The land ethic, Callicott has argued, is the latest realization of that communitarian disposition in people.

What if people's duties to different communities are in conflict? Callicott introduced the principle that duties to communities closer to people in terms of emotional involvement take priority over those farther away. By itself, however, this principle is unlikely to support a robust environmental ethic: Most people most of the time do not value their biotic communities over their human communities. That is why a second principle is required: The stronger the interest at stake, the higher the priority for its protection. This obliges people to sacrifice trivial human interests (e.g., the pleasure from eating whales) for the protection of significant environmental ones (e.g., the protection of endangered species).

Many important questions remain unanswered. How can one measure the significance of an interest? Is the second prioritizing principle, featuring interests, theoretically unified with the rest of Callicott's monistic communitarianism? What should people do when significant environmental interests conflict with significant human interests? People commonly take more care of those to whom they are closer and give more weight to more significant interests. Both prioritizing principles are already part of commonsense morality. The problem is that they sometimes point in different directions. How can the two be applied together to deliver a robust environmental ethic combined with an appropriate sensitivity to the many human needs, desires, and ambitions? These are difficult questions to which few theorists have concrete solutions. One of Callicott's contributions to environmental ethics has been his ability to provoke a wide range of debates about many fundamental and significant questions on values, morality, and people's relation to the larger environment.

SEE ALSO *Communitarianism; Land Ethic; Leopold, Aldo.*

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Y. S. Lo

CARIBBEAN

Debates about environmentalism in the Caribbean involve both residents and external actors. International tourism requires a supply of iconic island landscapes; the development community seeks to maintain the renewable resources and ecosystems of the region. Residents worry about natural disasters; urban services; water; pollution from military, mining, and manufacturing activity; the health effects of pesticide-intensive agriculture; urban sprawl; and access to land and resources. The debates focus on sustainability, environmental protection, access to resources, and public health. The locus of environmental decision making also is contested.

POLITICAL ISSUES

Environmental controversy reflects the role of the region in the global economic and political system and its vulnerability to natural hazards. After the eighteenth century colonial governments conducted scientific expeditions to identift strategic resources and to assert political control over the region (Sheller 2003, Momsen 2006, Grove 1995) for purposes, among others, of resource extraction. In the postcolonial era transnational tourism and agricultural and mining firms—often more powerful than the national governments they attempt to influence–have shaped island environmental and development policies. Capital flows to the United States and Europe that divert resources needed by Caribbean governments and rural households result in migration to Caribbean, European, and North American cities. Migrant remittances and investments have contributed to sprawl in the Puerto Rican and Dominican countryside. Migrant remittances to the Caribbean were estimated at $8.38 billion in 2006, accounting for over 20 percent of the gross domestic product in several countries. Caribbean migrants active in U.S. environmental justice movements have influenced regional environmental agendas.

The Caribbean region has strategic importance, and military bases such as the U.S. naval base on Vieques, a small island that is part of Puerto Rico, have become arenas of environmental conflict (McCaffrey 2002). The World Bank and the Inter-American Development Bank; the Caribbean Community Secretariat (CARICOM) and United Nations agencies; nongovernmental organizations such as the World Wildlife Fund, the Nature Conservancy, and the International Union for the Conservation of Nature; bilateral assistance agencies and universities; and trade agreements have shaped and constrained Caribbean environmental agendas. Externally funded environmental research and training programs do not always address residents' concerns, and the power of international actors to set agendas often is contested. In Puerto Rico, an American protectorate, and Martinique, a French

protectorate, environmentalism is coupled with demands for greater autonomy and equal enforcement of the environmental norms prevailing in mainland countries, respectively (Garcia, Ramos, and Rivera 2006, Burac 2006). Local elites in the Anglophone Caribbean have used international planning discourse to serve local interests (Pugh 2006). In attempting to control the terms of integration into the global economy, Cuba and the Dominican Republic have sought foreign investment in agribusiness, mining, tourism, and manufacturing. In those two countries protest against the environmental performance of transnational corporations has been muted (Lynch 2006).

COOPERATION AND SUSTAINABILITY

The cultural, linguistic, and political diversity of the region has impeded environmental collaboration, yet cooperation is essential in light of the ecological vulnerability of the Caribbean. Subject to hurricanes, earthquakes, and volcanic eruptions, island ecosystems have high rates of endemism but little biodiversity. Fish populations are endangered by reef and mangrove destruction, ocean dumping, oil drilling, pesticide runoff, and overfishing inshore and on the open seas. Food production has been pushed to marginal lands and no longer meets local needs, and throughout the islands clean water is becoming scarce.

In this context Caribbean environmentalists are asking questions about how to achieve sustainable development and about the kinds of social and political arrangements implied by different definitions of sustainability. Marian Miller, a Jamaican political scientist, argued that in areas of that country where landscapes are preserved for ecotourism spaces for the preservation of traditional sustainable landscape management practices may be reduced. Faced with the loss of Soviet aid in the 1990s, Cuba defined sustainability as economic self-sufficiency, embracing organic agriculture and energy conservation as survival strategies. Cuba led the region's transition to organic agriculture and supported urban agriculture. Banana producers in the Dominican Republic and eastern Caribbean have promoted organic agriculture as a marketing strategy. Deforestation in Haiti has been the subject of debates about sustainability. These debates focus on the extent to which Haiti's environmental vulnerability is a function or cause of its poverty.

THE GREEN AND THE BROWN

The British sociologist Mimi Scheller argued that tourism requires "an endless supply of 'pristine' beaches, 'untouched' coves, and 'emerald' pools," whereas "many islands struggle with the water and sewage demands of the hotel industry" (Scheller 2003, p. 68). Ecotourists want to visit national parks that have lush vegetation, well-marked trails, and folklore displays but are free of local human economic activity. The United Nations Environmental Program (UNEP) and international nongovernmental organizations (NGOs) emphasize biodiversity and forest and coral reef conservation. This preference is reflected in the ornithologist Jared Diamond's popular work *Collapse* (2005), which argues in favor of the repressive forest policies of the former Dominican president Joaquin Balaguer, which were condemned by human rights and environmental justice groups, including ENDA Caribe, an agroforestry organization in the Dominican Republic that fought to give farmers the right to harvest trees that they planted (Rocheleau and Ross 1995).

Charcoal Workers in Miragoane, Haiti. *In Haiti, charcoal and wood make up 70 percent of the country's energy resources. The use of wood for energy has caused devastating deforestation problems, despite the efforts of conservation organizations such as CARE, whose members plant approximately 800,000 trees per year. Many Caribbean nations are more concerned with "brown" issues, such as waste management and pollution.* **SHAUL SCHWARZ/GETTY IMAGES.**

In contrast, brown issues such as waste management and pollution often top local agendas. The Puerto Rican environmental movement began a critique of Operation Bootstrap, a 1948 industrial promotion package that encouraged polluting chemical and pharmaceutical firms to establish plants on that island (Concepción 1993, García, Ramos, and Rivera 2006, McCaffrey 2002). It went on to mobilize successfully against the contamination of Vieques by the U.S. Navy in the late 1990s. United Nations and United States Agency for International Development (USAID) programs have addressed brown issues with microprojects, but their impacts have been limited. Real estate markets consign poor people to polluted areas. Pollution is aggravated in countries where cars, buses, and trucks run on dirty petroleum fuels. Land markets also encourage sprawl, which raises the cost of urban services and takes land out of agricultural production, making it harder for families to find affordable food. Antisprawl campaigns in Puerto Rico, Martinique, and the Dominican Republic have targeted tourist and airport development.

ENVIRONMENTAL JUSTICE

Caribbean environmental justice movements often address access to water for drinking, bathing, and irrigation; sewer lines; land; renewable resources; beaches and coastal waters. Evictions of Dominicans and Jamaicans from forests have deprived them of resources needed for their livelihoods (Miller 2006, Lynch 2006). Protected area designation has pitted local fishers against environmental planners in Trinidad (Sletto 2002) and Puerto Rico (Griffith and Pizzini 2002). Puerto Rican environmentalists have fought against the development of resorts in coastal zones (Pizzini 2006, McCaffrey 2002) but also oppose regulations that restrict local fishing and recreation. Public health is of fundamental importance to environmental justice movements. Examples are Puerto Rico's Misión Industrial (García, Ramos, and Rivera 2006), the Vieques protests to stop the U.S. Navy from using that island as a bombing range, protests against pollution in the Dominican port of Haina, and the movement against nuclear power in Cuba.

Some Caribbean environmental initiatives are conservationist to the point of exclusion. Others call for continuing access to land and resources coupled with stricter regulation of polluting industries. As the Venezuelan anthropologist Francine Jacôme (1996) noted, conservationist programs abound, receiving funds from international NGOs and local foundations. Environmental justice organizations are often local, although they seek funds from bilateral assistance agencies and the United Nations Development Program. Northern funding has diverted some environmental justice NGOs to less transformative pursuits, but NGOs remain the backbone of the movement and succeed when they link their agendas to residents' broader concerns. For this reason Caribbean environmental debates often are couched in terms of anticolonial and antiglobalization struggles and linked to problems of eviction, worker health and safety, and cultural survival and revival.

SEE ALSO *Coral Bleaching; Global Climate Change; Mexico and Central America.*

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Barbara Deutsch Lynch

Rachel Carson, 1963. *Activist and author Carson testifies before a Senate subcommittee in Washington, D.C., urging the members to curb the sale of chemical pesticides and aerial spraying. Her book* Silent Spring *exposed the dangerous health and environmental effects of pesticides, and helped launched a social critique that continues to resonate in modern-day environmental movements.* **AP IMAGES.**

CARSON, RACHEL
1907–1964

The environmentalist and author Rachel Louise Carson was born in Springdale, Pennsylvania, on May 27, 1907, the youngest child of Robert and Maria McLean Carson. Carson showed early promise as a writer and a keen observer of nature. She studied English and biology at the Pennsylvania College for Women and did graduate work in marine biology at Johns Hopkins University, where she received a master's degree in 1932. Carson worked for the U.S. Fish and Wildlife Service for many years before devoting herself full-time to writing.

Best known for her book *Silent Spring* (1962), Carson was an established nature writer long before its publication. *Under the Sea Wind* (1941), *The Sea around Us* (1951), and *The Edge of the Sea* (1955) brought her critical acclaim and popular success. During the period of the Cold War (1945-1991), oceans were seen as a new frontier and an untapped natural and economic resource. Carson capitalized on the public's fascination with oceans, though she emphasized the mystery and allure of the sea over its utilitarian value. These writings do not contain a full-fledged marine ethic, but Carson saw the study of oceans as an occasion for humility and moral reflection; she highlighted human dependence on ocean waters, reminding readers of human insignificance relative to the vast and ancient sea. Carson tended to view the sea as inexhaustible. Humans might dominate terrestrial environments, but the sea, she believed, would remain largely alien and inviolate, rebuffing attempts to plunder and subdue it.

Carson's belief in the limits of human dominion was shaken by postwar developments in science and technology, particularly the unprecedented introduction of chemical pesticides into the environment. Her response was *Silent Spring,* and its impact was enormous. An exposé of the environmental and health effects of pesticides, *Silent Spring* also familiarized the public with basic ecological concepts and transformed ecology from a science to a social movement. Carson showed how bioaccumulation—increasing concentrations of chemicals in higher levels of the food chain—creates danger for wildlife and humans. *Silent Spring* made explicit the ethical concerns that were more muted in her earlier writings.

Carson defended moral consideration of nonhuman life by appealing to commonly held values—the average person's love of backyard birds and aesthetic appreciation of nature—rather than presenting philosophical arguments. She urged respect for the precarious balance and complex webs of relationship in nature and warned that humans would not escape the effects of their poisons, that people's war with nature was inevitably a war against themselves. The fact that those ideas have become commonplace is a tribute to Carson's work.

Silent Spring also launched a social critique that still resonates in radical ecology movements and grassroots environmentalism. Carson castigated the arrogant shortsightedness of a society that subordinates all other goods, human and natural, to the values of expedience and profit. She promoted scientific literacy but warned that modern scientists, whom she portrayed as giddy with power, had been entrusted with far too much authority. Protection of individuals against the harms inflicted by chemical pesticides is a basic human right, Carson maintained. She urged citizens to educate themselves about the dangers of environmental toxins and take action on behalf of local communities. Carson's death from breast cancer two years after the publication of *Silent Spring* has made her a symbol among ecofeminists of the links between environmental toxins and women's health.

With *Silent Spring,* concern for endangered species became a national preoccupation. A series of environmental laws followed in its wake. DDT was banned in the United States in 1972, and its use is banned or regulated in many other parts of the world. Although Carson's work on pesticides largely has been vindicated, her conclusions still generate controversy. Some charge that *Silent Spring* exaggerated the dangers of DDT for humans and that inordinate concern with the health effects of that chemical has been responsible for increases in mosquito-borne diseases such as malaria in some parts of the world. However, Carson never advocated a complete ban on the use of pesticides or regarded attempts to control nature as utter folly. Instead, she urged responsible use of chemicals and encouraged research into biological approaches to insect control.

Carson's abiding concern for future generations received special emphasis in an essay she wrote for *Woman's Home Companion* in 1956 titled "Help Your Child to Wonder." It was republished posthumously (1965) as an illustrated book, *The Sense of Wonder*, and celebrates the child's innate curiosity and enchantment with nature. Carson argues that direct sensory engagement instills in children a lifelong wholesome bond with nature that fact-based education alone cannot inculcate. *The Sense of Wonder* embodies the philosophy of the nature-study movement that was popular during Carson's childhood and has become a classic in environmental education.

SEE ALSO *Ecological Feminism; Ecology: III. Ecosystems; Environmental Activism; Environmental Education; Environmental Law; Oceans; Pesticides; Social Ecology.*

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Lisa Sideris

CAVES

What Ludwig Wittgenstein (1889–1951) says about pain in another context could be said about caves: they are "not a *something*, but not a *nothing* either" (Wittgenstein 1958, para. 304). Essentially, a cave is an open space in a geological formation such as rock or ice. Although some large caves are formed in lava fields as a result of volcanic action (lava tubes), most caves are formed in limestone or other rock formations such as chalk, dolomite, marble, granite, salt, sandstone, and gypsum. Normally, for a formation to be considered a cave, there must be a section of the cave that is not lit by daylight. Spaces without such a passage are called rock shelters. Most caves are formed by erosion from water containing carbonic acid (formed when rainwater comes into contact with atmospheric carbon dioxide and organic material such as leaves and dirt). Characteristically, passages form along joints (fractures in rock without vertical movement between the two sides) and faults (factures in rock with vertical movement).

ORIGINS AND FEATURES OF CAVES

Most caves have formed through phreatic action; the phreatic zone is the zone below the water table completely saturated with water, producing huge, rounded tubelike passages filled with water, often under immense hydrostatic pressure. At this stage they are called springs. They become caves when the down cutting of nearby rivers lowers the water table, producing air-filled space (the vadose region). Caves also can be produced through vadose action, erosion on the floor of the cave in air-filled spaces underground but above the water table, probably initially begun in a phreatic state.

Paradise Room in Carroll Cave, Missouri. *Usually for a formation to be considered a cave, there must be some part of it that is not lit by daylight, such as Carroll Cave, in the Ozark mountains. Caves are interesting, environmentally speaking, because of their aesthetic features and their fragility; once damaged, they cannot be repaired or replaced.* **PHOTO BY EUGENE C. HARGROVE.**

Caves produce unusual habitat for animals such as bats, birds, bears, other mammals, fish, and insects. Animals that live permanently in caves often display unusual evolutionary development, for example, white blind fish, blind salamanders, and a variety of insects that sometimes have unusually long life spans (Mohr and Poulson 1966).

AESTHETIC AND ETHICAL ISSUES

In terms of environmental philosophy, caves are of interest both aesthetically and ethically. Aesthetic appreciation mimics the history of nature aesthetics, which began with a fascination with castellated rocks (rock formations resembling castles and ruins). Most people first relate aesthetically to caves through cave formations that resemble parts of animals, plants, and humanly created artifacts. Aesthetic appreciation then extends to stalactites and stalagmites; columns; and a variety of speleothems, such as helectites, gypsum flowers, anthodites, selenite needles, angel hair, and cave pearls, along with the shapes of cave passages. The vocabulary for discussing the beauty of caves is limited. Aesthetic appreciation includes the sublime, although that term rarely is used. Typically, breakdown rooms—large collapsed areas covered with fallen boulders—and vertical shafts called domepits are considered sublime. Cave photography has evolved into an art form and is characterized by the use of light in otherwise totally dark environments.

Because much of the life of caves is repugnant to many people, for example, bats, arguments for the protection of caves usually are based on weak anthropocentric values rather than biocentric values. It is easier to protect the life of a cave with arguments about the aesthetic features of the cave admired by humans than to protect the aesthetic features by arguing that the life of the cave ought to be protected. Often arguing for the life of a cave directly may be counterproductive.

Caves represent a sensitive problem in nature protection because the aesthetically appreciated features of caves are fragile and usually cannot be repaired or replaced once they have been damaged. This aspect of nature protection is stressed by Holmes Rolston III in his chapter ''Natural Value'' in *Environmental Ethics* (1988), where he discusses angel hair in Turner Avenue in

NATIONAL SPELEOLOGICAL SOCIETY CAVE CONSERVATION POLICY

The National Speleological Society believes:

- Caves have unique scientific, recreational, and scenic values.
- These values are endangered by both carelessness and intentional vandalism.
- These values, once gone, cannot be recovered.
- The responsibility for protecting caves must be formed by those who study and enjoy them.

Accordingly, the intention of the Society is to work for the preservation of caves with a realistic policy supported by effective programs for: the encouragement of self-discipline among cavers; education and research concerning the causes and prevention of cave damage; and special projects, including cooperation with other groups similarly dedicated to the conservation of natural areas. Specifically:

All contents of a cave—formations, life, and loose deposits—are significant for their enjoyment and interpretation. Therefore, caving parties should leave a cave as they find it. They should provide means for the removal of waste; limit marking to a few, small, and removable signs as are needed for surveys; and, especially, exercise extreme care not to accidentally break or soil formations, disturb life forms or unnecessarily increase the number of disfiguring paths through an area.

Scientific collection is professional, selective, and minimal. The collecting of mineral or biological material for display purposes, including previously broken or dead specimens, is never justified, as it encourages others to collect and destroy the interest of the cave.

The Society encourages projects such as:

- Establishing cave preserves;
- Placing entrance gates where appropriate;
- Opposing the sale of speleothems [secondary mineral deposits];
- Supporting effective protective measures;
- Cleaning and restoring over-used caves;
- Cooperating with private cave owners by providing them knowledge about their cave and assisting them in protecting their cave and property from damage during cave visits;
- Encouraging commercial cave owners to make use of their opportunity to aid the public in understanding caves and the importance of their conservation.

Where there is reason to believe that publication of cave locations will lead to vandalism before adequate protection can be established, the Society will oppose such publication.

It is the duty of every Society member to:

Take personal responsibility for spreading a consciousness of the cave conservation problem to each potential user of caves. Without this, the beauty and value of our caves will not long remain with us.

SOURCE: NSS Conservation Policy. http://www.caves.org/info/policy.shtml

Mammoth Cave, which is so fragile that it is damaged by human visits of any kind. Three caves are featured in Eugene C. Hargrove's chapter "An Ontological Argument for Environmental Ethics" in *Foundations of Environmental Ethics* (1996 [1989]): Onondaga Cave in Missouri, which once was threatened by a proposed dam; the cave in Lascaux, France, which contains fragile cave paintings; and Mammoth Cave in Kentucky, which contains delicate cave formations. The main issue in Hargrove's discussion as well as Rolston's is whether natural objects have value that should be protected when direct experience of those objects will lead to the irreparable loss of the aesthetically valued features. In the normal account of value in terms of natural area management, value is created by the instrumental triggering of feelings of emotion in visitors by exposure to the natural objects, living and nonliving. In museums objects that are being damaged by visitation are simply removed from view to protect their intrinsic value. Because the aesthetic value of natural objects are considered instrumental, therefore requiring visitor viewing, managers cannot remove the natural objects from view since that would reduce their instrumental aesthetic value to zero. Instead, they reduce visitation to some lower level to prolong the possibility of visitation before the aesthetic consumption of the object is complete. Aside from the writings of these philosophers, little attention has been given to caves in the academic literature on environmental philosophy.

Cave conservationists have shown little interest in the development of cave-related environmental philosophy, relying primarily on the NSS Cave Conservation Policy from the 1960s (see sidebar).

SEE ALSO *Hargrove, Eugene; Rolston III, Holmes.*

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Eugene C. Hargrove

CHÁVEZ, CÉSAR
1927–1993

César Chávez was born on March 31, 1927, in the San Luis Valley near Yuma, Arizona, and died on April 23, 1993, in San Luis, Arizona. He worked as a union organizer, labor activist, Mexican-American civil rights leader, and leader in the farm workers movement in the United States from 1962 to 1993. He was the second of five surviving children: Rita, César, Richard, Librado, and Eduvigis (Vicky). His name was changed from Cesario to César when he started attending public school. His parents, Librado and Juana Estrada, were born in Chihuahua, Mexico, but lived in the United States for most of their lives.

After his parents lost their small farm and adobe farmhouse in 1938, César and his family became migrant farm workers in California. They picked beans, cherries, carrots, onions, broccoli, melons, and other fruits and vegetables. The children attended Mexican-only schools and on the weekends worked up to ten hours a day in the fields. César faced discrimination at diners and cafés in central California that would not serve Mexicans, who were forced to eat outside. They also were segregated in movie theaters in the San Joaquin Valley. In one instance Chávez was asked to leave a section of a theater; when he refused, the police took him to jail, where they kept him for an hour as a warning. He lived in a one-room shack without running water. It was often bitterly cold because the family had only a kerosene camping stove for heat. Chávez served in the U.S. Navy for two years, starting in 1944, and traveled extensively. He married Helen Fabela in 1948, and they had eight children.

Father Donald McDonnell encouraged Chávez to read about the nonviolent strategies for social change of Saint Francis of Assisi and Mohandas Gandhi. In 1952 Chávez met Fred Ross, who persuaded him to join the Community Service Organization (CSO). He worked full time for the CSO until 1958. Chávez used his CSO membership to document the abuse of Mexican farm workers throughout California. After failing to persuade the CSO to organize farm workers into a labor union, he resigned and moved to Delano, California. On September 30, 1962, he created the National Farm Workers Association (NFWA). The NFWA provided its members with burial insurance, an auto-repair cooperative, a credit union, a newspaper, and social activities.

On September 16, 1965, Chávez called a strike with the Filipino Agricultural Workers Organizing Committee (AWOC). The NFWA and the AWOC merged into an organization called the United Farm Workers Organizing Committee (UFWOC) with Chávez as its leader. Chávez led a grape boycott in Delano and other parts of California that lasted five years.

Chávez's nonviolent philosophy and approach to social changed were shaped by his Catholic faith. He also worked closely with mainline Protestants, Pentecostals, and Jews as well as many secular leaders. His philosophy was influenced by the Christian notion of serving the poor, Francis of Assisi's insistence that it is not possible to feel the pain of the poor unless a person is one of them, Pope Leo XIII's Catholic social teachings about the rights of labor, Mohandas Gandhi's notion of satyagraha (nonviolent resistance), Martin Luther King Jr.'s, Montgomery bus boycott, and Our Lady of Guadalupe, who served as a rallying point and source of faith for people of Mexican ancestry.

Chávez embraced a number of strategies for nonviolent social change. He led boycotts, pickets, marches, and spiritual fasts for better wages, the right to organize unions, better housing conditions, and social change. He also fought against the use of dangerous pesticides on behalf of both farm workers and consumers. He and Luis Valdez created *The Plan of Delano* (1965) to highlight the farm workers' struggle. This became the Magna Carta of the United Farm Workers (UFW) and the Mexican-American civil rights movement. In 1966 Chávez led a twenty-five-day, 340-mile pilgrimage march from Delano to Sacramento to attract media attention to the struggle of farm workers. In 1968 he began a twenty-five-day fast as a nonviolent protest that he ended after Senator Robert Kennedy of Massachusetts took communion with him, an event covered by the national media. He also began nonviolent meetings with a prayer, used

the Catholic Cursillo song "De Colores" as the UFW theme song, and led pickets and pilgrimage marches behind the colorful banner of Our Lady of Guadalupe. His pilgrimage, fasts, and picketing led to an end of the five-year grape boycott in 1970. In 1972 he changed the name of his organization to the United Farm Workers of America (UFWA). Chávez continued his struggles on behalf of farm workers until his death; over 50,000 people attended his funeral.

SEE ALSO *Chicana/Chicano Environmental Ethics; Christianity; St. Francis of Assisi.*

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Gastón Espinosa

CHERNOBYL

On April 26, 1986, an explosion rocked reactor Unit Four of the Chernobyl nuclear power plant in the Ukraine, then part of the Soviet Union. It spread a deadly plume of radiation through the immediate area and across much of Europe. The health effects were immediately evident, not only in the number of fatalities but also in the number of people (especially children) who developed various types of cancer in the wake of the incident.

FLAWS IN THE REACTOR TECHNOLOGY

At the time of the explosion, nuclear power was widely used across Europe and in the United States. In the light-water reactors favored in the United States, water is used as both the moderator and coolant, circulating constantly among the reactor fuel rods. But, in the RBMK (*reactor bolshoy moshchnosty kanalny*, or high-power channel reactor), the Soviet model that was in operation at Chernobyl, water is used as a coolant, but the moderator is graphite; the fuel rods and the control rods run through chunks of the graphite. The difference in moderator becomes important under the conditions that triggered the Chernobyl accident: In a water-moderated reactor, steam forming in the water will simply slow the reaction by increasing the moderating activity of the water. But steam in the cooling water can increase reactivity in a graphite-moderated reactor. As the cooling water turns to steam, it absorbs fewer neutrons. This means that more neutrons will pass to the graphite, which will slow them down and reflect them back, increasing fission. This process causes the power level to rise, which in turn increases steam formation, and the process can quickly escalate. This feature of the RBMK reactor—the propensity of steam formation and reaction intensity to reinforce each other in fatal positive feedback—is called a "positive void coefficient" (or "positive reactivity coefficient" or "positive-void effect").

The reactor was, therefore, inherently more dangerous and susceptible to explosion than those in use in Western Europe and the United States. Why did the Soviet Union build such reactors when better ones were available? First, in an autocratic society, there is little free dispute or criticism; if the engineers in the industry learn of a better way to do things or see inherent dangers in the way things are being done, they are unlikely to voice their concerns if another design is favored by the political bureaucracy. Second, in a closed society like the old Soviet Union, where access to information was tightly controlled, Soviet engineers were isolated from their Western European and American colleagues and thus had limited access to innovations in technology.

HOW THE EXPLOSION OCCURRED

The problems for reactor Unit Four began shortly after midnight on April 25, 1986, when the engineers decided to run a dangerous experiment to find out if they could squeeze extra work out of the reactor at very low power. The danger was that all the safety systems, which were programmed to shut everything down at once when the power falls, had to be disabled in order to conduct the experiment; if anything went wrong, there would be no way to stop the reaction. And something did indeed go very wrong.

After fiddling with every control on the reactor for over an hour to try to keep the power level where they wanted it, the engineers completely shut off the steam supply to the generator they were testing to see how long it could run on mechanical momentum alone. The first result was that the cooling pumps, which were being powered by that generator, started to run down. The water began to boil out of control, and then, because of that positive void coefficient, the power surged.

The operators spotted the surge and reacted immediately to lower the control rods into the core of the reactor to shut down the reaction (the record indicates that corrective action was taken less than a minute from the initiation of the experimental procedure). But it was already too late. The drive mechanism was slow, for lack of power; when the rods were released to fall of their own weight, the meltdown was already in progress, and they never reached the heart of the reactor. As the intensely

Pripyat, Ukraine, Twenty Years After Chernobyl Explosion. *The town of Pripyat still displays empty houses two decades after the 1986 explosion at the now closed Chernobyl nuclear power plant (in background). Radioactive particles settled over the surrounding communities, killing 31 people and injuring and displacing thousands more. Chernobyl remains a warning of the worst-case-scenario of the construction of nuclear power plants, particularly near humans.* **AP IMAGES.**

hot fuel melted the reactor, parts if which dropped in great pieces into the cooling water, a thermal explosion destroyed what was left of the reactor and most of the building. The blast blew off the thousand-ton lid on the reactor core, tore open the building's side and roof, and sent several tons of uranium dioxide fuel, burning graphite, and fission products (such as cesium 137 and iodine 131) off into the night in a three-mile-wide plume, starting numerous fires.

IMMEDIATE AFTERMATH OF THE EXPLOSION

In the ten days following the explosion, some 50 million curies of radioactivity were released into the air. Beginning with the three engineers who had run to see what had happened to the reactor immediately after the explosion, by September 1986 thirty-one people had died; many of the operators and firemen who dealt directly with the explosion and its fires died of radiation burns and poisoning, and the soldiers and volunteers who labored valiantly to cover the exposed core suffered the rest of the casualties. There were roughly 1,000 immediate injuries. Some 135,000 people within a radius of 19 miles of the plant had to be evacuated from their homes in the Ukraine. Ambient radiation continued to increase for weeks from the decay of the melted core.

About 7,000 kilograms of radioactive materials from the core of reactor Unit Four were released into the environment—50 to 100 million curies of radioactive isotopes. The city of Kiev, with 2.4 million people, fared better than some had feared because the winds blew away from the city during the worst period. But several wind shifts brought the nuclear cloud over nearly all of Europe, extending as far north as the Arctic Circle, as far south as Greece, and as far west as the British Isles. Potentially health-threatening levels of radioactive materials were deposited more than 1,200 miles from the plant, in at least twenty countries. The accident first came to light in Sweden on April 28, when technicians noticed atmospheric traces of radioactive gases, mostly xenon and

krypton, that could have come only from the Soviet Union. Shortly thereafter radiation was found in scattered regions throughout Europe.

LONG-TERM CONSEQUENCES

What consequences have ensued from this nuclear disaster? In addition to the thirty-one deaths from radiation poisoning, some 500 people had to be hospitalized with some form of radiation poisoning. Up to 24,000 of the evacuees received serious doses of radiation. Radiation-caused disorders, including cancer, have been documented in this population, including forty cases of pediatric thyroid cancer, ordinarily a very rare disease, among children from the contaminated villages near Chernobyl. Over the long term, for the region outside the nearest direct exposure, the effects of the disaster remain uncertain.

There are three major health threats from exposure to radioactive materials. First, there is direct exposure, resulting in burns and massive internal injuries, especially to all areas where cells divide rapidly; this type of radiation poisoning killed the operators and rescue workers around the reactor. Second, damage can result from inhaling radioactive dust; many of the citizens of Pripyat may have been injured by such inhalation. Third, there are the radioisotopes that come to rest in the drinking water and the food supply, entering the food chain through the rain and the grass. These are potentially the most worrisome. Iodine-131, entering the body through food or water, was the major threat immediately after the accident; it concentrates in the thyroid and was certainly responsible for the cases of rare thyroid cancer in the children. But iodine-131 has a half-life of eight days and was largely gone from the area in a month or so. Strontium-90, also released in the explosion, has a half-life of twenty-seven years, but it was not present in large quantities.

The worst danger came from cesium-137. It was carried on wind high above the ground and fell where the rain did, along a broad swath of territory from the central Ukraine north across eastern Belarus. Almost 13,100 square miles of agricultural land, dotted with small cities, are contaminated with radioactivity at levels of five or more curies per square kilometer. Cesium contamination forced farmers to destroy produce as far away as Lapland, in northern Sweden, and in Italy and Wales. There is no way of knowing how much damage to health can result from trace contamination of this carcinogenic element. Estimates of cancer deaths attributable to Chernobyl run between 5,000 and 50,000; the wide discrepancy in the estimates indicates how little is known about the long-term health effects of cesium-137.

SEE ALSO *Bhopal; Future Generations; Nuclear Power; Pollution; Precautionary Principle; Russia and Eastern Europe; Risk Assessment; Waste Management.*

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Lisa H. Newton

CHICANA/CHICANO ENVIRONMENTAL ETHICS

Rooted in Mexican American culture, Chicana and Chicano environmental ethics seeks to overcome historical inequity while preserving long-standing wisdom about the land and intimacy with the natural environment. Chicanas and Chicanos express their environmentalism in many ways, including activism, cultural production, and scholarship.

Chicana/o environmental activism centers on land rights and environmental justice. The land-rights movement led by Reies Lopez Tijerina in northern New Mexico in the 1960s brought national attention to denial of lands to many Mexican Americans after the Mexican-American War of 1846–48. Many of these cases involved original land grants from the Spanish and Mexican periods of colonial rule in the Southwest. After the war many grant holders were not able to validate their land grants in U.S. courts; others found their lands auctioned or sold without their consent. As a result many lost their lands. In the 1960s Tijerina organized a cooperative of Mexican American citizens, the Alianza Federal de Mercedes (Federal Land Grant Alliance), to recover lost ancestral lands. The group staged some protests, including a confrontation with local authorities at the Tierra Amarilla courthouse in 1967 and the takeover of a section of the Santa Fe National Forest for three days in 1969. The group primarily organized families to appeal land grants. Some of their cases remain active in courts as of 2008.

Chicana/o environmental activism encompasses the struggles of various groups, both urban and rural, for environmental justice. Groups such as the Mothers of East Los Angeles (MELA) and People Organized in Defense of Earth and Her Resources (PODER) in Austin, Texas, organize people of color and those in urban, low-income communities to protest against disproportionate exposure to toxic contamination. Rural environmental justice groups, such as Ganados del Valle, in

northern New Mexico, organize around agricultural issues. Ganados del Valle formed in the 1980s as a sheep cooperative, with a group of ranchers working together to implement environmentally sustainable practices and to survive the dominance of large-scale agribusinesses. The group helps to preserve Mexican American traditional environmental knowledge and sustainable agriculture in this region.

Chicana/o cultural production evokes the traditional environmental values of the Mexican American community as well as late-twentieth-century environmental justice struggles. María Amparo Ruiz de Burton's novel *The Squatter and the Don* (1997 [1885]) depicts the struggle to protect a land-grant ranch in Southern California from a squatter takeover. The book also portrays the sustainable approach to agriculture practiced by California's Mexican community in the arid climate around San Diego. In the 1930s Jovita González recorded folktales from South Texas for the annual publication of the Texas Folklore Society. Her folktales chronicle a creative natural history of this region through the eyes of Mexican Americans. Set in the region of the Lower Rio Grande Valley, Gloria Anzaldúa's book *Borderlands/La Frontera* (1987) features hybrid indigenous and European views on nonhuman nature that reach into the late twentieth century. Many other late-twentieth-century works explicitly criticize environmental injustice, especially as it pertains to the workplace and structural discrimination. These works include the novels of Ana Castillo (1994) and Helena María Viramontes (1995), the poetry of Cherríe Moraga (1983, 1993, 1994) and Jimmy Santiago Baca (1989), the murals of Judith Baca, and the songs of Tish Hinojosa (1992). Although many Mexican American works engage environmental issues, environmental studies do not center on Chicana/o environmental thought; Chicana/o environmental scholarship challenges the assumption that Mexican Americans have not made significant contributions to environmental thought. This scholarship works in two ways: to highlight Chicana/o environmental thought and to show the ways in which environmental injustice affects the Chicana/o community. There are significant works on Chicana/o environmental ethics in the social sciences, with book-length studies in the fields of cultural anthropology, geography, and urban studies. The humanities are starting to respond as well, with the publication of several journal articles that feature Chicana/o environmental writing and history.

Chicana/o environmental thought influences the academic studies in significant ways. For example, the idea of wilderness does not accord with Chicana/o present and historical sustainable dwelling on the land in North America. Moreover, the limitation of access to public lands by the National Park Service and other U.S. government agencies came at a time when Mexican Americans were fighting for recognition of their rights to remain a part of—and own—some of those areas. Likewise, environmental studies have influenced Chicana/o scholarship, fostering a greater awareness of the social-justice dimension of environmentalism in Chicana and Chicano activism, cultural production, and scholarship.

SEE ALSO *Environmental Activism; Environmental Justice; Sustainable Agriculture.*

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CHINA

China is the most populous country in the world, with a population estimated at of 1.3 billion in 2007. Since the late 1970s, China's economy has developed rapidly and continuously. During this expansion, many environmental problems that have haunted developed countries in various phases of their industrialization have occurred in China in a compressed time span. In China the conflict between the environment and development is becoming ever more prominent. A relative shortage of resources, a fragile ecology, and insufficient environmental capacity are becoming critical problems hindering China's continued economic development.

ENVIRONMENTAL PROTECTION IN CHINA

To tackle environmental problems arising from rapid economic growth, China has adopted a series of comprehensive measures, with marked achievements to its credit. For example, the amount of industrial waste water and industrial aerosols discharged in generating one unit of GDP in China in 2004 dropped by 58 percent and 39 percent, respectively, from 1995. Nonetheless, industrial pollution of the environment remains severe in China. In 2005 the forest area in China was 175 million hectares, with forests covering 18.21 percent of the country. This coverage ratio increased by a factor of 1.66 percent from 2003 to 2008. The National Coordination Committee on Climate Change was established in 2003, and China's National Climate Change Program was formulated, outlining objectives, basic principles, key areas of actions, as well as policies and measures to address climate change for the period up to 2010. In June 2007 China issued a work plan on energy conservation and pollutant-discharge reduction. According to the plan, the government was to invest 1.35 percent of its GDP each year for the following three years in environmental protection and would reduce its 2005 level of energy consumption by 20 percent by the end of 2010.

Nonetheless, the remaining environmental challenges for China are serious. Energy consumption per unit of GDP in China is eight to ten times of that in developed countries. China's emission of sulfur dioxide is the largest in the world, and its carbon emissions are second to those of the United States and soon to rise to first place. Sixteen cities in China are among the top twenty most heavily polluted cities of the world. Approximately 70 percent of China's water system is polluted. Some 300 million peasants have difficulties in accessing clean water. Species have disappeared or become endangered at the rate of 15 percent to 20 percent during the last twenty years.

MAJOR ENVIRONMENTAL EVENTS IN CHINA

Ethics, values, and major events contribute to the public's awareness of the environment and environmental ethics. The 1998 flood of the Yangzi River Valley made many people think seriously about the relations between humans and nature. The outbreak of severe acute respiratory syndrome (SARS) in 2002 led the public to reflect on its relationship with animals. In May 2004 the announcement by the Beijing Municipal Legal Affairs Office that it had drafted legislation on animal welfare spurred a vigorous debate about whether and in what sense animals have rights. Consequently, many universities have established laboratory animal ethics committees. The 2004 Indonesia tsunami triggered another public debate in China in 2005 about whether humans should revere nature. These events loom large in ethical reflections on environmental issues in China.

The development of Chinese environmental ethics has occurred in two phases. The first phase is the embryonic period, extending from the middle of 1980s to the middle of 1990s. The first Chinese article to argue for the intrinsic value and rights of nature was published in 1987 (Yu 1987). In 1991 Holmes Rolston visited China and encouraged Chinese scholars to explore and promote environmental ethics. The first paper that introduced the perspectives of contemporary European and North American environmental ethics appeared in 1993 (Yang 1993). This first phase came to its high point when the Chinese Society for Environmental Ethics was established and the First National Conference for Environmental Ethics was held at Renmin University in 1994. Several books on ecological ethics were published in China during this period (Xiangrong Liu 1992, Ye 1994, Yu 1995).

The second phrase is the growth and development period, which began in the late 1990s. Chinese scholars

Flooding in Yueyang, China, 1998. *The 1998 flooding in China's Yangzi river valley was one of the major environmental events that caused many in the country to start thinking about the relationship between man and nature. As the most populated country in the world, China faces many environmental challenges: around 70 percent of its water system is polluted, and some 300 million people have difficulty accessing clean water.* **AP IMAGES.**

made many advances during this period. The study of environmental ethics became more comprehensive, systemic, and deep. European and North American environmental ethics have been extensively explored (Yang 2000, Lei 2001), and many books, such as Roderick Nash's *The Rights of Nature* and Rolston's *Environmental Ethics* and *Philosophy Gone Wild*, have been translated into Chinese. Benefiting from the perspective of modern environmental ethics, some scholars expound systematically traditional Chinese conceptual resources and wisdom concerning the environment (She 2002, Meng 2004). Many textbooks and original academic writings on environmental ethics appeared during this period. (He 2002, Yu 2003, Yu and Wang 2004, Yang 2007).

In addition, many universities (such as Renmin University, Peking University, and Tsinghua University) and institutions (such as the Chinese Academy of Social Sciences) offer master's and doctoral degrees in environmental ethics. There are at least sixty universities that offer environmental ethics courses for undergraduate students. The first doctoral dissertation on environmental ethics in China was completed in 1998 (Yang 1998). In 2003 the Environmental Philosophy Committee of the Chinese National Association of Natural Dialectics was established. Academic activities in environmental ethics have also increased rapidly. The First National Conference on Environmental Philosophy, which Rolston attended, was held at Harbin Industry University in 1998. There has been at least one academic conference on environmental ethics or environmental philosophy each year since 1998. The First International Conference on Environmental Ethics was held at Nanjing University in 2004; among those in attendance were Dale Jamieson, Eugene Hargrove, Andrew Brennan, and Freya Mathews. The International Seminar for Environmental Ethics, the aim of which is to train teachers who teach environmental ethics for college students, was held at College for Environmental Management of China in 2006. Hargrove, Brennan, Mathews, and other scholars gave presentations for this seminar. Chinese scholars have also begun to go abroad to study environmental ethics and participate in international research programs (Yang 2006), among them Gao Shan at the University of North Texas doctoral program.

ACADEMIC DEBATES

Environmental issues that Chinese scholars have focused on include the following: the nature of environmental ethics, environmental justice (especially international environmental justice), intergenerational duties, sustainable-development ethics, the moral status of animals, ethical issues concerning animal experimentation, the contours of an ecological worldview, ecological culture, and green civilization. The following three debates are the most important theoretical focus of Chinese environmental ethics:

The Debate over Anthropocentrism In 1994 Yu published "Go Beyond Anthropocentrism" and triggered an unexpectedly enthusiastic and pertinent debate over anthropocentrism in academic circles. Roughly speaking, three camps developed around this debate. The anthropocentrism camp insists that (a) moral norms can apply meaningfully only to interhuman relations; (b) nonhuman beings are not members of the moral community; (c) the moral foundations of environmental protection are the interests of human beings as a whole. Therefore, human beings do not have direct duties toward nonhuman beings (Fu 2002, Zhang 1997, Han 2005). The nonanthropocentic camp argues that (a) nature has intrinsic values and rights; (b) the narrow metaethical

definition of morality as interhuman norms is not defensible; (c) and the moral community has been extended—therefore, human beings owe moral duties to nonhuman beings (Yu 1999, Lu 1996, Li 2001).

The third can be called the syncretism camp, which takes an open and inclusive approach to the issue and tries to achieve a Hegelian synthesis of the perspectives of the other two opposing camps of environmental ethicists (Yu and Wang 2004, Chao 2004). From the perspective of such syncretism, there are merits and limits in both anthropocentrism and nonanthropocentrism, so we should go beyond the dichotomy and integrate ideas from both camps. The Confucian theory about moral ideas can provide a foundation for such an integration. According to this approach, we can clarify and search for four moral ideals (or moral horizons): to love human beings, to sympathize with animals, to care for all life, and to respect nature as a whole. The first ideal belongs to the category of required morality, and the latter three belong to that of expected morality. The four major schools of environmental ethics—enlightened anthropocentrism, animal liberation/rights theory, biocentrism, and ecocentrism—can be understood as the theoretical expression of these four moral ideals. As when climbing a mountain, one can practice and realize these ideals gradually, beginning with the ideal of loving human beings and ending with the ideal of respecting nature. The more ideals one can practice, the more excellence humanity can realize and exhibit (Yang 2000, 2007).

The Debate over the Intrinsic Value of Nature Most Chinese scholars who have worked in environmental ethics argue that nature has intrinsic value. The main argument they provide is that living beings and natural systems (a) have their own *teloi* (ends, goals, purposes); (b) some are conscious beings with different subjectivities; and (c) some have their own wisdom about how to live and their own ability to value (Yu 1995, 2003; Li 2001). Those who reject the intrinsic value of nature contend that (a) value by its definition means utility of things for humans; (b) human beings are the only beings with self-consciousness and language, which are the presuppositions of valuing; and (c) to equate the being of nature with the value of nature is to move to ought from is to commit the "naturalistic fallacy" (Fushen Liu 1997, Han 2005).

The Debate over the Rights of Nature Some scholars argue that nature has rights. The rights of nature, according those thinkers, refer to a species' rights to exist by ecological laws; such rights, they argue, are natural and equal for all species. A species' rights are based on its intrinsic value and its role in maintaining the stability of an ecosystem (Xiangrong Liu 1992, Ye 1994, Yu 1995). But those who deny nature's rights argue that only those beings can have rights who (a) can understand the meanings of rights; (b) have moral autonomy; and (c) have the idea of intersubjectivity and reciprocity. On this view, therefore, nature cannot have rights (Fu 2002, Han 2005).

PROSPECTS AND PROMISES

Chinese environmental ethics has made much progress after two decades of development, and new trends are emerging.

1. First, more and more scholars focus on the practical policy application of environmental ethics. They try to make environmental ethics more policy- and problem-oriented, and focus on helping the environmental community to make better ethical arguments in support of environmental-protection policies. Ethical issues concerned with poverty, sustainable development, corporate responsibility, and war also capture the attention of many scholars.
2. Second, many environmental ethicists try to reflect critically on environmental ethics from new perspectives (such as Marxism, feminism, and virtue ethics) and explore new foundations, metaphysical and scientific, for environmental ethics.
3. Third, many efforts have been made to uncover and adapt the environmental ethical resources of Chinese cultural traditions (such as Confucianism, Taoism, and Buddhism). Thus, the forging of environmental ethics with distinctive Chinese characteristics is under way.
4. Fourth, many scholars make it their priority to deal with environmental justice, especially international environmental justice. They have come to realize that a whole and healthy environment is one of the basic human rights and that unjust social systems and structures, domestic as well as international, maintain and reinforce environmental injustice, allowing the privileged classes to enjoy environmental advantages while the disadvantaged classes disproportionately bear environmental disadvantages. Environmental-justice issues represent the greatest potential for Chinese environmental ethics to have a practical impact.

SEE ALSO *Animal Ethics; Energy; Environmental Education; Environmental Justice; Environmental Law; Environmental Policy; Pollution; Population; Rolston III, Holmes; Sustainable Development.*

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CHIPKO MOVEMENT

Chipko is a grassroots environmental movement that began in 1973 in the Chamoli district of the Indian State of Uttaranchal, then Uttar Pradesh in northern India. Its concern was to save the forests from contract lumbering, a practice inimical to the local economy. Its name is derived from its strategy of hugging (*chipko*) the trees to shield them from the lumberman's axe. The movement brought about a ban on the felling of trees for commercial purposes above an altitude of 1,000 meters in Uttar Pradesh and spread to South India as *Appiko* (to embrace), successfully protecting the tropical forests of India's Western Ghats. The influence of the movement is evident in other mountain regions of India and in other countries.

Chipko was part of a protracted struggle by village people against forest policy going back to the nineteenth century that limited their access to the forests for household needs, while supporting commercial exploitation of the forest that brought revenue to the state. By the mid-1900s forest policy had impoverished the hill villages, as jobs in the forest industry tended to go to workers whom contractors hired from outside the region. Those who did find employment usually found jobs on the plains, where they lived for long periods at a great distance from their families. The system of contract felling lumbering also led to environmental degradation. Severe floods in 1970 raised local awareness of the threat of deforestation. In the 1960s, social workers occupied with Gandhi's constructive program, began labor cooperatives that established small, forest-based industries to provide local employment. While thesey enjoyed some success, they had to compete for raw materials with established industries in the plains.

The Chipko movement began when the State Forest Department denied permission to a local organization called the Dashauli Gram Swarajya Mandal, or Dashauli Village Self Reliance Cooperative (DGSM) for to fell a small number of ash trees for the manufacture of farming implements. (The leaves of the ash trees were also important to the villagers because they provided fodder during the scarce season.) The forest department denied permission to this organization to cut five of ash trees, but granted permission to a sporting goods manufacturer based in Allahabad to cut an entire forest of ash trees only 13 thirteen kilometers away. The people resolved to enter the forest and if necessary to hug the trees marked for felling in order to shield them from the lumberman's axe. When the contract workers were unable to take away the trees they had been promised, the people's resolve spread to other areas where contract felling was in progress. The Garhwali folk singer Ghanshyam Sailani joined activist Sunderlal Bahuguna (b. 1927) on long *padyathras* or foot marches through the hills where he composed songs in support of the movement: "Embrace the trees / Save them from felling / The wealth of the hills / Don't let it be looted!"

Environmental Activist Sunderlal Bahuguna. *Bahuguna, a key figure behind the Chipko Movement in India, is seen here participating in a Save the Ganges march in New Delhi, 2006. The Chipko Movement began in 1973, when Bahuguna and others prevented the felling of ash trees in India by hugging those targeted by loggers.* **MANAN VATSYAYANA/AFP/GETTY IMAGES.**

Women took a decisive role in a demonstration in the Reni forest (near the Indo-Tibetan border) where they announced to contract workers that they came to the forest for fruit, herbs, and other products upon which their families depended. They saw the forest as their mother and they intended to protect it, if necessary, with their lives. The following years saw many similar demonstrations.

Such protests put a stop to the felling of trees in many places, but did not immediately alter forest policy. While the contract system remained in place, the forest department made concessions to local forest-based industries. In 1977, the tension between the concern for raw materials for small forest industries and the concern over deforestation began to come into focus. Over the protest of thousands in October of 1977, the forest department auctioned two forests in the Tehri district and scheduled them for felling the following December. For a week in December, women from fifteen villages guarded the forest. During demonstrations in this region, activists versed in the religious traditions of India gave discourses from the *Bhagavata Purana*, the Hindu text that tells the story of the earthly childhood of Lord Krishna in the forests of Vrindavan. Here the most celebrated slogan of the Chipko movement came to be widely known: "What do the forests bear? Soil, water, and pure air! Soil, water, and pure air are the basis of life." Unable to take any trees, the lumbermen departed but returned on February 1, 1978, with two truckloads of police. The villagers now engaged in the first mass tree hugging in the movement. Eventually the police and the workers departed, leaving the forest intact.

While the forest cooperatives wanted to save the forests for raw materials for small forest industries, many of the villagers, the women in particular, saw the forest as the source of food, fodder, and fuel for domestic needs. In 1973 the interests of the two had converged. Bahuguna understood the women's perspective and began to spread a message about the ecological demise of the hills. In 1981 Bahuguna brought the issues of the hills to Indira Gandhi, then prime minister of India. Through her influence, the state government imposed a ban on the felling of trees for commercial purposes above the altitude of 1,000 meters. The ban eventually extended to the mountain state of Himachal Pradesh.

The ideological viewpoints of Chipko were varied. The Uttarakhand Sangharsh Vahini (USV), an organization active in the region of Kumaun in the 1970s, was strongly influenced by Marxism and held that the ecological crisis of the hills was rooted in the destruction of nature by powerful economic interests had produced the ecological crisis of the hills. With a positive attitude towards science and technology, they were suspicious of tradition and of government programs. Less confident about science, Chandi Prasad Bhatt (b. 1934) and the DGSM advocated appropriate technologies. He favored cooperation with government programs and initiated prodigious efforts towards reforestation. He engaged the villagers with eco-development camps. Bahuguna shared the Marxists' concern with social and economic injustice. But his principal inspiration came from Gandhi. For him, the ecological crisis in the hills is caused by materialism—which makes man the butcher of the Earth. It has generated a mistaken notion of development that enriches the few at the expense of the many. For his approach Bahaguna found support both in ecology and in the spiritual traditions of India. From 1981 to 1983 he took this message to the villagers by means of a *padyathra* of 4,870 kilometers from Srinagar, in Kashmir, to Kohima, in Nagaland. During this time Chipko received international attention

and became an inspiration for environmentalism in India and abroad.

SEE ALSO *Civil Disobedience; Forests; Hinduism; India and South Asia.*

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George Alfred James

CHRISTIANITY

There are over 2.5 billion practicing Christians on earth, approximately 1 billion of whom are Roman Catholic. Orthodox and Coptic Christianity have roots as ancient as those of Roman Catholicism, and Protestant churches originated in the break with Rome in Europe during the Reformation in the sixteenth century or have developed through further schisms since that time. The twentieth century saw the proliferation of a range of new denominations. The largest of these is the Pentecostals, whose numbers are estimated at 600 million.

Christians are present on all continents, the largest proportions being found in Africa and North and South America, with far smaller portions in Asia than elsewhere. Europe has a predominantly Christian culture emanating originally from the Holy Roman Empire. Myriad religious buildings, legal customs, ethical mores, cultural artifacts and symbols, and educational and medical institutions survive as a shared cultural heritage from the era of Christendom. But far fewer twenty-first-century Europeans regularly participate in Christian worship than Christians on other continents, and knowledge of biblical narratives and Christian doctrine is declining rapidly among the young. European intellectuals have tended to assume that this European pattern of secularization would be repeated throughout the world, but there are signs of a resurgence of religion on other continents, and also in some parts of Europe, particularly in the East. In many regions—including the United States, the Middle East, Latin America, South and East Asia, Africa, and Eastern Europe—religious affiliation plays a significant role in shaping voter opinion, and hence public policy, on a range of issues. This rise in the public influence of religion is significant for environmental concerns, since it may indicate that in these regions, environmental beliefs and practices will need to find a central place in religious beliefs, ethics, and practices.

THE ENVIRONMENT IN CHRISTIAN HISTORY

Historically, there has been stronger environmental concern associated with Protestantism than with other religious traditions. Countries with the strongest array of environmental laws and regulations and the largest number of environmental nongovernmental organizations include Germany, Sweden, Switzerland, the United Kingdom, the United States, and New Zealand. Although environmental concern first arose in these Protestant countries in the 1960s, when formal churchgoing was in decline, elements of Protestant Christian culture are friendly toward environmental protest and democratically expressed pressure for restraints on capitalism and industrialism. Catholic and Orthodox Christian countries, by contrast, have seen much less environmental mobilization, and these countries have much laxer environmental regulations than most Protestant countries. Similarly, environmental pressure is weak in Islamic countries and countries with an Asian religious complexion. In the Asian context, the commonest form of environmental protest has not occurred in the formal political arena. Rather, it has taken the form of the environmentalism of the poor, in which communities whose natural resources are degraded or destroyed by the actions of corporations, governments, or private landowners protest or resist such abuse of their local habitats by forms of direct action, such as that of Chipko women who hugged trees to prevent them from being cut down by timber companies around their villages in North India.

Some argue that environmentalism arose in Protestant Christian countries because these countries were the first to experience significant rises in living standards in the mid-twentieth century. This produced a greater emphasis on quality of life, including the environment, in public concern and hence in public policy (Northcott 1996). These countries were also the early adopters of modern democratic practices, which have historical roots in the congregational culture of Protestantism. The open-meeting style of the early reformed churches in Geneva and Edinburgh paved the way for the open meeting of commoners in democratic parliaments. Similarly, the multiparty form of modern democratic polities mirrors the multidenominational character of many post-Reformation Protestant countries. Hence, in fostering democratic cultures, in which individuals claimed rights against monarchs' claims to divine authority, Protestantism may be said to have paved the way for the emergence of a culture of open debate

and plural political parties, in which environmental protest, and then green political parties, first arose in the twentieth century.

There is, however, little theoretical understanding of the association between Protestantism and environmentalism. Part of the reason for this is that Lynn White's famous essay "The Historical Roots of Our Ecologic Crisis" suggested that far from Protestantism's being friendly to environmental concerns, traditional Christianity in both Catholic and Protestant forms was the major ideational source of the antiecological tendencies of Western industrial societies and technologies. White argued that the Christian doctrine of creation involved a clear separation of the divine from the biosphere. This, combined with the Genesis teaching about human dominion over other species, fostered the desacralization of the nonhuman world in the West. It also fostered a strongly anthropocentric view of the biosphere and of other species that emphasized their instrumental value to humans, rather than their intrinsic value. By contrast, White claimed, other cultural and religious traditions have sustained a greater emphasis on divine immanence in the physical world and on the interrelationships between humans and other creatures, such as the belief in reincarnation in some Asian traditions. White also acknowledged, however, that the Christian tradition is not homogenous, and that Christian teachers such as Saint Francis and others have emphasized a less domineering and more democratic relationship between humans and other creatures. White's arguments that the Christian tradition is the root of the environmental crisis in Western civilization, and that it contains resources to repair that crisis, have been influential and have helped provoke an extensive array of Christian responses to the environmental crisis.

NATURE AND BELIEF IN THE CHRISTIAN TRADITION

Christian traditions in East and West have held a range of positions on the relationships between God, humanity, and nature, rooted mostly in the Biblical narratives of creation and redemption, the life of Jesus, and the early Christians. Genesis occupies a pivotal role in historical Christian reflection on the place of humans in the cosmos, particularly the first three chapters, on which the early Christian fathers commented extensively and to which modern Christians have returned for a source of traditional wisdom on the current environmental crisis. Christians have traditionally held that the Genesis narratives indicate that God created the world out of nothing (ex nihilo), and that it was created to reflect God's glory and to serve humanity. Christians, unlike Jews, have also held that the story of Adam and Eve and the forbidden apple indicates not only a changed relationship between humans and the Creator, but the entry of evil into the created order. The early Christian fathers adopted the Platonic view that humanity is a microcosm of the natural world and that the destiny of humans therefore has central significance to the destiny of all creatures. But for most of the early fathers, this unique status did not make humans the center or destiny of Creation. Rather, all life, all being in time, was conceived of as being in motion from birth to death. They saw creation in time and space as a realm set apart from the eternal, infinite divine yet teleologically ordered to return to God. As interpreted by the Greek fathers such as Gregory of Nazianzus (Bergman 2005), the Fall of Adam and Eve has consequences that are not confined to the human species but infect all creatures, and hence the whole biosphere.

Thus the doctrines of the Fall and of original sin have an important place in explaining the modern ecological crisis as both evangelicals, such as Francis Schaeffer, and Orthodox theologians, such as Patriarch Bartholomew, have argued. The Fall is the first instance in history in which humans pridefully set themselves in place of the Creator. In consequence, out of their created freedom they bring into the world evil, which sets humans at odds not only with God and with one another but also with other creatures. This new reality, evil, disturbs the original peace and harmony of the created order. In this perspective, the modern environmental crisis is the outcome of this sinful disturbance to the cosmos and is as much a moral and spiritual crisis as an economic and scientific one.

The prologue of the Gospel of Saint John acts as a significant supplement to the early chapters of Genesis. It indicates that the world was created through the action of the divine Word, which is Jesus Christ, as well as by the creator Spirit referred to in the Genesis narrative. This Trinitarian account of creation provides the principal doctrinal ground on which Christians have understood the relations between God and the earth, the one and the many, infinity and finitude. It also provides an account of the immanence of God as Spirit in the Creation, as well as the transcendence of God as Father, Son, and Spirit. Early Christians interpreted the events of Christ's life, death, and resurrection as indicating a renewal and redemption of the whole Creation, and as presaging a recovery of the original goodness of Creation before the Fall of humanity, whose effects marred and polluted all of Creation. This sense of the redemption of embodied life finds expression in the lives of the fourth- and fifth-century desert fathers, who, through their ascetic practices, are said to have achieved harmony with the divine and a new companionship with wild animals. This is illustrated in accounts of Saint Jerome (ca. 347–419/20) plucking a thorn from a lion's paw; in the rule of Saint Benedict of Nursia (c. 480–c. 547), founder of

Niccolo Colantonio,* Saint Jerome Extracting a Thorn from the Lion's Paw*, circa 1440–1470. *Colantonio's painting of Saint Jerome depicts the early Christian account of the saint removing a thorn from a lion's paw. The story is an example of one of the "desert fathers," who achieved harmony with the divine and companionship with wild animals.* **SCALA/MINISTERO PER I BENI E LE ATTIVIT CULTURALI/ART RESOURCE, NY.**

Benedictine order, in which agrarian work and related crafts redeem one from the effects of the Fall; and in the life and traditions of Saint Francis of Assisi (1181/82–1226), who preached to birds and animals and who, like the Hebrew Psalmists, taught that humans, together with all other creatures, owe celebration and praise to the Creator.

From the perspective of the ecological crisis of the twenty-first century, a crucial feature of the Genesis narrative is the distinctive role conferred on human beings to "rule over" other creatures and Creation. The teaching on dominion in Genesis 1 and 2 has received particular emphasis in theological teaching since the Protestant Reformation. This mandate of dominion was also frequently invoked by the missionaries who followed the traders and warships of modern European imperialism. The contiguity of Christian missions and the extinctions and ecological calamities that followed the introduction of nonnative species and the spread of European agricultural practices around the earth have led many environmentalists to argue, like White, that Christianity is the root of the ecologic crisis. However although such prominent figures in Western Christianity as Augustine (354–430) and Thomas Aquinas (1224/25–1274) have emphasized the dominion over Creation given to Adam and Eve as creatures made in the image of God, others such as Symeon the New Theologian (949–1022), Hildegaard of Bingen (1098–1179), and Francis have emphasized that humans and other animals share the status of being divinely made creatures called to

multiply on the earth, and that, according to the Genesis narrative, animals are created as companions for humans.

MEDIEVAL AND RENAISSANCE CHRISTIANITY

Michael Northcott (1996) has argued that it is not so much historical Christianity but the Protestant Reformation that paved the way for the environmental crisis in the modern West. He points to thinkers like the West's most influential theologian Thomas Aquinas. Though Aquinas held an instrumental view of the relationships of humanity to nature and argued that humans may use Creation as they see fit, since it was created primarily to serve them; he nonetheless enjoined careful use of animals when he suggested that abusive human relations with other animals will tend to deprave humans. Cruelty to animals diminishes human virtue, and so should be avoided. For Aquinas, the relation of humans to creatures is indicative of human holiness and human sin. Therefore, dominion cannot be rightly exercised unless it is framed by the theological virtues of faith, hope, and love, and the cardinal virtues of courage, justice, prudence, and temperance. In this perspective, destruction of ecosystems in pursuit of material satiety indicates a moral and spiritual lack in humans who pursue such a path, while the virtuous individual, whose life is directed to love of the Creator, will express that love in just and temperate relations with other creatures, as well as other persons.

In Western medieval Christianity, a dominant metaphor for relations among creatures was the "great chain of being." This organic metaphor, which may be traced from medieval theology back through Plotinus (205–270) and Neoplatonism more generally to Plato (c. 428–347/8 BCE) and Aristotle (384–322 BCE) represents all life as existing in a hierarchy of interdependent biotic relations. This metaphor carried with it the conception that all physical reality is ensouled and has its origins in the divine mind. It also carried with it the claim, first advanced by Plotinus, that the earth is "the best of all possible worlds" because of the beauty, diversity, and fecundity of the forms that inhabit it. In the early modern era, the concepts of the great chain of being and the ensoulment of all reality were increasingly replaced by a cosmology of mechanism, which from the time of Isaac Newton (1642–1727) grew in significance in Western theology and philosophy, as well as in Western science and technology.

Renaissance thinkers restated a significant element from ancient Greek philosophy: Protagoras's claim that "man is the measure of all things." The appropriation of this claim in the Italian Renaissance was an important moment in the displacement of earlier Christian accounts of God as the sovereign Lord of Creation, and of the status of humans as creatures who in important respects stand *with* other creatures rather than over and above them. The philosophical fruit of the cosmology of mechanism and the relativizing claim that man is the measure of all things was modern Deism. Deist theologians such as William Paley (1743–1805) represented the Creator as a temporally and spatially distant being or "first cause," whose principal relation to Creation was one of instigator or maker (as watchmaker to watch), instead of that of immanent Spirit and sustainer. By the nineteenth century, Deist ideas could be found in much Western Christian culture, across traditions from the evangelical to the Roman Catholic. The rise of Pentecostalism, with its reemphasis on the divine Spirit, may be seen as one response to Deism. Yet this in itself does not mean that Pentecostalism can provide an ecological theology. Pentecostalism recovers the doctrine of the Spirit in a very anthropocentric way, its millennialism suggesting that the present material earth will be burned up in a final conflagration.

CHRISTIANITY SINCE THE RENAISSANCE

The increasingly anthropocentric trajectory of Western Christianity since the Renaissance is charted by Keith Thomas (1986) in a valuable study of English preaching and other religious practices. He shows a consistent decline in respect for animals and other parts of material Creation since the late Middle Ages. A significant root of the increasingly anthropocentric tendency of Western Christianity lay in late medieval theology, and especially in the rise of nominalism, whose advocates, most notably William of Ockham (c. 1285–1349?), argued for a more radical break between the divine intent of the creator and the accidental appearances of species and kinds than had early Christian theologians. This ontological break paved the way for the Renaissance recovery of an earlier classical Greek view of matter as ontologically insecure and inferior to spirit. It was given added cultural force by the tendency of late medieval Catholicism to confine the action of grace and the sacred to the ordinances of priests, and especially to the divinely ordained sacraments. The Reformers protested at the consequent hierarchical control of the means of grace and proposed instead a democratization of the interpretation of scripture and the sanctifying actions of grace in the lives of individual Christians, in the "priesthood of all believers." Nonetheless, their ritual and theological reforms did nothing to reverse, and instead advanced, the gradual evacuation of the sacred from the everyday lives of European Christians, and hence promoted growing anthropocentrism in the relations of humans to nature.

After the Reformation in Europe, the desacralization of everyday life proceeded apace and was accompanied by a growing instrumentalism in the treatment of animals and the use of "wild" lands. This instrumentalism took theological form in the teachings of John Calvin (1509–1564), who argued that nature was redeemed from the Fall by being transformed by human work. This perspective found its most influential advocacy in the political theology of John Locke (1632–1704), who gave theological warrant to colonial expropriation of native lands. Settlers acquired rights to native lands because the settlers tilled the soil, and thus fulfilled a mandate from the book of Genesis, while natives had merely gathered fruits and hunted animals on the land while leaving it wild and disordered in the eyes of Europeans.

AFTER WHITE 1967

Lynn White (1967) suggested that the problem of a desacralized natural world could be resolved by recovering a Franciscan theology of Creation that reemphasizes the companionship of all creatures and the immanence of the divine Spirit in all life. White's challenge to Western theology received a range of answers from Christian churches and theologians of ecumenical, evangelical, Orthodox, and Catholic hue in the late twentieth century. John Cobb and Charles Birch argued that the relation between Western Christianity and the earth could be healed by abandoning traditional Christian metaphysics and adopting a process view of reality more in accord with modern evolutionary beliefs. Birch was particularly influential in the ecumenical body known as the World Council of Churches, which represents most major Protestant and Orthodox churches and was established after the Second World War. Through its Geneva office, assemblies, boards, and reports, the World Council of Churches became an influential advocate of the human duty to care for the Creation. The World Council of Churches framed a program for the justice, peace, and integrity of Creation that was designed to raise awareness in churches and public life of the threats to the biosphere from industrial civilization. The World Council of Churches also linked these threats with injustices in human society and suggested that addressing the ecological problems of habitat destruction, air and water pollution, deforestation, and the loss of biodiversity would also help address the injustices in the distribution of access to the riches of the earth between the wealthy and the poor.

Under the program for the justice, peace, and integrity of Creation, the World Council of Churches produced many ecumenically agreed-on reports on the importance of respecting the integrity of Creation and the need for societies to regulate industrial capitalism to reduce its ecological impacts, and to restrain economic growth and technological manipulation of the nonhuman world. Among the fruits of the program was a major study of the ethics of technology and of nuclear power. The World Council of Churches also played a significant role in efforts to inaugurate the United Nations Framework Convention on Climate Change, and it has been prominent in emphasizing the ethical urgency of preventing dangerous climate change at the Conferences of the Parties, which met under the convention and negotiated the Kyoto Protocol. The program has also fostered liturgies and rituals, performed at ecumenical gatherings, that focus on the beauty and diversity of Creation, the immanence of the Holy Spirit in Creation, and the representative role of the Church in calling people to care for Creation. A significant emphasis in the reports of the World Council of Churches was the theme of a "sustainable society," which maintains that people need to live lives characterized by health, social justice, ecological sustainability, peace, and spiritual fulfillment. This approach required a radical revision to the mainstream model of economic development and challenged the consumerist lifestyle it promoted.

Under the process of the program for the justice, peace, and integrity of Creation, many member churches of the World Council of Churches began to focus more directly on environmental concerns in the 1980s. Other faith groups were also drawn into dialogue on ecological issues, and in 1991 the World Council of Churches hosted a consultation of faith groups that laid the groundwork for the development of an Earth Charter, which was taken up at the Rio de Janeiro Earth Summit in 1992. The Earth Charter consists of a number of principles, including respect and care for the community of life, ecological integrity, socioeconomic justice, democracy, nonviolence, and peace. The charter was drafted over a three-year period and was reviewed by faith groups, nongovernmental organizations, international business groups, and religious communities, and it was formally presented to the international community at the Peace Palace in the Hague on June 29, 2000, and to the United Nations General Assembly in New York in 2002.

CURRENT ORTHODOX CHRISTIANITY AND THE ENVIRONMENT

Ecumenical interest in ecological concerns is deeply informed by Orthodox Christian perspectives that have roots in the writings of the Greek Fathers and their emphasis on humanity as a microcosm of Creation. Orthodox theologians, who are often Bishops and priests instead of professional scholars, have been notable in advocating a conception of salvation that includes all embodied life, and not just human beings. The liturgy in the Orthodox tradition is the focus for celebrating the

divine will said to be revealed in the scriptures and presenting the teachings of the Eastern Fathers that all creatures will eventually participate in the restoration of all things, set in train by the bodily resurrection of Christ. Creation was polluted by the corruption and pride of human beings, and human participation in the divine liturgy anticipates the redirection and restoration of all creatures to the good ends toward which Creation was originally directed by the Creator.

Orthodox theology has not only been a significant source of theological and liturgical renewal in the Western churches that are members of the World Council of Churches; Orthodox theologians, most notably Patriarch Bartholomew, have also become leaders of ecological action through the offices of the church. Bartholomew, who has become known as the Green Patriarch, has led annual pilgrimages to several great bodies of water to draw attention to the threats faced by them, the species that dwell in them, and the human communities that live around them, from industrial pollution, excessive modern water extraction, and introduced nonnative species. Bartholomew has gathered religious leaders, scientists, regional politicians, and conservationists to study what is happening to the Black Sea, the Mediterranean, and the Amazon, among other bodies of water. The meetings themselves and the published proceedings that followed have played an important role in highlighting the threat that modern industrial practices and technologies represent to that essential element, water, that is sufficiently abundant to generate and sustain life only on the earth. They have also provided a powerful model of the social significance of environmental leadership when it is offered by people of faith drawing on rich ancient traditions and teachings.

CURRENT EVANGELICAL TRADITIONS AND THE ENVIRONMENT

In contrast to the relative alacrity with which ecumenical and orthodox leaders and theologians have taken up modern environmental concerns, evangelical and Roman Catholic traditions have been more resistant. One of the earliest attempts to address the environmental crisis from a faith perspective was penned by the conservative evangelical theologian Francis Schaeffer. In 1962 Schaeffer founded an evangelical theological, therapeutic, and artistic community called l'Abri (the Shelter) in Switzerland, with sister communities in Britain and the United States. The position of the community at Champéry in the midst of the Swiss Alps indicated his own particular love for the mountain environment. Schaeffer argued that environmental pollution and the destruction of the environment were consequences of human sin and rebellion against God, and represented the profound disrespect for the Creator in modern Enlightenment philosophy and modern mechanistic science. For Schaeffer (1992), the problem was not with Biblical teaching, but with secular humanism and the modern abandonment of the divine command to love God and neighbor. Schaeffer believes that the ecological problem is connected with a spiritual crisis in modern humanism. Humanists do not perceive the beauty of the biosphere as reflecting the glory of God, and hence they no longer love it as the divine Creation.

Though evangelicals have been slow to take up Schaeffer's prophetic call, a range of evangelical ecological initiatives emerged in Europe and North America in the 1990s and early twenty-first century. Prominent among these was the founding by Peter Harris of the

Operation Noah Banner, London, 2007. *Operation Noah campaigners march in London to bring attention to the issue of global climate change. The organization was founded in 2001 by Christian Ecology Link, to promote the idea of a more simple, liveable, and supportable lifestyle in the name of God. While the religion has not been traditionally considered to be "nature loving," many denominations are disproving this stereotype by pointing out the links between Christianity and a more eco-friendly lifestyle.* **© MARK BOULTON/ALAMY.**

evangelical conservation trust A Rocha, which focuses on conserving habitats crucial to migrant and wetland birds. First in the Algarve (Portugal); later in Provence (France), the East End of London, and Kenya; and now in a number of other locations; A Rocha has become associated with efforts to conserve and restore habitats for migrant and wetland birds, and efforts to enhance evangelical consciousness of the plight of Creation through this faith-based witness to a conservation effort informed by science. Among its patrons, the prominent evangelical leader John Stott is a significant guiding light, and Stott is himself an avid bird watcher.

British evangelicals have also played a significant role in drawing evangelical leaders in North America toward great ecological sensitivity. Sir John Houghton, former chair of the science panel of the Intergovernmental Panel on Climate Change and also an evangelical Christian, has spoken at meetings of evangelical leaders in Britain and the United States about the close relationship between the Christian mission to witness to Jesus Christ and the ecological imperative to redeem Creation from the effects of industrial pollution and habitat destruction. These transatlantic friendships have played a crucial role in promulgating in the United States an evangelical statement on climate change arguing that climate change is a faith issue for all Bible-believing Christians. In this statement and in other initiatives, evangelical leaders such as Richard Cizik, president of the National Alliance of Evangelicals, attempted to use the influence that evangelicals had on the U.S. Republican Party and the administration of George W. Bush to persuade political leaders in Washington, D.C., as well as evangelical Americans, that they had a God-given duty to conserve the earth from ecological destruction.

CURRENT ROMAN CATHOLICISM AND THE ENVIRONMENT

The largest Christian communion on earth in terms of present membership is the Roman Catholic Church, and here again there has been notable resistance to official comment on the environmental crisis. The most prominent focus of Catholic criticism of modern technology and the lifestyle and ethics it has promoted is not the ecological crisis, but the use of contraception and abortion to control human sexual reproduction and family size. In many parts of the developing world, the Catholic Church has used its considerable influence in schools, in hospitals, and in public life in Catholic countries to suppress knowledge of birth-control techniques other than abstinence. The Catholic pro-life ethic has yet to consider fully how the dramatic expansion of the human species that occurred in the twentieth century will affect the lives of other creatures on earth. At international gatherings such as the Rio Earth Summit, Catholic influence has been used to suppress reference to the pressure of the human population on the planet and the need to restrain further expansion of the human species.

Some detect a shift in the last decade of the papacy of Pope John Paul II (r. 1978–2005), during which he seemed to have awoken to the significance of the environmental crisis as another of the threats to life furthered by the "culture of death," which, the Church has traditionally maintained, fostered the growing use of abortion and modern methods of preventing conception. In his first sermon as pope, Benedict XVI used the metaphor of the desert to link the spiritual vacuity of materialism and consumerism with ecological destruction. As he put it, "The deserts of the world are spreading because of the growing desert in the human heart." This reference suggests that the new pope harbors a stronger ecological awareness than that of his predecessor. Pope Benedict XVI has begun to address the ecological, and especially climatic, impacts of the Vatican on the environment, using Vatican funds to purchase a formerly forested area in Hungary, where the Vatican will sponsor the replanting of forest to offset the greenhouse-gas emissions of Vatican flights and other activities. The pope has also installed solar panels on the roof of the papal residency in Vatican City. In this respect, Benedict XVI may be said to be following the lead of such Catholic theologians as Leonardo Boff and Sean McDonagh, who have been adumbrating a Catholic ecotheology for more than thirty years, and of Catholic lay communities in South America and the Philippines that have witnessed environmental problems arising from industrial development and agribusiness in Catholic countries in the South.

The environmental turn of some Catholic theologians, particularly in the South, is now mirrored by a green turn in religious communities in the developed world. Thus, communities of nuns in North America are recovering a traditional connection between the religious vocation and the care of Creation. These "green sisters" or "eco-nuns" are using the Church's ownership of agricultural land and the buildings, diets, and lifestyles of religious communities to create a new sensitivity to Creation. Some have started using organic methods on their farms and market gardens. Others are utilizing renewable energy in their community houses. This move toward a religious practice of care for the Creation is part of a larger refocusing of the Christian tradition in the late twentieth and early twenty-first centuries. Many of the new liturgies written under the influence of the liturgical movement since the mid-1960s have given a more prominent role to the doctrine of creation and to the place of nonhuman creatures as revelatory points of contact with the divine Spirit. And many congregations and ecumenical associations have been endeavoring locally and regionally to practice care for the Creation in their

material relations with the nonhuman world. Thus church buildings on every continent may now be seen displaying solar panels as a symbolic witness to their members and communities for the need for modern humans to live within the carbon budget of the planet, rather than profligately burning stored carbon in ways that damage the earth for present and future generations. There is also growing Christian involvement in secular environmental initiatives as Christians overcome their suspicion that such movements represent not only a turn to the earth but a denial of the role of the Creator in creating the earth.

In a historical sense, modern environmental protest is a child of religious Protestantism inasmuch as Protestantism gave rise to the culture of multiparty democracy of modern nation-states. And with the turn of Orthodox, Catholic, and Protestant Christians toward environmental awareness, the ecological alienation that was manifest in both Catholic and Protestant teachings about creation after the Reformation may at last be being healed. For in ethics, practice, and theology, there is increasing emphasis on the ecological effects of the life, death, and resurrection of Jesus Christ, the creative Word, in healing human-earth relations, as well as the human body and soul.

SEE ALSO *Bible; Chipko Movement; Earth Charter; Ecotheology; Environmental Philosophy: II. Medieval Philosophy; Process Philosophy; St. Francis of Assisi; Stewardship; Sustainability; White, Lynn, Jr.*

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Michael Northcott

CIVIL DISOBEDIENCE

Civil disobedience is a form of political protest that is intended to counter injustice and immorality. It has been used to object to such matters as racism, sexism, animal experimentation and testing, warfare, abortion, exploitation of workers and the poor, violations of human rights, and the devastation of nature. While there are disagreements about some of its features, it is commonly defined as a deliberately unlawful, nonviolent act of resistance that is conscientiously motivated by moral, religious, or political reasons, some having to do with environmental ethics and philosophy. It is addressed to the community at large and must be "civil"—that is, publicly and openly done. It can involve disobeying a law directly or selecting some other, illegal means to object to that law. The standard definition also implies that it is not a revolutionary attack on a government or legal system, and reflects fidelity to that system. Moreover it is sometimes asserted that practitioners must be willing to accept the consequences of their disobedient behavior, including arrest and lawful penalties, and that it should be a "last resort," used only after all available means of legal redress have been tried and failed.

HISTORIC USES OF CIVIL DISOBEDIENCE

Civil disobedience in the nineteenth and twentieth centuries has been closely associated with Henry David Thoreau and Martin Luther King Jr. in the United States, and Mohandas (Mahatma) Gandhi in South Africa and India. In July 1846 Thoreau refused to pay his taxes and was jailed overnight in Concord, Massachusetts. He subsequently advocated civil disobedience in an 1849 essay in which he criticized the federal government for waging war against Mexico and supporting slavery. Gandhi was strongly influenced by Thoreau, and after

World War I advocated non-cooperation with the British colonial government as a means to achieve independence from British rule. He called his version of resistance *Satyagraha* and thought its use would bolster the inner, spiritual strength of his followers. Britain ultimately ceded independence to India in 1947, after a long campaign carried out by Indian protestors and leaders. Martin Luther King Jr. promoted the use of civil disobedience during the civil rights movement of the 1950s and 1960s. He was impressed with the power of nonviolent action to eliminate unjust laws and was able to mobilize many African Americans to oppose racial segregation and support economic justice for the poor.

DISOBEDIENCE IN DEFENSE OF NATURE

Since the late 1960s, some environmental groups such as Earth First! have adopted civil disobedience as one of several tactics—including clandestine law-breaking—to defend wild animals and wilderness from harm. This has grown out of a keen awareness of the negative environmental impacts of humans, increasing dissatisfaction with mainstream environmentalism, and a growing commitment to eco-centered philosophies such as deep ecology and ecofeminism. Activists and citizens have used the tactic to protest nuclear testing in the South Pacific, illegal whaling in the earth's oceans, fur sealing in Eastern Canada, destructive fishing by factory trawlers in the Pacific, logging in western North America, India, and Southeast Asia, air and water pollution by multinational corporations in many countries, and fox hunting and new road construction in England.

An example from reports by Mike Roselle and George Draffan of protests in the forests of western Oregon in the United States will illustrate this tactic and some of the reasoning behind it. From May through July 1984, members of the Cathedral Forest Action Group (CFAG) participated in acts of civil disobedience aimed at stopping old-growth, clear-cut logging in the Middle Santiam area of the Willamette National Forest (WNF), in the Central Oregon Cascade Mountains. One of their protests involved hiking into a federal timber sale area in the Middle Santiam and blocking the path of logging trucks by forming lines across a bridge into the area. The sale area was closed to the public while a private logging company under contract with the United States Forest Service logged it. Over the summer, twenty-seven members of CFAG were arrested when they refused to move off the bridge. Other members cooperated with sheriff deputies and Forest Service agents by getting up voluntarily when asked to do so. Those arrested were booked and taken to a county jail. CFAG members stated that their arrests would not deter them from continuing their protests, and they kept coming back to the timber sale area for several months. Most of those arrested were charged with misdemeanors, such as obstructing work in progress and disorderly conduct. They subsequently pleaded innocent and were brought to a jury trial in a local county court.

Greenpeace Logging Protest, 2004. *Greenpeace activists attach themselves to trees on Kupreanof Island's Tonka Mountain, near Petersburg, Alaska, to protest a plan they believe would weaken logging restrictions. Greenpeace, along with several other environmental activism groups, employs the technique of civil disobedience as a means of protecting nature.* **AP IMAGES.**

CFAG protestors justified their actions in terms of following their consciences and trying to protect valuable life on earth, namely, plants and animals that have intrinsic value and should be preserved in perpetuity for their own sake. They were concerned about the diminishing amount of wildlife habitat and old growth forest in the WNF, and the destruction of the Middle Santiam de facto wilderness area. They claimed that logging in the Middle Santiam posed an imminent threat to the Central Cascade environment because an increasingly rare

Douglas-fir ecosystem was being endangered. Once the logging was completed, they argued, it would be impossible to redo what nature had built up over many centuries. Several protestors also stated that the area was a "spiritual haven" because of its "cathedral" groves of large, ancient trees. The protestors also pointed out that they had exhausted all other means of halting logging in the Middle Santiam and hoped to arouse the public into calling for new legislation from the U.S. Congress to preserve more of the area as wilderness. Only 20 percent of the area had been designated as wilderness, and the rest was available for logging. They had tried for years to get federal protection for the whole Middle Santiam wilderness, writing letters to politicians and government officials, testifying at public hearings, and filing ineffective lawsuits, leaving them no choice but to blockade the road. The protesters were ultimately unsuccessful in gaining wilderness designation for the whole of the Middle Santiam, but their actions were some of the first in a lengthy series of protests against old growth logging that has continued in the western United States and western Canada for more than twenty years. In time, environmental protestors have helped to turn public opinion against this kind of industrial forestry and to significantly reduce old growth harvesting in federal forests.

This and other cases illustrate that civil disobedience can be effective in changing the environmental practices of governments and corporations. However, it can also harden the resolve of authorities and resource users to proceed with environmental exploitation and has sometimes been counterproductive. Much depends then on the particular social and political circumstances in which this tactic is used.

SEE ALSO *Chipko Movement; Deep Ecology; Earth First!; Ecological Feminism; Environmental Activism; Thoreau, Henry David.*

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Peter C. List

CLIMATE CHANGE

SEE *Global Climate Change.*

COGNITIVE ETHOLOGY

Cognitive ethology generally is viewed as an area of comparative cognition or animal learning that is both naturalistic in its emphasis and open to consideration of the experiential, cognitive, and subjective aspects of animal behavior. In regard to environmental ethics, the way in which one views the mental abilities of other species will have a bearing on how one treats them and whether one exploits them.

DEVELOPMENT OF THE FIELD

Cognitive ethology is in many respects a descendant of the nineteenth-century post-Darwinian search for the evolutionary and comparative roots of human mental and emotional life in ancestral species. George John Romanes, Charles Darwin's protégé and successor in the study of animal minds, wrote a number of books on the subject, including *Mental Evolution in Animals* and *Mental Evolution in Man,* and produced several editions of the popular *Animal Intelligence.*

Those and many other books of that period relied almost exclusively, as did Darwin, on anecdotal reports. Those stories about remarkable animals, recounted by frequently unreliable observers who tended to endow nonhuman animals with humanlike characteristics (anthropomorphism), were easy to criticize. However, they constituted the main body of work in comparative psychology at that time.

A backlash appeared by the end of the nineteenth century, primarily as a result of the work of Edward L. Thorndike. That tendency reached its height with the rise and dominance of behaviorism in the 1920s, led by James B. Watson, who was inspired by the writings of

Ivan Pavlov (Burghardt 1985, Boakes 1984). The hallmark of the behaviorist approach was that empirical data largely collected experimentally and in controlled laboratory settings using domesticated animals were essential. Basic processes such as Pavlovian conditioning and instrumental (trial-and-error) learning were the main methods for interpreting findings on animal learning and intelligence. Mentalistic attributions were frowned on even if they were based on experimental evidence. Thus, consciousness, emotion, insight, imitation, awareness, problem solving, and other concepts essentially were ignored or rejected.

In contrast, natural history studies, which flourished before Darwin, became even more popular as explorers and field biologists with an evolutionary perspective continued to study exotic species in the field or in relatively naturalistic captive environments. Animals collected from the wild ended up in zoos around the world, where they could be studied as well as provide entertainment for visitors. Such studies also became more experimental and less anthropomorphic and were extended to include a wide range of species. Studies on spiders by the Peckhams, insects by Henri Fabre, mimicry by Edward B. Poulton, ''lower'' invertebrates by Herbert S. Jennings, tropisms by J. Loeb, and doves and pigeons by Charles O. Whitman and Wallace Craig were systematic and accomplished for their time. Those authors were not averse to using anthropomorphic labels in interpreting the behavior of their subjects.

Originating in zoology and natural history, European ethology, led by Oscar Heinroth, Julian Huxley, Jacob von Uexküll, A. F. J. Portielje, Konrad Lorenz, and Niko Tinbergen, became established in the period from about 1910 to 1940. Although those scientists did not focus on mental processes in animals, they diverged from the behaviorists by emphasizing the importance of studying natural behavior in diverse species and applying interpretations informed by comparative evolution. Those comparisons differed from the more linear arrangement of species often used by comparative psychologists. From the late nineteenth century through the behaviorist era and into the 1960s, many psychologists attempted to characterize the intelligence of the fish, the frog, the lizard, the bird, the monkey, and so on, and such efforts still are found in some popular writing on animals. In the contemporary period, because of the work of ethologists, it is known that it is necessary to compare closely related species, as their differing ecologies and behaviors can lead to divergent behavioral and cognitive characteristics.

The ethologists were eager to make their naturalistic, ecological, and evolutionary approach to behavior more biologically sound than typical behaviorist studies of animal behavior while being equally objective and adhering to the procedures of empirical science. However, the ethologists' resuscitation of the notions of animal instinct, long decried by comparative psychologists, drew the attention and often criticism of comparative psychologist. Nonetheless, by the 1960s fruitful collaborations were under way (Dewsbury 1984). Many ethologists, including pioneers such as Niko Tinbergen, were adamant about the need to exclude anything ''mentalistic'' from ethology (Tinbergen 1963).

However, one U.S. researcher, Donald R. Griffin, a zoologist and physiologist, took exception to that exclusion. In the mid-1970s Griffin was both well placed among U.S. elite scientists and sympathetic to the goals of the still largely European ethological movement. As an undergraduate student Griffin had codiscovered the echolocation abilities of bats, and he continued that work throughout his career. He also studied bird migration. A member of the United States National Academy of Sciences who spent his career at Harvard and Rockefeller universities, Griffin was highly respected in the biology research community in the United States. Aware that the echolocation abilities of bats raised issues of perception and cognition, he became fascinated by the studies of Karl von Frisch demonstrating language-like communication in honeybees, the field studies by Jane Goodall reporting tool making and tool use in chimpanzees, and the success of Beatrice and R. Allen Gardner in training human-reared chimpanzees to communicate with humans and one another with American Sign Language.

Jane Goodall and Chimpanzee Nana. *Cognitive Ethnology is essentially the study of non-human animal minds, searching for the mental and emotional life we as humans are used to experiencing. Jane Goodall, a British primatologist, began her pioneering field studies of chimps in the 1960s in Tanzania, revealing their remarkably human-like qualities, inculding the ability to use tools.* **JENS SCHLUETER/AFP/GETTY IMAGES.**

Griffin was convinced that those accomplishments by animals could not be incorporated readily within the framework of traditional behaviorism and experimental psychology. They were also outside traditional natural behavior–oriented ethology. To Griffin such studies indicated that scientists had underestimated the abilities of nonhuman animals to accomplish complex mental tasks that in humans were accompanied by subjective processes. The behavior of such mentally aware animals seemed to be based on more than chaining reflexes (linking stimulus and response in series through associative and reinforcement processes) and operant responses to stimuli. Griffin gave an address to the International Ethological Conference in 1975, followed in 1976 by the seminal book *The Question of Animal Awareness*. That book was reviewed widely, though often critically, and set Griffin on the course that dominated his career for the next twenty-five years. He influenced many people, wrote and edited many books (e.g., *Animal Minds* 2001), was instrumental in the founding of the journal *Animal Cognition,* and wrote the initial essay in that journal.

CURRENT STATUS AND RECENT DEVELOPMENTS

There have been numerous semipopular books on animal mentality by writers who have used the mentalistic aspects of Griffin's work to expand people's regard for animal intelligence and consciousness (Balcombe 2006, Bekoff 2007). Many established scientists have expanded Griffin's work in a sympathetic but rigorous manner. Others have been more wary of being closely associated with cognitive ethology because of Griffin's reliance in his later work on anecdotal examples and tendency to attribute fairly advanced mental states to insects with very small brains and simple nervous systems. Griffin even argued that animals with small brains cannot have as many hardwired or instinctive responses as animals with larger brains and thus should be expected to rely even more on complex assessments and decision making and could be conscious. The various kinds of meanings attributed to the term *consciousness* and some of the evidence presented is discussed in several works (Radner and Radner 1989, Mitchell, Thompson, Nicholas, and Miles 1997, Allen and Bekoff 2007).

Other scientists, especially in the growing field of comparative cognition, do not identify with cognitive ethology but have been influenced by it. Griffin was aware that he was taking an extreme and perhaps untenable stance on animal consciousness and cognition. His goal was to shift the field from a rigid behaviorism reluctant to look at complex and diverse animal behavior as evidence of mental experiences to a position that would entertain possibilities of their existence. By taking an extreme stance he hoped to shift the field more effectively than he could by being a reasonable moderate with a balanced perspective. In retrospect he was successful. He in effect sacrificed his scientific reputation to reshape the field of animal behavior to one in which animals' cognitive and emotional abilities are considered more sympathetically.

There have been other consequences of his work. Many scientists are exploring aspects of animal mentality and experiences. As in the understanding of other human beings, researchers make inferences about animal subjects' cognitive and emotional states that are based on their behavior. Brain imaging studies are allowing researchers to identify whether brain processes similar to those in humans are activated when other animals make decisions, perceive events, or have experiences. Although such evidence is not conclusive, it makes it harder to dismiss the possibility of psychological similarities between people and animals.

In the past the study of comparative psychology was based largely on how quickly animals could learn and repeat rote tasks such as bar pressing and pecking a colored disk. At the beginning of the twenty-first century animals were being trained in many complex tasks, including spatial learning, the use of numbers, and symbolic communication. Chimpanzees and many other species can learn by observing other animals, including people. They can learn the correct stimulus or the correct response to make to obtain a reward or even how to deceive another animal about the location of a reward.

Animal also have been shown to use arbitrary symbols and gestures in communication, count, and even add and subtract. Some animals, such as chimpanzees, can recognize themselves in a mirror and use the mirror image to examine their own bodies; that ability often is interpreted as suggesting self-recognition. Animals also can signal intentions and desires. Cats, for example, can convey when they want to eat, what they want to play with, when they want to be scratched, and when they want to go outside.

In the mid-twentieth century most scholars thought that animals could not use tools, but it has been established that some animals can. Galapagos woodpecker finches, for example, routinely use cactus spines to stab insects in crevices or holes. Jane Goodall's observations about tool manufacture and use by chimpanzees refuted the human-exclusive claims made in books with titles such as *Man the Toolmaker*.

Another phenomenon once thought to be linked to big brains and advanced intelligence is play behavior. As late as the 1980s claims were made that only mammals play, though some authorities would include a few birds. By the beginning of the twenty-first century it was

known, after the development of improved definitions to aid in identifying play, that that behavior is found in reptiles, amphibians, fish, and insects and other invertebrates. The more closely scientists look objectively at diverse species of animals, the more they see evidence of thought and sophisticated emotional processing. Among other remarkable talents, fish can watch other fish courting and mating and then make decisions about the most appropriate mate for them (Bshary et al. 2002).

ENVIRONMENTAL AND ETHICAL IMPLICATIONS

After the firewall of symbolic communication, tool construction, and other major phenomena separating humans from other species was breached, new hurdles were erected to maintain human uniqueness. It was claimed that animals live only in the present, with no sense of the past or the future other than mechanically conditioned repertoires of stimulus and response. However, it now is known that animals from rats to monkeys have the ability to recall events in a narrativelike manner. Later it was claimed that animals do not have the ability to employ abstract concepts such as cause and effect, but it has been shown that they have causal understanding at some level.

Animals are not identical to people mentally. All species differ and are unique in differing ways. However, scientists have found that Darwin was correct in a more profound way. Nonhuman animals have at least incipient or rudimentary versions of almost all aspects of human behavior, and the corollary also is true: People harbor in their behavior the complex legacy of the human evolutionary heritage.

However it is characterized, the essential continuity of human and nonhuman in the mental and behavioral as well as anatomical and genetic realms makes it difficult to maintain the kind of ethically sharp distinction between humans and other species that has characterized Western history from at least the time of the ancient Greeks to the present (Adler 1967). It is hard to argue any longer that animals lack capacities such as sentience, memory, feelings, and even consciousness as a way to justify their use for food, clothing, recreation, and research. The recognition of animals as beings with minds and emotions, simple beliefs and desires, has ecological implications as well. Cognitive ethology will continue to make an important contribution to environmental and animal ethics.

SEE ALSO *Animal Ethics; Consciousness.*

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Gordon M. Burghardt

COMMONER, BARRY
1917–

Barry Commoner, a cellular biologist and eco-socialist, helped initiate the modern environmental movement. He was born in Brooklyn, New York, on May 28, 1917. Commoner taught for many years at Washington University in

St. Louis, Missouri. In 1981 he left Washington University for Queens College in New York. After his retirement in 2000, he was a senior scientist at Queens College.

Commoner's contribution to environmental ethics is implicit in his activities as a public advocate for the environment. These activities began in the 1950s, when Commoner played a role in the movement to end aboveground nuclear testing. On this occasion he displayed his flair for bringing scientific knowledge to bear on public-policy debates. His advocacy organization, the Committee for Nuclear Information, collected and analyzed baby teeth from children in the Midwest. The analysis demonstrated that their growing bones picked up radioactive fallout from nuclear tests in Nevada. Commoner's interests soon widened to take in the issue of environmental pollution. His book *The Closing Circle* (1971) was an early environmental bestseller. Since none of the presidential candidates seemed to be dealing seriously with environmental concerns, Commoner decided to run in the 1980 U.S. presidential election on the Citizens Party ticket. The campaign gave him an opportunity to speak to thousands of people around the country. Later Commoner became an advocate for solar power and other alternative forms of energy.

These activities illustrate a primary ethical principle underlying Commoner's vision: his belief that scientists are responsible for informing the citizenry about the products of their research. Nuclear weapons was the first technology that made it impossible for scientists to remain in their ivory towers. But Commoner identified many other technological changes in the economy after World War II that had massive environmental impacts. Thus not only physicists but also chemists, biologists, and other scientists and engineers became responsible for participating in public debate.

Commoner's most important contribution to these debates concerned the role of technology in environmental pollution. In the early 1970s, as the environmental movement gained a wide audience for the first time, Commoner was critical of Paul Ehrlich and other advocates of population control. He argued that not the size of the population but the impact of the technology it used should be the focus of environmental reform. He believed that an emphasis on lifestyle changes (having fewer children) would make it more difficult to impose regulations on business.

Commoner was also concerned that some advocates of population control are willing to abridge the rights of individuals to have children, the most extreme among them having even proposed suspending food aid to poor countries lacking coercive population controls. Commoner followed the views of many demographers in arguing that increased prosperity and reduced infant mortality will naturally stabilize populations in such countries. Wealthy nations were often partly responsible for overpopulation in their former colonies. They should now help these poor countries develop their economies as a morally acceptable way of bringing population growth under control.

Important ethical principles underlie these positions of his. After World War II, scientists acquired enormous authority in the eyes of the public through their success in creating the atom bomb. To many scientists, this authority was an essential tool needed to convince the public to take seriously the threat of nuclear war. Later, scientists involved in the environmental movement attempted to rely on the authority of science to achieve public influence. Some environmentalists asked Commoner to abstain from criticizing population control to protect the image of science in the community. But Commoner believed that the serious disagreements in the environmental movement made a show of unity undesirable. The public needs to be informed and to make its own choice when scientists disagree.

In the cases of both the environmental regulation of business and the demographic transition in poor countries, Commoner followed a principle of social ethics: the preference, wherever possible, to achieve social goals through democratic control over social processes rather than through restrictions on the private activities of individuals. Commoner's democratic socialist politics conform with this principle. The rights of businesses were to be curtailed rather than the rights of individuals.

Commoner's argument for regulating business has another important implication for environmental ethics. Too often philosophers conceive technology as a fixed, quasi-natural background condition of human action. This view tends to individualize responses to environmental problems by artificially freezing one of the main social factors involved. Commoner realized the implications of this static view of technology and rejected it. Commoner argued that the good delivered by a technology can be distinguished from the contingent form in which it is delivered, for example, mobility from automobiles or cleanliness from detergents. This distinction made it possible for him to argue that environmental reform is compatible with prosperity at a time when many in the environmental movement advocated voluntary poverty or de-development. In Commoner's view, the great task facing contemporary democracy is reconciling economic and environmental goals, and this task, he believed, is a technical challenge capable of being met, rather than a necessary tradeoff.

SEE ALSO *Alternative Technology; Economics, Environmental; Economism; Ehrlich, Paul; Energy; Environmental Policy; Environmental Politics; Nuclear Power; Pollution; Population; Technology.*

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Andrew Feenberg

COMMUNITARIANISM

Communitarianism surfaced in the Anglo-American political philosophy of the 1970s and 1980s as a critical reaction to political liberalism. After the publication of John Rawls's *A Theory of Justice* (1971), political philosophers such as Alasdair MacIntyre (1984), Michael Sandel, Charles Taylor, and Michael Walzer disputed Rawls's claim that the principal task of government is to secure the liberties of its citizens to lead freely chosen lives. Although these philosophers never identified themselves as communitarians, they developed a core set of arguments that laid the philosophical groundwork for a political philosophy meant to contrast with liberalism's devaluation of community.

Communitarians frequently perceive modern social phenomena such as alienation, economic greed, loneliness, urban crime, and high divorce rates as byproducts of liberalism. In the 1990s a second wave of communitarians such as Amitai Etzioni and William Galston turned from a primarily philosophical debate to more practical political concerns such as social responsibility and countering the erosion of communal life. Etzioni is the director of the Institute for Communitarian Policy Studies, a policy think tank located at George Washington University in Washington, D.C. The institute's chief goals are fostering a greater sense of personal and social responsibility among individual citizens; strengthening the cohesion of families and local communities; encouraging reconciliation among various racial, ethnic, and religious groups; and fostering a national policy about humankind's moral horizon and the social responsibilities of the individual and the community (Institute for Communitarian Policy Studies 2008). In another example of contemporary political action based on communitarian philosophy, Don Eberly leads the nonprofit Civil Society Project, an organization dedicated to engendering a "civic renaissance" that will renew civil society, voluntary social institutions, civic responsibility, and philanthropy.

CHALLENGE TO UNIVERSALISM

Communitarians maintain that the standards of justice are contextual and must be found in the traditions and cultures of particular societies. This view is in contrast to liberalism's claims to universality, especially with regard to issues such as human rights. This is one of the most controversial aspects of the communitarian position, as liberal universalism includes such values as universal human rights. However, some communitarians argue that there is little real debate about the desirability of universal human rights and that the real question is whether there are other, contingent rights that may vary based on culture and context. One example of this appeal to cultural and contextual diversity is the call, which became popular in the 1990s, for a better comprehension of non-European values and ethical standards.

Daniel Bell noted three persuasive East Asian arguments for cultural particularism that contrast with traditional European and North American arguments for liberal universalism (2000). The first is that cultural factors can affect the prioritizing of rights, which matters when a conflict of rights demands a decision about which right to sacrifice. Second, cultural factors can affect the *justification* of rights; rights may be justified not only by abstract universal principles but also by specific examples and contexts. Third, cultural factors can provide moral foundations for *distinctive* political practices and institutions, such as the Confucian value that children have a profound duty to provide for their parents. The consequence of such a value would be a political obligation to foster the social and economic conditions that conduce to the realization of this duty.

TYPES OF COMMUNITIES

Communitarians commonly invoke three types of communities (Bell 1993): First, there are communities of place, which are based on geographical location. This is perhaps the most common meaning associated with the notion of community. Communitarians suggest that planners and decision makers consider the character of the local community when considering plans for development. Second, there are communities of memory, or groups of people who share a morally significant history. These are communities of collective consciousness that may go back several generations or even thousands of years. Members strive to maintain values and traditions associated with such communities. Politically this entails nation building meant to strengthen the bonds of commonality. Civic engagement and public-spiritedness are important components of this type of community. Third, there are psychological communities, or communities of face-to-face interaction. These are groups that participate in common activities and experience a psychological connection in

striving toward common goals. These communities are governed by sentiments of trust, cooperation, and altruism insofar as individual members act with the good of the community in mind. Examples include the family unit and small school or work communities. Among these kinds of communities, allegiance to one, such as the workplace, can undermine responsibilities to another, such as the family.

COMMUNITARIAN ENVIRONMENTAL ETHICS

Many environmental philosophers use the concept of community to portray the relationship between humans and the natural environment. J. Baird Callicott defends a communitarian environmental ethic founded on humans' shared kinship and community with the natural world. Callicott writes, "All our duties—to people, to animals, to nature—are expressible in a common vocabulary of community" (Callicott 1994, p. 53). Callicott's notion of community is based on Aldo Leopold's land ethic. Leopold claims that we have inherited a concept of land as a commodity belonging to us, but "when we see land as a community to which we belong, we may begin to use it with love and respect" (1949, p. viii). Further, he claims that we ourselves are but "plain members and citizens of the biotic community" (1949, p. 204). Callicott considers this a communitarian environmental ethic in which the well-being of the entire community, or ecosystem, matters no less than the well-being of any one individual or group (i.e., humans). Callicott finds the philosophical antecedents to ethical communitarianism in David Hume's moral philosophy and in Charles Darwin's account of the origins and evolution of the "moral sense" among *Homo sapiens*.

Callicott's communitarian environmental ethic—and, by implication, the Leopold land ethic, which he purports to represent and elaborate—has been criticized as a form of ecofascism because it seems to imply that human welfare should be subordinated to the integrity, stability, and beauty of the biotic community. Callicott answers this objection by claiming that the land ethic merely calls attention to one of humans' recently discovered community memberships; it does not cancel or replace memberships in other kinds of communities or the duties implied by them.

Nevertheless, there remains a possibility of conflict between the protection of members of the human (and mixed human–domestic animal) community and the protection of the biotic community as a whole. Callicott provides a two-stage algorithm to resolve such conflicts: Priority should be given first to duties and obligations generated by membership in more intimate and venerable communities, such as family; for example, care for one's sick children or aged parents should take precedence over volunteering to serve the homeless in a soup kitchen. Likewise, priority should be given to the duties and obligations generated by membership in the human "family" over those generated by membership in biotic communities.

How, then, would humans' distinctly environmental duties and obligations—as generated by membership in biotic communities—ever become operative? Callicott answers with the second-stage of the algorithm: Stronger interests should prevail over weaker interests. Thus, although one's own children have an interest in receiving birthday presents, such an interest is weaker than the interest of neighbor children in having adequate nutrition. Thus, one might well be required to forego giving one's own (thus disappointed) child an expensive birthday present in order to buy food for one's neighbor's children if they would not be able to eat otherwise. Likewise, weak human interests in having such things as huge houses and gas-guzzling cars should be trumped by the strong "interests" of endangered species to survive or ecosystems to remain healthy.

Another challenge to a communitarian environmental ethic is one's identification with one's community. Though ecosystems are communities that may warrant respect, they may not inspire as intense a commitment as social communities do. On the other hand, ecosystems do inspire such a strong sense of commitment in the works of authors such as Henry David Thoreau, John Muir, Henry Beston, Annie Dillard, and Edward Abbey, to say nothing of Aldo Leopold himself.

Bioregionalism provides another way of conceiving of a communitarian environmental ethic. Bioregionalism is the view that natural features should provide the defining conditions for places of community and that achieving a secure and satisfying life means knowing a place, learning its lore, and developing its potential within ecological limits. Critics of this view have puzzled over exactly which natural features should provide the basis for community—geological, ecological, climatic, or hydrological. Further, given its emphasis on identification with local communities, a question arises over whether bioregionalism is relevant in a globalized planet.

SEE ALSO *Callicott, J. Baird; Ecology: II. Community Ecology; Future Generations; Land Ethic; Regionalism; Social Ecology.*

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Erin Moore

CONFINEMENT AGRICULTURE

SEE *Factory Farms.*

CONFUCIANISM

Confucianism has conventionally been described as a humanistic tradition that focuses on the roles and responsibilities of people in regard to family, society, and government. Thus, Confucianism is considered primarily as an ethical or political system of thought with an anthropocentric focus. However, on further examination and as more translations become available in western languages, this narrow perspective has to be reexamined. Confucianism is not simply anthropocentric; it is, rather, anthropocosmic.

Some of the most important results of this reexamination are the insights that have emerged in seeing Confucianism as not simply an ethical, political, or ideological system. Instead, Confucianism is being appreciated as a profoundly religious tradition that is different from Western traditions (Tu and Tucker 2003–2004). This may result in an expansion of the idea of religion to include more than criteria adopted from Western traditions, such as notions of God, salvation, and redemption. Moreover, Confucianism is being recognized for its affirmation of relationality not only between and among humans but also between humans and the natural world (Tucker and Berthrong 1998).

The Confucian worldview might be described as a series of concentric circles in which the human is the center not as an isolated individual but embedded in rings of family, society, and government. This is especially clear in the text of the *Great Learning* (De Bary and Bloom 1999). All these circles are contained within the vast cosmos itself. Thus, the ultimate context for the human is the "10,000 things," nature in all its remarkable variety and abundance.

HISTORICAL DEVELOPMENT

Scholars have identified four major periods of Confucian thought and practice. The first is classical Confucianism, which lasted from approximately the sixth century BCE to the second century BCE. This was the era of the flourishing of the early Confucian thinkers: Confucius and Mencius. The second period is that of Han Confucianism, in which the classical tradition was shaped into a political orthodoxy under the Han empire (202 BCE–220 CE) and began to spread to other parts of East Asia. The Han period saw the development of the theory of correspondences of the microcosm of the human world with the macrocosm of the natural world. The third major period was the Neo-Confucian era from the eleventh century to the early twentieth century. This includes the comprehensive synthesis of Zhu Xi in the eleventh century and the distinctive contributions of Wang Yangming in the fifteenth and sixteenth centuries. The influence of both Confucianism and Neo-Confucianism as an educational and philosophical system spread beyond China and shaped East Asian societies, especially Korea and Japan, along with Taiwan, Hong Kong, and Singapore.

In the twentieth century a new epoch of Confucian humanism emerged that is called New Confucianism. This represents a revival of the tradition under the influence of scholars who came to Taiwan and Hong Kong after the ascendancy of Mao Zedong in 1949. Mao maintained that Confucianism was essentially a feudal tradition anchored in history and that for his ideas to flourish, a radical break had to be made with the past. The anti-Confucian campaigns during Mao's rule were virulent, especially in the Cultural Revolution of the 1960s and 1970s. However, since Mao's death there has been a resurgence of interest in Confucian values, some of which has been encouraged by the government. The International Confucian Society held two major conferences in Beijing and in Confucius's birthplace, Qufu, to explore the future of the Confucian Way. Those conferences were held to commemorate the 2,540th anniversary of Confucius's birth and marked a renewed interest in Confucianism to balance the unsettling effects of the rapid industrialization and modernization of China.

MAJOR THINKERS AND TEXTS

The acknowledged founder of the Confucian tradition was known as the sage-teacher Kongzi (551–479 BCE). His name was Latinized by Jesuit missionaries as Confucius. Born in a time of rapid social change, Confucius was concerned with reestablishing political and social order through rectification of the individual and the state. The principal teachings of Confucius are contained in his conversations, which were recorded in the *Analects*. In that work Confucius emphasized the cultivation of moral virtues, especially humaneness (*ren*) and the practice of civility or ritual decorum (*li*), which includes filiality (*xiao*). Virtue and civility were exemplified by the noble person (*junzi*), particularly within the five relations: between ruler and minister, parent and child, husband and wife, older and younger siblings, and friend and friend. The essence of Confucian thinking was that to establish order in society one had to begin with harmony, filiality, and decorum in the family. Then, like concentric circles, the effects of virtue would reach outward to the society. Similarly, if the ruler was moral, it would have a ripple effect on the rest of society and beyond to nature, like a pebble dropped into a pond.

At the heart of the classical Confucian worldview was a profound commitment to humaneness and civility. Those two virtues defined the means of human relatedness as a spiritual path. Through civility, beginning with filiality, one could repay the gifts of life both to one's parents and ancestors and to the whole natural world. Through humaneness one could extend that sensibility to other humans and to all living things. In doing so one became more fully human. The root of humaneness was considered to be filial relations. When a person extended those relations from his or her family and ancestors to the human family and the cosmic family of the natural world, those primary biological ties provided that person with the roots, trunks, and branches of an interconnected spiritual path. Humans, nature, and the cosmos were joined in the stream of filiality. From the lineages of ancestors to future progeny, intergenerational connections and ethical bonding arose. Reverence and reciprocity were considered a natural response to the gift of life from parents and ancestors. Analogously, through reverence for heaven and earth as the parents of all life, one realized one's full cosmological being and one's place in the natural order.

Confucian thought was developed further in the writings of Mencius (c. 385–c. 312 BCE) and Xunzi (c. 310–c. 219 BCE), who debated whether human nature is intrinsically good or evil. Mencius's argument for the inherent goodness of human nature became dominant among Confucian thinkers and gave an optimistic flavor to Confucian educational philosophy and political theory. That perspective also influenced the spiritual aspects of the tradition because self-cultivation was seen as a means of uncovering this innate good nature.

Mencius contributed an understanding of the process required for self-cultivation by identifying the innate seeds of virtues in the human and suggesting ways in which they could be cultivated toward their full realization as virtues. Analogies taken from the natural world extended the idea of self-cultivation of the individual for the sake of family and society to a frame of reference that encompassed the natural environment. This can be described as a path of botanical cultivation. In addition to his teachings on personal cultivation, Mencius advocated humane government as a means to promote the flourishing of a larger common good. His political thought embraced appropriate agricultural practices and the proper use of natural resources. In particular, he urged that the ruler attend to the basic needs of the people and follow the way of righteousness, not that of profit.

Xunzi contributed a strong sense of the importance of ritual practice as a means of self-cultivation. He noted that human desires had to be satisfied and that emotions such as joy and sorrow should be expressed to the appropriate degree. Rituals provided the form for such expression in daily human exchange as well as in rites of passage such as marriage and death. Moreover, because Xunzi saw human nature as innately flawed, he emphasized the need for education to shape human nature. He had a highly developed sense of the interdependent triad of heaven, earth, and humanity that was emphasized also by many later Confucian thinkers. He wrote, "Heaven has its seasons; earth has its riches; humans have their government." Heaven was understood as the guiding force of the universe; the earth was the natural world within which people lived and flourished.

Confucianism blossomed in a Neo-Confucian revival in the eleventh and twelfth centuries that resulted in a new synthesis of the earlier teachings. The major Neo-Confucian thinker, Zhu Xi (1130–1200), designated four texts from the canon of historical writings as containing the central ideas of Confucian thought. In 1315 those texts and Zhu Xi's commentaries on them became the basis of the Chinese civil service examination system, which endured for nearly six hundred years, until 1905. Every prospective government official had to take the civil service exams based on Zhu Xi's commentaries on the *Four Books*. The idea was to provide educated, moral officials for the large government bureaucracy that ruled China.

The influence, then, of Neo-Confucian thought on government, education, agriculture, land use, and social values was extensive. Views regarding nature, agriculture, and management of resources were derived from Neo-Confucian understandings of the importance of people

working to cultivate and care for nature as a way to fulfill their role in the triad of heaven and earth.

Zhu Xi's synthesis of Neo-Confucianism was recorded in his classic anthology *Reflections on Things at Hand* (*Jinsilu*). In that work Zhu formulated a this-worldly spirituality based on a balance of cosmological orientation, ethical and ritual practices, scholarly reflection, and political participation. The aim was to balance inner cultivation with outward investigation of things in concert with the dynamic changes of the natural world. Zhu Xi affirmed those changes as the source of transformation in both the cosmos and the person. Thus, Neo-Confucian spiritual discipline involved cultivating one's moral nature to bring it into harmony with the larger pattern of change in the cosmos. Each moral virtue had its cosmological component. For example, the central virtue of humaneness was seen as the source of fecundity and growth in both the individual and the cosmos. By practicing humaneness, one could effect the transformation of things in oneself, in society, and in the cosmos. In so doing, one's deeper identity with reality was recognized as forming one body with all things. As the *Doctrine of the Mean* stated, "being able to assist in the transforming and nourishing powers of Heaven and Earth, one can form a triad with Heaven and Earth."

CONFUCIAN RELATIONALITY AND NATURE

From the classical texts to the later Neo-Confucian writings there is a strong sense of nature as a relational whole in which human life and society flourishes. Confucian thought recognizes that the rhythms of nature sustain life in both its biological needs and its sociocultural expressions. For Confucians the biological dimensions of life are dependent on nature as a holistic, organic continuum. Everything in nature is interdependent and interrelated. Most important, Confucians see nature as dynamic and transformational. These ideas are evident in the *Book of Changes* and are expressed in the *Four Books,* especially in *Mencius*, *Doctrine of the Mean*, and *Great Learning*. The ideas come to full flowering in the Neo-Confucian tradition of the Sung and Ming periods. Nature in this context has an inherent unity in that it has a primary ontological source (*Taiji*). It has patterned processes of transformation (*yin/yang*) and is interrelated in the interaction of the five elements and the ten thousand things. Nature is dynamic and fluid with the movements of material force (*qi*).

For Confucians, humans are anthropocosmic beings, not anthropocentric individuals. The human is viewed as a microcosm in relation to the macrocosm of the universe. This is expressed most succinctly in the metaphor of humans forming a triad with heaven and earth. These relations were developed during the Han period with a complex synthesis of correlative correspondences involving the elements, directions, colors, seasons, and virtues. This need to make a conscious connection between the patterns of nature and the rhythms of human society is ancient in Confucian culture. It is the basis of the anthropocosmic worldview, in which humans are seen as working with heaven and earth in correlative relationships to create harmonious societies. The mutually related resonances between self, society, and nature are described repeatedly in the Confucian texts and are evident in art and architecture as well.

For Confucians, nature is not only inherently valuable, it is morally good. Nature thus embodies the normative standard for all things; it is not judged from an anthropocentric perspective. There is not a fact-value division in the Confucian worldview, for nature is seen as an intrinsic source of value. In particular, value lies in the ongoing transformation and productivity of nature. A term repeated frequently in Neo-Confucian sources is *sheng sheng,* reflecting the ever-renewing fecundity of life itself. The dynamic transformation of life is seen as emerging in recurring cycles of growth, fruition, harvesting, and abundance. This reflects the natural processes of flourishing and decay in nature, human life, and human society. Change thus is seen as a dynamic force with which humans should harmonize and interact rather than withdraw from.

In this context Confucians do not view hierarchy as leading inevitably to domination. Rather, they see that value rests in each thing, though not in each thing equally. Everything in nature and society has its appropriate role and place and should be treated accordingly. The use of nature for human ends must recognize the intrinsic value of each element of nature and also its value in relation to the larger context of the environment. Each entity is considered not simply equal to every other; each interrelated part of nature has a particular value according to its nature and function. Thus, there is a differentiated sense of appropriate roles for humans and for all other species. For Confucians hierarchy is seen as a necessary way for each being to fulfill its function. Thus, no individual being has an exclusive privileged status in relation to nature. Rather, the processes of nature and its ongoing logic of transformation (*yin/yang*) is the norm that takes priority for the good of the whole society.

Confucians were mindful that nature was the basis of a stable society and that without the careful tending of nature, imbalance would result. There are numerous passages in *Mencius* advocating humane government based on the appropriate management of natural resources and family practices. There also are passages in

Confucian texts urging people not to cut down trees or kill animals needlessly.

However, the establishment of humane society, government, and culture inevitably results in the use of nature for housing, production, and governance. In this sense Confucians might be seen as pragmatic social ecologists (rather than deep ecologists) who recognize the necessity of forming human institutions—both educational and political—for a stable society. Nonetheless, for Confucians human cultural values and practices are grounded in nature and are part of its structure, and thus humans are dependent on its beneficence. In addition, the agricultural base of Confucian societies has always been recognized as essential to the political and social well-being of the country. Humans prosper by living within nature's boundaries and are refreshed by its beauty, restored by its seasons, and fulfilled by its rhythms. For Confucians, human flourishing is dependent on fostering nature in its variety and abundance; going against nature's processes is self-destructive. Human moral growth means cultivating one's desires not to interfere with nature but to be in accord with the great Dao of nature. Thus, the "human mind" expands in relation to the "Mind of the Way."

For Confucians, harmony with nature is essential and human self-realization is achieved in relation to nature. The great triad of Confucianism—heaven, earth, and humans—signifies the understanding that humans can attain their full humanity only in relationship to both heaven and earth. This became a foundation for a cosmological ethical system of relationality applicable to spheres of family, society, politics, and nature.

SEE ALSO *Asian Philosophy; Buddhism; China; Daoism; Deep Ecology.*

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Mary Evelyn Tucker

CONSCIOUSNESS

In environmental ethics, the issue of consciousness arises primarily in controversies concerning the moral status of animals. These debates often center on the degree to which animals possess consciousness–or whether they possess it at all.

VARIETIES OF CONSCIOUSNESS

The word *consciousness* can be used in a bewildering variety of ways. Here are some of the most common:

1. *Waking State*: A creature is conscious when it is awake as opposed to asleep or otherwise unconscious.
2. *Sensitivity*: A creature is able to detect salient features of its environment.
3. *Access consciousness*: A creature's mental representations (neural states that carry information about the environment) are poised for use in the control of action (including, but not restricted to, verbal action).
4. *Phenomenal consciousness*: A creature has experiences, and there is *something that it is like* to have these experiences. Suppose you stub your toe. This feels a certain way–it hurts. This way that it feels to stub your toe is one example of what philosophers have in mind when they talk of phenomenal consciousness.
5. *Self-consciousness*: This mode of consciousness can take two forms (a) awareness of oneself as an entity that is distinct from other entities and which persists through time, and (b) awareness of one's own mental states.
6. *Mentality*. In discussions of non-human animals the term *consciousness* is often used as a catchall for mental states or abilities; judging whether an animal is conscious or not is often seen as tantamount to working out whether it can believe, think, remember, reason, and so on.

There are two other complicating factors. First, the defining concepts of each of these six categories are often obscure or otherwise controversial. For example, some accounts of cognition eschew appeals to mental representations, and therefore dispute the characterization of access consciousness contained in category 3. Second, depending on how they are interpreted, some of these categories can overlap or even collapse into each other. For example, higher-order representation accounts (see below) explain phenomenal consciousness in terms of self-consciousness, specifically form 5(b). The truth of such accounts, therefore, requires the collapse of category 4 into the second form of category 5. This is by no means an isolated example.

The prospects of a unified definition of consciousness are, therefore, bleak because it is unlikely that there is any unified phenomenon to be defined. However, some scientific and philosophical discussions of consciousness have tended to focus on consciousness in the sense described by categories 4 to 6.

PHENOMENAL CONSCIOUSNESS AND ANIMALS (CATEGORY 4)

Far from being part of popular wisdom, the idea that phenomenal consciousness is restricted to humans is a deeply counterintuitive idea. The common sense attribution of consciousness to animals has found support in the work of cognitive ethologists who study emotions in animals (Bekoff 2003, 2008). The burden of proof is, therefore, on those who deny that animals are phenomenally conscious. The idea that many animals are conscious in this sense can be further supported by three types of consideration: *behavioral*, *neuropsychological*, and *evolutionary*.

There are broad similarities in the responses of nonhuman animals and humans to various circumstances. For example, both humans and animals try to avoid sources of pain (noxious stimuli); if they fail they are both likely to cry out. Following exposure to noxious stimuli, animals, like humans, will usually try to avoid further exposure and might limit the use of an injured body part. Thus, the behavior of many humans and nonhuman animals can be similar enough to invite the same kind of explanation: they are both phenomenally consciousness. That is, they experience the world in similar–though not necessarily exactly the same–ways.

Anatomical and physiological evidence also supports the idea that animals are phenomenally consciousness. For example, the presence of endogenous opiates has been demonstrated in all mammals, birds, reptiles, amphibians, fish, and in some invertebrates such as earthworms. These are the body's natural opiates, and their function is to alleviate pain following major injury (a possible survival mechanism that allows an injured animal to function normally until the immediate danger has been avoided). It is difficult to see why an animal would possess such a substance unless it is capable of feeling pain. Finally, the enormous evolutionary continuity between human and non-human animals makes it unlikely that phenomenal consciousness should be confined only to humans.

These arguments do not strictly entail that non-humans are phenomenally conscious. However, collectively, they seem to provide as much reason for thinking non-humans are conscious as for thinking that pre-linguistic humans are conscious.

Carruthers (1992, 1996), however, objects to the ascription of phenomenal consciousness to animals. His objection is based on the *higher-order thought* (HOT) model of phenomenal consciousness. According to this model, in order to be in a phenomenally conscious state–such as pain–it is necessary that a creature also possess a thought about this pain: a thought to the effect that it is in pain. Animals, Carruthers claims, cannot do this because they do not possess the requisite concepts. Therefore, he concludes, animals cannot be the subjects of even the most primitive of phenomenally conscious states.

The HOT account of consciousness, especially in the form developed by Carruthers, seems to have some deeply implausible consequences. It precludes the attribution of phenomenal consciousness not only to animals but also to young children–those too young to have acquired concepts of mental states, and therefore incapable of having thoughts about them. This restriction of phenomenal consciousness to creatures that have, in this sense, a *theory of mind* is wildly implausible. Moreover, among the principal defenders of HOT accounts only Carruthers is willing to embrace this implication of the theory. Other proponents typically attempt to show why HOT accounts do not have this highly counterintuitive consequence. And to the extent they are successful, HOT will also be compatible with the attribution of phenomenal consciousness to animals. It is also worth noting that HOT accounts are implausible on other grounds. Most notably, they face a nasty dilemma (Rowlands 2001a, b). My thought that I am in pain, for example, is either conscious or it is not. If it is conscious, the HOT account has not explained consciousness but presupposed it. That is, it can explain the consciousness of my pain only by presupposing the consciousness of my thought. If, on the other hand, my thought is not conscious, then it is difficult to see how it can make my pain conscious: my unconscious thoughts typically do not make me aware of what they are about: that is precisely what makes them unconscious.

BELIEFS, DESIRES AND ANIMALS (CATEGORY 6)

As is the case with phenomenal consciousness, the attribution of cognitive and affective states (such as beliefs and desires) to animals appeals to common sense. This practice is based largely on behavioral considerations. Suppose a dog chases a squirrel up a tree. The dog sits at the foot of the tree barking. However, unbeknownst to her, the squirrel has long since jumped to another tree and disappeared. It seems natural to assume that the dog believes the squirrel is in the tree. For what else would explain her behavior?

There are, however, various philosophical objections to this commonsense assumption. One criticism is loosely associated with the ideas of the Austrian philosopher Ludwig Wittgenstein (1889-1951). Humans learn

to attribute beliefs and desires to other humans and then, by analogy, extend this attribution to nonhuman animals. Many critics argue that this extension by analogy is not justifiable (Leahy 1993). This objection, however, fails to recognize that, in many cases, the practice of belief-desire attribution is learned through its application both to humans and non-humans at the same time. For example, a child who grows up in the company of a dog will acquire his ability to attribute beliefs, desires, and other psychological states partly by observing how his or her parents use this sort of psychological language in connection with the dog (Gaita 2003).

Another objection to the attribution of beliefs and desires to animals has been developed by the late Berkeley philosopher, Donald Davidson. In order to have the belief that the squirrel is in the tree, the dog would have to have the concept of a squirrel (and a tree). But, in order to have the concept of a squirrel, the dog would have to know various things about squirrels; for example, that squirrels are mammals, that they are warm-blooded, that they have skeletons, etc. Therefore, on Davidson's view, in order to have a single belief, one has to have many beliefs, and this *holism of the mental* precludes the possession of beliefs, desires and other propositional attitudes by non-human animals.

However, it is not exactly clear is why this is so. The holism of the mental is, of course, compatible with the *de re* ascription of propositional attitudes to animals–where *de re* means *of the thing*. Thus, Davidson accepts that it is legitimate to say that the dog believes *of* the squirrel that it is in the tree. It is the so-called *de dicto* ascription of squirrel-beliefs that is precluded by the holism of the mental. A belief *de dicto* is about an object only under a *mode of presentation*. So, the dog might be able to think *of* the squirrel that it is in the tree. But, according to Davidson, it cannot think of this object that is in the tree *as* a squirrel. This would be to think of it under a mode of presentation that, because of its conceptual poverty, the dog cannot posses.

However, if this correctly captures Davidson's rather difficult argument, then it is not clear why the squirrel cannot be presented to the dog under a mode of presentation at all. It is true that the dog might not identify the squirrel as, say, a mammal, or as warm-blooded, etc. But this does not mean that there could not be other modes in which the squirrel might be presented to the dog (Rowlands 1998). These might be *affordance*-related modes of presentation in which the squirrel is represented as a *chaseable* thing or an *eatable* thing; this form of presentation might categorize squirrels and rabbits as belonging to the same kind. To say that a squirrel is presented to a dog in a very different way from which it is presented to a human does not, of course, negate the fact that it is presented to the dog in some way or other. Thus, Davidson's argument notwithstanding, it is not clear why the holism of the mental rules out the attribution of propositional attitudes to nonhumans.

SELF-CONSCIOUSNESS AND ANIMALS (CATEGORY 5)

Discussions of self-consciousness in animals typically focus on whether they are able to recognize themselves in the sense of being able to distinguish themselves from others. These discussions thus pertain to category 5(a) of the above classification. Here, the well-known 'mirror test' has tended to dominate discussion (Gallup 1970, Gallup et al 2002). According to Gallup et al. (2002) mirror self-recognition is an indicator of self-awareness. This may be true, but the claim is, at the very least, unclear in two important ways. First, it is not clear whether mirror-self recognition is proposed as a necessary condition of self awareness, or as a sufficient condition, or both. Second, it is not immediately obvious what constitutes success in the mirror test. The classical version of the test involved putting a visible mark on the face of the animal, and seeing whether their attention was drawn to the mark when it viewed itself in a mirror. Chimpanzees and orangutans are the only non-human species that consistently pass the mirror test in this form.

This version of the test is, however, simplistic. First, as Allen and Bekoff note, the test depends on "the ability to match motor to visual information, a skill that may not have needed to evolve in a majority of species, for example those species that depend more on chemical or auditory clues." (2007, p. 60). Secondly, to suppose that manually inspecting the visible mark placed on one's face is the only way to pass the mirror test is implausible. Such a response would be appropriate to creatures that engage in manual exploration of their bodies–such as chimpanzees and orangutans. However, obviously this standard can't be applied to creatures that do not engage in such manual self-exploration. On the other hand, if it is the elicitation of surprise or its behavioral analogue, that is thought to be decisive, then it is far from clear why the mirror test, when properly understood, is not passed by many creatures. There is no reason to suppose that a dog, for example, would be in any way surprised by a new mark appearing on her face: they are frequently covered in such marks in the form of mud, burrs, etc. and can do little about them. What a dog would be surprised by is the presence of a new, unfamiliar, dog in her environment. By that standard, the dog's indifference to her image in the mirror is the clearest indication imaginable that she passes the mirror test.

SEE ALSO *Animal Ethics; Cognitive Ethology.*

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Mark Rowlands

CONSERVATION

Built on eighteenth- and nineteenth-century ideas and practices but rooted deeply in history and even prehistory, conservation emerged as a conscious goal of public policy, citizen action, and professional endeavor in the early twentieth century. Since then conservation has evolved in response to varied forces: new findings in the natural sciences; emerging environmental concerns; shifts in philosophical assumptions and aesthetic standards; novel technologies and techniques; expanding legal mandates; and changing constituencies, cultural influences, and social, economic, and political conditions. The complex interplay of these forces has produced a movement whose goals, approaches, and philosophical foundations remain in flux.

Because of this complexity, conservation has always been a sensitive indicator of changing philosophical premises and principles. As a manifestation of ethics, conservation has demarcated how humans understand, value, and choose to act in relation to nonhuman nature. In all its permutations, however, conservation has sought to define and achieve a more responsible relationship between people and nature.

PREHISTORIC PRECEDENTS

The term *conservation* acquired its modern meaning during the Progressive-Era conservation crusade in the United States in the early twentieth century. As an expression of a cultural commitment to an enduring relationship with the natural world, however, conservation has deep historical and prehistoric foundations in older traditions of resource management, nature protection, and veneration of natural events, features, and processes.

Prehistoric cultures did not exist in a stable state of coexistence with their natural surroundings. Converging lines of evidence from paleontology, paleoecology, archaeology, and anthropology suggest, in fact, a sobering picture of human dispersal over the last 120,000 years, accompanied by waves of continental and insular extinction and other forms of environmental degradation. Against this record, however, there is countervailing evidence of many cultures that have achieved relatively sustainable ways of life. For centuries and even millennia native peoples in landscapes around the world have developed sophisticated belief systems and land-use practices that recognize cultural connections to and dependence on the nonhuman world. Some of these traditions have survived into the modern era, although they now cope with intense pressures from diminished resources, human population growth, a globalized economy, and rapid economic and technological change.

In many native cultures social mechanisms evolved to reinforce an attitude of respect and deference toward nature, to evoke nature's bounty, and to sanction appropriate human use of that bounty. These mechanisms included hunting and planting rituals, fertility and birth-control practices, and recognition of sacred spaces, taboos, totems, stories, and myths. The conservation movement may be thought of as modern society's conscious effort to develop and exercise such social practices and restraints in its relations with the nonhuman world.

HISTORIC PRECEDENTS

Evidence of early conservation practices can be found in the history of Europe, North America, and other cultures. These include efforts to protect particular species and special lands, to maintain or enhance populations of wild plants and animals, and to sustain the productivity of agroecosystems. European traditions of forestry and game keeping date to the Middle Ages. The establishment of game preserves and royal forests on the land estates of feudal Europe led to the development of customs and, later, formalized laws regulating hunting and

the use of forests. Germany and France in particular developed silvicultural systems and techniques to prevent the wholesale destruction of their forest estates.

Europeans carried these protoconservation traditions to their expanding empires, even as colonization disrupted traditional patterns of land tenure and resource use. In North America unchecked resource exploitation was the norm as European settlement proceeded. Despite this record, seeds of the later conservation movement were apparent in efforts in the American colonies to protect wild game populations, forests, soils, and special natural features. Through the 1800s the new American states intermittently passed laws establishing closed seasons, prohibiting the hunting of nongame birds, and mandating bounties on predators.

The exploitation of North America's abundant native forests—for conversion of land to agriculture, for housing and naval construction materials, and for charcoal and domestic fuel supplies—drove economic development throughout the colonial and early American era. Depletion of the eastern forests and settlement of the interior of North America shifted the focus of forest exploitation to the Great Lakes region. The swift destruction of the Great Lakes forests marked a turning point in the development of American forestry and conservation thought. A parallel pattern of resource degradation and early conservation response is evident in the response to widespread soil erosion, loss of wild landscapes and natural features, and overexploited game populations. The trend toward protection or regulated exploitation of economically or esthetically important components of the landscape or ecosystem provided the foundation upon which a coherent conservation movement began to form.

PRELUDE TO A MOVEMENT

The conservation movement arose in the eighteenth and nineteenth centuries as a result of changes in demographic and environmental conditions and in human perceptions and understanding of the natural world. Global exploration ushered in a golden age of natural-history studies. These studies provided essential foundations for the development of evolutionary theory in the work of Alfred Russel Wallace (1823–1913) and Charles Darwin (1809–1882). These advances occurred as the Industrial Revolution altered the scale, pace, and character of human environmental impacts.

Coincident with these scientific, cultural, and environmental changes, the Enlightenment and romantic movements were reshaping European and North American conceptions of order, value, and beauty in the natural world. The natural philosophers of the Enlightenment stressed the smooth workings and stability of a mechanistic natural order. The romantic philosophers and poets perceived unity and wholeness in a spontaneously creative organic nature. Although offering very different, even opposed, conceptions of nature, both outlooks encouraged human comprehension of natural objects and processes and thus provided a foundation for greater appreciation of human impacts upon the natural world. The writings of Thomas Malthus (1766–1834) and other early economic philosophers provided the basic framework for considering the interwoven fate of the human population, human economies, and natural resources.

George Perkins Marsh's *Man and Nature: Or, Physical Geography as Modified by Human Action* (1864) is widely regarded as the first philosophical and ethical landmark in modern conservation literature. Drawing on extensive personal observations of long-term landscape change in New England and the Mediterranean, Marsh argued that human actions had caused widespread disruption of the "harmonies" of the natural world, and that "all nature is linked together by invisible bonds" (p. 66). The publication of Marsh's book provided direction to the conservation movement as it gained definition through the remainder of the 1800s.

In North America dispossession of Native Americans, enactment of liberal land-distribution policies, and the flow of settlers and capital into "virgin" landscapes resulted in an unprecedented wave of exploitation of forests, wildlife, fisheries, agricultural lands, rangelands, and aquatic systems. The last quarter of the nineteenth century also produced the first concerted efforts to address the causes and consequences of these extensive environmental changes through policy reforms, land protection, and the rise of a public and professional forestry movement. By the turn of the twentieth century, varied strands of conservation concern had emerged in the United States, but they were only loosely connected. They drew together as the Progressive movement came to the fore in the political arena.

PROGRESSIVE-ERA CONSERVATION

When Theodore Roosevelt assumed the American presidency in 1901, the stage was set for a revolution in conservation policy. In his first address to the U.S. Congress, Roosevelt spoke at length of the importance of the nation's forests, stating that "We have come to see clearly that whatever destroys the forest ... threatens our well-being" (Pinchot 1947, p. 190). Conservation became a cornerstone of the Progressive movement and of Roosevelt's presidency. Roosevelt's partner in political innovation was his "chief forester," Gifford Pinchot (1865–1946). As head of the U.S. Forest Service, established in 1905, Pinchot embodied the Progressive approach to bureaucratic responsibilities, administering the nation's newly created national forests according to the utilitarian

credo of "the greatest good of the greatest number over the long run." Applied not only to forests but also to natural resources in general, the "resource-conservation ethic" provided the dominant paradigm of the early movement (Callicott 1990). In Pinchot's words, "The first great fact of conservation is that it stands for development" (Pinchot 1910, p. 42).

At the core of utilitarian conservation was the concept of *sustained yield* through wise use. As Aldo Leopold later observed in his text *Game Management*, under the Progressive banner

> wild life, forests, ranges, and waterpower were conceived ... to be *renewable organic* resources, which might last forever if they *were harvested scientifically, and not faster than they reproduced*. "Conservation" had until then been a lowly word, sleeping obscurely in the dictionary. The public never heard of it. It carried no connotation of woods or waters. Overnight it became the label of a national issue. (1933, p. 17)

As the leading edge of the movement, the Forest Service became a model for other resource-management agencies and for Progressive-Era government.

Absent from many of the Progressive-Era initiatives were the voices of the increasingly influential nature preservationists, led by the naturalist and writer John Muir (1838–1914). As Pinchot appropriated the term *conservation*, its meaning became subject to lasting confusion and debate: *conservation* is sometimes understood, in contradistinction to *preservation*, to mean "wise use of natural resources" and is sometimes understood more broadly to encompass the idea of preservation. In contrast to the utilitarian approach, adherents of the "romantic-transcendental preservation ethic" emphasized wild nature's aesthetic and spiritual values and the need to safeguard those values through strict prohibitions on development and manipulation (Callicott 1990). The tensions between the utilitarian and preservationist approaches intensified as the conservation movement, broadly understood, coalesced.

These tensions surfaced in the changing relationships between the principal players. Pinchot and Muir had been personal friends, but their differing approaches to conservation of the nation's forests caused a rift between them beginning in the late 1890s. Their differences came to a head in the protracted political struggle over plans to dam the Tuolomne River in Yosemite National Park's Hetch Hetchy Valley. The battle culminated in 1913 with the adoption of national legislation providing federal support for the dam. Although Muir and his colleagues lost the battle, they had aroused a national constituency in favor of nature protection that in turn led to establishment in 1916 of the U.S. National Park Service. Nevertheless, the rift between the utilitarian and preservationist camps in conservation persisted for decades, with only a gradual and partial rapprochement as conservation science, philosophy, policy, and practice coevolved through the twentieth century.

INSTITUTIONALIZING AND INTERNATIONALIZING CONSERVATION

The first half of the twentieth century saw the consolidation of the Progressive Era's conservation gains in the United States and the gradual growth of an increasingly international movement. As conservation became institutionalized, it tended to follow the tenets of Pinchot's resource-conservation ethic. The principles of utilitarian resource conservation were applied beyond forests to other "useful" components of the biota and the landscape: rangelands, game animals, sport and commercial fisheries, scenic areas, agricultural soils, and river systems. New policies, laws, academic disciplines, research and training programs, and professional societies arose to promote sustained yields of and from these various "resources."

Although increasingly defined by this enhanced structure of agencies, disciplines, and professions, the conservation movement in the U.S. remained a battleground for competing approaches and philosophies. Even as conservation became professionalized, growing numbers of citizens became active as members of nongovernment conservation organizations. The preservationist approach found renewed vigor as campaigns to protect wildlife, natural areas, and wildlands reemerged. In the international arena early conventions and treaties addressed such problems as the protection of marine mammals and migratory birds. After World War I international conferences on conservation became more frequent, primarily in Europe and North America.

The social, economic, and environmental convulsions of the 1930s and 1940s fundamentally altered priorities and perspectives in the conservation movement. With the outbreak of World War II conservation issues fell into the background of concerns, proving the difficulty of maintaining mindfulness of human-nature relationships when social crises erupt. Yet, as in no other time since the advent of conservation, these years of crisis demonstrated the complex nature of environmental problems. Moreover, they forced the conservation movement to again confront its own internal tensions.

Beneath the very active surface of conservation, there remained the unresolved philosophical split between the utilitarian and preservationist approaches. Neither approach adequately addressed extensive problems such as soil erosion or the loss of wildlife. In the United States these problems stimulated new efforts to address the root causes of

Dust Storms. *A dust storm is set to engulf the town of Spearman, Texas on April 14, 1935. Storms like these could build clouds thousands of feet into the sky and carry millions of tons of dirt. In response, programs were developed to teach farmers new farming practices that would make soils less vulnerable to water and wind erosion.* **NATIONAL OCEANIC AND ATMOSPHERIC ADMINISTRATION/ DEPARTMENT OF COMMERCE.**

conservation ills. Drawing upon both utilitarian and preservationist frameworks, a new generation of conservationists embraced both the preservationist critique of human hubris, with its emphasis on aesthetic appreciation of wild nature, and the utilitarian commitment to wise use and stewardship of resources. This evolving synthesis also reflected a basic shift in conservation's scientific foundations, as ecology and evolutionary biology were revolutionizing the understanding of the structure and functioning of biological communities, landscapes, and systems.

For at least some conservationists, these advances suggested a new need: to marry ecology and the various fields of resource management in the effort to sustain not simply the yields of particular commodities but also the healthy functioning of entire systems. Writing in 1939, Aldo Leopold noted that ecology provided "a new fusion point for the all the natural sciences," that its emergence had "lift[ed] the veil from a biota so complex, so conditioned by interwoven cooperations and competitions, that no man can say where utility begins or ends" (Leopold 1991, pp. 266–267). Leopold's expanded conservation philosophy, as finally expressed in his landmark essay "The Land Ethic" in *A Sand County Almanac* (1949), emphasizes the integrity, stability, and beauty of what he called the "biotic community" and rejects the view of nature as a mere collection of disaggregated natural resources. It "changes the role of *Homo sapiens* from conqueror of the land community to plain member and citizen of it" (Leopold 1949, p. 204). Leopold's "evolutionary-ecological land ethic" redefined resources as components within complex and diverse systems, connected to and interacting in complex ways with other parts of the system (including human beings) (Callicott 1990). It followed that the conservation professions had

to develop better integrated approaches to resource management and stewardship.

FROM CONSERVATION TO ENVIRONMENTALISM

Conservation emerged from World War II into a world transformed. The war had altered conservation's social and ecological context. As the bonds of empire dissolved in the postwar decades, former colonies and colonial powers alike struggled to somehow reconcile development and conservation priorities. These changes in international relations occurred as human population growth, land degradation, air and water pollution, and overexploitation of marine resources fully emerged as global conservation issues. Reflecting the broader scale of concern, a wide spectrum of national and international organizations and governments met in 1948 and formed the International Union for the Protection of Nature (now called the World Conservation Union). The newly formed United Nations also became involved in international conservation programs. These were early expressions of what became an increasingly global response to conservation problems.

Conservation was subject to the social and economic forces rising in aftermath of the war. The postwar years brought a new generation into forestry, wildlife management, agriculture, and other conservation fields. As the pressure to meet rising material demands increased, the professions became more specialized, more focused on commodity outputs, and more inclined to adopt technological solutions to conservation problems. These changes overwhelmed the integrated approach that had emerged before the war. Resource managers confronted complex environmental problems with an increasingly rigid framework of disciplines, agencies, and institutions.

These same years, however, also gave rise to countervailing forces. New tools in the earth sciences provided greater understanding of natural systems. Through the 1950s and 1960s, revolutions in fields from genetics and evolutionary biology to geology and atmospheric chemistry reshaped humans' understanding of the global biosphere and their place in it. Meanwhile, the indiscriminate adoption of novel technologies—especially agricultural pesticides, industrial chemicals, and nuclear power—created new concerns about their effects on human health and ecological systems.

With the publication in 1962 of Rachel Carson's landmark book *Silent Spring*, the modern environmental movement began to assume an identity of its own, distinct from but still connected to the older conservation movement. Over the next decade, the U.S. Congress adopted a series of important environmental protection laws, responding to a rising wave of environmental awareness, popular support, and organized advocacy. The movement achieved symbolic and political maturity with the observance of the first Earth Day on April 22, 1970.

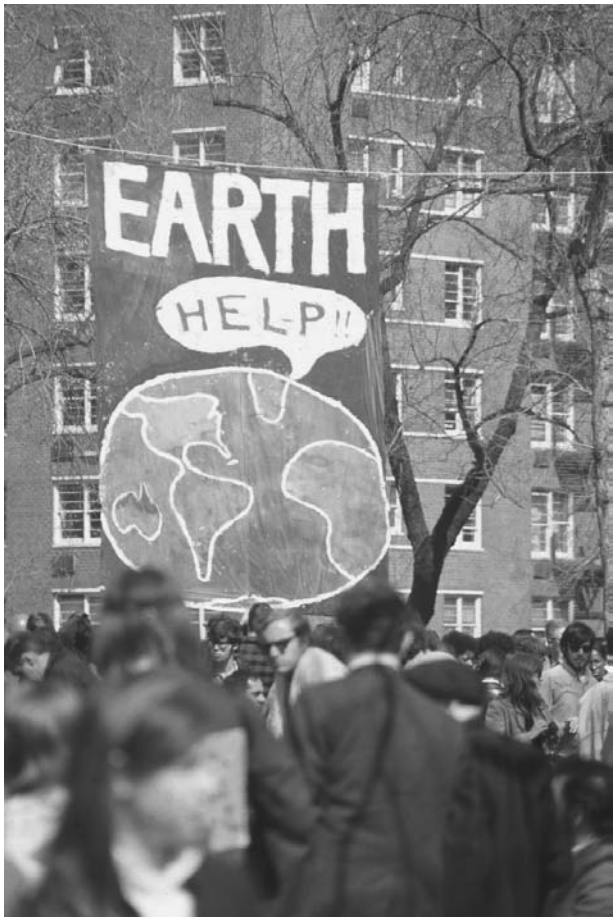
THE REINTEGRATION OF CONSERVATION

The years following Earth Day saw an increasing acceptance of environmental values in the conservation professions and in society. Those values, however, were not easily transformed into effective conservation action. The tendency toward overspecialization was difficult to overcome. Conservation programs usually focused on single species, particular economic resources, discrete goals, or separate jurisdictions within a given landscape. As the long-term adverse impacts of such fragmented approaches became evident, the traditional conservation fields came under increasing public scrutiny. While environmentalists pressed for change through legal means, the evolution of conservation philosophy, policy, and practice required years of incremental change.

At the international level differences in perspective and priorities between the wealthier, developed nations of the north and the poorer developing countries of the south likewise proved difficult to overcome. International conservation continued to make gains through a series of conventions, treaties, and global conferences. Nevertheless, international development policies only gradually incorporated stronger conservation and environmental provisions, as the need to connect economic development and long-term environmental security became evident.

Even as these broad patterns of change unfolded, conservation's scientific foundations were again shifting. Ecology in particular moved away from its classic paradigm, which emphasized singular, stable, deterministic equilibria, and toward a multiscalar view of ecosystems characterized by constant flux, inherent uncertainty, and contingency. Increasingly, conservation strategies required the integration of knowledge from the many branches of science and across the science-humanities divide. This need to rethink conservation across disciplinary lines was driven not only by changes in the foundational sciences but also by accelerating changes in the environment itself, including the worldwide loss of biological diversity, degradation of aquatic and marine systems, and climate change. These concerns prompted the growth, in the 1980s, of such synthetic disciplines as conservation biology, agroecology, restoration ecology, ecological economics, and environmental history. They brought to the fore new core concepts such as *sustainability*, *biodiversity*, and *ecosystem management*.

The trend toward integrated conservation approaches has meant a move away from narrow economic criteria and



Earth Day 1970, New York City. *The modern environmental movement achieved a symbolic and political height with the celebration of the first Earth Day conservation awareness celebration on April 22, 1970. Since then, environmental values have continued to become more acceptable in the mainstream.* **HULTON ARCHIVE/GETTY IMAGES.**

toward broader ecological standards of success; away from a mathematically derived goal of sustained yield and toward the more complex objective of healthy and resilient ecosystems; away from a restrictive focus on the goods and services provided to humans by ecosystems and toward the sustaining of the biological diversity and ecological functions that yield such goods and services. These changes also began to redefine the value of wildlands within a broader conceptual framework of conservation—as repositories of biodiversity, as core protected areas and corridors in greater ecosystems, and as "controls" against which to compare human impacts on more intensively utilized lands.

In many ways these trends toward increasing integration in conservation harked back to the synthesis that Leopold and others had articulated decades before. Since then the science of ecology has advanced; its analytical tools have grown vastly more sophisticated; and the social and economic context of conservation has changed dramatically. Nevertheless, there has been a continuity between modern efforts to expand conservation's cultural and natural connections and Leopold's call to "[enlarge] the boundaries of the community to include soils, waters, plants, and animals, or collectively: the land" (Leopold 1949, p. 204).

EMERGING THEMES IN CONSERVATION

As in the past, conservation movements remain responsive to new information, demands, and realities. The forces that have reshaped conservation since World War II will continue to register in its changing philosophical premises, human dimensions, and practical methods. Conservation will likely continue to seek greater collaboration among the sciences, even while reaching beyond the sciences to strengthen connections with philosophy, theology, economics, history, literature, and the arts. Although ecology remains the "fusion point" of the sciences, conservation faces a continuing challenge of incorporating ecology's systems perspective into the various resource-management professions. The new integrated fields that have arisen to meet this challenge will confront the tendency toward specialization and reductionism to which even interdisciplinary fields are prone.

Meanwhile, a suite of interacting threats is making the work of conservation ever more daunting. These threats include the now-unavoidable impacts of global climate change; the rapid spread of invasive exotic species (especially as the human economy continues to globalize); the seemingly relentless fragmentation of landscapes and ecosystems; increasing human demand for freshwater; the increased presence of genetically modified organisms in the landscape and growing pressure to devote cultivated and uncultivated landscapes alike to biofuel feedstock production; the advent of new emerging diseases; and the degradation of ocean ecosystems and marine fisheries.

The continued growth in human population and resource-consumption rates remains a profound influence on conservation theory and practice. Conservationists are seeking novel ways in which to integrate sustainable economies with effective environmental protection, management, and restoration programs. Conservation-planning efforts are expanding their reach across jurisdictional boundaries and across the landscape, recognizing the ecological connectivity of wildlands, semiwild lands, "working" landscapes, and suburban and urban environments. Such cross-boundary, landscape-scale approaches have few precedents in conservation history. They represent an important departure from the past,

spurring the expansion of the land ethic to encompass the entire continuum of land uses.

In the past conservation has focused primarily on natural systems while neglecting human and cultural relationships. Increasingly conservationists recognize the need to build connections between the natural sciences, cultural traditions, and human communities in the effort to protect, restore, and sustain healthy landscapes. In seeking a better fit between the built environment and the surrounding landscapes, conservationists have begun to work with colleagues from varied fields to incorporate and apply emerging principles from conservation biology and landscape design. Likewise, conservationists and their colleagues in the medical fields increasingly work together to understand the links between ecosystem health and human health.

As a social movement conservation itself continues to diversify as individuals from varied backgrounds come into conservation as both professionals and committed amateurs. Local nongovernmental organizations are now important and increasingly influential conservation stakeholders. Although international action remains necessary to address global threats and to support local initiatives, the assumption of greater local responsibility for ecosystem health is increasingly urgent. A vital community-based conservation movement has arisen to meet that need. As these experiments in ''bottom-up'' conservation continue, they seek to create not just an enhanced conservation movement but also an enduring culture of conservation. In so doing, they both embody and extend a conservation ethic that has been evolving continually since the movement first emerged.

SEE ALSO *Biodiversity; Carson, Rachel; Conservation Biology; Ecology: I. Overview; Ecology: III. Ecosystems; Hetch Hetchy; Leopold, Aldo; Marsh, George Perkins; Muir, John; Pinchot, Gifford; Preservation; Resource Management; Roosevelt, Theodore; Sustainability; U.S. National Park Service; Utilitarianism.*

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Curt Meine

CONSERVATION BIOLOGY

Concern for the protection of useful species goes back to ancient cultures. In India the Mauryan emperor Asoka (299–237 BCE) ordered the preservation of forests that provided a critical habitat for the Indian elephant, an important component of his army. Shortly after the turn of first millennium CE limited forest management practices began to be advocated in many regions, including China, Japan, and Europe. Since the eighteenth century there has been a continuous history of forestry in European countries and their colonies and ex-colonies, starting primarily in Germany. The goal was to ensure the sustained availability of forest products, primarily timber. By the early twentieth century those practices had been extended to include the

management of game and other charismatic species as well as forests (Sarkar 2005). After World War II wildlife conservation emerged as an important transnational goal for organizations such as the United Nations Educational, Scientific and Cultural Organization (UNESCO). In 1968 a new European journal, *Biological Conservation*, began to provide an outlet for research based on this broadened scope of species conservation.

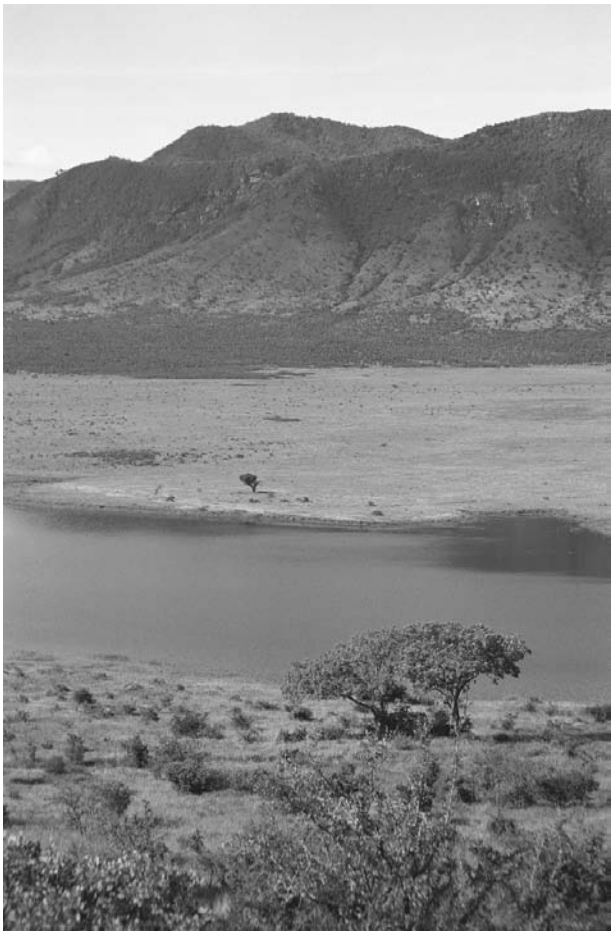
EARLY YEARS OF CONSERVATION BIOLOGY

An organized discipline of conservation biology did not emerge until the 1980s, initially primarily in the United States. In the late 1970s conservation practice and research in the United States was dominated by legislative developments, in particular the Endangered Species Act (ESA) of 1973 and the National Forest Management Act (NFMA) of 1976. The ESA led to a focus on endangered and threatened species and the enactment of policies to assist their recovery. Those policies typically required the designation on scientific grounds of critical habitats for the persistence of those species. Meanwhile, guidelines for the implementation of the NFMA required the maintenance of ''viable'' populations of native mammals in all national forests. Techniques of population viability analysis (PVA) were invented, starting in the late 1970s, to carry out that task (Shaffer 1978). Because most endangered or threatened species were at risk as a result of the small size of their populations, PVA methods were primarily used to generate models of populations that were under threat of stochastic (random) extinction.

In the United States and elsewhere concern was spreading among ecologists about the increased rate of destruction of neotropical natural habitats, especially rain forests, since the 1960s (Gómez-Pompa, Vásquez-Yanes, and Guevera 1972). At the sociocultural level one problem with generating political will for the protection of those habitats was the absence of conspicuous charismatic species found elsewhere, for instance, in Africa and Asia. Ecologists began to urge attention to all habitats and all biota in an explicit effort to generate such public support. An influential edited book titled *Conservation Biology* (Soulé and Wilcox 1980) documented the gradual emergence of a new discipline concerned with the protection of all biota, not just wildlife.

THEORETICAL ISSUES

Early research in the new discipline became bogged down in a series of seemingly intractable theoretical problems the reverberations of which continue to be felt today. First, PVA was supposed to establish minimum viable populations (MVPs) for individual species that would guarantee their survival with a specified probability (typically 0.95) for a certain number of years (typically 100 years). However, ecological PVA models were often subject to serious structural instabilities: Slight changes in assumptions led to serious divergence of results (Sarkar 2005). The MVP seemed to be highly sensitive to details of ecological context, and the concept fell into disuse by the 1990s. Even after three decades of sustained research, though new techniques for PVA, including new software packages typically based on computer simulations, have continued to be developed, detailed predictions of expected population extinction times and other parameters are often not considered reliable for small populations. A meta-analysis of three decades of work on this problem confirmed the context-sensitivity of the MVP (Traill, Bradshaw, and Brook 2007); the only general conclusion is that the MVP for most species exceeds a few thousand individuals.



Mkomazi Game Reserve, Tanzania. *The Mkomazi Game Reserve, in northeastern Tanzania, on the Kenyan border, was established in 1951. It is one of the only places in the country where one can spot a black rhinoceros. Like many conservation areas and national parks, Mkomazi has dealt with contention. To construct the reserve, government conservation officials evicted groups of pastoral herders from the land.* **© SYLVIE RALUY/BIOS/PETER ARNOLD, INC.**

Graeme Caughley (1994) urged that PVA concentrate on large populations for which model reliability can be tested in properly designed experiments with adequate controls. It has become clear that reliable PVA requires access to a range of demographic and other data for populations (typically intrinsic growth rates, carrying capacities of environments, age and spatial structures, etc.) that are not available except for a tiny fraction of species that are of conservation interest. Difficulties with PVA contributed to a shift in focus from individual species to habitats (or landscape elements) as units of conservation concern in the 1980s. This shift perhaps has been least pronounced in the United States, where the legal requirements of the ESA have continued to dominate conservation planning. Some major nongovernmental organizations (NGOs) continue to focus primarily on critically endangered species, but by and large conservation planning has taken a different route.

In the 1970s, when conservation biology was gradually becoming an independent discipline, the design of networks of reserves to protect habitats emerged as a major theoretical problem that generated several disputes. The problem of area prioritization for conservation attention has continued to be central to conservation biology, though the term *conservation area* has replaced *reserve* to indicate that managing habitats as traditional reserves is only one policy option (Sarkar 2003). In the 1970s and 1980s it was assumed that all areas managed for conservation should be similar to "wildernesses," which exclude permanent human presence or use. However, the determination of the most appropriate management plan to maintain species or habitats should be based on empirical research, not traditional intuition, in this case biased toward Northern conceptions of protected nature (Sarkar 1999).

ETHICAL AND PRAGMATIC ISSUES

Besides these scientific qualms, the wilderness model of conservation areas has been criticized on ethical and pragmatic grounds, most forcefully by social ecologists from the developing countries of the South (Guha 1989). Mark Dowie (2005) documented the creation of a new class of "conservation refugees" throughout the South created by the expulsion of people from their homes to create nature reserves. The Southern countries also typically have the most biota of conservation concern, in part because of the latitudinal species richness gradient (that is, the increase of richness with latitude) and in part because of the necessity of economic expansion to alleviate poverty. In such contexts excluding people from habitats to protect other species is both morally suspect and prone to generate local conflict that is inimical to the success of conservation plans. In response, proponents of conservation have urged that conservation areas be policed by armed militias (Brockington 2002). The resulting "fortress conservation" model has been challenged by anthropologists, political and social ecologists, philosophers, and social activists. Whether conservation biology still is committed to the fortress conservation model in the first decade of the twenty-first century remains a matter of controversy.

A lack of attention to empirical detail manifested itself in early attempts to solve the conservation area network (CAN) design problem in the 1970s in yet another way. The first attempts were based on applying island biogeography theory to the problem on the assumption that conservation areas in a landscape matrix are analogous to islands in oceans (Diamond 1975). This assumption was criticized on the ground that the analogy is misleading because the regions between conservation areas are not as inhospitable as oceans are to terrestrial species (Margules, Higgs, and Rafe 1982). Nevertheless, design principles based on such assumptions were promoted with vigor and sometimes advocated by NGOs that were beginning to become influential during the late 1970s. Research on the CAN problem also generated the "single large or several small" (SLOSS) debate, which was based on species-area curves as models for species distributions across landscapes. As with the MVP problem, it eventually was realized that any answer to the SLOSS question must be highly context-dependent (Soulé and Simberloff 1986).

ORGANIZATIONS AND MANIFESTOS

In 1985 the Society for Conservation Biology was founded in the United States to promote the new field (Soulé 1987). Its activities included the publication of a new journal, *Conservation Biology*. In a coordinated move, Michael Soulé (1986) published a manifesto that set the agenda for the new discipline. Two aspects of that agenda merit attention in this context. First, conservation biology was explicitly conceived of as a hybrid interdisciplinary field drawing insights from a variety of social sciences and philosophy besides biological disciplines. (However, conservation biology during the 1980s and 1990s rarely seriously engaged the social sciences and still only pays lip service to the humanities.) Second, the new discipline also had an explicit normative component based on assumptions such as evolution is good but extinction is not and that biological diversity has intrinsic value. Those normative assumptions were supposed to make conservation biology analogous to medicine, and Soulé drew an analogy to cancer biology. The fact that the manifesto took a stand on an issue as philosophically contentious as the ascription of intrinsic value to nonhuman entities has encouraged a refusal to countenance trade-offs between biodiversity protection and other legitimate human interests and has thus promoted the fortress conservation model.

Shortly after Soulé's manifesto, in 1986 Daniel Janzen exhorted ecologists to undertake the political activism

necessary to make conservation happen in the real world. Between 1986 and 1988 a new term, *biodiversity*, was introduced to refer to diversity at all levels of organization (Takacs 1996). The goal of conservation biology was the protection of biodiversity. Because of that goal, the concept of biodiversity has had a normative component since its introduction (Norton 2003). The first journal with *biodiversity* in its title, *Canadian Biodiversity,* appeared in 1991 and changed its name to *Global Biodiversity* in 1993; a second, *Tropical Biodiversity,* began appearing in 1992; *Biodiversity Letters* and *Global Biodiversity* followed in 1993. There was a sociologically synergistic interaction between the growing popularity of the term and the new field of conservation biology. In 1989 Soulé and Kathryn Kohm published a primer on research priorities for the field. In 1993 Richard Primack produced the first textbook of conservation biology, followed by Gary Meffe and C. Ronald Carroll (1994) a year later.

Those developments show that in spite of the theoretical impasses mentioned above, the early practitioners of conservation biology in North America succeeded in establishing research traditions that were independent from both academic ecology and traditional resource management studies such as forestry and fisheries science. However, in the late 1980s and early 1990s much of the theoretical progress and technical innovations in the field initially came from Australia. A 1989 volume of *Biological Conservation* (Margules 1989) recorded those developments, as did a textbook (Caughley and Gunn 1996).

Australian researchers were the first to advocate the use of computer-based and Geographical Information Systems (GIS) tools in the field. They also took planning for conservation—with all its pragmatic aspects and sociopolitical constraints—to be an integral part of the discipline. In the late 1980s they made significant progress in solving the CAN design problem (Margules, Nicholls, and Pressey 1988) by showing that a modified measure of beta-diversity called complementarity can be used to select conservation areas so that a maximal amount of biodiversity is represented in as minimal an area as possible. This ensures that resources are not wasted through ad hoc selection of areas for conservation management. Area selection algorithms have been implemented in software packages that can process large amounts of remote-sensed and other data as represented in GIS models. Beyond the many disciplines that Soulé (1985) envisioned as playing a role within conservation biology, the information sciences have emerged as a major component of the field.

SYSTEMATIC CONSERVATION PLANNING

Since, the mid-1990s the Australian innovations have been combined with the ongoing more traditional work on species' persistence, particularly in the United States, to generate an integrated framework that has come to be called systematic conservation planning (Margules and Pressey 2000). This framework is an incomplete synthesis because determining appropriate management options to ensure the persistence of biota remains an area of ongoing research. Single-species management continues to be driven by a species' autoecological requirements. For multiple species, ecosystem management, which focuses on the maintenance of basic ecological processes, has been proposed as a solution but also criticized (Simberloff 1998). It also has been argued that management be "adaptive" in the sense that goals and protocols should be updated periodically and systematically to reflect changes in the field (Holling 1978, Margules and Sarkar 2007).

The goals of systematic conservation planning are (1) adequately representing all components of biodiversity in CANs; (2) ensuring their persistence into the future; and (3) achieving those ends with maximum economy of resources (Margules and Sarkar 2007). Besides the requirement of economical resource allocation, sociopolitical considerations are incorporated into systematic conservation planning by requiring the explicit involvement of stakeholders from the beginning of the planning process. This requires attention to normative issues, including an answer to the question: Who is a legitimate stakeholder when the future of an area is being negotiated?

THE NEED FOR NORMATIVE ANALYSIS

The fact that this question remains relatively unexplored shows that in spite of Soulé's (1985) early recognition that conservation biology has an important normative component, ethics and associated normative disciplines have never been incorporated adequately into the field. Environmental ethics is rarely a required component of conservation biology curricula even though philosophers have pointed out the significance of normative issues for the field (Callicott, Crowder, and Mumford 1999, Norton 2003). Philosophers also have stressed the importance of decision theory and rational choice theory in analyzing decision making in the field; this aspect of normative analysis has gained some traction within the practice of conservation biology (Moffett and Sarkar 2006).

Besides incorporating normative issues completely, the goal of "integrative habitat planning," which generalizes systematic conservation planning, is to develop plans for entire land- and seascapes that optimize options for production (resource extraction, agriculture, etc.) and habitation in addition to management for conservation. In light of the extent of anthropogenic transformation of both land- and seascapes that has occurred, habitat reconstruction may be unavoidable in achieving such an end.

Conservation biology may benefit from increased interaction with restoration ecology. However, if the goals of the field are broadened to such an extent, conservation biology may become a misnomer that will be replaced by a more general term that reflects the increasing interdisciplinarity of the enterprise, going well beyond its origin in the biological sciences.

All planning and practice in conservation biology is fraught with uncertainty, from predicting the fate of a species or habitat to predicting the prospects for practical implementation of a management plan. All those uncertainties are compounded by projected global changes, in particular climate change, whose effects are difficult to predict. With respect to addressing issues relating to uncertainty, an interaction between conservation biology and epistemology has already begun (Reagan, Colyvan, and Burgman 2002), and further interaction with the philosophy of science has been urged (Sarkar 2005).

SEE ALSO *Biodiversity; Conservation; Endangered Species Act; Environmental Law; Nongovernmental Organizations; Society for Conservation Biology; Species; United Nations Educational, Scientific and Cultural Organization.*

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CONSUMPTION

The primary source of environmental damage is the population's production, use, and disposal of material goods. The only source of the material used in production is the natural environment, which is also the only place where the waste products associated with production and use can be disposed of. Consequently, higher levels of production and use of material goods cause higher levels of environmental stress and degradation.

THE RISE OF CONSUMERISM

Modern market economies have been labeled consumer economies because their productivity and the overall economic well-being of participants are often measured in terms of the delivery of an ever-expanding variety and quantity of goods and services to people. That flow of goods and services from our commercial businesses to our households far exceeds what is necessary to satisfy biological or even comfort needs. Consumerism and the consumer economy are a reflection of the affluence of at least some segments of most contemporary societies. In this economic context, people are increasingly described as consumers rather than as workers or citizens. Their primary economic function is to express their preferences for goods and services through their market purchases; a well-functioning economy is expected to respond to that effective demand by producing goods and services that match those preferences at affordable prices. It is not surprising, therefore, that those concerned with environmental degradation see high and growing levels of consumption as the primary source of environmental destruction. The more we consume, the more raw materials have to be extracted from the earth's crust and the more waste has to be dumped back into the earth's land, water, and atmosphere.

CONSUMERISM AND THE ENVIRONMENT

Although many environmental observers have argued that overpopulation is the primary source of environmental damage, it is clear that each person does not have the same environmental impact. A household's environmental impact is proportional to the level of consumption of goods and services and the technologies used in production, use, and waste disposal. A hunter-gatherer household using traditional means of livelihood may be compatible with sustainable natural systems. On the other hand, an economy supporting a contemporary upper-middle-class American suburban or exurban household may have an environmental impact 100 or 1,000 times as great. Population matters, but consumption levels and the technology deployed matter even more.

Given that much of what the economies of developed countries produce is not "necessary" for biological survival but rather seeks to satisfy consumers' discretionary subjective preferences, a potential for a serious ethical conflict arises. Under what circumstances does the pursuit of a discretionary subjective preference justify serious, perhaps permanent damage, direct or indirect, to the environment and other living things, including other people?

PROSPERITY VS. THE ENVIRONMENT?

If high and growing levels of consumption are the chief source of environmental damage, then it might appear logical to conclude that in a consumer-driven economy, there is an unavoidable conflict between environmental protection and economic well-being. On this view, reduced environmental damage would require reduced consumption, which, in turn, would translate into reduced economic activity. To be greener, a society would have to become poorer. Many in both the business and environmental communities have come to that conclusion. The business community sees environmental regulation as necessarily discouraging or banning certain types of economic activity. Some environmentalists insist that the only way out of growing environmental dangers is the voluntary adoption or governmental imposition of a simpler and more austere lifestyle that involves much lower levels of consumption (and economic activity).

This conventional analysis of the link between consumption, environmental degradation, and economic well-being confuses or ignores several important distinctions. First, it equates commercial businesses with the "economy" and treats those businesses as the sole source of economic well-being. Second, it assumes that economic well-being is primarily tied to material flows. Third, it ignores the flexibility people have in how they pursue their preferences—in the kinds of technology they deploy. Correcting these conceptual errors undermines the assumption that improvements in economic well-being necessarily bode ill for the natural environment.

In fact, economic well-being is heavily determined outside the commercial business sectors. A reduction in the level of commercial economic activity does not imply a reduction in prosperity. It is necessary to consider the productivity of the "total economy," including the productivity of natural systems and noncommercial sectors. Although some argue that the commitment to "consumption" is evidence of "materialism," often the purchase of material goods indicates a quest for subjective experiences, not the materials themselves. The purchase of an audio system does not imply a concern about the character of the material components: Consider the shift from vinyl records to magnetic-tape cassettes to CDs and DVDs to the direct digital download of music onto a variety of storage devices. People do not typically want

Landfill Overflowing with Trash. *While some environmentalists argue that overpopulation is the primary source of environmental degradation, others believe that consumption is the real culprit. This scene at a landfill in Ohio illustrates the large amount of materials that are discarded daily in a consumer-driven society.* **AP IMAGES.**

discs or tapes or even big speakers; they seek mainly the subjective experience of the music and the convenience of reproducing it, not the particular material form of the technology. The same is true of many consumer goods—they satisfy a desire for particular types of subjective experiences, styles, tastes, or conveniences, but not necessarily a desire for the accumulation of materials.

THE SERVICE ECONOMY AND MATERIAL THROUGHPUT

In addition, consumers are increasingly pursuing ''services,'' not goods—so much so that the U.S. economy is often described as a ''service economy.'' Services involve people or organizations assisting other people in realizing their needs, preferences, or desires. Services are labor- rather than material-intensive activities that run the gamut from health care to recreation guides to household repair to personal appearance to teaching. People go to restaurants because they are seeking an attractive human-designed atmosphere or environment in which to eat aesthetically attractive and expertly prepared food. The objective is not primarily the materials in use but the subjective, nonmaterial qualities that are added to them.

This development opens up the possibility of creating more valuable qualities and services with the same or even reduced material throughput. It is not clear, for example, that rearing more graceful, inquisitive, and imaginative children requires an ever larger environmental footprint. Nor is it likely that better-informed citizens, more beautiful poetry and music, or more skilled athletes are necessarily the result of increased greenhouse gas emissions. These and other aspects of human well-being need not be tied to material throughput and the resulting environmental disruption.

The scarce and productive resources that we protect and develop can be combined in many different ways to produce goods and services. This potential flexibility in production technologies and the mix of goods and services provides numerous possibilities for reducing environmental impacts while sustaining economic well-being. This

does not mean that every such possibility will be realized. Most countries' national economic policies are committed to expanding the levels of consumption rather than finding other means of protecting and improving levels of well-being. Continuous worldwide expansion in the levels of material consumption seems incompatible with environmental stability and long-run human well-being.

The important public policy question is how to shift from efforts to enhance well-being mainly through expanding material throughput, with its accompanying environmental disruption, to fostering noncommercial sectors and commercial businesses that can boost prosperity without harming the planet. Markets cannot do this because many of the important sources of well-being are nonmarket and noncommercial in character, for example, family life, culture and education, supportive communities, the rule of law and respect for diversity, and other elements of rich, productive, and stable social and natural environments. Cultural, social, and political institutions will have to direct this change. Once the legal framework has been imposed for steering toward this objective, markets might help to attain it in the most cost-efficient manner.

ETHICAL AND PHILOSOPHICAL ISSUES

Environmental ethics and philosophy are central to understanding the likely cost or gain of modifying the economy to make it ecologically sustainable. Central to this issue is the question of what incremental changes in material consumption contribute to well-being as opposed to, say, the contribution made by changes in activities, social status, aesthetic enjoyment, social and cultural solidarity, and interaction with natural systems. What are the important elements of the good life, and how can their attainment be made consistent the long-term human habitation of a natural world?

This is not an ethical or philosophical inquiry that can be carried out in the abstract. The social sciences make important contributions to the understanding of the subjective experience of well-being and the collective management of its pursuit in ways that respect both the autonomy and the basic social character of individuals. One example is the accumulating evidence that, after people have reached a minimum level of insulation from the harsh pangs of biological necessity, their experience of well-being is correlated with their perceived social status. That is, people often judge well-being in relative, not absolute, terms, immersing themselves in a costly game of competitive consumption in which most of them end up losers while exhausting themselves and their families and inflicting damage to the social and natural environments. It will require the combined resources of environmental ethics, philosophy, and critical social science to find ways to promote greater consciousness of the broad range of the sources of human well-being and the serious costs of consumption in the quest for an environmentally sustainable prosperity.

SEE ALSO *Environmental Policy; Population; Sustainability.*

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Thomas Michael Power

CONVENTION ON BIODIVERSITY

The Convention on Biological Diversity is an international treaty for conservation of biological diversity, sustainable use of the environment, and equitable sharing of the benefits of genetic resources (see Table 1). The convention addresses some of the central topics in contemporary environmental ethics and philosophy, such as the concept of biodiversity and anthropocentrism versus ecocentrism (Yamin 1995). Other philosophical issues dealt with by the convention include the moral status of nation-states and the ethical obligations of the present generation to future generations.

HISTORY

The World Conservation Strategy of 1980 adopted by the World Conservation Union, World Wide Fund for Nature, and the United Nations Environment Programme is considered the starting point of negotiations at the United Nations (UN) throughout the 1980s that culminated in the Convention on Biological Diversity (Shine and Kohona 1992, Boyle 1996, Stoianoff 2004). Whereas the World Conservation Strategy focused on the loss of biological diversity, the UN Environment Programme's Governing Council also wanted to address socioeconomic

Main Goals of the United Nations Convention on Biological Diversity

Article	Article Topic or Goal
Preamble	**Characterizes the conservation of biological diversity as a "common concern of humankind."**
1	Describes convention's objectives: conservation and sustainable use of biodiversity and equitable sharing of genetic resources.
2	Defines *biological diversity* and *sustainable use*.
3	Affirms states' rights to exploit their own resources.
6	Delineates requirements for national and international conservation plans.
7	Describes directives for biodiversity monitoring. Each state creates its own list of important ecosystems and species.
8	In situ conservation: conservation of ecosystems and species in their natural habitats.
9	Ex situ conservation: conservation in seed and gene banks and zoos.
10	Sustainable use of biological resources to prevent their long-term decline.
11	Incentive measures.
12	Establishment of scientific training programs related to biodiversity and support for such training for developing countries.
13	Public awareness and education.
14	Environmental impact assessment and the minimization of adverse impacts.
15	Rights of states to genetic resources. Requirements for sustainable use limit state sovereignty over genetic resources.
16	Transfer of biotechnology.
18	Improvement of the research and technical capabilities of developing countries.
19	Distribution of the benefits of biotechnology.
20	Financing of the convention, including the transfer of funds from developed nations to developing nations.
24	Establishment of the convention secretariat (located in Montreal), which organizes meetings of the Conference of the Parties.
25	Establishment of a subsidiary body to provide scientific, technological, and technical advice.
27	Dispute resolution.
39	Establishment of the Conference of the Parties and designation of the financial mechanism of the convention.

SOURCE: Compiled from data from the *Handbook of the Convention on Biological Diversity Including Its Cartagena Protocol on Biosafety*, Third Edition. Montreal, Canada.

CENGAGE LEARNING, GALE.

issues in developing countries that contributed to that loss. In 1986 the World Commission on Environment and Development proposed legal principles that would require states to maintain maximum biological diversity. In 1987 the UN Environment Programme Ad Hoc Working Group of Experts on Biological Diversity proposed a convention on biological diversity, the drafting of which began in 1989 (Secretariat of the Convention on Biological Diversity 2005). From 1991 to 1992 the UN Environment Programme Working Group of Legal and Technical Experts negotiated the treaty in seven sessions. The Convention on Biological Diversity was opened for signature at the UN Conference on Environment and Development on June 5, 1992, in Rio de Janeiro. One hundred eighty-seven countries and the European Union (EU) have subscribed to the convention, which entered into force on December 29, 1993.

SIGNIFICANCE

In contrast with previous environmental treaties, which were designed to protect particular ecosystems, species, or resources, the Convention on Biological Diversity represents a new development in international law to the extent that it formulates a comprehensive framework for the conservation of global biological diversity (Boyle 1996). However, the term *biological diversity*, as used in the convention, has several meanings. For example, the preamble of the convention ascribes "intrinsic value" to biological diversity, but its articles exemplify anthropocentrism insofar as they characterize utility to human beings as the fundamental purpose for conserving the environment (Yamin 1995). The convention equates biological diversity with "variability among living organisms" (Article 2) but also lists wilderness as a component of biological diversity (Annex I) (Sarkar 1999). The conflation of biodiversity and wilderness is not justified on scientific grounds and may have been added to the convention for political reasons.

The convention constitutes a case study in ethics because of its use of the principle of distributive justice. Recognizing that biodiversity is concentrated in southern countries but wealth is concentrated in northern countries, Article 8 directs northern countries to provide

financial support to developing countries for biodiversity conservation, scientific education, and training. In addition, the convention acknowledges the ethical obligations of present-day human beings to posterity, prescribing that biological diversity be used to "meet the needs of present and future generations" (Article 2).

PROPOSAL OF THE CONVENTION

Serious disagreements between developed nations and the Group of Seventy-Seven nonaligned developing nations complicated the negotiations for the convention. Developing states sought access to biotechnology and compensation for providing biological resources to developed nations. The United States objected that the directives of the convention for the transfer of biotechnology would erode intellectual property rights; ultimately, the convention was signed by the Clinton administration but not ratified by Congress (Boyle 1996). Drafts of the convention characterized biological diversity as the "common heritage" of humankind, but that wording was dropped from the final version because developing nations were concerned that it could justify infringement on national sovereignty.

ACCEPTANCE AND EFFECTS OF THE CONVENTION

Since the convention entered into force, it has become standard practice to obtain informed consent from developing countries for natural products discovery programs intended to produce new drugs or improved crop plants; however, not enough time has passed for this practice to provide royalties to developing countries (Davis 2007, Miller 2007). Administrative bodies created by the convention include the convention secretariat and the Conference of the Parties, which reviews the implementation of the convention and can amend it. However, the convention does not create an international authority to manage shared biological resources (Boyle 1996). This is problematic because it is sometimes unclear where the authority to regulate a sought-after biological resource resides within the government of the country that has that resource (Lesser 1998, Chaves 2004). To address this issue, the convention secretariat created a list of national focal points to help organize negotiations on the sharing of genetic resources.

Since 1998, sixteen developed countries have provided $1 billion per year to fund the objectives of the convention, but such financing has been in decline or stagnant (Secretariat of the Convention on Biological Diversity 2006). Nevertheless, the convention secretariat has set the agenda for international environmental agreements such as the Cartagena Protocol on Biosafety, which regulates the international transportation of genetically modified organisms; the Bonn Guidelines on Access to Genetic Resources; and the 2010 Target, a program to establish an ecologically representative network of terrestrial protected areas by 2010 and marine protected areas by 2012 (Secretariat of the Convention on Biological Diversity 2006).

Since ratifying the convention, the EU has developed laws to promote the sustainable use of biodiversity (as required by Article 6) and to protect wildlife through conservation areas, seed and gene banks, and zoos, as required by Articles 8 and 9 (European Commission 2006). The EU also has provided €60 to €200 million per year since 2001 for biodiversity-related projects in developing countries. Since the convention entered into force, the governments of Ecuador and the states of Queensland and Western Australia in Australia have enacted legislation conferring on their citizens the right to profits generated by biodiversity; in addition, Costa Rica, Fiji, Mexico, and Peru have passed laws to ensure that access to genetic resources is based on prior informed consent (Stoianoff 2004).

SEE ALSO *Biodiversity; Environmental Philosophy: V. Contemporary Philosophy; Future Generations; Rio Declaration; Seed Banks; Sustainability.*

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CONVERGENCE HYPOTHESIS

Bryan Norton's convergence hypothesis, a controversial argument about the predicted policy implications of alternative environmental ethical theories, is best understood against the backdrop of the rise and dominance of nonanthropocentric approaches in environmental ethics in the 1980s and early 1990s. The human-centeredness of the conventional Western ethical system was singled out by the first wave of environmental philosophers for its failure to extend the boundaries of moral considerability—which often was understood as the attribution of intrinsic value—to nonhumans (including animals and plants), species, and ecological communities. The primary intellectual task for most environmental ethicists since the early years of the field thus has been the articulation of a new nature-centered or nonanthropocentric worldview and an accompanying normative system that can account for the good of nonhumans and nature as a whole and compel the promotion of that good in ethical decision making.

ANTHROPOCENTRIC AND NONANTHROPOCENTRIC PERSPECTIVES

This mandate to combat unbridled anthropocentrism in environmental ethics always has harbored a serious policy ambition. By raising the flag of nonanthropocentrism, philosophers were hoping to advance a persuasive moral justification for a robust environmental policy agenda and a general rationalization of proenvironmental practices. If an ethical defense could be mounted successfully, public policies directing the protection of endangered species, wetlands, wilderness, natural areas, and so on, would appear to rest on solid and perhaps unassailable foundations.

The judgment that a nonanthropocentric program is necessary to combat moral humanism and underwrite stringent environmental policies and practices did not go unchallenged. One of the more visible and historically important dissents was voiced in the mid-1980s by Norton, who argued that the adoption of a nonanthropocentric worldview was neither philosophically viable nor politically necessary (Norton 1984). Norton disputed the prevailing view in environmental ethics that humanism was the enemy of environmental protection by advancing a less aggressive, pluralistic version of anthropocentrism. Calling the new approach "weak" anthropocentrism, Norton proffered a kinder and gentler vision of humanist environmentalism that marked a departure from the generally hostile reception of the anthropocentric worldview within environmental ethics.

Norton's alternative anthropocentric project was articulated most fully in his influential 1991 book *Toward Unity among Environmentalists.* He made the provocative claim that what had been presented as the foundational rupture in the moral bedrock of environmental concern—the deep rift between anthropocentrism and nonanthropocentrism—was vastly overestimated. Norton wrote that nonanthropocentric claims and his own formulation of weak anthropocentrism should, in practice, "converge" on the same set of environmental policy goals. He named this argument the convergence hypothesis and stressed that it was both an "article of environmentalists' faith" and an empirical hypothesis that could be falsified by subjecting it to experimental text (Norton 1991, p. 240). Logically, the convergence thesis was a hypothetical conditional: It predicted that if individual A is a consistent weak anthropocentrist (embracing the full range of human values in the environment—aesthetic, spiritual, recreational, educational values—over time) and individual B is a nonanthropocentrist who endorses a consistent notion of the intrinsic value of the environment, both A and B will end up supporting the same environmental policy positions.

Norton predicted this convergence because he believed that despite their different philosophical starting points, weak anthropocentrists and nonanthropocentrists embraced values that were ultimately dependent on the long-term ecological sustainability of natural systems. The maintenance of multigenerational ecological processes, he argued, was the only way to preserve ecological health,

integrity, and biological diversity over the long run whether this was done for the good of present and future generations of humans (the weak anthropocentrist position) or for the value that such ecological health, integrity and biological diversity possesses in or for itself (the nonanthropocentrist position). In *Toward Unity*, Norton illustrated the hypothesis by referring to environmentalists' efforts to protect wetlands, a policy goal that united advocates of a variety of value and ethical orientations, including hunters and traditional conservation organizations such as Ducks Unlimited and the National Wildlife Federation as well as nature/wildlife appreciation societies such as Audubon and Defenders Of Wildlife (Norton 1991).

THE PRAGMATIST MOVEMENT IN ENVIRONMENTAL ETHICS

Although Norton's prediction of the policy convergence of nonanthropocentric and anthropocentric positions was a bold move in environmental ethics, he drew a further conclusion that ensured that the convergence hypothesis would become a lightning rod for criticism. Because he believed in the empirical validity of the convergence thesis and also believed that a number of thorny and insurmountable philosophical and practical problems afflicted nonanthropocentric theory, he concluded that it was more effective to argue for environmental policy goals from the weak anthropocentric point of view, that is, from the standpoint of the maintenance of options for future generations (Norton 1999). The convergence thesis thus took a pragmatic and consequentialist line on value debates in environmental ethics. He favored normative arguments, such as the claim that the environment should be protected for its ability to provide a harvest of cultural values for present and future generations, that he believed would lead most effectively to the resolution of actual environmental controversies.

In taking this position, Norton tended to cast aside other arguments, such as the nonanthropocentrist appeal to the intrinsic value of nature, that he felt would not resonate as strongly with mostly anthropocentric-minded decision makers and citizens. The turn to naturalistic methods and empirical tests to resolve value disputes in environmental ethics and Norton's work in the field generally have become fixtures in the pragmatist movement in environmental ethics and philosophy, an alternative set of approaches emphasizing value pluralism, experimentalism, and the search for policy consensus despite value differences (Light and Katz 1996, Norton 2003).

DEBATE AND CRITICISM

Norton's argument for convergence and discussion of the implications of convergence for environmental ethics and environmental policy have generated a great deal of debate. Critics such as Brian K. Steverson, J. Baird Callicott, Laura Westra, and Mikael Stenmark have rejected the convergence argument, declaring Norton's prediction of the policy junction of weak anthropocentric and nonanthropocentric positions suspect or, in Callicott's words, "dead wrong." Callicott, Westra, and others insist that it makes a great practical difference whether one argues from anthropocentric or nonanthropocentric principles in discussions of policy and conservation. These "divergence" proponents argue that humanist and nature-centered moral stances ultimately will lead to very different environmental policy agendas and practices (Minteer 2009). Most criticisms of Norton's thesis, however, have been largely conceptual and hypothetical. One attempt to test his thesis with experimental methods (Minteer and Manning 2000), however, provided empirical confirmation of Norton's argument by demonstrating the convergence of Vermont citizens' ethical attitudes on a common agenda for ecosystem management.

In more recent work Norton (2005) argued that the convergence hypothesis may be only temporarily valid because it is premised on a philosophical dualism that he hoped will be replaced by a more integrated, less antagonistic account of the relationship between environmental and human values. In such a nondualistic worldview, Norton believes, the convergence hypothesis no longer will be necessary; indeed, it will "wither away for lack of polarized interests to be brought together" (Norton 2005, p. 510).

SEE ALSO *Biocentrism; Callicott, J. Baird; Environmental Philosophy: V. Contemporary Philosophy; Environmental Policy; Future Generations; Norton, Bryan; Pragmatism.*

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CORAL BLEACHING

Coral bleaching occurs when corals expel the symbiotic algae that live within them, giving the remaining live tissue a whitish or bleached appearance. Corals normally function as both animals and plants because they obtain energy in two ways: by breaking down organic molecules caught by the tentacles of the coral polyps and by means of photosynthesis in the symbiotic algae. Bleaching therefore significantly reduces the ability of a coral to obtain energy, and although corals can recover from a bleaching event, mortality of the entire colony may result if the bleaching is too extensive or persists for too long.

PHYSICAL CAUSES

The causes of bleaching are not always clear, and a number of factors may be involved. There is general agreement that high water temperatures usually result in bleaching, but other factors, such as bacteria and disease, have been implicated. This suggests that bleaching is caused by multiple stress factors. Corals can withstand a certain level of stress, but they expel their algae when the total of all stress factors passes a threshold level (which varies for different species). It seems counterintuitive that corals respond to stress by doing something that places additional stress on them by reducing their energy intake, but corals may still see the symbiotic algae as "foreign" tissue and reject the algae under conditions of severe strain.

Stresses interact in that a coral that is stressed by high temperature, for example, and expels its algae is weakened and therefore is less able to resist bacterial infection. This is why bleaching can have a devastating effect on a stressed reef, whereas an unstressed reef in pristine conditions can recover. In general, therefore, increased stress on corals leads to increased frequency of disease and mortality.

ANTHROPOGENIC CAUSES

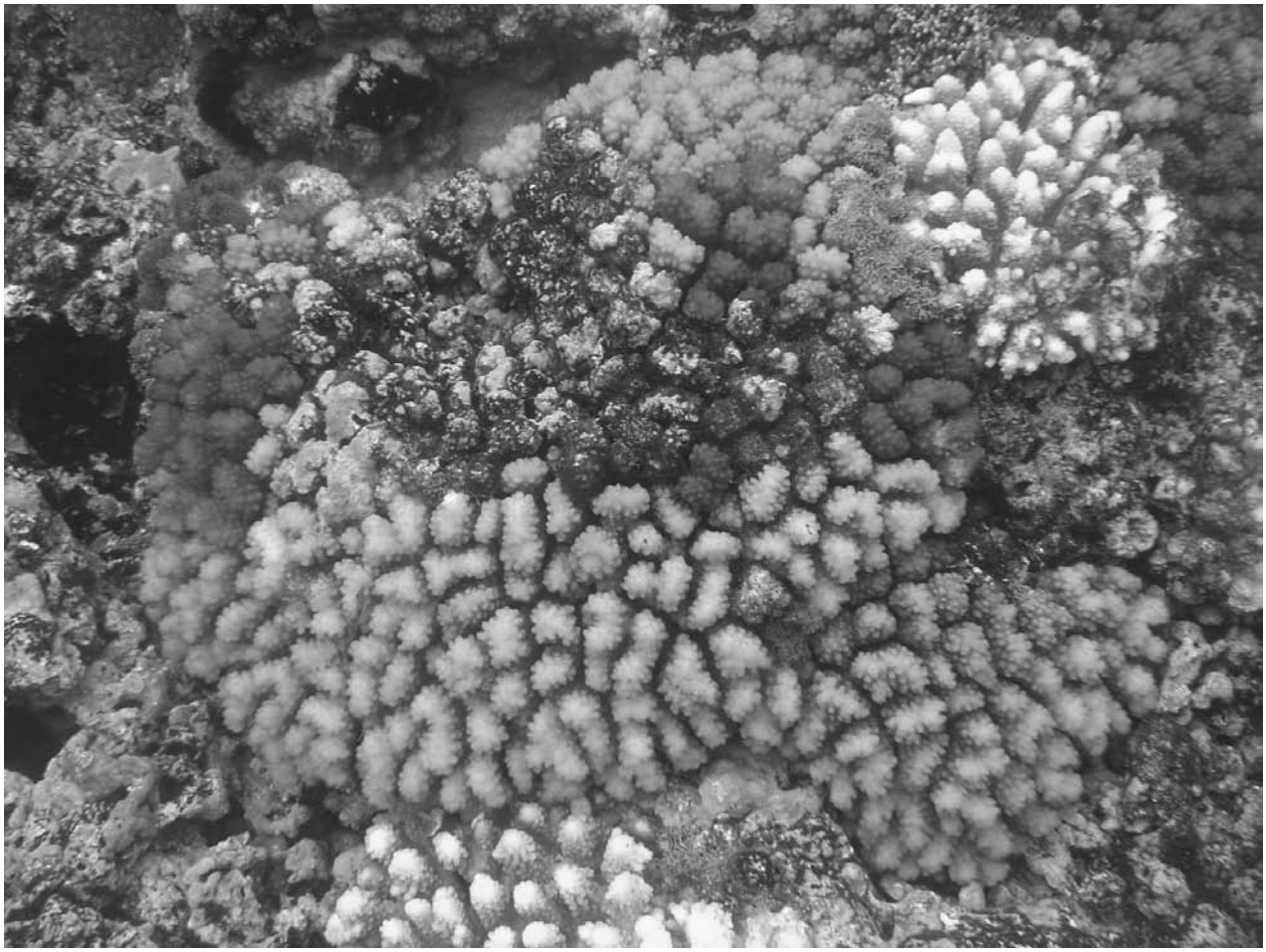
A number of anthropogenic features can increase the frequency and extent of bleaching events, including global climate change. The documented incremental increase in average daily temperatures has been relatively small so far; National Aeronautics and Space Administration (NASA) figures showed a mean increase of 0.6°C in global sea surface temperatures between 1976 and 2005. However, this small increase in the average temperature can be misleading because sea temperatures fluctuate. This means that a small increase in the average temperature can cause two serious problems: substantial increases in peak temperatures and increases in the total number of days on which temperatures exceed coral thermal tolerance levels. For shallow-water coral species in the Caribbean, for example, bleaching is common when water temperatures exceed 31°C. Thus the modest average increase in sea temperatures has resulted in a substantial increase in both the number and the extent of yearly bleaching events. Between 1979 and 1990 there were more than 60 recorded coral reef bleaching events out of a total of 105 coral mortality events, compared with just 3 recorded bleaching events out of a total of 63 coral mortality events over the previous 103 years. The warmest twelve-month sea temperatures on record occurred in 1998, a period that was associated with exceptionally severe coral bleaching.

However, the interrelationship between human influences and bleaching is complex, as local warming factors in one section of the globe can lead to disruption of the prevailing currents in another section, as occurs with the El Niño and La Niña periodic events. This can lead to increased cooling and less extensive bleaching at some localities in some years.

Another complicating factor is the fact that different coral species in different localities around the world are adapted to different temperature regimes. Coral species in the Persian/Arabian Gulf, for example, can tolerate temperatures over 31°C and seasonal temperature variations of over 9°C, but Caribbean and Indo-Pacific species subjected to a similar regime would experience extensive bleaching and high mortality rates. Similarly, shallow-water coral species are subjected to higher temperatures and greater temperature ranges than are their deeper-water counterparts, and some researchers have suggested that the shallow-water species are more resilient, either bleaching less or being more likely to recover from bleaching once it has occurred.

Thus the connection between anthropogenic climate change and coral bleaching is complex and not well established. However, there are strong grounds for thinking that it is an important cause of bleaching in regions such as the Caribbean.

More generally, it is clear that a range of human activities have led to a significant decline in coral reefs around the world. The most vulnerable reefs are usually those in shallow water close to human population centers.



Coral Bleaching in Guam, Mariana Islands. *One environmental cause known to increase the frequency and extent of coral bleaching is global climate change, although many factors are involved in the causal mechanisms. While coral can recover from a bleaching event, if it is severe enough bleaching can lead to the death of the entire coral colony.* **DAVID BURDICK/NATIONAL OCEANIC AND ATMOSPHERIC ADMINISTRATION/DEPARTMENT OF COMMERCE.**

These areas are typically under stress from many anthropogenic factors, such as the following:

- The discharge of nutrients in the form of human wastes and agricultural runoff into shallow coastal waters can result in the increased presence and growth of algal species, which then overgrow the coral reef. This algal cover prevents coral growth and settlement and in some cases can cause coral death by cutting off access to oxygen and sunlight.
- Overfishing can remove many of the species involved in the complex predator-prey dynamics of the reef. Overfishing primarily removes the large fish that are terminal predators in the food chain, leading to an increase in boring and encrusting organisms that compete with or kill corals.
- Pathogens can spread to different regions through the discharge of ballast waters from ships.
- Silt from eroding soils or construction work can flow down rivers into coastal waters, cover reefs, and kill them by cutting off their oxygen and sunlight.

These problems also interact. Increased pollution, for example, often leads to increased water turbidity as algal microorganisms proliferate at higher levels of phosphates and nitrates, decreasing sunlight and thus photosynthesis. A surge in algal growth normally supports an increase in herbivorous fish and other organisms that eat algae, but growing fishing pressure may remove too many of those organisms and prevent herbivorous fish populations from increasing. This allows the algae to spread unchecked. Increased sediment levels also can decrease photosynthesis and at the same time increase energy expenditure by the corals as they secrete extra mucus to rid themselves of the deposited sediment particles.

If a coral is subjected to a number of these pressures as well as to higher water temperatures than it can tolerate, it is unlikely to survive for long. As a result of these combined pressures, many inshore corals around the world have suffered extensive and sustained bleaching from which they have not been able to recover.

CONSEQUENCES AND POSSIBLE SOLUTIONS

The death of coral has a number of serious consequences, such as loss of biodiversity, including potentially valuable sources of new pharmaceuticals; collapse of fisheries; and loss of coastal protection. Some of the sources of stress—such as climate change—are difficult to remediate, but others—such as overfishing, sewage runoff, and ballast discharge—can be controlled. This might be sufficient to reduce the stress back to a tolerable level in many cases. Thus much of the damage could be prevented.

SEE ALSO *Biodiversity; Global Climate Change; Hunting and Fishing: V. Commercial Fishing; Mexico and Central America; Oceans; Pollution.*

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COST-BENEFIT ANALYSIS

Cost-benefit analysis (CBA) is a method of evaluating investments in public projects, programs, and policies. The analysis seeks to determine whether the initial costs of the investment will yield commensurate benefits later. The theoretical foundations and empirical methods of CBA are shaped by the ideas of publicness and investment. From publicness comes the concept of benefits as aggregate public willingness to pay (WTP; as opposed, say, to owners' profit), and from investment theory comes the notion of expressing the benefit and cost streams in present-value terms.

CONCEPTS OF COST AND BENEFIT: HISTORICAL ROOTS

In 1776 the Scottish moral philosopher and pioneering political economist Adam Smith (1723–1790) asked us to imagine a group of neighboring farmers: All could benefit from extending a canal into their district, but none acting alone would profit enough to bear the cost. Yet, if they all cooperated, the total benefits would exceed the cost. Furthermore, it should be possible to calculate a set of individual contributions that would cover the cost and allow every one of the farmers to profit from extending the canal. This idea was extended in the work of several nineteenth-century thinkers: The English utilitarian philosopher Jeremy Bentham (1748–1832) popularized the view that public virtue resides in whatever policy yields the greatest good for the greatest number; in 1844 the French civil engineer and economist Jules Dupuit (1804–1866) advanced the argument that the benefit of building a bridge was the sum of the users' willingness to pay. In the late nineteenth century the Italian sociologist, economist, and philosopher Vilfredo Pareto (1848–1923) argued that public action is justified if it benefits at least one person at the expense of none (actions that meet this test became known as Pareto-improvements). Around 1940 the Cambridge economist Nicholas Kaldor (1908–1986) and the Oxford economist John Hicks (1904–1989) independently offered a way around Pareto's demanding test: If the gainers from a proposed action could hypothetically compensate the losers, the action would constitute a potential Pareto-improvement (PPI). The PPI implements Bentham's criterion by aggregating individual benefits and costs, but with an important twist: Individuals will be the judges of the costs and benefits they (expect to) experience.

APPLICATION OF CBA: A BRIEF HISTORY

In the United States the Flood Control Act of 1937 enabled the allocation of federal funds to water-resources projects so long as the benefits conferred on the recipients exceeded the costs. Intentionally or otherwise, Congress thus unleashed a continuing process of developing and refining formal CBA procedures, punctuated by periodically updated principles and guidelines. By the early 1950s the World Bank, faced with the problem of making prudent investments in impoverished countries with premodern economies, began to incorporate modern CBA into the tradition of financial-feasibility analysis and thereby generated contributions to the professional literature and operational manuals for practitioners. About the same time U.S. water-resource agencies began looking toward recreational benefits to help justify additional projects, focusing attention on nonmarket valuation to estimate WTP that is not revealed in markets.

KEY CONCEPTS

Benefit: Benefits are the value of goods and services received. To get these goods and services, people are willing to pay as much but no more than the benefits. It follows that willingness to pay (WTP) is a measure of benefits.

Cost: Costs are the value of goods and services given-up or foregone. To induce people to give-up these goods and services voluntarily, they would need to be given acceptable compensation. It follows that willingness to accept compensation (WTA) is a measure of costs.

Present Value and Discounting: To induce commitment of capital now in expectation of benefits later, the acceptable net benefit must be at least as great as the amount of interest that could be earned by simply banking the money. In cost-benefit analysis, it is standard practice to systematically account for the value of capital committed over time by discounting future benefits and costs by the rate of interest, which reduces future costs and benefits to present value.

Laws requiring CBA remain the exception, but well-entrenched executive practice routinely considers benefits and costs for a considerable set of public activities in many countries. Many countries and international agencies have issued detailed manuals for conducting CBA in both general and specialized applications. Furthermore, public agencies often conduct CBA where it is not formally required, as part of the public process that attends controversial proposals. CBAs produced in academic institutions and research organizations are likely to have informal influence even when they have no formal standing in reaching a decision.

CONTEMPORARY CBA

By the 1970s the theory of welfare-change measurement (basically, utilitarian accounting consistent with modern microeconomic theory) was well established as the foundation of modern CBA. WTP for gains and WTA (willingness to accept) for losses have been recognized as the ideal measures of value in CBA; market prices, demand, and supply are also acceptable insofar as they reflect WTP and WTA accurately.

If value is not revealed directly in markets, it must be inferred from actual consumer decisions or from choices in hypothetical or contingent contexts. The travel-cost method estimates demand for outdoor recreation by inference from the time spent and costs incurred in accessing the recreation site. Because air quality is an attribute of houses and workplace safety is an attribute of jobs, hedonic price analysis (which decomposes the value of a product or service into the value contributed by its various attributes) estimates the marginal WTP for these amenities through econometric analysis (the application of statistical methods to economic problems and data) of housing and job markets, respectively. Contingent-choice experiments infer nonmarket amenity values from hypothetical choices among, say, vacation resorts with different features and costs. Contingent valuation uses survey or experimental methods to discover citizens' stated WTP for environmental amenities directly or by inference from their choices in hypothetical referenda. A large body of literature addresses theoretical and estimation issues with each of these methods and reports empirical results; meta-analyses (statistical analyses of findings from previous research) have proved useful in generalizing the findings of site- or project-specific studies. Nevertheless, nonmarket valuation remains challenging, and some controversies endure. For example, charges persist that contingent valuation fails various rationality tests despite the accumulating evidence that people's choices deviate systematically from expected rational choices in general, not just in matters of contingent choice.

Modern CBA seeks to conform to the theory of welfare-change measurement, but there is some hesitancy to embrace WTA fully, and some skepticism about nonmarket values. WTA, as the measure of losses, is susceptible to the holdout problem—one individual refusing even huge amounts of (hypothetical) compensation would, if taken literally, doom any public-goods proposal. Nonmarket values have equal standing with market values, other things being equal. But other things are not always equal—markets may be incomplete and misleading about value (where, for example, trade is impeded, or polluters can escape the costs of the damage they cause), and nonmarket value estimates may be based on evidence thought by some to be thin and controversial (experts under contract to the Exxon Corporation raised these kinds of charges in response to nonmarket estimates of economic damages from the *Exxon Valdez* oil spill).

ETHICAL FOUNDATIONS OF THE COST-BENEFIT CRITERION

Economists are likely to justify the cost-benefit (CB) criterion (acceptable projects are those that yield positive net present value) as a filter for inefficient public investment and as a defense against rent seeking (the promotion of proposed projects by prospective beneficiaries,

even when positive net benefits for society are unlikely). A better ethical justification for the CB criterion is possible: It evaluates proposed actions by offering a reasonably good accounting of their prospective contribution to the satisfaction of human preferences (Hubin 1994). This kind of account places a high value on the goodness of outcomes. It aggregates benefits and costs across gainers and losers anonymously (i.e., without consideration of who, and what sorts of people, stand to gain and lose), and it makes individual preferences the foundation of value (Randall 1999). So the CB criterion has coherent ethical foundations, even though they are controversial and have elicited objections from adherents of other ethical systems.

CB CONTROVERSIES

The CB criterion gives voice to human preferences for environmental goods and services that would likely be ignored or undervalued in ordinary accounts of private gains and losses. Yet it remains controversial from several standpoints.

Philosophical When applied to environmental issues, the CB criterion encounters objections from proponents of alternative ethical theories.

- *Preferences may be ill-considered and ephemeral, which would distort estimates of benefits (and costs, which are also subjective).* Decisions about environmental matters may commit society to long-lived outcomes (at worst, some natural asset, such as a forest, may be lost forever); some critics worry, therefore, that, because human preferences might be whimsical, ill-considered, and shaped by the past, they might travel poorly into the future. The sense that preferences are impermanent may lead to a quest for some more enduring foundation for value.
- *Value may involve more than preference*. The German philosopher Immanuel Kant (1724–1804) insisted that aesthetic judgments, although subjective, involve much more than mere personal preference—such judgments can make a claim to interpersonal agreement because they arise from good reasons and shared experiences. The view implies that certain natural entities have intrinsic value—a good of their own, independent of human concern.
- *The great moral questions should be addressed by principles, not values.* Kant also contended that universal moral principles could address the important decisions of human and social life, an argument that relegates mere preferences to a lower order of ethical significance. This perspective leads to a search for moral principles that imply human duties toward natural entities.
- *The great moral questions are best addressed in terms of rights that must be respected.* Rights-based theories of the good offer an array of positions. For example, contractarians (those who believe that moral standards derive their legitimacy from a social contract or common agreement) object to the PPI criterion, arguing that hypothetical compensation is a kind of hypothesis, not a kind of compensation. Libertarians might argue that people's rights to enjoy nature oblige other people not to befoul it.
- *It is not just about humans.* Standard economics assumes, along with many other strands of philosophy, that humans are the only entities whose concerns matter. This position has been attacked from many quarters: Some Utilitarians argue that animal welfare matters, some Kantian aesthetes ascribe intrinsic value to natural entities, and some rights-based deontologists (those who stress the inherent rightness or wrongness of actions rather than their consequences) contend that rights should be extended to natural entities.
- *Perhaps it is not about humans at all.* The basic program of deep ecology is to take any or all of the basic approaches of moral philosophy and expand the set of entities that matter—that is, entities whose welfare counts, that have a good of their own, and/or that have rights—independently of human concern or patronage.

Issues That Engage Economists The claim that CBA offers a reasonably good accounting of prospective welfare change invites this question: Even if this proposition is true, what are the caveats underlying the qualifier ''reasonably''?

- The PPI values and prices used in CBA, WTP, and WTA are consistent with the standard concepts of market value (buyer's best offer, seller's reservation price, and, ideally at the margin, market price). This consistency (imperfect as it may be) with market value has evidentiary value in cases where market observations are available and grounds the claim that the CB criterion is a filter for proposed actions that would increase the size of the game. Because individual WTP is constrained by the ability to pay, however, the preferences of the well-off count for more in CBA. Economists have considered various valuation frameworks that give added weight to contributions to basic needs or gains to the worst-off households, but in the end economists usually decide against such amendments and in favor of consistency with the PPI criterion.

- Issues of risky future outcomes are usually addressed in CBA by expressing costs and benefits in expected value terms, an approach that is appropriate when probabilities can be specified and the decision maker is risk-neutral. Uncertainty is usually addressed through option values, and risk aversion sometimes enters into the CB calculations. These accommodations to risk and uncertainty may be inadequate to deal with gross ignorance (a condition in which we are unable even to enumerate the possible outcomes) about the workings of environmental systems under increasing levels of stress from human activities; some economists are sympathetic to precautionary restraints invoked for threats beyond an appropriate threshold. Precautionary restraints may take the form of interruptions in the activities that stress the system (e.g., resource harvest, waste disposal, or introduction of new technologies with unknown consequences) to provide scope for the system to recover (as with a safe minimum standard of conservation) or allowing time for people to learn more about the dangers involved and the potential for mitigating harmful prospects (UNESCO 2005).
- Calculating net present values discounts future prospects and serves as a lightning rod for critics who interpret discounting as devaluing future welfare. Discounting does in fact devalue future prospects in the "cake-eating" case, which is all about determining the ideal rate at which to consume an endowment (e.g., a cake of given dimensions). However, a cake is a poor metaphor for a productive economy. It turns out that positive discount rates are necessary to maximize long-run welfare in a productive economy, because capital is productive and scarce. In the productive economy case, discounting does not devalue future welfare, so long as utility itself is not discounted.

Objections from Environmentalists

- Some environmentally concerned critics claim that CBA is an economic tool that is out of place in the environmental arena. This view seems to express an intuition that the economy (and economics) is the problem, not the solution.
- Environmentalists often object that CBA views everything in terms of its monetary value. But money is not the real issue. Money, after all, is just a convenient token of value in exchange. The real issue is that this monetary outlook assumes the economic fungibility of environmental entities: that they can be exchanged for, and substituted for, equivalents in ordinary goods and services, and that tradeoffs across these two categories are meaningful. The notion of fungibility is opposed by those who believe that tradeoffs between natural entities and ordinary goods and services are inappropriate, in general or in particular circumstances. Some environmental economists are sympathetic to arguments that some natural entities merit preservation for reasons that are independent of quantifiable costs and benefits.

Practical Concerns

- Some object that the claims for ethical foundations of ideal CBA are undermined when implementation diverges (perhaps systematically) from ideal welfare change measurement.
- Other critics worry that because CBA fosters the illusion of a science-based, empirical criterion for decision making, it may command more authority than it merits.
- It makes sense to treat these concerns as problems to guard against in particular applications—be on the watch for attempts to cut theoretical and methodological corners in CBA application, and appeals to the authority of CBA as a science-based decision tool—rather than problems endemic to CBA.

CBA IN PUBLIC LIFE, GOVERNMENT, AND THE COURTS

Some have argued that CBA, by focusing on tradeoffs in an environment of scarcity rather than on unyielding principles, serves a civilizing and democratizing role in public decision making (Sunstein 2004). CBA sometimes has been applied selectively as a barrier to rent seeking. Former President Jimmy Carter promoted rigorous CBA of water-resources project proposals in order to rein in the responsible agencies. His example was not lost on his successor, Ronald Reagan, who issued executive orders prescribing CBA of regulatory initiatives. But CBA does not always raise barriers to public action. Particularly in the nonmarket domain, CBA that attends to nonmarket evidence of WTP may well help justify public actions that might otherwise be thought well-meaning but impractical. For example, air quality standards often are shown by WTP to improve human health.

Where public debate, government, and the courts are responsive to CB evidence, CBA is susceptible to all the pitfalls of the politicization of science. When CBA is applied systematically to environmental issues, the theory and methods of nonmarket valuation may become targets of "junk science" charges. One strategy to tilt the playing field toward commercial interests is to insist upon a CB

filter while arguing that nonmarket valuation methods should be ruled out as evidentially inferior. The rigorous theoretical foundations and empirical methods of CBA provide the best defenses against these sorts of attacks.

CONCLUSION

Despite some persistent criticisms of the application of CBA to environmental issues, CBA based on the PPI can provide a more plausible account of value than its practicable utilitarian competitors; PPIs are at least correlated with the good of society (Hubin 1994). It makes sense, then, to take benefits and costs seriously in public life, perhaps even to the extent of using them as a basis for public decisions when there is nothing more important at stake. There are, however, clear limits to the applicability of CBA to public policy decisions: For example, CBA may be insufficiently alert to the value of unique environmental entities and/or the possibility of conservation crises arising from ignorance about the workings of environmental systems and the failure to foresee the consequences of various proposals. Such concerns can help policy makers to define both the potential and the limits of business-as-usual CB as a yardstick of the public good (Randall 1999).

SEE ALSO *Economic Discounting; Economics, Environmental; Economism; Environmental Policy.*

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Alan Randall

CREATIONISM AND INTELLIGENT DESIGN

Creationism has a long and colorful history in America. Creationists often object to the perceived moral and theological implications of Darwinian theory of evolution. For some, morality is undermined by the idea that humans are evolved from other species, rather than having been specially created in God's image (Genesis 1), as it implies that humans are morally no different from (other) animals. Christian theology sees humans as sinful and fallen from a more perfect state, and the remedy for this fallen state lies in God's saving grace and the sacrifice of Jesus to redeem human sin. If science contradicts the Genesis account of the special creation and fall of humans, then divine sacrifice and the promise of redemption may also be called into question. Evolutionary accounts of human origins thus appear to threaten cherished sacred history and views of human destiny. Accordingly, creationists past and present have charged Darwinian theory with eroding personal morality and promoting a host of social ills.

THE SCIENTIFIC CREATIONISTS

Creationists who believe that a literal reading of Genesis must be maintained to preserve faith and morality have devised various ways of reconciling Genesis with observations of the natural world. One important belief among creationists concerns their view of the earth's age. In post-Darwin America, the first wave of creationists generally accepted the conventional geological account of an earth billions of years old but rejected the idea that the earth is the product of undirected natural processes. Even William Jennings Bryan, known for his 1920s crusade to ban evolution from public schools, believed the earth to be older than do many early-twenty-first-century "scientific creationists." One approach of old-earth creationists is the day-age theory, which interprets the six days of the Genesis account as corresponding to vast stretches of geological time, rather than twenty-four-hour periods. Gap theorists too accept the antiquity of the earth, but posit a gap of geological time between the first two verses of Genesis—that is, between the original creation "in the beginning," which occurred many eons ago, and much more recent creation, including the creation of Adam and Eve, which occurred within six days. Some gap theorists hold that geological formations were produced during that first phase, a time of serial cataclysms and creations that preceded the supernatural creation of humans.

Young-earth creationists estimate the age of the earth as between six and ten thousand years. Flood geologists, a subset of the young-earth contingent, maintain that life recently appeared on the earth and attribute existing geological formations to Noah's flood. In *The New Geology* (1923), George McCready Price, an early advocate of this view, argued that the Noachian deluge is the central explanatory event in a scientific reading of Genesis. John C. Whitcomb and Henry M. Morris revived and popularized Price's theory in *The Genesis Flood* (1961), abandoning gap and day-age theories. Though their "scientific creationism" downplayed Biblical references, it made radical claims about the brief history of life on earth.

After this book was published, Morris and other young-earth creationists formed the Creation Research Society and eventually set up the Institute for Creation Research in San Diego. Unlike earlier creationists, many members of the Creation Research Society had advanced degrees in science and engineering. Scientific creationists present their theory as a viable alternative to evolution, deserving equal time in biology classrooms. Simultaneously, they attempt to discredit evolutionary theory by pointing to apparent gaps in the fossil record and lack of transitional forms, and by recasting natural selection as unproven theory rather than fact, although nobody denies that evolutionary theory is in fact a theory. Many creationists hold that only a fixed number of kinds were created (by God), and believe that while there is no problem in maintaining microevolution, for example, genetic modifications within a species, larger-scale macroevolution does not occur.

Many creationists are concerned that evolutionary theory undermines morality, but in fact the emergence of environmental and animal ethics owes much to the recognition of all life forms as biological kin worthy of our moral consideration. Creationists who reject evolutionary kinship might nevertheless construct an environmental ethic based on Biblical sources, as some evangelicals active in environmentalism have done. Firm belief in the world as God's creation may promote care and respect for the environment. Biblical concepts of a Sabbath for the land, Biblical injunctions governing humane treatment of animals, and Noah's preservation of species during the flood provide just a few examples of an environmentalism based on the Bible. Nevertheless, creationists' complete rejection of evolution raises problems for environmental ethics. For example, environmentalists often seek to protect not only species but also natural processes like speciation, which some creationists deny. Interpretations such as Whitcomb and Morris's also assume that prior to the fall, death and predatory strife among animals did not occur. The conviction that death and carnivory are part of God's curse for Adam and Eve makes it difficult to positively value natural processes that are integral to nature's functioning. It is also questionable whether an interpretation of the Bible that lays such heavy stress on the special creation of humans in God's image can support a nonanthropocentric assessment of nature's value.

T-Rex Model at Dinosaur World, in Cave City, Kentucky. *While Darwin's Theory of Evolution holds that humans evolved from other species, creationists refute this claim, believing instead that God made man in His image. According to some "Young-earth" creationists, the world is only between six and ten thousand years old, whereas scientists estimate that dinosaurs were present on earth between approximately 250 and 65 million years ago.* **AP IMAGES.**

INTELLIGENT DESIGN

While scientific creationists have continued their efforts unabated into the twenty-first century, a new form of creationism, intelligent design, began garnering attention in the 1990s. Intelligent design is a revised and updated form of arguments from design. Proponents claim empirical evidence for intelligent agency, but most do not explicitly identify this agency with the God of Christianity, nor even necessarily with a benevolent deity. In general, intelligent design eschews ties with creationism. Its advocates make no attempt to reconcile natural science with interpretations of Genesis, literal or otherwise, and they accept some core ideas of evolutionary theory, including the antiquity of the earth and the development of life from a common ancestor. Like creationism, however, intelligent design casts doubt on evolution by claiming that it is conjectural rather than a well-confirmed, settled theory. They create the impression that evolution is a contested and incomplete theory in the scientific community. They contest details of the theory of evolution—for example, continuous gradual change or rapid change followed by relative stability (punctuated equilibrium)—but the general theory remains uncontested and well confirmed. Proponents of intelligent design also express ethical misgivings about the worldview promoted by modern Darwinism, though in ways different from traditional creationists.

Intelligent design arose in part as a reaction to the alleged atheistic, materialistic naturalism of neo-Darwinian theory (that is, the modern synthesis of Darwin's theory with Mendelian genetics). The origins of intelligent design can be traced to a 1984 work titled *The Mystery of Life's*

Origin, by Charles B. Thaxton, Walter L. Bradley, and Roger L. Olsen. The authors claimed that the complex origin of life on earth pointed to a divine Creator. This was followed in 1986 by Michael Denton's *Evolution: A Theory in Crisis*, in which the author insisted on the evidence for divine design and the inadequacy of the neo-Darwinian paradigm. Yet the first intelligent-design-inspired book to make a noticeable impact was a supplement to high-school-biology textbooks titled *Of Pandas and People: The Central Question of Biological Origins* (1989), by Dean H. Kenyon and Percival Davis. It presented case studies and guided students toward the conclusion that intelligent design, rather than evolutionary theory, provided the better explanation. In the early 1990s Phillip E. Johnson, a law professor at the University of California, took up the cause of intelligent design and mounted an attack on naturalism. In works such as *Darwin on Trial* (1991), Johnson claimed that naturalism in science—the practice of excluding explanatory references to divine action—is no neutral methodology, but rather an unwarranted, dogmatic bias against theistic forms of explanation.

In 1996 Michael Behe, a Catholic biochemist at Lehigh University, published *Darwin's Black Box*. Behe argued that structures such as the cell confront biologists with a degree of complexity that remains inexplicable in Darwinian terms. Intelligent design, he maintained, was clearly at work, because complex, functional systems could not arise in a gradual, stepwise fashion. Behe labeled his challenge "irreducible complexity." Another prominent supporter of intelligent design is the mathematician and philosopher William Dembski, who, in *The Design Inference* (1998), argued for what he termed specified complexity. Invoking probability theory, Dembski maintained that it is implausible for certain structures to arise by any means other than design. Dembski also decried the ascendancy of ideological, atheistic naturalism, arguing that the concept of design has a rightful place in a scientist's explanatory toolbox.

A key strategy of intelligent design is its appeal to the values of a democratic, pluralistic society, such as tolerance for differing viewpoints and free and critical inquiry in education. Purveyors of intelligent design urge educators to teach the controversy: to present the available evidence and alternative theories and allow students to decide for themselves. Reasonable as it sounds, critics object that this approach falsely encourages students to perceive a controversy in biology where none exists. Nevertheless, this tactic, combined with arguments for redefining scientific method, proved successful in some school districts, particularly in Kansas in the late 1990s. The political struggles came to a head in Dover, Pennsylvania, following a school board decision instructing teachers to read a statement to their classes characterizing evolution as "theory, not fact." A highly publicized trial ensued and on December 20, 2005, Judge John E. Jones III ruled that intelligent design failed to qualify as science because it relied on supernatural causation. This was a significant blow to intelligent design, but proponents continue their struggle.

Although intelligent design is not obviously linked to environmental ethics, some forms of environmental thought bear a resemblance to intelligent design. The convergence results from a shared distaste for the perceived excesses of materialism in neo-Darwinism and in modern science generally. Like advocates of intelligent design, some environmental philosophers, ecotheologians, and ecofeminists promote a more active and creative view of matter than modern, gene-centered biology seems to allow. They criticize the mechanistic worldview that permeates scientific investigation and perpetuates harmful attitudes toward nonhumans. These environmentalists join advocates of intelligent design in lamenting the materialist commitments of science and its reduction of all natural phenomena to valueless material components. Like intelligent-design advocates, they discern such biases particularly in the polemical neo-Darwinism popularized by Richard Dawkins (*The Blind Watchmaker*, 1986; *The God Delusion*, 2006) and Daniel Dennett (*Darwin's Dangerous Idea*, 1995). But while they share intelligent-design advocates' distaste for the mechanistic paradigm and for evolutionary ideologues like Dawkins, few environmental thinkers make the stronger claim that the boundaries of science should be reconfigured to allow a place for supernatural causation.

Some environmental thinkers occupy a middle ground between the twin dogmas of intelligent design and atheistic evolutionism, advocating theistic forms of evolution that confer great value to nature without claiming empirical evidence for a designer. On the whole, environmental philosophers have been somewhat more successful than ecotheologians in presenting environmental ethics from a Darwinian standpoint. Controversies surrounding creationism and intelligent design serve as a reminder that while embracing evolution remains difficult for many Christians, it is necessary for religious environmentalists who hope to engage in dialogue with scientists and influence the public.

SEE ALSO *Animal Ethics; Bible; Christianity; Darwin, Charles; Evolution; Stewardship.*

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Lisa Sideris

D

DAMS

A dam is an artificial structure that impounds stream flow to yield diverse benefits. The oldest dams in North America are prehistoric. Natural twig and branch constructs engineered by beavers can reach up to 850 meters wide and can wreak considerable ecological disturbance. However, for economic, ethical, and philosophical purposes this entry deals only with human-built dams, from a six-foot-high farm pond to the Three Gorges Dam in China.

HISTORICAL BACKGROUND

Dams are not a new technology. Water storage dams in Jordan, Egypt, and other parts of the Middle East were built 5,000 years ago. Long before the Columbus's voyages to the New World, Native Americans diverted rivers with small dams to irrigate arid land crops in the Southwest; other tribes built temporary dams to channel fish into traps. However, as the social structure of the country became larger, more permanent, more politically centralized, and more economically complex, so did the dams on which Americans depended.

HISTORY AND NUMBERS OF U.S. DAMS

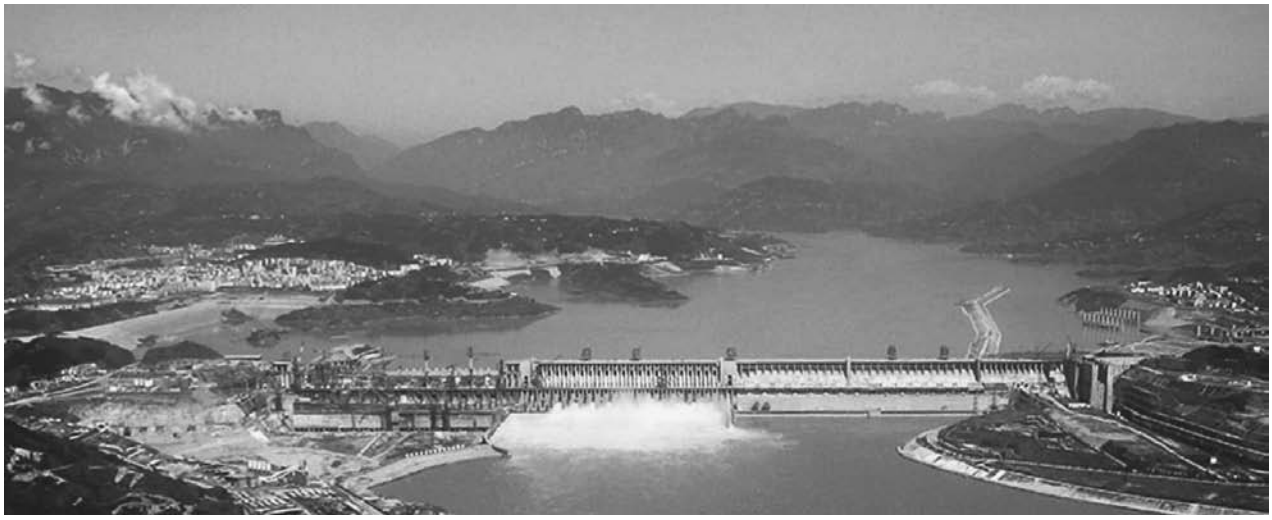
In early U.S. history dams became political and economic cornerstones. Hundreds of dams turned water mills or allowed barge transport. Thousands soon absorbed flood surges, diverted water for irrigation, and provided water for livestock. Later, tens of thousands generated electrical power, cooled industry, stored drinking water for cities, and provided recreation. Today virtually every river in the 48 contiguous states has been dammed, diked, diverted, or dewatered by human intervention.

The number of American dams varies widely according to size, scope and classifying institution. The Natural Resources Conservation Service estimated in 1977 that there were over 2.5 million small dams. The National Inventory of Dams lists 78,747 structures so large that they require federal hazard safety oversight. Some 99,000 dams are regulated by states and listed in the U.S. Fish & Wildlife Service Database. The Federal Energy Regulatory Commission licenses and exempts roughly 2,500 hydropower dams to private and public utility owners. No one knows how many dams there are in the United States.

ECONOMICS AND PURPOSES

Every dam arose as an economic creation. A new dam is born when public bondholders, taxpayers, or private investors are persuaded that the potential goods and services will outweigh the immediate costs of investment significantly. Initially most dams fulfill those expectations. As productive architecture, dams embody human values; they reflect human ethics set in stone, wood, debris, earth fill, and cement. Some embrace the collective philosophy of a country, whether nation building or the conquest of nature. Large engineering feats such as Hoover Dam—a smooth concave wall consisting of 66 million tons of concrete and rising 726 feet high, backing up 9 trillion gallons of Colorado River water into a 115-mile-long reservoir—are regarded as heroic works and national monuments.

North America built 13 percent of its largest dams for flood control, 11 percent for irrigation, 10 percent for



Three Gorges Dam, Yichang, China. *Spanning 1.2 miles and standing 600 feet about normal river level, environmentalists criticize the Three Gorges Dam on the grounds that it will reduce fish stocks, eliminate 78,000 acres (32,000 ha) of important agricultural lands, and threaten habitats of critically endangered species.* **AP IMAGES.**

water supply, 11 percent for hydropower, 24 percent for another single purpose such as recreation or navigation, and 30 percent for a mix of these purposes. Contemporary dams are built primarily for domestic water storage and, to a very small extent, hydropower.

Abstract figures shape people's evolving perception far less than do the cumulative, qualitative impacts of dams. All dams began as productive "liquid assets," but time and change have transformed the types, extents, and perceptions of dam benefits until eventually some dams have come to be regarded as fixed liabilities, environmental travesties, and even public nuisances.

ETHICAL ISSUES

Three interwoven forces drive ethical changes in regard to dams: growing risk, changing economics, and shifting social values. First, all dams are mortal; their days are numbered. As they stop stream flow, dams trap much more than water. River silt or sediment annually accumulates behind walls at average rates of 0.5 percent to 1 percent of storage capacity and sometimes much more. As it becomes shallow and warm, more water evaporates under rising heat, and the water that remains often blooms with algae and deteriorates in quality until eventually no impoundment remains. Wear and tear also takes a toll on dam structures, sometimes exacerbated by climate changes. By the middle of the twenty-first century 85 percent of U.S. dams will have surpassed what engineers consider their average 50-year life span. The American Society of Civil Engineers currently gave U.S. dams a grade of D because they put lives, property, and the environment at risk.

Second, as static dams age in place, the surrounding human demographics and economics grow more dynamic, diverse, and complex. Old mills became shopping malls; transport canals became freeways; farms became subdivisions; fly-fishing and rafting replace flat water recreation. Tribal groups have gained economic clout and political influence. As the social economy has evolved, dams that cannot adapt become anachronistic remnants. Some historical societies seek to preserve them as a record of days gone by, but upkeep to meet safety and ecological standards grows increasingly expensive. In the United States the backlog of projected expenses to bring dam infrastructure into safety compliance is from $10 to $36 billion. That price tag leads some 12 percent of "indeterminate owners" to abandon even more "deadbeat dams." However, neglect is equally costly. From the Civil War to the present, dam failures have caused extensive damage to river ecosystems, destroyed billions of dollars in property, and killed over 5,128 people.

Third, that's when social values change. Economic surplus and leisure allow an honest assessment not only of the obvious benefits of dams but of their less noticed substantial social costs and ecological losses. Peer-reviewed studies have documented how over the twentieth century large dams uprooted whole populations, displacing 40 million to 80 million people worldwide. Though the United States was less densely populated, federal dams on the Columbia River extinguished the oldest continuous civilization on the continent when they drowned the 10,000-year-old salmon fishery at Celilo Falls.

Even small dams disrupted the natural cycles of flooding and fish passage, sediment transport, riparian vegetation, and

channel shape. In fact, small dams and culvert crossings are responsible for the vast majority of habitat fragmentation in river systems. Upstream, dams cause algal blooms, raise water temperature, accumulate pollutants, submerge and smother streambed habitat, and trap nutrients and sediment. Downstream, dams alter the dissolved oxygen, biological stability, and chemical integrity of "natural" water and can result in severely degraded riverbeds. As a result of the accumulated impacts of dams, a third of American aquatic biodiversity has become endangered.

In comparison to climate change, dirty coal, and escalating oil prices, dam energy seems clean. However, fewer than 2 percent of U.S. dams produce power. While some contest the findings, all existing peer-reviewed scientific research has demonstrated how dam reservoirs trap rotting vegetation from the entire watershed, trapped in upstream water until released by dam gates emitting methane, a potent greenhouse gas. The National Institute for Space Research in Brazil calculated that the 52,000 large dams (typically 50 feet or higher) worldwide contribute more than 4 percent of the total warming impact of human activities. These dam reservoirs contribute 25 percent of human-caused methane emissions, the largest single source.

POLITICAL CONFLICT

People's philosophical values in regard to dams may shift incrementally and peacefully over the course of a century or switch overnight. This can lead to aggressive political conflict with angry protests mounting before the first concrete can be poured.

Widespread ethical confrontations over the impact of dams on wild places and wild rivers date back to the first dams. Indeed, dams may be the founding cornerstone not just for raising the American civilization but for giving birth to American civil disobedience. Henry David Thoreau was famous for remarks such as "that government is best which governs least" and "in wildness is the preservation of the world," but first he was a critic of the consequences of enslaving wild rivers. While paddling with his brother for *A Week on the Concord and Merrimack Rivers* in 1839, Thoreau lamented, on Saturday the disappearance of formerly abundant salmon, shad, and alewives. Those species had vanished because "the dam, and afterward the canal at Billerica . . . put an end to their migrations hitherward." His elegy read like an Earth First! manifesto: "Poor shad! where is thy redress? . . . armed only with innocence and a *just cause.* . . . I for one am with thee, and who knows what may avail a crow-bar against that Billerica dam?" (1961 [1849], p. 39). Thoreau restrained himself from vigilante dam busting, but he sowed the seeds of activism and resistance that would grow over the years as dam impacts multiplied in number and size.

The highest-profile American showdown pitted John Muir against Theodore Roosevelt and Gifford Pinchot in a fierce political crusade. O'Shaughnessy Dam was designed to fill Hetch Hetchy, Yosemite Valley's national park twin, to provide water and power for San Francisco. Muir's loss, his drowned "cathedral" and martyrdom, gave rise to the powerful Sierra Club.

The first incidence of American domestic terrorism may have occurred when California farmers blew up dam infrastructure that diverted water from the Owens River away from their valley to Los Angeles. A few decades later fishers in Idaho blew up a dam that blocked salmon migration.

Muir's post-World War II successors, David Brower foremost among them, opposed dams in the Grand Canyon. Preserving Dinosaur Canyon intact but sacrificing Glen Canyon was a trade-off that Brower regretted to his dying day. During the 1960s and 1970s dam opposition grew more assertive; in acts of civil disobedience activists handcuffed themselves to boulders in Sierra Nevada rivers so that they would be drowned if dam reservoirs filled. Edward Abbey's fictional *Monkey Wrench Gang* (1975) planned to blow up Glen Canyon Dam through "eco-tage," a nonviolent but disruptive tactic later embraced by radical groups. Among the first tests of the Endangered Species Act was a political eruption over construction of the Tennessee Valley Authority's Tellico Dam. Economic studies triggered by a Supreme Court injunction based on threats to the endangered snail darter fish demonstrated the economic dysfunctions of the dam, though the public works lobbies ultimately pushed the dam to completion.

Internationally, dams have been opposed less for ecological or scenic reasons than for their impact on human rights. Medha Patkar and her group Save the Narmada have borrowed passive resistance techniques from Thoreau and Mahatma Gandhi to oppose dams that would destroy hundreds of thousands of homes and livelihoods. The Internet has linked formerly isolated, muted, and marginalized antidam groups into a coordinated, vociferous, and formidable opposition. Private and public backers of dams such as Three Gorges have been boycotted, and protests have forced them to amend the terms of financing and compensation for the social and environmental mitigation for 1.3 million people who were displaced.

In developed countries, there have been fewer protests against raising new dams than against razing old ones. From 1994 to 2000, Democratic Interior Secretary Bruce Babbitt led a nationwide campaign to remove obsolete dams; over the next three years his Republican successor, Gale Norton, removed twice as many in half the time. From the Klamath River in California to the Snake River in Idaho, protesters once waved placards,

shouting "Save our rivers!" and "Save our salmon!" However, reservoirs have their own special interest support groups, motivated by cheap electricity and barge traffic, fishing for alien catfish and carp, or simply a strong sense of nostalgia, leading to protests from Glen Canyon to Maine to North Carolina to the Pacific Northwest at which protesters have shouted, "Save our dams!"

SEE ALSO *China; Energy; Environmental Activism; Global Climate Change; Hetch Hetchy; Muir, John; North America; Thoreau, Henry David.*

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James G. Workman

DAOISM

In her popular 1988 book, *Sacred Land, Sacred Sex–Rapture of the Deep*, the environmental thinker Doris LaChapelle announced that a "'new idea' for saving the planet" had already been discovered by Daoist thinkers in China two millennia ago. All that is now needed, therefore, is to "follow … the Way of Lao Tzu and Chuang Tzu" (cited in Miller 2003, p. 139). Her announcement illustrated the widely shared conviction of that time that among all Asian traditions, Daoism has the most to contribute to environmental thought. Despite skeptical responses such as those of Holmes Rolston (1987) and David E. Cooper (1994), this conviction persists in some circles. Among informed scholars of Daoism, however, something of a consensus was emerging by the beginning of the twenty-first century. Although Daoism displays an "ecological sensitivity" that "exerts a positive influence" on environmental attitudes (Miller 1998), its potential contribution does not consist in an important new idea and it is not one that is easy to integrate with the main tendencies of Western environmental philosophy.

After a brief review of the origins and development of Daoism and some of its central concepts, this entry discusses the character of the possible contribution of Daoism to environmental ethics and policy.

[In the remainder of this article, the newer Pinyin system of romanizing Chinese terms is used, but the older Wade-Giles spellings of especially important names and words are given in parentheses.]

ORIGINS AND DEVELOPMENT

The Chinese term translated as Daoism (or Taoism) was coined around 100 BCE to refer to a style of thought preeminently found in two texts compiled at least two hundred years earlier, during the so-called Period of the Warring States. Those two classic texts are the *Daode jing* (*Tao Te Ching* [The book of the way and its power]) and the *Zhuangzi* (*Chuang Tzu* [The book of Master Zhuang]). According to tradition, the first text was written by Laozi (Lao Tzu, or "Old Master"), a sixth-century BCE contemporary of Confucius, and the second by a minor official from Honan during the fourth century BCE. Modern scholarship, however, favors the view that the earliest of those works was the first seven ("inner") chapters of the *Zhuangzi,* written by Master Zhuang himself, with the remainder of that book and the whole of the *Daode jing* being later compilations by followers of Zhuangzi. Much of Zhuangzi's critical irony is directed against the Confucians, and the *Daode jing* probably was ascribed to Laozi because that was the title given to a man in one of the Confucian classics to whom Confucius seems to defer.

Both Daoist classics invoke the idea of a "nameless" Dao (or Way) that is the ground or "mother" of everything and whose essential nature human beings should emulate. In the *Daode jing* the main focus is on how in times of war the ruler of a state might govern effectively by following the Way. The *Zhuangzi* is concerned more generally with life led "in the Way."

During the second century CE there emerged the first of several organized religious "Ways" that have since been labeled "religious Daoism," partly because of their invocation of Laozi, who by that time was held to be divine and immortal. The primary concern of religious Daoism—the main indigenous religious tradition of China—has been with the ritual and "biospiritual" endeavor to achieve longevity, even immortality, by "purifying" bodily energy to an extremely refined, subtle form.

The relationship between the philosophical Daoism of the classic texts and the later religious tradition remains in dispute. The older view of many Western

Ma Yuan,* Scholar Viewing a Waterfall*, late 12th–early 13th century. *Flowing water is the most common of the many Daoist metaphors, taken from the natural world, for the effortless process of the dao. The Dao ideal of "wuwei" seems to be the basis for the religion's connection to ecological sensitivity. This involves living a simple life free from the ambitions that may contribute to environmental degradation, and respecting the perspectives of other living beings by simply letting them be.*

scholars—that religious Daoism was a superstitious perversion of authentic Daoism—has given way to a more nuanced perception. Although the classics do not anticipate the alchemical and "magical" interests of Daoist religious adepts, they convey a spiritual outlook on human life. At the same time, the huge corpus of Daoist religious texts contains, alongside the magic, some interesting elaborations on the cosmology that is only hinted at in the two classics. It would be limiting in the context of environmental debate to ignore religious Daoism in light of the growing perception that, in Jordan Paper's words, it "offers the most useful possibilities for saving the planet" (Paper 2001, p. 15).

Like other ancient philosophies and religions, Daoism was persecuted—its temples destroyed and its priests murdered—during Mao Zedong's Cultural Revolution.

Since 1980, however, Daoist religious institutions have been reestablished in China, and the popularity of Daoism has grown abroad. In the United States organizations such as Orthodox Daoism of America have stimulated interest in a religion some of whose associated practices, such as Tai Chi and feng shui, also have been attractive to Western audiences.

DAO, *DE*, AND *WUWEI*

In Confucian texts the term *Dao* generally referred to the ways human beings should follow to prosper and live harmoniously. In the Daoist texts, however, the term refers primarily to something wider and more nebulous: the "complete, universal, all-inclusive" (*Zhuangzi*,Chap. 22), the "beginning of heaven and earth," and "the mother of the world" (*Daode jing*, Chaps. 1 and 25).

These gnomic remarks have been interpreted in different ways. For some, the Dao is an entirely naturalistic concept: the general order of nature or the combined laws of nature. However, this is hard to reconcile with the insistence that the Dao is ineffable, that, as the opening sentence of the *Daode jing* puts it, "The Way that can be spoken of is not the constant Way." The perception that the Dao is "mysterious" has encouraged some to construe it as a transcendent power akin to the creator god of monotheistic religions. However, this reading is difficult to square with what Roger T. Ames (1989, p. 134) calls "the mutual dependence of *dao* and *de,*" that is, the doctrine that although the Dao is somehow responsible for the existence of things, it has no being in isolation from those things and their "powers" (*de*).

The Dao is best thought of perhaps as a "matrix" that enables the emergence of things without being disjoined from them, rather as a language might be thought of as a matrix that enables the generation of words that become parts of itself. This analogy with language would help explain a salient feature of Daoism: its *holism*. Just as a language is not a collection of separate words (words have meaning only in relation to one another and to the language as a whole), so it is an error, according to the *Zhuangzi,* to become rigidly fixated on the distinctions that humans, for pragmatic reasons, draw between separate things.

This holistic emphasis both reflects and inspires an ideal of harmony (*he*). According to one scripture, where there is "Central Harmony . . . the thousand things will flourish [and] people will live harmoniously" (cited in Lai 2001, p. 102). Harmony will prevail, it is held, if beings act in accordance with the Dao, but this is something that certain beings—namely, humans—typically fail to do. For this reason, Laozi laments, the Way largely has been "lost," and the great task for human beings is to rediscover it.

In Daoist religious practice, various techniques—ritualistic, bodily, meditative—are employed in this "human mission to preserve, protect, and circulate harmonious communication between the realms of cosmos and humanity" (Lai 2001, p. 104). In the ancient classics, however, the primary strategy is *wuwei*, variously translated as "nonaction," "doing nothing," and "noncontending action." *Wuwei* is the form of human conduct that emulates the Way, for "The Way never acts, yet nothing is left undone" (*Daode jing,* Chap. 37). The examples given include Laozi's "lords and princes" who barely intervene in their subjects' affairs and Zhuangzi's craftsmen whose "know-how" enables them to dispense with deliberation and effort.

Wuwei cannot literally mean doing nothing, and it is not simply "cost-effective" action that uses minimal effort to get maximum results. As A. C. Graham (1981) proposes, *wuwei* is behavior that is optimally responsive to situations as they are and therefore is not dictated by inflexible preconceptions, desires, or rules. It is spontaneous behavior not in the sense of being impulsive but in the sense of being supple, of "going with the flow." The Dao, which achieves everything, often is likened to water, which by never contending succeeds in bypassing obstacles and reaching its natural level. Similarly, the responsive, supple strategy of *wuwei* enables human beings to achieve their ends and live harmoniously and naturally.

DAOISM AND ECOLOGY

Some ancient Daoist texts exhibit a concern for the treatment of nonhuman life and nature. Passages in the *Zhuangzi* criticize inappropriate treatment of wild animals, and several of the *One Hundred and Eighty Precepts* (c. third century CE) prescribe environmental protection. One example is "You shall not wantonly fell trees" (Schipper 2001).

What is less apparent is the basis for such concerns. One should not foist upon Daoism the notion that nature has rights that it is people's duty to honor. As the *Daode jing* advises, such moralistic-cum-legalistic talk is a sign that the Dao has "fallen into disuse," so that people should "discard rectitude" and "principles" if they are to recapture spontaneity (Chaps. 18 and 19). Nor should Daoism be credited with a "biocentric egalitarianism" that assigns equal value to all life. Although the *Zhuangzi* (Chap. 17) holds that "in the light of the Dao . . . no one thing stands out as better," the point is not that fish, flowers, and people have equal value but that only in relation to human schemes of evaluation does the idea of having value make sense.

Perhaps it is in the holistic conception of "harmonious communication . . . between cosmos and humanity"

that Daoist ecological sensitivity is located. However, it is in rituals and biospiritual disciplines of self-cultivation, not in relations with the environment, that Daoist religious practice has sought the means of such communication. (The point of the precept against tree felling seems to have been to protect the purity of particular sacred sites.) Also, this harmonious communication is too embedded in a complex cosmology—*qi* ("breath of life"), the polar forces of *yin* and *yang,* the "astral translucence of the body," and so on—to be appropriated by people outside of this cosmological tradition. When extracted from the tradition, harmonious communication between cosmos and humanity becomes a slogan for ecologically responsible behavior rather than a basis for it. However, religious rhetoric concerning the integrated and responsible position of humans within the cosmos may serve to promote ecological awareness.

Arguably, it is less to cosmology than to the ideal of *wuwei* that one should turn for a Daoist contribution to environmental ethics. Two features of *wuwei* are especially relevant in this context. First, to become spontaneous and responsive, a person must "have little thought of self and as few desires as possible" (*Daode jing,* Chap. 19). Fixation on one's own ends is the main obstacle to fluent living; hence, the life of a Daoist sage will be simple and undemanding, free from the acquisitive ambitions that are responsible for environmental exploitation. Second, *wuwei* entails freedom from the rigid and partial perspectives that shape conventional judgments. When *Zhuangzi* (Chap. 3) tells of the bird that prefers to struggle for its food than to live well fed in a cage, his point is that one should heed a creature's own idea of what is good for it. One should be responsive to the good of animals and other living things as it appears to them, respecting their perspectives and letting them be what they are.

The ecological sensitivity of the Daoist is that of someone whose awareness of the world is determined neither by selfish desires nor by a particular conceptual grid. Instead, that person is able to appreciate and respond to things on their own terms.

ENVIRONMENTAL ACTION

Although Daoist ecological sensitivity is benign, it is unlikely to translate into dramatic interventions to save the planet. The posture of *wuwei* is unsympathetic to the evangelism characteristic of environmental activism at the turn of the twenty-first century. There is a Daoist reluctance, moreover, to accept the idea that an environmental catastrophe is occurring. "I see no crisis," wrote the founder of Orthodox Daoism of America (cited in Girardot, Miller, and Xiaogan 2001, p. 379). This is the case because it is only from the vantage point of human or other creaturely interests—not of the Dao itself—that it makes sense to judge that the world is in bad shape. Also, if the Dao is the mother of everything, including the current state of the planet, that state is just one more stage in an evolutionary and patterned process that cannot be lamented.

When looking for a metaphor to characterize Daoist comportment in regard to the natural environment, several writers draw on an activity that has always formed an important part of Daoist culture: gardening. As James Miller (2003, p. 46) puts it, Daoists are "the gardeners of the cosmos." This is perceptive, for it is in responsible gardening that heeds the good of plants and animals that one finds an appropriate vehicle for those virtues of restraint, impartiality, and humility that are integral to the way of *wuwei*.

SEE ALSO *Asian Philosophy; Buddhism; China; Confucianism; Deep Ecology.*

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David E. Cooper

DARWIN, CHARLES
1809–1882

Charles Robert Darwin was born in Shrewsbury, Shropshire, England, on February 12, 1809, and died in Kent, England, on April 19, 1882. He was the grandson of the noted physician and naturalist Erasmus Darwin and the famous potter Josiah Wedgwood. Educated at the University of Edinburgh and Cambridge University, Darwin, upon graduation, was invited by his mentor John Henslow to become the naturalist on the survey voyage of Captain Robert Fitzroy's ship the *Beagle*. It was on this voyage that Darwin began to formulate what would become his greatest and most lasting biological theory. Darwin first hinted at ideas that later made up his theory of evolution by natural selection in *The Voyage of the Beagle* (2001; originally titled *Journal and Remarks*), published in 1839. Then building on the work of scholars such as Jean-Baptiste Lamarck, Charles Lyell, and Thomas Malthus, Darwin fully formulated his theory of evolution in *On the Origin of Species by Means of Natural Selection, or the Preservation of Favoured Races in the Struggle for Life*, published in 1859. Though reluctant to publish what he knew would be a controversial theory, he was prompted to do so by a letter from Alfred Russel Wallace proposing much the same theory. His book *The Descent of Man, and Selection in Relation to Sex*, published in 1871, rounded out his main works on the theory of evolution.

DARWIN'S THEORY OF EVOLUTION

In the most basic terms, evolution is a reference to the cumulative process of change within a population over time. Natural selection is the specific mechanism that Darwin employed to explain this change. Genetic variations in living beings manifest themselves in morphological variations in those beings, though Darwin himself knew nothing about genes. Given limited resources and environmental variations, those individuals, within a species, possessing morphological variations that allow them best to adapt to this limited and variable environment will be the ones most likely to survive, reproduce, and pass those successful genetic and morphological traits on to their offspring. This ability to survive and reproduce is known as fitness.

Darwin's theory has been revolutionary, and like nearly every discipline within the academy, philosophy has been greatly influenced by it. One of the immediate and profound implications of Darwin's theory was the underlying metaphysical image of variability and change. In his 1910 essay "The Influence of Darwin on Philosophy," John Dewey spoke of the influence of Darwin in drawing philosophers away from the Aristotelian notion of nature (*phusis*), ruled by a kind of permanence or changelessness, and toward a more Heraclitean nature in flux. The influence of Darwin, Dewey wrote, "conquered the phenomena of life for the principle of transition" (p. 8). Perhaps the other important ontological implication of Darwin's theory was the idea that entities in the world (including humans) are shaped over time by the world in which they are embedded. That is, things in the world are what they are because of the context in which they live and evolve over time, not in spite of that context.

THE DESCENT OF MAN

The last of Darwin's great works, *The Descent of Man*, has had a dual impact on environmental philosophy and ethics. First, Darwin's work served to challenge and blur the boundaries that humans had, until that time, always been assured existed between themselves and their nonhuman animal counterparts. Darwin argued that humans, like all living organisms, are subject to the biological process of natural selection. After demonstrating physical continuity between humans and nonhuman animals in chapter 1 of *Descent*, Darwin, in chapter 2, works through an exhaustive list of mental attributes—from lower-level instinct and desire to higher-level reason and abstraction—and likewise concludes "that there is no fundamental difference between man and the higher mammals in their mental faculties" (p. 35). This Darwinian challenge was important for early versions of nonhuman-centered ethics (most notably, animal ethics) because justifications for the ethical exclusion of nonhuman animals are usually premised on an alleged fundamental distinction between humans and nonhumans on the basis of some quality that humans are said to possess and all nonhumans are said to lack. In blurring the metaphysical boundaries assumed to exist between humans and nonhumans, Darwin paved the way for the expansion of the moral community that we began to see in the 1970s with the advent of animal ethics. A good contemporary example of Darwin's influence on the extension of ethics is the Great Ape Project. This project "demand[s] the extension of the community of equals to include all great apes: human beings, chimpanzees, gorillas, orang-utans," because humans are members of the biological family of great apes and the other members of this family are therefore "the species that are our closest relatives" (Cavalieri and Singer 1994, pp. 4, 1).

Second, Darwin's portrayal of the biological world profoundly influenced natural scientists with ethical interests, such as Aldo Leopold. In his environmental classic *A Sand County Almanac* (1949), Leopold suggested that there are ethical implications that follow from Darwin's more metaphysical message that "men are only fellow voyagers with other creatures in the odyssey of evolution." An internalization of Darwinism, according to Leopold, implies "a sense of kinship with other creatures," from which follows "a wish to live and let live"

(p. 109). More abstractly, it might be argued that a Darwinian vision ought to inspire in us certain virtuous attitudes toward nature: wonder, humility, respect, and caring being chief among them.

In chapter 3 of *The Descent of Man*, Darwin develops a purely biological account of the origin, existence, and nature of ethics. Inspired by the theory of moral sentiments put forward by the philosophers David Hume and Adam Smith, Darwin suggests that ethical sentiments are traits like other traits we possess—traits that facilitate survival. For animals such as humans, whose fitness is positively affected by being members of cohesive societies, ethics are necessary for social cohesiveness, and hence facilitate survival: "No tribe could hold together if murder, robbery, treachery, etc. were common; consequently such crimes within the limits of the same tribe are 'branded with everlasting infamy'" (Darwin 1981 [1871], p. 93). Hence, certain "limitations on freedom of action in the struggle for existence," as Leopold ecologically defines ethics (1949, p. 202), increase fitness by increasing social cohesion. Darwin even suggested that this ability to extend ethical consideration to other individuals is not unique to humans: "Any animal whatever, endowed with well-marked social instincts, would inevitably acquire a moral sense or conscience, as soon as its intellectual powers had become as well developed, or nearly as well developed, as in man" (1981 [1871], pp. 71–72). Darwin also realized that the focus of these moral sentiments can extend beyond the human community:

> As man advances in civilization, and small tribes are united into larger communities, the simplest reason would tell each individual that he ought to extend his social instincts and sympathies to all the members of the same nation, though personally unknown to him. This point being once reached, there is only an artificial barrier to prevent his sympathies extending to the men of all nations and races. . . . *Sympathy beyond the confines of man, that is humanity to the lower animals, seems to be one of the latest moral acquisitions.* (1981 [1871], pp. 100–101; emphasis added)

DARWIN AND THE BIOTIC COMMUNITY

Darwin ultimately demonstrates that there exists a correlative relationship between our sense of ethical inclusiveness and our sense of community. As our sense of community becomes more (or less) inclusive, our sense of ethics changes in kind. Hence, if humans could somehow come to see themselves as members of an integrated biotic community, inclusive of the nonhuman world, then a land ethic—an ethic that "enlarges the boundaries of the community to include soils, waters, plants, and animals, or collectively: the land" (Leopold 1949, p. 204)—would follow. If Leopold is correct—if "the problem we face is the extension of the social conscience from people to the land," and if "no important change in ethics was ever accomplished without an internal change in our intellectual emphasis, loyalties, affections, and convictions" (1949, pp. 209–210)—then a main focus of our efforts to solve environmental problems ought to be facilitating biotic community. Darwin, then, explains the mechanism that allows us to extend ethical consideration to the land (to nature, to the environment). As Leopold famously put it, we can measure the extent to which an action, policy, or program is good or bad, right or wrong, on the basis of its environmental impact; we can say, "A thing is right when it tends to preserve the integrity, stability, and beauty of the biotic community. It is wrong when it tends otherwise" (1949, pp. 224–225). While many environmental philosophers see Leopold as an inspiration for their positions, J. Baird Callicott (1989, 1999) is the philosopher advancing an environmental ethic most directly in line with Darwin's and Leopold's ideas about ethical evolution and expansion.

As summarized in Pickett and Ostfeld's essay "The Shifting Paradigm in Ecology" (1995), more recent work in theoretical ecology challenges the image of natural units (e.g., biotic communities) thought to be implied by early thinkers such as Darwin and Leopold. This work seeks to move away from static and uniform images of biotic communities and the like, and toward more indefinite and dynamic biological collectives. Since images of nature and natural units are inevitably reflected in ecologically rooted environmental philosophies and ethics, this shift has prompted environmental ethicists to make their theories dynamically correspond to changing images of biological groupings (see Callicott 1999 for an example).

SEE ALSO *Animal Ethics; Callicott, J. Baird; Ecology: II. Community Ecology; Ecology: III. Ecosystems; Environmental Philosophy: V. Contemporary Philosophy; Evolution; Land Ethic; Leopold, Aldo.*

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Michael P. Nelson

DEEP ECOLOGY

Adherents of the *deep ecology* movement share a dislike of the human-centered value system at the core of European and North American industrial culture. Deep ecologists argue that environmental philosophy must recognize the values that inhere objectively in nature independently of human wants, needs or desires.

The popularity of deep ecology spans from headline-grabbing environmental activists dressed in coyote costumes to scholars of an astonishing assortment of backgrounds and interests. Authors have made connections between deep ecology and ecological science (Golley 1987), religions from around the world (Barnhill and Gottlieb 2001), New Age spirituality (LaChapelle 1978), direct action/ecological sabotage (Foreman 1991), the poetry of Robinson Jeffers (Sessions 1977), the land ethic of Aldo Leopold (Devall and Sessions 1985), the monism of Baruch Spinoza (Sessions 1977, 1979, 1985; Naess 2005), and the phenomenology of Martin Heidegger (Zimmerman 1986). Such variety is invigorating, but it makes it difficult to find the common thread in all these diverse manifestations of deep ecology. As one commentator has observed, "Any one who attempts to reconcile Heidegger's with Leopold's contributions to deep ecology finds the going rugged" (Oelschlaeger 1991, p. 304). (To differentiate between the broad popular and narrow academic usages of *deep ecology,* the term *Deep Ecology* will be used to denote the latter.)

Much more narrowly, deep ecology represents the psychologization of environmental philosophy. Deep ecology in this sense refers to an *egalitarian* and *holistic* environmental philosophy founded on phenomenological methodology. By way of direct experience of nonhuman nature, one recognizes the equal intrinsic worth of all biota as well as one's own ecological interconnectedness with the lifeworld in all its plenitude.

Understanding Deep Ecology in its academic sense demands reading the work of four environmental philosophers: the Norwegian Arne Naess, the Americans George Sessions and David Rothenberg, and the Australian Warwick Fox. Deep Ecology is inextricably associated with Naess (Katz et al. 2000, p. xv) and owes its prominence to him. Naess's many strengths—strong will, humble demeanor, playful personality, estimable academic reputation, aversion to judgment, predilection for inclusivity, and an odd mix of interests—have stimulated many others to spend considerable amounts of time, talent, and energy teasing out the nuances of his creative insights.

ORIGINS OF THE DEEP ECOLOGY MOVEMENT

Arne Naess invented the term *deep ecology* in a famous 1973 English-language article, "The Shallow and the Deep, Long-Range Ecology Movement: A Summary." By "ecology movement" Naess means a cosmology or worldview. Naess faults European and North American civilization for the arrogance of its human-centered instrumentalization of nonhuman nature. He contrasts his new "deep" (or radical) ecological worldview with the dominant "shallow" (or reform) paradigm. The shallow worldview, which he finds to be typical of mainstream environmentalism, is merely an extension of European and North American anthropocentrism—its reasons for conserving wilderness and preserving biodiversity are invariably tied to human welfare, and it prizes nonhuman nature mainly for its *use*-value. The deep ecological worldview, in contrast, questions the fundamental assumptions of European and North American anthropocentrism—that is, it digs conceptually *deeper* (Fox 1995, pp. 91-94). In doing so, deep ecological thinking "is not a slight reform of our present society, but a *substantial reorientation of our whole civilization*" (Naess 1989, p. 45 [italics in original]). This radicalism has inspired environmental activists of many stripes to hoist up Deep Ecology as their banner in calling for nothing less than the redirection of human history (Manes 1990).

Naess, like Socrates, makes no claims to certainty. In word and deed, Naess instead has inspired others to engage in deep philosophical questioning through example. Naess's own environmental philosophy, ecosophy T (1986, pp. 26–29)—named for his secluded boreal hut, Tvergastein (Naess 1989, p. 4)—is meant to serve as a template for other personal ecosophies (philosophies of ecology).

ACADEMIC DEFINITIONS OF DEEP ECOLOGY

Deep ecology in its narrow academic sense rests on two fundaments: an axiology (The study of the criteria of value systems in ethics) of "biocentric egalitarianism" and an ontology (the study of existence) of metaphysical

holism which asserts that the biosphere does not consist of discrete entities but rather internally related individuals that make up an ontologically unbroken whole. Both principles are rooted in an intuitive epistemology reminiscent of Descartes' "clear and distinct" criteria—once you grasp them, their truth is beyond doubt.

The first principle, biocentric egalitarianism—known also by other phrases that combine *biocentric, biospherical,* and *ecological* with *equality* and *egalitarianism* (Naess 1973, p. 95; Devall and Sessions 1985, pp. 67-69)—holds that biota have *equal* intrinsic value; it denies differential valuation of organisms. In the words of Naess, "*the equal right to live and blossom* is an intuitively clear and obvious value axiom" (1973, p. 96 [Naess's emphasis]). In the words of the sociologist Bill Devall, writing with George Sessions, "all organisms and entities in the ecosphere, as parts of the interrelated whole, are equal in intrinsic worth" (1985, p. 67). Naess shrewdly preempts invariable attacks on this idea of the equal worth of all organisms by adding the qualifier "in principle" because "any realistic praxis necessitates some killing, exploitation, and suppression" (1973, p. 95). This qualifier has not, however, staved off criticisms of biocentric egalitarianism.

The valuing of human beings over other life forms in the teleology of a great chain of being (Lovejoy 1936) has been a key feature of the European–North American intellectual tradition—and, to the dismay of deep ecologists, also a feature of some prominent variants of environmental ethics (Birch and Cobb 1981; Bookchin 1982; Rolston 1988). Biocentric egalitarianism aims directly at this target. By denying humans special moral consideration, Deep Ecology is not just nonanthropocentric, but *anti*-anthropocentric (Watson 1983).

Sessions has categorically rejected any differential axiology on the grounds that hierarchies of value lay the groundwork for claims of moral superiority. Quoting John Rodman (1977, p. 94), Sessions cautions that any comparative axiology merely reinstates a "pecking order in this moral barnyard" (Sessions 1985, p. 230). At a 1979 conference devoted to reminding philosophers of the purpose of their discipline (namely, deep questioning), Sessions warned environmental ethicists of the temptation of looking to a metaphysics based on intensity of sentience. "The point is not whether humans in fact do have the greatest degree of sentience on this planet (although dolphins and whales might provide a counterinstance), deep ecologists argue that the degree of sentience is *irrelevant* in terms of how humans relate to the rest of Nature" (Sessions 1985, p. 18). The second principle is *metaphysical holism*. One can apprehend ontological interconnectedness through enlightenment or "self-realization" (Devall and Sessions 1985, pp. 67–69; Naess 1987). As Fox says, "It is the idea that we can make no firm ontological divide in reality between the human and the nonhuman realms. . . . [T]o the extent that we perceive boundaries, we fall short of deep ecological consciousness" (Fox 1984, p. 196). Through this awakening, the ontological boundaries of the self extend outward, incorporating more and more of the lifeworld into the self. This insight discloses that there is in reality only one big Self, the lifeworld, a notion developed in the article "The World Is Your Body" (Watts 1966).

This method of self-realization is identification: By recognizing the intrinsic worth of other living beings, one recognizes the solidarity of all life forms. Naess, upon watching a flea immolate itself in an acid bath under a microscope, empathized with the suffering flea, identified with it, and thereby felt deeply connected with the entire lifeworld (1987, p. 36).

Once ontological boundaries between living beings are recognized as illusory, one realizes that biospherical interests are one's own. Devall and Sessions assert that "if we harm the rest of Nature then we are harming ourselves. There are no boundaries and everything is interrelated" (1985, p. 68). In the words of the environmental activist John Seed, the statement "I am protecting the rain forest" develops into "'I am part of the rain forest protecting myself.' I am that part of the rain forest recently emerged into thinking. . . . [T]he change is a spiritual one, thinking like a mountain, sometimes referred to as 'Deep Ecology'" (Devall and Sessions 1985, p. 199). Because the rainforest is part of the activist Seed, he is inherently obliged to look after its welfare. The rainforest's well-being and needs are indistinguishable from Seed's.

Naess and Sessions have emphatically emphasized the phenomenological spirit of deep ecology and downplayed dicta; the psychological realization of metaphysical holism makes ethics superfluous. As Naess has said, "I'm not much interested in ethics or morals. I'm interested in how we experience the world. . . . " (Fox 1995, p. 219). In Sessions words, "The search . . . is not for environmental ethics but for ecological consciousness" (Fox 1995, p. 225).

THE EIGHT-POINT PLATFORM

Growing out of the knowledge of nature's concrete contents is the recognition of the need for some kind of political action. To this end Naess and Sessions laid out an oft-cited eight-point program (that they conjured while camping in Death Valley in 1984) For example (Naess 1986, p. 24), in the diagram Buddhist, secular philosophical, and Christian first principles (the bust) converge in the eight-point platform (the waist), which then justifies an array of activisms (the skirt [see Figure 1]). Buddhist metaphysics might channel through the waist of deep ecological principles calling for environmental action to

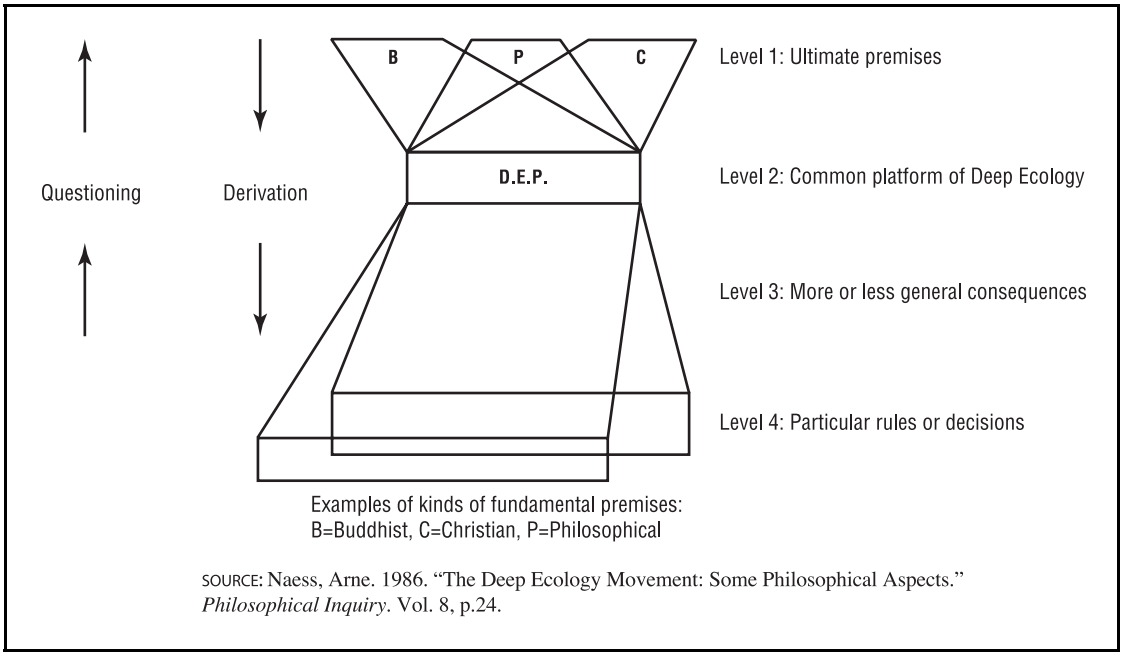

Figure 1. *Arne Naess's Apron Diagram.* **CENGAGE LEARNING, GALE.**

reduce consumption; secular metaphysics might channel through the waist of Deep Ecology calling for action to reduce human population growth; or Christian metaphysics might channel through the waist of Deep Ecology to call for action to preserve biodiversity. Both the eight-point platform and the apron diagram imply that Deep Ecology is above all an ontology and incidentally an ethic.

CRITIQUES OF DEEP ECOLOGY

The deep-ecological principles of biocentric egalitarianism and metaphysical holism have elicited robust critiques. Some of the most interesting debates have centered on the normative status of Deep Ecology. Naess maintains that Deep Ecology is essentially *descriptive*. For Naess unmitigated empiricism or "ecophenomenology" (Brown and Toadvine 2003) promotes a direct experience of the qualities of nature—its "concrete contents" (Naess 1985). Deep Ecology, he argues, is simply an enumeration of general principles that command the assent of persons open to the direct apprehension of nature.

Scholars have found the disclaimer that Deep Ecology is not a normative system—and ought not be judged as such—disingenuous. They have treated Deep Ecology as the legitimate object of the analysis of moral philosophy. Some regard Deep Ecology as strident axiological egalitarianism that is useless in adjudicating conflicting interests. If all organisms are of equal value, then there is no basis upon which to make prescriptions because the kind of value distinctions necessary for evaluating the moral situations of environmental ethics are deliberately disqualified. The principle of biocentric egalitarianism, on this view, renders Deep Ecology impotent as an ethical theory. Environmental ethics is predicated on the possibility of a *nonegalitarian* axiology. In the words of the American philosopher Bryan Norton, "The 120,000th elk cannot be treated equally with one of the last California condors—not, at least, on a reasonable *environmental* ethic" (1991, p. 224). Baird Callicott has surmised that environmental ethics must manifestly not "accord equal moral worth to each and every member of the biotic community" (1980, p. 327). These scholars argue, therefore, that biocentric egalitarianism must be scrapped (Sylvan 1985).

In a similar vein Fox has argued that the leveling axiology of orthodox Deep Ecology must be forsworn. If all organisms are really of equal intrinsic worth, the deep-ecological doctrinaire might just as well eat veal as vegetables (Fox 1984). In reality, Fox predicted, deep ecologists probably tend to be vegetarians, because—in the words of Alan Watts—"cows scream louder than carrots" (Fox 1984, p. 198). Orthodox Deep Ecology, Fox contends,

> does itself a disservice by employing a definition of anthropocentrism which is so overly exclusive that it condemns more or less *any* theory of value that attempts to guide "realistic praxis. . . ." Unless deep ecologists take up this challenge and employ a workable definition of anthropocentrism, they may well become known as the

> advocates of "Procrustean Ethics" as they attempt to fit all organisms to the same dimensions of intrinsic value. (Fox 1984, pp. 198–99).

Not eager to be labeled a procrustean ethicist, Fox persuasively argues for a position that abandons biocentric egalitarianism and instead asserts that all biota *have* intrinsic value but are not *equal* in intrinsic value because the "richness of experience" differs (Fox 1984, p. 198). On this point Fox aligns himself with the Whiteheadian-inspired environmental ethics based on intensity of sentience(Ferré 1994) that Sessions so adamantly opposes.

To mark the difference between his sophisticated reformulation of deep ecological thinking from orthodox Deep Ecology, Fox rechristened his theory transpersonal ecology (1995). Fox has since moved beyond Deep Ecology and has developed a more integrated approach that encompasses interhuman ethics, the ethics of the natural environment, and the ethics of the human-constructed environment (Fox 2006). In contrast, Sessions has reasserted the importance of deep ecology's ecological realism as opposed to social constructivism (2006) as the philosophical foundation for a "new environmentalism of the twenty-first century" (1995).

Naess has steadfastly resisted any gradations or differentiations of intrinsic value among organisms in light of such criticisms. Responding to Fox, Naess wrote that *some* intrinsic values *may* differ, but not the kind he talks about. He and Fox, said Naess, "probably do not speak about the same intrinsic view" (Naess 1984, p. 202). Naess has reiterated his intuition that "living beings have a right, or an intrinsic or inherent value, or value in themselves, that is *the same* for all of them" (Naess 1984, p. 202). As Naess conceded early on (1973), brute biospherical reality entails some forms of killing, exploitation, and suppression of other living beings; the aim is to do more good than harm, to respect on an equal basis the right of every life form to flourish (Naess 1984). Nevertheless, some philosophers have found such a guideline essentially vacuous, like vowing honesty until lying is warranted (Sylvan 1985a), thus undermining the very foundation of the principle itself. If any realistic practice deals with few situations where biota may be valued equally, then the principle is empty.

According to some critics, there are irresolvable structural tensions between biocentric egalitarianism and metaphysical holism in ecological value systems (Keller 1997). They argue that, in light of the real functions of living natural systems, it is impossible to even come close to affirming both the ability of all individuals to flourish to old age and the integrity and stability of ecosystems. The necessity of exterminating ungulates such as goats and pigs for the sake of the health of fragile tropical-island ecosystems is but one example. Regard for the health of whole ecosystems might, therefore, require treating individuals differently, because individuals of different species have unequal utility (or disutility) for wholes; if that were the case, then viewed from the standpoint of an entire ecosystem, biocentric egalitarianism and metaphysical holism might be mutually exclusive and inconsistent with each other to the extent that at least one would have to be abandoned—or perhaps both (Keller 1997).

DEEP ECOLOGY, SOCIAL ECOLOGY, AND ECOFEMINISM

Social Ecologists and ecofeminists have also formulated robust critiques of Deep Ecology. Social Ecologists, speaking as secular humanists of the European Enlightenment tradition, have excoriated biocentric egalitarianism as misanthropic. In particular Murray Bookchin criticized Deep Ecology for reducing humans from complex social beings to a simple species, a scourge that is "overpopulating" the planet and "devouring" its resources (1988, p. 13). Bookchin argues that Deep Ecologists' ahistorical "zoologization" prevents them from seeing the real *cultural* causes of environmental problems (1988, p. 18).

In the estimation of ecological feminists, the idea of self-realization is patriarchal. The Australian philosopher Val Plumwood, for instance, argued that the notion of the expanded self results in "boundary problems" stemming from the impulse of subordination (Plumwood 1993, p. 178). There are serious conflicts of interest between constituent members of larger wholes, and, she has argued, expansionary selfhood does not adequately recognize the reality of these conflicts. In the political arena, she contends, the expansionary holist is forced into the arrogant position of implying that anyone in disagreement does not in fact *understand* what is in her or his own best interest. Instead of approaching a situation of conflicting interests with a conciliatory attitude (e.g., "I realize your interests are different from my interests, so here we have a real conflict of interest that we need to resolve by compromise"), the expansionary holist approaches the situation, tacitly or overtly, self-righteously (e.g., "I know what your *real* interests are, and here we have a conflict because you don't seem to understand what your own interests are—whereas I do, fortunately for you.") Ecofeminists suspect that self-realization is a front for an imperialistic philosophy of self, springing from "the same motive to control which runs a continuous thread through the history of patriarchy" (Salleh 1984, p. 344).

Consider the activist John Seed. According to the ecofeminist critique, there is nothing to guarantee that the needs of the rainforest should govern those of Seed: Why should Seed's needs not dictate the needs of the rainforest? (Plumwood 1993). Or why should the needs of unemployed loggers not trump the needs of Seed and the forest?

THE EIGHT-POINT PLATFORM OF DEEP ECOLOGY

1. The well-being and flourishing of human and non-human life on Earth have value in themselves (synonyms: intrinsic value, inherent worth). These values are independent of the usefulness of the non-human world for human purposes.
2. Richness and diversity of life forms contribute to the realization of these values and are also values in themselves.
3. Humans have no right to reduce this richness and diversity except to satisfy vital needs.
4. The flourishing of human life and cultures is compatible with a substantially smaller human population. The flourishing of non-human life *requires* a smaller human population.
5. Present human interference with the non-human world is excessive, and the situation is rapidly worsening.
6. Policies must therefore be changed. These policies affect basic economic, technological, and ideological structures. The resulting state of affairs will be deeply different from the present.
7. The ideological change will be mainly that of appreciating life quality (dwelling in situations of inherent value) rather than adhering to an increasingly higher standard of living. There will be a profound awareness of the difference between bigness and greatness.
8. Those who subscribe to the foregoing points have an obligation directly or indirectly to try to implement the necessary changes (Naess 1986, p. 14).

Even while consenting to some of the insights of deep ecological questioning, for the unemployed logger the need to feed and cloth her or his children might easily outweigh any concern for ecosystemic integrity and stability.

Furthermore, some ecofeminists argue, affirming the ontological interconnectedness of all human and nonhuman organisms and the nonliving environment does not necessitate an embrace of the holism of self-realization. In an article that has become required reading for students of Deep Ecology, the Australian philosopher Richard Sylvan notes that the premise that individuals are not absolutely discrete does not entail the conclusion that all relations are internal and that individuals are ontological chimeras: "Certainly, removing human apartheid and cutting back human supremacy are crucial in getting the deeper value theory going. But for this it is quite unnecessary to go the full metaphysical distance to extreme holism, to the shocker that there are no separate things in the world, no wilderness to traverse or for Muir to save. A much less drastic holism suffices for these purposes" (1985b, p. 10).

CONCLUSION

Taken together, these various critiques have contributed to a significant consensus that Deep Ecology has reached its logical conclusion and has exhausted itself (Fox 1995). For example, in the respected textbook *Environmental Philosophy* (Zimmerman et al. 2005), the section on Deep Ecology, which enjoyed a coveted place in the first three editions, was eliminated in the fourth.

Compared to other prominent theories, Deep Ecology has not crystallized into a complete system. As Rothenberg states in the English revision of Naess's earlier *Økologi, samfunn, og livsstil*, deep ecological thinking is process without end (Naess 1989, Rothenberg 1996). For Rothenberg (1996), Deep Ecology is a set of prescient "hints" about the real relations of culture and nature. These hints are to environmental philosophy as a tree trunk is to roots and branches (Rothenberg 1987). Inverting the apron diagram, Rothenberg visualizes the platform of Deep Ecology as a tree, its conceptual roots deriving nourishment from various religious, aesthetic, and speculative soils and its branches reaching out into the world, enjoining various types of political action (1987). Rothenberg's ideas have stimulated new ways of thinking about the ways in which humans experience nature and about the limits of human language (1996).

Deep Ecology is less a finished product than a continuing, impassioned plea for the development of ecosophies (roots and branches) that merge shared nonanthropocentric core principles (the trunk). At the same time it is clear that Deep Ecology has earned a permanent and well-deserved place in the history of environmental philosophy; that this outlook has generated an abundance of academic articles and books in the field of environmental philosophy is ample testimony to its enduring influence and importance.

SEE ALSO *Biocentrism; Ecological Feminism; Holism; Naess, Arne.*

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David R. Keller

DEFENDERS OF WILDLIFE

With its howling wolf logo, the environmental group Defenders of Wildlife is one of the better-known North American nongovernmental organizations (NGOs) that

defend biodiversity conservation. Founded in 1947 under the name Defenders of Furbearers, this group initially focused on preventing the trapping of coyotes and wolves with conventional steel leg traps. Over the years, though, Defenders has broadened its geographical compass and its species concerns, helping to spur national legislation in the United States such as the Endangered Species Act of 1973 and later emerging in the twenty-first century as one of the leading forces for broader biological-protection initiatives. Although defending wolf populations, which were nearly eradicated in the lower forty-eight states in the mid-twentieth century, is still high among Defenders' priorities, the group's agenda has expanded to include not only an array of threatened and endangered species (such as grizzly bears, manatees, prairie dogs, bison, and butterflies) but also entire ecosystems. Since 2002 Defenders has expanded from its U.S. base to sponsor programs in Canada and Mexico.

Addressing the problems of large-range predators such as wolves and grizzly bears dictated this geographic shift. Because predators require large swaths of territory, groups such as Defenders have fought to protect the 19.6 million acre Arctic National Wildlife Refuge (ANWR) from petroleum exploration, reflecting a commitment to broader habitat health amid the intensifying pressures of corporate globalization. Arctic foxes and caribou as well as significant offshore den habitats for polar bears are among the chief biodiversity concerns in the campaign to keep Big Oil out of ANWR. In July 2005 Defenders became one of the six founding members of Exxpose Exxon, a consortium that encourages a boycott of Exxon-Mobil in order to pressure the oil giant to recognize global climate change as a legitimate, human-caused threat, to halt efforts to drill in ANWR, and to lessen America's dependence on carbon fuels.

As a 501(c) 3 charitable organization under the United States tax code, Defenders is prohibited from electoral campaigning and legislative lobbying in the United States. To circumvent this restriction, Defenders created a sister organization, the Defenders of Wildlife Action Fund, in February 2001. As a 501(c) 4 organization, donations to which are not tax-deductible, any Action Fund monies may be used to lobby for specific legislation or to campaign for or against members of Congress. The Action Fund's successful 2006 Conservation Majority Project, which targeted a number of representatives deemed unfriendly to the environment such as Richard Pombo (R-CA), is an example of this kind of activity. The fund publishes a regularly updated Congressional Report Card, which details how both senators and representatives vote on environmental legislation, and conducts a "Heads in the Sand" campaign to unseat members of Congress who continue to challenge scientific consensus on climate change.

The dawn of the Internet era in the mid-1990s created fresh opportunities for grassroots networking and educational outreach for activist groups like Defenders. The organization still publishes traditional documents such as the attractive quarterly magazine *Defenders,* but it was its Internet presence that sparked a jump in membership from 62,000 in 1991 to more than 500,000 in 2008. The Defenders Wildlife Action Center helps members find nearby wildlife educational events, join or start online discussions with one another and Defenders staff, and send out electronic activist letters to various officials around the country.

As a nongovernmental organization, Defenders can affect environmental policy only indirectly. It seeks to influence policy by promoting public awareness and then mobilizing civil society to pressure government officials and agencies. The reintroduction of wolves in the Northern Rockies, especially in Yellowstone National Park, in 1995 is a notable example of the success of such work. President Bill Clinton's Secretary of the Interior, Bruce Babbitt, instituted the formal policy, clearing the path for the Fish and Wildlife Service with a final 1994 environmental impact statement (EIS) that concluded that the reintroduction of wolves would not threaten the greater Yellowstone area. In early 1995 United States District Court Judge William Downes removed the last obstacle, a temporary injunction, by rejecting the American Farm Bureau Federation's argument that reintroduction would cause irreparable harm to ranching interests in the community. But it was Defenders' years of relentless pressure and dialogue on this issue that helped to bring about these government actions; a key early initiative was the 1987 establishment of a trust by Defenders to reimburse ranchers who lost livestock to wolf attacks. Such initiatives, which cannily combine dialogue and financial assistance, continue in the form of the Defenders' Bailey Wildlife Foundation Wolf Compensation Trust.

SEE ALSO *Biodiversity; Conservation; Endangered Species Act; Environmental Activism; Nongovernmental Organizations; North America.*

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Michael M. Gunter, Jr.

DESCARTES, RENÉ
1596–1650

René Descartes was born at La Haye near Tours in France on March 31, 1596, into a family that belonged to the landed gentry. He was sent at a young age to the Jesuit college of La Flèche, where he received a thorough grounding in Scholastic philosophy. That philosophy was deeply rooted in Aristotle's views, and Descartes later challenged those views. After taking a degree in law, he spent his early adult life moving around the European continent, part of the time as a gentleman soldier. A large part of his later life was spent in Holland. Between 1637 and 1649 he published various works in philosophy and science. In 1649 he went to Sweden at the invitation of Queen Christina. He died in Stockholm.

VIEWS ON KNOWLEDGE AND NATURE

Descartes's views usually are seen as completely antithetical to those of animal ethicists and environmental philosophers. In his best-known work, the *Meditations on First Philosophy*, Descartes sets out to establish a system of knowledge founded wholly on certain truths. To achieve this, he resolves in the First Meditation to set aside any opinion that is open to doubt and skeptical challenge. He then shows that the existence of an external world is open to doubt: Any particular "experience" of the world may turn out to be part of a dream. Moreover, the entire external world may be a "fiction" induced in him by a deceiving evil demon.

In the Second Meditation, Descartes establishes that to be deceived in this manner, he must exist as a conscious thinker. On the basis of this first certainty about his own conscious existence, he shows that there is a nondeceiving God who guarantees that any proposition that he is certain of (i.e., that he "clearly and distinctly perceives") is true. God's nondeception then enables him to reestablish that an external material world exists. In the Sixth Meditation, Descartes states clearly his dualist position, in which the created world is composed of two kinds of substances: conscious minds (the repositories of all experience) and an external material world. Human beings are composites, consisting of a mind and a body that is part of the material world. The mind and body causally interact with each other. For example, the mental decision to raise an arm causes the bodily arm to go up, and injury to the body causes a mental perception of pain.

Descartes's basic views as encapsulated in the *Meditations* are thought to lead to controversial doctrines about nature. The external world Descartes reintroduces toward the end of the *Meditations* is very different from the natural world of his medieval predecessors. Medieval scholars, following Aristotle, had seen all living things as having specific sets of capacities. For example, blades of grass have the capacity for nutrition and growth; cats have those capacities and the additional capacities of movement and sensation; and so on. Human beings have all the capacities of nutrition, growth, movement, and sensation, as well as the unique capacity to reason. In contrast, Descartes was a supporter of the scientific revolution that replaced Aristotle's views with a conception of nature as wholly mechanical in character. Thus, the external world reintroduced in his *Meditations* consists of "dead" matter whose behavior can be understood by reference to a set of mathematical laws.

The *Meditations* also is seen as privileging the conscious thinker and his or her experiences over the "dead" material world, which is seen as the "other" that lies outside the mind. Thus, although Descartes saw human beings as composites of mind and matter, he is held to have ascribed moral standing to them solely on the grounds that they have minds and are capable of conscious experience.

In the *Discourse on Method*, Descartes argued that there are no grounds for thinking that animals have minds or the capacity to reason, as all their behavior is explicable if they are conceived of as clockwork machines that operate according to mechanical laws. Descartes thus indicated that animals belong wholly to the material realm. As clockwork machines without minds, they do not see, hear, or feel pain. They also have no moral standing and can be used as conscious human beings wish.

Again, Descartes thought that the entire physical universe, of which animals are parts, is dead matter governed by the same uniform set of mechanical laws. It too has no moral standing and can be treated as an instrument to be exploited for human ends and goals. In the *Discourse on Method,* Descartes exhorts human beings to harness the various powers of nature so that they may become the "masters and possessors of nature."

CRITIQUES

Descartes's views have met with strong objections in recent times. Gilbert Ryle famously described Descartes's dualist position as "the Dogma of the Ghost in the Machine"

(1949, pp.15–16). In Descartes's view, the human body, like the animal, is a clockwork machine. Unlike animal machines, however, it is driven by a ghost that is "invisible, inaudible and has no size and weight" (p. 20). Ryle argues that it is hard to conceive of causal transactions between the clockwork machine and the "ghost" or mind. Other philosophers point out that Descartes's material universe is a closed system that proceeds inexorably according to its own laws. How, then, can the thinker's mental decisions causally affect the human body and, by extension, the wider processes in the universe?

Animal ethicists also disagree with Descartes's views. Descartes posits that animals are clockwork machines and hence have no moral standing. This is in clear contrast to the views held by many animal ethicists. Peter Singer, for instance, maintains that animals have the capacity to feel pain and pleasure and are entitled to moral consideration precisely because they have that capacity (Singer 1998).

Environmental ethicists such as Aldo Leopold, J Baird Callicott, and Holmes Rolston would object to Descartes's position that the physical universe can be exploited for human goals and ends. They would maintain that the physical universe, in particular its various ecosystems, have moral standing and should not be exploited or destroyed.

Ecofeminists also have also been critical of Descartes's views. Descartes's dualism privileges the conscious thinker over the material world, which is seen as an alien object to be mastered. That perspective deprives humans of ("feminine") sympathy and connection with nature. Carolyn Merchant (1980) also notes that historically Descartes was a major figure who helped displace earlier conceptions of the earth as a nurturing mother with the view of nature as a machine to be used and abused at will.

ALTERNATIVE INTERPRETATIONS

The interpretation presented above is a standard reading of Descartes's views. Although there is considerable textual basis for this reading, some recent writers have argued that Descartes's views may have been more nuanced and perhaps more ambiguous than this reading allows. For example, philosophers such as John Cottingham (1978) have argued that although Descartes denies that animals have reason, he accepts the idea that animals experience passions and sensations. It also has been claimed that Descartes thinks that the physical universe as a whole should be accorded moral standing insofar as it is God's creation.

SEE ALSO *Animal Ethics; Callicott, J. Baird; Consciousness; Ecological Feminism; Environmental Philosophy: V. Contemporary Philosophy; Environmental Philosophy: II. Medieval Philosophy; Leopold, Aldo; Rolston III, Holmes; Singer, Peter.*

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Cecilia Wee

DESERTS AND DESERTIFICATION

A desert is most often defined as an area where annual rainfall is between 10 and 20 inches. More specifically, semiarid deserts receive less than 23.6 inches of rain annually, arid deserts less than 7.8 inches, and hyperarid deserts less than .98 inches. Major deserts today include the Sahara, the world's largest at 3.5 million square miles; the Arabian Desert; the Great Sandy, Great Victorian, and Simpson deserts of Australia; the Thar Desert of India and Pakistan; the Sonoran Desert of North America; the Atacama Desert of South America; the Takla Makan Desert of China; and the Gobi Desert, which covers parts of China and Mongolia. Many of these deserts include or adjoin other, smaller deserts.

Desertification—land degradation that is caused by climatic variation and human activities—has occurred for thousands of years. Desertification can be either a physical or a chemical process. An example of physical desertification is Greece over the last 4,000 years: The clearing of forests to cultivate sloping land initiated progressive soil erosion over millennia, causing a shift from cultivation to grazing—often overgrazing—which then further accelerated soil degradation. Mesopotamia, the "cradle of civilization" between the Tigris and Euphrates rivers in present-day Iraq, has been transformed into arid desert by chemical desertification. Excessive irrigation, beginning around 5000 to 4000 BCE, raised the water table so high that water repeatedly pooled in sloughs to evaporate, leaving the salts from the water on the surface of the land, where it inhibits plant growth.

Desert near Dunhuang, China. *A woman walks through the desert that threatens to engulf her onion farm in China's northwest Gansu province. Desertification is increasingly becoming a major problem in the destitute province, along the historic Silk Road. The ancient city of Dunhuang is in danger of being completely lost to the sands of the Kumtag Desert, which are creeping closer at a rate of up to four meters each year.* **PETER PARKS/AFP/GETTY IMAGES.**

The Sahara was largely uninhabited until roughly 8500 BCE because of extreme desiccation; rainfall greatly increased between 8500 and 3500 BCE, attracting many plants, varieties of wildlife, and human settlements into its valleys and oases. When rainfall declined again around 3500 BCE, the Sahara returned to desert. Yet today the borders of the Sahara advance .6 miles per year because of human deforestation, overgrazing, inappropriate cropping, and, in some areas, salinization from overirrigation.

Deserts make up about one-third of the earth's land surface. But desert area is growing because of the impoverishment of arid, semiarid, and some subhumid ecosystems by the combined impact of human activities and drought. These impacts can be measured by reduced plant productivity, alterations in the biomass and the diversity of the micro and macro fauna and flora, accelerated soil deterioration, and rising risks for human occupancy. In addition to areas that are threatened with desertification, many deserts themselves are endangered. The 250,000-square-mile Rub'al-Khali, the southern part of the Arabian Desert and one of the driest, hottest, and least hospitable places on earth, contains only thirty-seven species of plants, seventeen of which are on its periphery. The primary threats to the Rub'al-Khali today are overgrazing, roadbuilding, oil wells, and war**.** In the 1991 Gulf War, not only did American tanks damage the thin, fragile crust that protected sand dunes from erosion, creating a massive, slow-moving sand dune that will soon threaten Kuwait City while Iraqi forces turned 1,164 Kuwaiti oil wells into oil lakes in the same Arabian Desert, but Iraqi forces also punished Saudi support for the war by shooting missiles into Saudi wells, leaving lakes of over 60 million barrels of oil in the Rub'al-Khali Desert covering over 30 square miles of land. In the Arabian Desert a number of native species, including the striped hyena, the jackal, and the honey badger, are now extinct because of hunting and habitat loss. But a few species which had disappeared, such as the endangered white oryx and the sand gazelle, have now been reestablished and, with the protection of some reserves—the first of which were established by Abu Dhabi—seem to be recovering numbers.

Almost one-third of China is made up of deserts that produce seasonal sandstorms that scour the northern cities, including Beijing. Across China many semiarid and dry subhumid zones have experienced temperature increases and precipitation decreases since the 1970s. As precipitation has decreased, animals, both wild and domestic, have overgrazed the diminished vegetation, killing vegetation and inviting erosion, a further cause of desertification. Humans followed the example of animals; instead of easing the strain on the land caused by lowered precipitation by cutting herd size and moving to other areas, they have remained in place, shifting their herds and ploughs to those border areas not yet destroyed, thus hastening desertification of nearby land.

Global climate change may be an even greater cause of desertification in the future because the Tibetan glaciers that feed China's streams are melting. According to the Millennium Ecosystem Assessment (2005), desertification is not an inexorable process; degraded land can often be restored if local communities are involved and funds and infrastructures are provided. China has begun a number of projects aimed at addressing desertification.

The U.N. Convention to Combat Desertification, together with the Conventions on Biological Diversity and Climate Change, can provide an initial roadmap for combating desertification. Drylands (a collective noun for a variety of arid regions, including deserts) have variable climatic conditions; droughts are periodic. Human impacts must be adjusted to account for these variations. The most common action taken to halt desertification is tree planting, which, if well planned, can counter more than one aspect of this process. Trees help hold soil in place, thus decreasing wind and water erosion, while providing shade and habitat for other plants and animals. Tree planting, however, is not a cure-all for the complex causes of desertification; each degraded area must be individually assessed.

Increasing desertification is a threat not only to the earth's human population, but also to its overall biodiversity. Since the agricultural revolution of 8000 BCE, humans have been governed by an agricultural mindset that dismisses as unimportant any land not usable for farming; this attitude must be overcome to preserve the health of both existing deserts (which, like other biomes, have an ecology all their own) and drylands, lest they, too, become deserts.

SEE ALSO *Biodiversity; China; Convention on Biodiversity; Global Climate Change; Israel and the Middle East; Millennium Ecosystem Assessment; Tragedy of the Commons.*

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DISEASE

Definitions of disease affect policy decisions and social roles: where money should be spent, what doctors may do, who is excused from normal social obligations. Definitions can also have an impact on the environment, since prevention or cure can draw upon natural resources, and seems more legitimate, if the condition to be treated is classified as disease.

The boundaries of the concept of disease, like those of most concepts, are not precise. In general, conditions that cause pain, disability, disfigurement, or early death count as diseases, particularly when the conditions are in some sense atypical. What is considered abnormal pain, disability, disfigurement, and lifespan differ somewhat across cultures and through time. Hence, whether a condition is a disease is not a simple empirical fact, but a conclusion shaped partly by human norms and projects. There is less controversy about disease in animals and plants. If an infection does not limit the animal's activities or (so far as we can tell) its experiences, there can be disagreement about whether the infection constitutes a disease. Yet if the animal is stressed in some way, the infection can weaken its ability to respond, in which case we are likely to classify the condition as a disease. An organism may carry some pathogen affecting others without itself being sick. But here too human purposes will operate: A condition that makes an organism less useful or even dangerous to human beings is more likely to be called a disease.

Black Legged, or Deer, Tick Through Microscope. *Deer ticks, like the specimen shown here, are the carriers of Lyme Disease to humans. Diseases transmitted between humans and animals raise many other issues related to the environment, such as the ethical nature of recreational hunting and the effects of human population growth on species extinction.* **AP IMAGES.**

Other physical conditions are not ordinarily called diseases, but have been treated medically, sometimes in ways that affect the natural world. After menopause, women are often considered estrogen-deficient, because their supply of the hormone declines significantly, a condition resulting in an increased risk of osteoporosis and cardiovascular disease. To mitigate this risk, such women have sometimes been given estrogen replacements. In addition, fertility (never considered a disease, but certainly a biological fact of great significance) has been regulated for many years with estrogen-containing oral contraceptives. Estrogen in the urine of these women reaches the broader environment and may be implicated in, for instance, an increased incidence of malformed frogs and fishes.

Health is even harder to define than disease; sometimes one concept is defined in terms of the other (e.g., health is the absence of disease), but often more positive terms are used (e.g., health is the ability to respond to challenge or restore homeostasis). The most all-encompassing definition comes from the World Health Organization: Health is a state of complete physical, mental, and social well-being. Whatever the definition, the concept of health does imply some conception of an ideal life. Some environmentalists, drawing a parallel with Attention Deficit Disorder, a recently accepted category, suggest a Nature Deficit Disorder. The suggestion is that lives divorced from the natural world are deficient in themselves and likely to result in other problems.

In most ways a healthy ecosystem contributes substantially to human well-being, so much so that environmentalists often frame their cause in terms of public health. As the ozone layer thins, skin cancer increases, and so do cataracts. When air pollution worsens, respiratory diseases increase. The causal web can be complex. Global warming, for instance, allows temperature-sensitive mosquitoes to fly higher, at which altitudes they infect more migratory birds, and infected birds then spread diseases more widely.

Yet there are also many apparent tensions between human health and that of the natural world. For example, vitamin A deficiency causes compromised vision or blindness, and seriously compromises the immune system. It is a significant cause of death in many poor countries. Genetically modified Golden Rice, a promising intervention to ward off vitamin A deficiency, raises all the environmental issues associated with any genetically modified organism. In another example, the anticancer drug Paclitaxel was derived from the Pacific yew tree, an endangered species. Such tensions, however, can be apparent rather than real, temporary rather than permanent. Vitamin A can be provided in the form of inexpensive drops, and Paclitaxel is now made in laboratories. There are generally many different ways of protecting human health, some of which are costly, disruptive, or inconvenient, and some of which affect the environment. It is ethically important to consider the wide array of possible strategies.

Many infectious diseases are either zoonotic (transmitted between animals and humans) or carried by insect vectors. Both categories raise ethical issues. Zoonosis, the source of about 70 percent of newly identified diseases, increases as contact between human beings and wildlife increases. Human beings settle or work or play in what was once wilderness, and wild animals, dislodged or deprived of habitat, move closer to human beings. The prevalence of household pets, high-density food-animal production, and international trade in exotic animals also play a role. Habitat destruction and climate change, as well as extermination campaigns, can eliminate predators and dramatically increase some animal populations. For example, New Zealand possums, introduced by colonists, have no natural predators; in North America, campaigns against wolves contributed to the large number of deer. Both possums and deer carry bovine tuberculosis, a zoonotic disease.

Sometimes, however, managing disease seems to require environmental destruction with no benefit except to human beings. Dichlorodiphenyltrichloroethane (DDT) is the best known example. The pesticide, effective against

malaria- and typhus-bearing mosquitoes, was originally used in the developed world not only for disease eradication but also as a pesticide in agriculture. In the 1950s and 1960s its use was widespread and heavy. As a persistent organic pollutant, DDT accumulates in living tissue, and concentrations increase at higher levels in the food chain. Because of eggshell thinning, DDT decimated some bird species. Moreover, it is toxic in varying degrees to many kinds of fish, shellfish, and amphibians. For these reasons, DDT became widely banned, even though typhus and especially malaria remain major problems in the poorer countries. Years later it became evident that occasional indoor use of DDT on walls and bed nets can dramatically lessen the incidence of malaria with little negative effect on the environment. In 2006 the World Health Organization endorsed the use of DDT for vector control.

Human beings also carry disease to animals, in a variety of ways. Using minnows caught in one lake as bait in another can spread viral diseases among fish. Primate tourism may increase disease in the great-ape population, whether from increased contact with human beings, increased stress, or other changes in the local environment. Curtailing the recreational activities that spread these diseases probably raises more political issues than ethical ones, since fishers and tourists ultimately benefit from restrictions on what they do. But there are larger and more difficult issues: Human population growth, technological intensification, and climate change lead, in many complicated ways, to increased disease in animals and to species extinction. One example is the mercury poisoning of loons, due to emissions from coal-burning plants. Yet here again, the ethical difficulty diminishes when the issue is seen on a larger scale: The environmental mercury that sickens fish threatens people too.

Finally, disease in human beings can affect the environment indirectly. Diseases to which Native Americans had no immunity were largely responsible for their replacement by Europeans, who responded to the natural world differently. Conversely, quinine allowed Europeans to colonize areas where malaria would otherwise have made it impossible. Ecological concerns pale, however, in comparison with ethical considerations about the cruelty and carnage to human beings that often accompanied colonization.

SEE ALSO *Extinction; Food Safety; Genetically Modified Organisms and Biotechnology; Global Climate Change; Pesticides; Pollution; Population.*

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EARTH CHARTER

The Earth Charter is a people's declaration on global interdependence and universal responsibility that sets forth fundamental principles for building a just, sustainable, and peaceful world. It endeavors to identify the critical challenges and choices facing humanity in the twenty-first century. Its principles are designed to serve "as a common standard by which the conduct of all individuals, organizations, businesses, governments, and transnational institutions is to be guided and assessed" (Earth Charter Initiative 2000).

The Earth Charter is the product of a decade-long, worldwide, cross-cultural dialogue on common goals and shared values conducted during the 1990s. This process, which involved the most open and participatory consultation process ever associated with the drafting of an international document, is the primary source of the legitimacy of the Earth Charter as an ethical guide.

ORIGINS OF THE EARTH CHARTER

Among the many recommendations in *Our Common Future* (1987)—the report of the World Commission on Environment and Development (WCED)—is a call for creation of a "Universal Declaration on Environmental Protection and Sustainable Development" in the form of a "new charter" with principles to guide nations in the transition to sustainable development. Building on this recommendation, Maurice F. Strong, the United Nations secretary-general of the 1992 Rio Earth Summit, proposed in 1990 that the summit draft and adopt an Earth Charter. Intergovernmental consultations were held on the Earth Charter during the preparatory process for the Rio Earth Summit, but an intergovernmental agreement on principles for an Earth Charter could not be reached. Therefore, in 1994, Strong, as chairman of the Earth Council, joined with Mikhail Gorbachev in his capacity as president of Green Cross International to launch a new Earth Charter initiative. This partnership was formed with the support of Jim McNeill, secretary-general of the WCED, and Queen Beatrix and Prime Minister Ruud Lubbers of the Netherlands. The plan was to draft a charter that articulates the consensus that is taking shape in the emerging global civil society on values and principles that promote a sustainable way of life.

Ambassador Mohamed Sahnoun of Algeria served as the first executive director of the Earth Charter project during 1995, as new research in the fields of environmental ethics, sustainable development, and international law was initiated and a new international consultation process got under way. An Earth Charter secretariat was established at the Earth Council in Costa Rica under the management of the executive director of the Earth Council, Maximo Kalaw of the Philippines. In 1996 Mirian Vilela of Brazil became coordinator of Earth Charter activities at the Earth Council. Toward the end of 1996, an Earth Charter Commission was formed to oversee the drafting process. It was cochaired by Strong and Gorbachev and included eminent persons from twenty-one nations. The commission invited Steven C. Rockefeller, a professor of religion and ethics from the United States, to chair and form an international drafting committee. The drafting process, which began in January 1997, required three years.

Hundreds of organizations and thousands of individuals participated in the creation of the Earth Charter.

Forty-five Earth Charter national committees were formed. Earth Charter dialogues were conducted throughout the world and on the Internet, and major regional conferences were held in Asia, Africa, Central and South America, North America, and Europe. The ideas and values in the Earth Charter reflect the influence of a great variety of intellectual sources and social movements. These include the new scientific worldview being shaped by physics, cosmology, and ecology, and the wisdom of the world's religions and great philosophical traditions and of indigenous peoples.

The Earth Charter should be seen as a product of the global ethics movement that inspired the Universal Declaration of Human Rights and gained wide support in the 1990s. The drafting committee worked closely with the Commission on Environmental Law of the International Union for the Conservation of Nature (IUCN) (often referred to as the World Conservation Union) and carefully reviewed all relevant international-law declarations and treaties and more than 200 civil-society declarations and people's treaties. The Earth Charter builds on and extends international environmental and sustainable-development law. It reflects the concerns and aspirations expressed at the seven UN summit meetings held during the 1990s on the environment, human rights, population, children, women, social development, and the city. It recognizes the importance of the spread of democracy for human development and environmental protection.

THE CONTENT OF THE EARTH CHARTER

The final text of the Earth Charter, which was approved at a meeting of the Earth Charter Commission at the UNESCO headquarters in Paris in March 2000, contains a preamble, sixteen main principles, sixty-one supporting principles, and a conclusion titled "The Way Forward." The preamble affirms that "we are one human family and one Earth community with a common destiny," and the Earth Charter encourages all people to recognize their shared responsibility, each according to his or her situation and capacity, for the well-being of the whole human family, the greater community of life, and future generations (2000). According to the Earth Charter, all life forms are worthy of respect and ethical consideration, regardless of their utilitarian value to human beings. Recognizing the interrelationship of humanity's environmental, economic, social, and cultural problems, the Earth Charter presents an inclusive, integrated ethical framework. The titles of the four sections into which the principles are divided indicate the breadth of the vision: I. Respect and Care for the Community of Life; II. Ecological Integrity; III. Social and Economic Justice; and IV. Democracy, Nonviolence, and Peace. The Earth Charter identifies a number of widely shared spiritual attitudes and values that can strengthen commitment to its ethical principles, and the document culminates with a vision of peace and the joyful celebration of life.

THE CONTINUING EARTH CHARTER INITIATIVE

The Earth Charter was formally launched at the Peace Palace in The Hague in June 2000. It has been translated into forty languages and endorsed by more than 2,500 organizations representing the interests of hundreds of millions of people. Among the endorsing organizations are UNESCO, IUCN, the International Council of Local Environmental Initiatives (ICLEI), and the U.S. Conference of Mayors. A number of international lawyers recognize the Earth Charter as an increasingly influential soft-law document, and efforts to seek formal recognition of the Earth Charter by the United Nations General Assembly are continuing.

The Earth Charter provides an excellent overview of the essential elements of sustainable development and world peace, and it is widely used as a teaching tool in schools, colleges, universities, and nonformal education programs. In 2006 the Earth Charter Secretariat was reorganized as Earth Charter International (ECI). An ECI Council was formed to oversee ECI's core programs and small staff, which has its headquarters at the University for Peace in Costa Rica. The mission of ECI is to help establish a sound ethical foundation for the emerging global society and to promote education for sustainable development and implementation of Earth Charter principles by civil society, business, and government. ECI encourages decentralized Earth Charter initiatives throughout the world and has affiliate organizations and partners in more than fifty-seven countries.

SEE ALSO *Earth Summit; Rio Declaration; Sustainable Development.*

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Steven C. Rockefeller

EARTH FIRST!

Earth First! is an American environmental advocacy group formed in 1980 at a highway rest stop north of Tucson, Arizona (Cahalan 2001, p. 192). Angered by the federal government's continued failure to protect and preserve wilderness (Scarce 2006, p. 58), a small cadre of friends acted on impulse and inspiration, vowing "No Compromise in Defense of Mother Earth" (Cahalan 2001, p. 192). The group gained members instantly, becoming known, politically, for its cynicism of regular legislative process and its penchant for direct action, and, prophetically, for anticipating ecological apocalypse (Foreman 1986, p. 2) and the demise of industrialized civilization (Abbey 1986, p. 22).

Whereas political environmental groups such as the Sierra Club attempt to preserve biodiversity through lobbying and legislation, Earth First! prefers techniques of "direct action" pioneered by Greenpeace (Scarce 2006, pp. 47–48). The goal of direct action is twofold. First is to draw public attention to environmental problems through media stunts in order to bolster the efforts of mainstream environmental organizations. Earth First!'s initial foray into public relations was the memorable "cracking" of Glen Canyon Dam (Scarce 2006, pp. 57–58).

Second, Earth First! seeks to physically impede development. The most common strategy is nonviolent civil disobedience such as personally blocking bulldozers. Much more controversial is sabotage, principal to the establishment of Earth First! but rejected by Greenpeace (Scarce 2006, p. 54). One known instance of Earth First! sabotage was the targeting of a power line tower in Arizona (Robbins 1989). Though violent, sabotage is not terrorism. Terrorism aims at mutilation and murder; sabotage, in the spirit of English activist Ned Ludd (Sale 1999), is designed to destroy the technological infrastructure of industrial economy (Abbey 1983, p. 94).

Cofounder Dave Foreman traces the necessity of direct action back to the formation of the U.S political economy and the near absolute control of industrialists on environmental policy. Foreman contrasts the visions of Alexander Hamilton, who advocated an economy built on industry, and Thomas Jefferson, who advocated an economy built on agriculture. According to Foreman, the Hamiltonian vision triumphed, with the U.S. government essentially becoming an organ for the promotion of business (Lee 1995, p. 5) making normal legal and political means insufficient for the end of wilderness preservation.

For Foreman biodiversity is the summum bonum (greatest good). Economic activities that threaten biodiversity must be forestalled. Earth First! claims that in this mainstream environmentalism has failed through capitulation and concession (Foreman 1983, pp. 95–96). In an industrial economy, destruction of industrial infrastructure is more effective than negotiation. Laws protect property, making sabotage intrinsically illegal. In contrast to "reform" environmentalism, which operates within normal legal paradigms (Manes 1990, pp. 45–65), sabotage, as illegal, is "radical" (Scarce 2006, p. 5).

Sabotage for ecological ends—"ecotage" or "ecosabotage"—is the use of the tools of industry against itself (Foreman 1981). This method, also known as "monkeywrenching," was famously sketched by Edward Abbey in novel form (1985 [1975]). In the enigmatic relationship between Abbey, who clearly enjoyed the role of rhetorician provocateur, and Earth First!, art imitated actuality, and actuality art. Of *The Monkey Wrench Gang,* Abbey wrote: "This book, though fictional in form, is based strictly on historical fact. Everything in it is real or actually happened. And it all began just one year from today" (1985, frontispiece). Foreman (1993, frontispiece) makes a similar jocose disclaimer in his practical field guide to ecotage in spite of the book's apparent intent to foment the collapse of the Hamiltonian economy.

Foreman diagnosed philosophical rumination leading to political impotence (1983). Given the preference for action over thought, the exact ecological axiology in the Earth First! platform is vague, a conglomeration of biocentric egalitarianism (Foreman 1995 [1980], p. 2), ecocentric holism (Wolke 1983, p. 3), and pantheism (Taylor 1991). The strongest of these themes is ecocentrism. The loci of moral consideration are ecological wholes, and given the negative human impact on the biosphere, *Homo sapiens* are of disvalue (Foreman 1991, p. 26).

Themes of antihumanism in Earth First! became explicit in the mid-1980s. Associate journal editor Christopher Manes (1986) argued that technology exacerbates overpopulation by staving off death and therefore the practice of medicine ought to be discontinued. Most contentiously, Manes (1987) asserted that the biosphere would benefit from a substantial decline in human population, and acquired immune deficiency syndrome (AIDS) might provide a welcome palliative.

Members of Earth First! Protest the Timber Industry. *Earth First! is an environmental activist group that distinguishes itself by utilizing direct action, nonviolent civil disobedience, and sometimes ecotage as techniques. Here members protest logging of old-growth or "ancient" forests in the Pacific Northwest. Some, including Murray Bookchin, have criticized the group's ideology as being antihumanist.* **STEPHEN FERRY/LIAISON/GETTY IMAGES.**

Predictably, this argument and others like it provoked the wrath of social justice thinkers and drew the battle lines of a barbed exchange between Foreman and Murray Bookchin (Chase 1991). Bookchin argued that ecocentrism leads to unconscionable misanthropy (1988, p. 25). Earth First!ers treat humanity as one undifferentiated overpopulating mass, missing the fact that ecological problems are not the result of human existence per se but rather the differential consumption of resources between socioeconomic classes (Chase 1991, p. 57). Bookchin's critique suggests Foreman has tended to focus categorically on the impact of humans on nonhuman nature in terms of industrialization and overpopulation. This overlooks the relationships of individuals to each other within unjust social structures (such as patriarchy and class hierarchy) and how these inequities translate into the human devastation of ecological systems.

This external debate mirrored an internal debate and precipitated an eventual rupture in the ranks of Earth First! (Lee 1995, pp. 115–127). Demographically, this schism occurred between the original founding faction—the "rednecks"—predominately from the desert southwest, and younger members—the "hippies"—predominately from northern California and Oregon.

Generally, while the founding faction applauded ecotage, the second generation favored civil disobedience. For the latter, environmental justice requires social change, and ecotage merely generates antagonism. Judi Bari publicly renounced tree spiking, the iconic hallmark of Earth First! ecotage, in an effort to forge alliances between loggers and environmentalists and win public support (Lee 1995, p. 134).

Ecotage works best when decentralized. In this sense, first-generation Earth First!ers departed from their fundamental premise the moment they gave themselves a name. Nevertheless, the project of initiating social change is amenable to, and benefits from, efficient systematic organization. This ideological difference gave the social change faction an inherent institutional advantage. By the late 1980s these dynamics played out and the social justice faction gained majority control. Foreman departed in 1990 (Lee 1995, pp. 139–140) and, perhaps ironically,

went on to serve on the Sierra Club's Executive Committee from 1995 to 1996 (Sierra Club 2007).

Earth First! has succeeded remarkably in expanding the range of debate about environmental issues. It has achieved its objective of making mainstream environmentalism seem moderate and hence more widely palatable. Any assessment of Earth First! must look beyond the group itself to the ripple effect it has had on the totality of political ecology.

SEE ALSO *Abbey, Edward; Biodiversity; Civil Disobedience; Deep Ecology; Ecosabotage; Ecotage and Ecoterrorism; Environmental Activism; Greenpeace; Nongovernmental Organizations; Sierra Club.*

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EARTH SUMMIT

The United Nations Conference on Environment and Development (UNCED), popularly known as the Earth Summit, was convened in Rio de Janeiro, Brazil in June 1992 in the hopes of securing a number of environmentally responsible international agreements. The conference brought together the largest number of world leaders that had ever been assembled: 118 heads of state and government and delegations from 178 nations. There were 7,000 diplomats and their staff. As Thomas Kamm wrote in the *Wall Street Journal*, this "mother of all summits" was "the biggest gathering of world leaders ever held" (1992, p. A1). Through media coverage from the 7,000 journalists who were present, UNCED gained world attention for major environmental issues. The chief official for UNCED was Maurice Strong, a Canadian businessman and environmentalist.

THE CONFERENCE AND ITS PUBLICATIONS

Parallel to the official summit was a Global Forum. Here, by one count, there were 3,738 nongovernmental organizations (NGOs) from 153 countries that had something to say about the environment, and about 30,000 participants in total. The Global Forum featured hundreds of displays in outdoor booths and had hundreds of speakers, including many celebrities.

The conference produced the *Rio Declaration* (United Nations Conference on Environment and Development 1992b), a short statement of principles on environment and development. It also produced *Agenda 21* (United Nations Conference on Environment and Development 1992a), at over 500 pages long perhaps the most complex and comprehensive international document ever attempted. Initially, there was hope for four international conventions—(1) Forests, (2) Biotechnology, (3) Biodiversity, and (4) Climate—though only the latter two survived the negotiating process, both in greatly weakened form. The principal stumbling blocks on biodiversity and biotechnology conventions revolved around access to genetic resources and technology transfer.

UNCED did adopt a more schematic statement of principles for the sustainable management of forests.

A widely read preparatory study, *Our Common Future* (World Commission on Environment and Development 1987), commonly called the Brundtland Report after its chair, Norwegian Prime Minister Gro Harlem Brundtland, set the tone for much of the debate. The study opened with a memorable aphorism: "The Earth is one but the world is not." On the one home planet, with its plural and often divisive peoples and their national interests, the principal focus must be on sustainable development. "Sustainable development is development that meets the needs of the present without compromising the ability of future generations to meet their own needs" (World Commission on Environment and Development 1987, pp. 27, 43). That statement set future generations on the horizon of the present but also opened up questions of distributive justice in the present time, whether current patterns of wealth and poverty would contribute toward sustaining such a future.

UNCED and the Global Forum turned out, to the surprise of some, to be a global morality play, where the developing nations could gain equal hearing with the developed nations. "The summit must establish a whole new basis for relations between rich and poor, North and South, including a concerted attack on poverty as a central priority for the 21st century" (Maurice Strong, quoted in Allen, 1992, p. A8). At both UNCED and the Global Forum, much concern was expressed about the North, the rich, American and European lifestyles, the G-7 nations, and paternalistic do-gooders. The event became almost a guilt trip, with, at the same time, many world leaders inclined to pin responsibility on someone else and to duck strong measures that could hurt them economically or politically.

One lesson from Rio is the excruciating difficulty of getting past the political barriers facing any attempt at a concerted international effort to achieve reform that is in every human being's long-term interest but runs contrary to many countries' short-term priorities. National sovereignties tended to constrain the effectiveness of the conference when it sought to protect the global commons. Concern was ample, but cooperation was elusive because nation-states defended the interests of their citizens, and this cast nation against nation, and often the developed nations against the developing nations. The question of responsibility to Earth was addressed only subsequently, when it was discussed at all. More frequently, the developing countries were demanding what they claimed to be their rights and the developed countries were defending what they claimed to be theirs.

A VISION FOR THE FUTURE

Nevertheless, UNCED produced memorable visions of responsibilities to life on Earth. Boutros Boutros-Ghali, speaking as the United Nations secretary-general, closed the Earth Summit: "The Spirit of Rio must create a new mode of civic conduct. It is not enough for man to love his neighbour; he must also learn to love his world" (Boutros-Ghali 1992a, p. 1). "We must now conclude an ethical and political contract with nature, with this Earth to which we owe our very existence and which gives us life" (Boutros-Ghali, 1992b, vol. IV, pp. 66–69). Such an environmental ethic enlarges its vision from a social contract to a natural contract between one planet and many peoples in search of an urgent world vision. The summit was a watershed because two principles of international order were solidified: an equitable international economic order and sustainable development with requisite protection of the environment.

The United Nations (UN) set up a Commission on Sustainable Development (CSD) for effective follow-up. In 1997 at the New York headquarters, the UN General Assembly held a five-year review of progress on Earth Summit, commonly called Rio+5. The assembly found uneven progress, with widening inequities in income and continued environmental deterioration. The World Summit on Sustainable Development (called Earth Summit 2002) was held, after ten years, in Johannesburg, South Africa, in 2002; it was boycotted by the United States. The UN simultaneously sponsored an intensive analysis, the *Millennium Ecosystem Assessment,* and a statement of millennium development goals.

SEE ALSO *Biodiversity; Brundtland Report; Convention on Biodiversity; Global Climate Change; Nongovernmental Organizations; Rio Declaration; Sustainability; Sustainable Development; Technology.*

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Holmes Rolston III

ECOCRITICISM

If our personal lifestyles and the public policies of our governments are dictated by systems of values, then what shifts in values might guide us toward patterns of behavior that would be less detrimental to environmental health and social justice than the activities of the currently dominant model of global capitalism? What is the ideal relationship between the individual human mind and the rest of the world, or between human society in general and the rest of the world? How does language rhetorically function in environmental contexts? And what kinds of artistic expression—in literature, film, visual art, music, and even dance and television—might prompt people to attend more deeply to these questions, might guide us toward imaginative solutions of our most serious social and environmental problems?

When scholars ask themselves questions like these as they read, teach, and comment on literary texts and other works of art, they are practicing what scholars since the early 1990s have come to call ecocriticism, short for *ecological literary criticism*. The actual term *ecocriticism* was first used by William Rueckert in "Literature and Ecology: An Experiment in Ecocriticism" (1996 [1978]). Later Cheryll Glotfelty defined *ecocriticism* as "the study of the relationship between literature and the physical environment" (1996, p. xviii). Glotfelty's definition seeks to go beyond the narrowly anthropocentric scope of most literary scholarship, which has traditionally emphasized interactions among human beings, relationships between humans and their own constructs, and during recent centuries the interior psychological lives of human characters.

In various publications Scott Slovic defined the field more broadly:

> It is the study of explicitly environmental texts by way of any scholarly approach or, conversely, the scrutiny of ecological implications and human-nature relations in any literary text, even texts that seem, at first glance, oblivious of the non-human world. In other words, any conceivable style of scholarship becomes a form of ecocriticism if it is applied to certain kinds of literary works; and, on the other hand, not a single literary work anywhere utterly defies ecocritical interpretation, is off-limits to green reading. (1999, p. 1102)

Slovic's understanding of the field emphasizes the porousness of ecocriticism: the idea that any standard mode of textual and cultural analysis in contemporary literary studies—from formalism to gender studies to cultural materialism—can be practiced from a green perspective.

The practical dimension of the field is reflected in Greg Garrard's approach in *Ecocriticism*: "Ecocriticism makes it possible to analyse critically the tropes brought into play in environmental debate, and, more tentatively, to predict which will have a desired effect on a specific audience at a given historical juncture" (2004, p. 14). Of the many definitions of the field proposed in recent years, the most profound may be David Mazel's flippant yet poignant assertion that ecocriticism is the examination of literature "as if the earth mattered" (2001, p. 1).

So does the environment, the Earth on which we live, matter? Even to teachers and scholars of literature? Even the most postmodern, urban, petroleum-loving, animal-hating individuals would have to admit that they breath air, drink water, and in myriad ways depend on the world for survival, while also affecting the world through resource use and the by-products of consumption. Because the condition of Earth is intrinsically important to all beings living on the planet, the decrease and outright destruction of the biosphere ought to be of concern to all thoughtful people, including scholars working in the humanities. It is no accident that the self-conscious practice of ecocritical scholarship began shortly after the emergence of the modern environmental movement in the 1960s. Ecocriticism enables literary scholars and scholars in neighboring disciplines to assert the relevance of their work to many of the world's most pressing contemporary issues.

Despite suspicion toward Western-style ecocriticism, the discipline quickly gained footholds in scholarly communities throughout the world. Initial resistance occasionally occurred because the field seemed to be relatively new and untested, sometimes because the theoretical apparatus of ecocriticism appeared less elaborate and sophisticated than that of other branches of contemporary humanities scholarship, and at other times because of an innate uncertainty about the social/political aims of Western environmentalism. As South Korean ecocritic Dooho Shin put it, "Without taking into consideration the political and social conditions of Korean society and

its South-North divided situation, ecocriticism will be dismissed as just one of those foreign ideas that the First World foregrounds and pushes onto less powerful countries to keep them under economic and political control" (1999, p. 127).

In many parts of the world today, one encounters the concern that Western environmentalism, including ecocritical literary scholarship, is simply a new form of colonialism. The answer to this concern may be to encourage countries across the globe to pursue their own versions of environmental protection and social justice, not merely to mimic or absorb approaches practiced in the West. As Shin proceeds to state in the previously cited essay,

> Implications of ecocriticism in Korea can also be found in the movement of the re-appreciation of traditional Korean and, more broadly, Asian religious thinking, culture, and literature. Blaming Western culture for many of the root causes of the current world-wide environmental catastrophe, scholars from both West and East began to turn to Eastern religious traditions as an alternative ecological solution, because, unlike the West's tendency to materialize nature, Eastern traditions value the harmony between nature and humans. (p. 127)

There is much to be gained from sharing culture in every direction. Quite possibly, some of the most wholesome and inspiring ideas about the relationship between humans and the rest of nature to be found in American environmental literature—works by David Abram, Peter Matthiessen, and Gary Snyder, among others—originated in Daoist, Confucian, and Buddhist philosophies from various parts of Asia. But it is also possible that the sense of contemporary urgency that we find in the environmental movements throughout the world—from Ishimure Michiko's stories of Minamata disease in southern Japan to Homero and Betty Aridjis's literary efforts on behalf of gray whales off the coast of Mexico—may have its source in the European and American tradition of social activism, spurred perhaps by the extreme environmental destruction caused by Western consumer cultures.

As various scholars have stated over the years, ecocriticism is not so much a specific critical methodology as a movement, a broader perspective toward the enterprise of literary scholarship and toward the meaning of human society on this planet. As Lawrence Buell stated, "The environmental turn in literary studies is best understood, then, less as a monolith than as a concourse of discrepant practices" (2005, p. 11). The cross-disciplinary influences on ecocriticism bring together ideas and vocabularies from the social and natural sciences to foster a deeper appreciation of the environmental implications of literary texts.

In today's society one of the most basic roles of environmental writers and their scholarly commentators is simply to redirect our attention to the world beyond human construction—to make us pay more attention to ourselves and to nature. This emphasis on consciousness raising often considers the psychological processes by which humans contemplate their relationships to place and other living organisms, employing the terminologies of ecopsychology, cognitive psychology, and sometimes the philosophical ideas expressed in such works as Anna L. Peterson's *Being Human: Ethics, Environment, and Our Place in the World* (2001). Other common ecocritical perspectives focus on the significance of gender in determining and explaining human attitudes and behaviors toward each other and toward the natural world. The natural and engineering sciences—from evolutionary biology to concepts of prediction and computer modeling—have provided useful theoretical scaffolding for ecocritical studies.

The 2002 publication of *The Environmental Justice Reader*, edited by Joni Adamson, Rachel Stein, and Mei Mei Evans, formalized the work that many scholars had been pursing for years in the effort to show how environmental problems are often fundamentally linked to social problems and social injustice. As T. V. Reed put it in his contribution to that collection, environmental justice ecocriticism asks such questions as,

> How can literature and criticism further efforts of the environmental justice movement to bring attention to ways in which environmental degradation and hazards unequally affect poor people and people of color? . . . How can issues like toxic waste, incinerators, lead poisoning, uranium mining and tailings, and other environmental health issues, be brought forth more fully in literature and criticism? . . . To what extent and in what ways have other ecocritical schools been ethnocentric and insensitive to race and class? (2002, p. 149)

Subsequent volumes, such as the collection *Caribbean Literature and the Environment* (DeLoughrey et al. 2005), have demonstrated that environmental justice is the most suitable lens through which to appreciate the complex intertwining of social and ecological history in some parts of the world, especially where the impact of colonial brutality has been most destructive and where the legacy of colonialism continues to affect how people and the land are treated. Meanwhile, other scholars, especially moved by human mistreatment of other animal species, argue that until humans can learn to respect the subjectivity and intelligence, the mere right to life, of organisms other than ourselves, we cannot be fully humane in our treatment of each other. Particularly

eloquent studies of how literature can guide us toward this expansion of ethical thought and action include Randy Malamud's *Poetic Animals and Animal Souls*, in which he calls for a new "ecocritical aesthetic ethic": "seeing animals without hurting them; seeing them in *their* differences; teaching about animals; advocating respect for them; and finally *knowing* them, richly but also incompletely" (2003, p. 45).

Finally, some of the important contributions to ecocriticism have been studies not of literature per se, but of artistic media that closely parallel literary expression. These studies serve as demonstrations that film, visual art, and music probe our experience of the natural world and compel audiences to contemplate important social change in an effort to overcome environmental destruction. Major ecocritical examinations of film include Jhan Hochman's *Green Cultural Studies* (1998), David Ingram's *Green Screen* (2000), and Scott MacDonald's *The Garden in the Machine* (2001). Works such as Simon Schama's *Landscape and Memory* (1996) and David Rothenberg's *Sudden Music* (2001) extend ecocritical analysis into the realms of visual art and music/natural sound, respectively.

In this disparate and energetic field of humanities research, what is there to hold the discipline together, to provide a center of gravity, a common focus of attention? Several theorists of ecocriticism, less patient with the pluralism of the field than their predecessors, have suggested that ecocriticism, in its purest and most potent form, must address the moral urgency of the environmental degradation of the planet. For instance, the Puerto Rican scholar Camilo Gomides writes that ecocriticism, for him, is "the field of enquiry that analyzes and promotes works of art which raise moral questions about human interactions with nature, while also motivating audiences to live within a limit that will be binding over generations" (2006, p. 16). Ecocritics working in all branches of the field take heart in the activist zeal that motivates the more extreme and militant practitioners, even if most scholars, like the artists they study, operate in a more celebratory, less overtly political, vein.

Using their preferred term *ecoliterature*, the Chinese ecocritics Wang Nuo and Zhang Bigui have offered a prognosis for the future of the field—both the literature itself and the scholarly examination of this literature. They write that the field of ecoliterature will prosper so long as the ecological crisis is with us, and that the field will decline only when it achieves its purpose of a "reliable, sustainable, and secured environment" (2006, p. 10). Unfortunately, we are not close to achieving this dream of a stable, secure, healthy environment. Hence, the field of ecocriticism and the artistic texts it examines will likely become increasingly important during the coming decades. If this work manages to gain some traction in the realm of public policy and in the daily lifestyles of people in consumerist, polluting societies around the world, there is a slight chance we might avert, or at least slow down, the collapse of the ecosystems that we rely upon for our very lives. And it is in pursuit of this goal that ecocritics toil.

SEE ALSO *Asian Philosophy; Buddhism; Confucianism; Daoism; Environmental Aesthetics; Environmental Art; Environmental Justice.*

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Scott Slovic

ECOLOGICAL FEMINISM

Ecological feminism is the confluence of feminist and environmentalist strains of thought. Its main claim is that "nature" (or the natural environment) is a feminist issue. Something is a feminist issue when understanding it helps one understand something about the social and economic status of women. Equal rights, comparable pay for comparable work, and day-care centers are feminist issues because understanding them sheds light on the subordination of (many) women. Sexism, racism, classism, heterosexism, ethnocentrism, and colonialism are also feminist issues because understanding them helps one understand the subordination of (many) women. Likewise, deforestation, desertification, and water pollution are feminist issues because understanding them helps one understand both the subordination of (many) women.

Defining ecological feminism more precisely in the context of environmental ethics and environmental philosophy is not that easy. There are five contributing factors that make defining ecological feminism (or "ecofeminism" as it is often called) difficult. The first is that just as there is not one feminism, there is not one ecological feminism. Historically, the variety of different feminisms (e.g., liberal, Marist, radical/cultural, social/socialist feminisms) gave rise to a variety of different ecological feminisms. A second factor is that the varieties of ecological feminism that emerged in the 1980s and continued through the 1990s often were a response to two competing environmental ethics: deep ecology and social ecology. Separating off the basic claims of ecological feminism from the positions they criticized poses its own challenges. A third factor is that some ecological feminisms emerged as differing accounts of how the separation of the human from the nonhuman world happened and ways the separation disproportionately and adversely effected women and children. For example, Greta Gaard and Lori Gruen define ecological feminism in this way, offering six explanations of the ways the separation occurred: scientific; religious; psychological; economic; human evolutionary development; and the mistreatment of animals and women (Gaard and Gruen 2005). Such accounts, however, do not define ecological feminism as an environmental ethic or environmental philosophy, because none of the six explanations is distinctly philosophical and the set of six parameters of human-nonhuman separation might exclude some noncontroversial ecological feminisms. Fourth, ecological feminism has become a scholarly topic in nearly every academic discipline and many interdisciplinary programs, producing positions that do not easily fit within disciplinary boundaries, emphases and methodologies. Fifth, taxonomies of ecological feminisms in terms of alleged women-other Others-nature connections (Warren 2000) often mistakenly suggest that these connections are stable, static or fixed; that suggestion misrepresents both differences and commonalities among distinct ecological feminisms. (The word *Other* is often capitalized by feminists to refer to any description or characterization of beings [human and nonhuman animals], "natural objects" [such as forests, watersheds], and nature itself as mere objects that do not have or deserve moral consideration [or, are not morally considerable]. This status of an Other is in contradistinction, and often opposition, to those "others" who regard themselves, or are regarded by the dominant group or tradition, as subjects who have or deserve moral consideration. For many ecofeminists, the "Other" refers to those deemed inferior by 'ratio-normative, hetero-normative, white male human being, who, by contrast, historically or currently accept and assimilate themselves to the dominant norm.) The sixth and last factor is implied by the other five: There is simply no one, unified notion of ecological feminism. Instead, there are clusters of positions and efforts that are related as much by family resemblances as by common perspectives, analyses and agendas.

Mindful of all its diversity, what is a minimal-condition characterization of ecological feminism? First, all ecological feminisms are explicitly both feminist and environmentalist, despite very real differences among them regarding their understandings of feminism and environmentalism, women and nature, oppression and liberation (Cuomo 1998). Second, ecological feminism posits a variety of connections between the domination of women (and other Others) and the domination of "nature." Beyond that, self-identified ecological feminists seem to share three additional convictions: (1) ecological-feminist insights concerning women-other Others-nature connections should be a part of any adequate environmental ethic or environmental philosophy; (2) ecological

feminism's critique of the gender-exclusive nature of leading positions in environmental ethics and environmental philosophy comes with the responsibility of engaging in practices intended to help dismantle the unjustified systems of human domination; (3) a commitment to ecological feminism involves creative problem-solving in developing life-affirming, environmentally and socially sustainable, biologically and culturally diverse practices, policies, lifestyles, and communities of choice.

Even though one can so characterize ecological feminism (especially as a philosophical position), it is quite a different matter whether, in contemporary patriarchal and naturist culture, one can live anything like an ecological feminist lifestyle or practice the commitments of ecological feminism in one's personal and professional lives. That is neither a defect of ecological feminism nor a defect of human will. Ecofeminists see this as the current reality of what is and is not possible in a society that is institutionally structured by "isms of domination," that lacks the infrastructure to make it possible to live an ecologically responsible lifestyle or to always act in accordance with one's feminist commitments. In addition, ecological feminism is not a fixed position or event; it is a way of thinking and set of practices in transition, a social movement in-process. Ecological feminism is about the gendered journey to continually seek out and expose (objectionable) male-bias wherever and whenever it occurs in feminism, environmentalism, environmental ethics and environmental philosophy. Recognition of the in-process nature of ecological feminist theorizing, practice, and grassroots activism contributes to its health, growth and sustainability, as well as its potential to join in solidarity with other social movements—such as the environmental justice movement, the civil rights movement, the peace movement—that (unlike ecofeminism) may or may not have gender as the starting point or primary category of analysis.

LINKS BETWEEN ENVIRONMENTAL AND FEMINIST ISSUES

Connections among environmental and feminist issues are well documented in two (of many) principal ways—empirical and linguistic—about which a brief account follows (Warren 1987). For empirical connections, consider women's gendered role responsibilities in much of the "South" (countries in the "developing" world or the less developed tropical and subtropical regions of the world in both the Northern and Southern hemispheres) regarding trees and forests. In India forests are inextricably connected to rural and household economies managed by women. As managers of forests, collectors of firewood, and heads of subsistence domestic economies, Indian women are thus the primary victims of forest resource depletion (Fortmann and Rocheleau 1985). Trees provide such essential elements necessary to the maintenance of women-headed households as food, fuel, fodder, products for the home (including building materials, household utensils, gardens, dyes, medicines), and products that generate income on local markets. As trees become scarce, women must walk farther for fuelwood and other forest resources and carry it without the help of animals or vehicles. Moreover, as a result of World Bank projects designed to solve tree shortages by creating monoculture tree plantations (typically eucalyptus or teak), rural men increasingly seek employment in towns and cities, leaving women to carry out both men's former jobs and their own time- and labor-intensive tasks of collecting and processing forest products on degraded soils.

The impact on Southern women of fuelwood scarcity is serious. The United Nations reports, "Rough estimates of the proportion of rural women affected by fuelwood scarcity—based on estimates . . . of the percentage of household energy provided by fuelwood—are 60 percent in 32 African countries, nearly 80 percent in 18 Asian countries, and nearly 40 percent in 14 Latin American and Caribbean countries" (United Nations 1995). These empirical data link feminist and environmentalist issues by showing how women's responsibilities for collecting firewood, maintaining domestic households, and managing forests is significantly, directly and disproportionately affected by tree shortages and loss of indigenous, multispecies forests (Warren 2000).

Environmental issues and feminist issues are also linguistically and conceptually linked. The twentieth-century Austrian philosopher Ludwig Wittgenstein (1889–1951) argued that the language one uses mirrors one's view of oneself and one's world. Language thereby plays a crucial role in concept formation. Women routinely are described in pejorative animal terms: Women are dogs, cats, catty, pussycats, bitches, beavers, old bats, cheetahs, vixens, serpents, pets, dumb bunnies, cows, foxes, chicks, old hens, old crows, queen bees, hare-brains and bird-brains, elephants, and whales, and go to hen parties. Women cackle, henpeck their husbands, and become old biddies (old hens no longer sexually attractive or able to reproduce) (Dunayer 1995). Animalizing women in a patriarchal and naturist culture in which animals are seen as inferior to humans reinforces and authorizes women's inferior status.

Similarly, language that feminizes nature in a patriarchal culture, in which women are viewed as subordinate and inferior, reinforces and authorizes the domination of nature. Mother Nature (not Father Nature) is raped, mastered, controlled, conquered, and mined. Her secrets (not his) are penetrated, and her womb (men do not have

one) is put into the service of the man of science (not woman of science, or simply scientist). Fertile (not potent) soil is tilled, and land that lies fallow is useless or barren, like a woman unable to conceive a child. In these cases, the exploitation of nature and animals is justified by feminizing (not masculinizing) them; the exploitation of women is justified by naturalizing or animalizing (not humanizing) them. As Carol Adams argues in *The Sexual Politics of Meat,* language that feminizes nature and naturalizes women describes, reflects, and perpetuates unjustified patriarchal domination by failing to see the extent to which the dominations of women and nature, especially of nonhuman animals, are culturally analogous and not simply metaphorically analogous (Adams 1990; Warren 2000).

HOW ECOLOGICAL FEMINISM EPISTEMOLOGICALLY AND CONCEPTUALLY LINKS ENVIRONMENTAL ISSUES AND FEMINIST ISSUES

The preceding section illustrated the sort of empirical and linguistic connections that link feminist and environmental issues in ways that substantiate key claims of ecological feminism. But to establish ecological feminism as an environmental ethic and environmental philosophy, one must show that these links are grounded in deeper philosophical connections as well. How does one do this? There are three ways. The first identifies the male-gender bias of epistemological assumptions underlying these empirical and linguistic connections, which, unless questioned, perpetuate inaccurate, male-biased understandings of environmental issues concerning women, trees and forests. The second describes the conceptual framework that provides the theoretical basis for ecological feminism's linking of feminist and environmentalist issues. The third demonstrates how male-biased concepts, dualisms, and distinctions provide the argumentative justification for recognizing ecological feminism as an environmental ethic and environmental philosophy.

Consider examples of each of these three ways to link empirical, linguistic and conceptual links to philosophical connections. The first—identifying epistemological assumptions—may be illustrated by a long-standing assumption of orthodox forestry: "the outsider knows best": It is the detached, impartial, objective, graduate-degreed scientist who is the presumed expert ("knower") solving tree shortage problems. The World Bank funded these experts to plant and oversee monospecies eucalyptus plantations in northern India. But the empirical data on women and trees in northern India, as in much of the South, shows this assumption to be false: It is "the insider" (i.e., the local women most inside the culture)—who have the vital responsibilities regarding trees and forest management; it is they who have the requisite *indigenous technical knowledge* to know what is needed to restore indigenous forests and to solve the problem of tree shortages and deforestation. Their knowledge is not the "justified true belief" of an impartial independent, detached, objective observer, idealized in mainstream epistemology and philosophy of science. What they know is gained through their daily, concrete, felt, lived, partial, attached, involved, relational experience as primary users of the forest (Fortmann and Fairfax 1985). It is more akin to biologist Donna Haraway's epistemological view that knowledge is "situated"; situated knowledge is always given relative to a particular set of observations, beliefs, values, attitudes, or assumptions (Haraway 1988). The empirical data on women in Northern India as the "expert knowers" about trees is substantiated by a separate study of women in a Sierra Leone village: Women were able to identify thirty-one products from nearby bushes and trees while men could identify only eight (Hoskins 1982). Women's firsthand, experiential, gender-generated knowledge about multiple kinds and uses of local trees was neither available to local men nor Western ("outsider") foresters. The outsider does not necessarily know best.

A second assumption of commercial Western forestry is that activities that fall outside the boundaries of commercial fiber production are less important, because it does not register in econometrics. Yet these activities are precisely those that women engage in daily. Conceptually, this standard economics "invisibility" of what women do accounts for the mistaken assumption that management and production policies of orthodox forestry are not male gender-biased.

A third assumption of orthodox Western forestry concerns efficiency. Usually it assumes that it is better to have large-scale production using a small number of species than small-scale, community-based forestry using a wide variety of species. But the Chipko Movement (initially a movement of twenty-four women from northern India who hugged trees to prevent them from being felled by commercial loggers) challenges this assumption. Small-scale production reflects local priorities, involves multiple uses of many species of trees, is responsive to the social reality of women's importance in agriculture and forest production, and maintains the livelihood and well-being of women and children.

The second way ecological feminism links feminist and environmental issues is through the apparatus of an oppressive (especially patriarchal) conceptual framework. A conceptual framework is a learned set of basic beliefs, values, attitudes, and assumptions that shape and reflect how one views oneself and one's world. It functions as a

lens through which one perceives reality; it is socially constructed by such factors as sex/gender, race/ethnicity, class, age, affectional orientation, marital status, religion, nationality, colonial influences, and culture.

Some conceptual frameworks are oppressive. An oppressive conceptual framework functions to explain, maintain, and "justify" relationships of (unjustifiable) domination and subordination. When an oppressive conceptual framework is patriarchal, it functions to "justify" or legitimate the subordination of women by men.

There are five features of an oppressive (and patriarchal) conceptual framework (Warren 2000). First, an oppressive conceptual framework (OCF) involves value-hierarchical or Up-Down thinking—thinking that attributes greater value to that which is "Up" (e.g., wealthy white men) than to that which is "Down" (poor white women) (Gray 1981). It does so typically by citing some property that the Ups have and the Downs lack (or lack in the proper amount or respect)—such as reason or rationality. The claim then is that the Ups are justified in being Ups by virtue of that property. Second, an OCF contains descriptions of reality in terms of mutually exclusive, oppositional (not complementary) value dualisms (e.g., reason/emotion; culture/nature; mind/body; objective/subjective). These dualisms (disjunctions) are expressed through "either-or" thinking and language that places higher value (status, prestige) on that disjunct that historically is associated with male-gender identified traits. For example, Western philosophy historically has privileged reason over emotion, culture over nature, mind over body, objectivity over subjectivity. It also has associated (stereotypical) male-gender identified traits with the privileged disjunct—reason, culture, mind and objectivity, and women with the inferior or lower status disjunct—emotion, nature, body, and subjectivity. So the first and second features of OCFs are mutually reinforcing. They support the view that Ups are superior to Downs by virtue of their reason/rationality (not emotion) being in culture (not nature), having minds (not bodies) and being capable of objectivity (not mere subjectivity).

Third, in OCFs Ups have power and privilege—for example, to mobilize resources for self-determined ends—that systematically advantage them over Downs. Fourth, in systems of domination that assign power and privilege to those born male (white, upper-class) over those born female (of color, poor), the power and privilege of Ups is unearned, undeserved, and unmerited.

The fifth and philosophically most important characteristic of an oppressive (and patriarchal) conceptual framework is that it sanctions a "logic of domination." This is the moral premise that superiority justifies subordination. A logic of domination is the moral stamp of approval that "justifies" the domination of women, other Others and nature. This justification turns on the premise that reason (rationality) is the property that Ups have and Downs lack or, at least, lack to the requisite extent.

The five features of an oppressive, patriarchal conceptual framework provide the third way ecological feminism conceptually links feminist and environmental issues. All five of these time-honored features of mainstream ("canonical") Western philosophy are critiqued by ecological feminists. Ecofeminist philosophers Karen J. Warren (1992) and Val Plumwood (1993) critique the Western notion of reason as part of a male gender-biased dualism—reason/emotion—that creates a false ontological divide between humans and other beings, elevating humans into culture and out of nature. Plumwood adds that reason thereby provides a faulty conception of an atomistic, abstract individual self "hyperseparated from nature" in a way that makes impossible the notion of a relational, ecological self—a mainstay of much ecological feminist theorizing. This mainstay claim is that the self is not an isolated, immaterial Cartesian ego, soul or psyche in a physical body (lampooned as "the ghost in the machine"); rather, it is constituted by its relationships with others—just as in ecology the characteristics of various species are constituted by their relationships with other species and the abiotic environment.

Ecofeminist philosopher Chris Cuomo also criticizes dualistic thinking as male-biased, false dichotomies "construed in order to maintain a power structure and a false conception of essential reality" (1998). Because dualisms are construed in systems of binary opposition, they often become the bases of systems of domination and subordination; in fact, "many dualisms are based on a scientific view of the world that favors the most simple explanations consistent with the previous findings of science over more complex explanations that call given models into question" (1998). Theories and positions that presuppose such dualisms contradict feminist commitments to deconstructing oppressive systems and creating genuinely liberating systems and intentional communities.

ECOLOGICAL FEMINISM AND AN ETHIC OF CARE

The historical development of ecological feminism since the early 1970s reflects the variety of tradition-based positions in environmental ethics. For example, Peter Singer's utilitarian-based "animal liberation" and Tom Regan's animal-rights-based position were theoretical resources for early ecofeminist positions in defense of animals based on traditional rights theory (Adams 1990; Brown 2004; Kheel 1985; Gaard 1993; Gruen 1996), as were alternative theoretical positions based on Mill's utilitarianism (Donner 1997), and Immanuel Kant's ethics of duty (Wilson 1997). As feminist ethicists began developing an "ethic of

care," based on the work of Carol Gilligan (1980), so did ecofeminist ethicists (Curtin 1996; Warren 2000). Care functions as a primary, essential, moral ingredient of an ecofeminist ethic (see "justice versus care debate," below). The different ethical starting points of ecological feminism provide different accounts and recommendations about who and what is valuable, what sort of value nonhuman nature has, and what empirical aspects of life are ethically significant. Cuomo's ecological feminist ethics values "the flourishing of all living beings and communities" (Cuomo 1998). Her point of departure presupposes a conception of human well-being, grounded in a feminist conception of the self and the view that nonhuman beings and communities have value. Unlike other environmental ethics, Cuomo's offers notions of moral agency and moral considerability that are fluid (not static, unchanging, sets of essences or essential properties); moral agency is compromised and shifts by such factors as historical and material location, oppression, marginalization.

Warren (1990) has identified nine key features of an ecological-feminist ethic:

1. Ethical theory is conceived as theory-in-process that will change over time (illustrated through the metaphor of theorizing as quilting).
2. Nothing is part of an ecofeminist ethic that consciously, deliberately, or knowingly promotes sexism, racism, classism, naturism, or any other "ism of social domination."
3. An ecofeminist ethic is a contextualist ethic—one that sees ethical discourse and practice as emerging from the "voices" of entities located in different historical circumstances; an ecofeminist ethic often functions as a kind of narrative about humans, human-human relationships, and human-nonhuman animal or nature relationships.
4. These features of a contextualized ethic that often provides a sort of narrative, is a shift from a traditional, canonical ethic that is monist and focuses on absolute rights and rules to a pluralist focus on a variety of relevant values (rights, utility, duty, care), principles (including reformed principles of traditional normative ethics), narrative constructions and forms of intelligence (centralizing the role of "emotional intelligence" operating in concert with rational intelligence, as indicated below). It provides "a highly contextual attempt" (Cheney 1987 p. 143). For ecofeminist ethicists, how a moral agent is in relationship to another is of central significance. That is, it is not simply the nature of the agent or "other," or the ascription of rights, duties, and rules that apply to the agent that constitutes an ethic; the ethical nature of the relationship itself must be taken into consideration as well.
5. An ecofeminist ethic is an inclusive ethic that grows out of and reflects the diversity of perspectives of women and other Others, particularly those who disproportionately experience the harmful destruction of nonhuman nature (often poor women or communities of color in the North as well as the South. An ecofeminist ethic presupposes and maintains difference between humans and nonhuman animals and nature while also recognizing commonalities among these groups. Ecofeminist philosophy recognizes that humans, as ecological selves, are both members of an ecological community (in some respects) and different from other members of that community (in other respects). Accordingly, the attention of ecofeminist ethics to relationships and community is not an erasure of difference but a respectful acknowledgment of it.
6. Furthermore, an ecofeminist ethic makes no attempt to provide an "objective" point of view, since it assumes that in contemporary culture there really is no such point of view. This does not relegate ethics to relativism however. It acknowledges, for example, that, as a feminist ethic, if is gender-biased, but claims that this is a better bias (more inclusive and therefore less partial) bias than a male-gendered bias or biases that exclude the voices of the dominated.
7. An ecofeminist ethic provides a central place for values typically unnoticed, underplayed, or misrepresented in traditional ethics (e.g., values of care, love, friendship, and appropriate trust). It need not do this at the exclusion of considerations of rights, rules, or principles. There may be many contexts in which talk of rights or of utility is useful and appropriate; but the concept of care, for example, is not reducible to traditional theories of rights, rules, or principles; indeed Gilligan originally formulated the ethics of care as a feminist alternative to ethics of rights, rules, and principles.
8. An ecofeminist ethic involves a reconception of what it is to be human and to engage in ethical decision making, because it rejects as either meaningless or currently untenable, any gender-neutral description of humans, ethics, and ethical decision making.
9. An ecofeminist ethic acknowledges what psychologists and neuroscientists (see Goleman 1995) identify as "emotional intelligence," adopting their evidence that the ability to empathize and care is necessary for ethics, ethical reasoning and ethical decision making.

Some ecological feminists have focused on the "justice versus care" debate, both as Gilligan first articulated it and as it has been developed by feminist philosophers since. The justice perspective assesses moral conduct in terms of basic rights, rules or principles. A moral agent is viewed as a rational, detached, disinterested, impartial, independent being. The justice-oriented ethical framework is essentially hierarchical or pyramidal, where the "authority" of a right, rule, or principle is given from the top of a hierarchy of rights, rules, and principles. In contrast, the care perspective assesses moral conduct in terms of such values as intimacy, empathy, friendship, and appropriate trust. Selves are conceived "ecologically" as relational, partial, attached, interdependent, and historically situated. Morality is a matter of values, virtues, and vices, which are not unpacked in hierarchically ordered, ahistorical principles of justice.

An ethic of care offers six types of criticisms of an ethic of justice:

1. An ethic of justice is based on a faulty conception of selves as atomistic individuals, rather than as socially constructed, relational, selves that are themselves historically situated, geographically located, ecological beings (like organisms that are adapted to a niche in the "biotic community") and whose "nature" is not determined by any transcendental "essential properties";
2. It preserves a mistaken or limited concept of morality as fundamentally a matter of absolute and universal rights, rules, and principles;
3. It assumes that moral conflict resolution is always about adjudicating competing interests, rights, or rules in a hierarchical, adversarial, winner-loser ("zero-sum") way;
4. It fails to appreciate the extent to which other values, particularly values of care, enter into actual decision-making of actual women (and others) confronted with genuinely morally conflictual situations;
5. It misrepresents morality as non-ambiguous, simplified, and abstract, when most of us experience morality as ambiguous, complex, and concrete;
6. Its methodology tends to reproduce the status quo, entrenching existing power- and authority relations by methodologically concealing those relations.

The scholarly literature on an ethic of care is extensive. Ecological feminist ethics that appeal to care agree with the six main criticisms care ethicists make of "the justice perspective." However, ecological feminisms that utilize notions of care in fundamental ways do not necessarily adopt an "ethic of care." That is because they do not locate the moral significance of care in a separate ethic, which (allegedly) contrasts or competes with, or is integrated with, an ethic of justice. Locating care in this way only serves to perpetuate the traditional adversarial and hierarchical approach to ethical monism. Instead, the moral significance of care is understood as contributing to ethics in at least four ways:

1. It makes the ability to care central to motivating ethical conduct, reasoning ethically, and making ethical decisions;
2. It assesses the appropriateness of an ethical decision in a given context partly by how caring the resulting practices are;
3. It makes care a moral emotion and locates ethics in human psychology.
4. It provides a non-question begging answer to the question "Why care?" The answer: One cannot reason morally, be motivated to act morally, choose to act morally, or value certain practices as moral and others as immoral or amoral unless one cares.

THE "DEEP ECOLOGY/ ECOFEMINISM DEBATE"

In 1973 Norwegian philosopher Arne Naess wrote a seminal article, "The Shallow and the Deep, Long-Range Ecology Movement," in which he used the term "deep" to refer to the development of a new, challenging, profound ecological consciousness, in contrast to a "shallow" focus on more conventional, apolitical issues like resource depletion, pollution, and recycling, While no attempt is made here to engage the debate, in part because most ecofeminisms have moved beyond the debate, some of the points of contention in the ecofeminism/Deep Ecology debate are summarized.

Deep Ecology, like ecofeminism, is not one unified movement. Although the Deep Ecology "platform" consists of eight planks, there are four basic claims of Deep Ecology:

1. Deep Ecology is contrasted with "reform environmentalism" (shallow ecology);
2. Deep Ecology endorses "biocentric egalitarianism—in principle," the position that all living things have an "equal right to live and blossom" as entities with "inherent" or "intrinsic" value;
3. Deep Ecologists are critical of animal ethics as not a true liberation of nature but only of sentient life forms within nature;
4. According to the Deep Ecology principle of Self-realization, humans are not discontinuous with nature. The human self (*jiva* in ancient Hindu

thought) is only fully realized when it identifies with the larger cosmos—the Self (*Atman/Brahman*).

"The Deep Ecology-Ecofeminism Debate" that began in the early 1980s focused on five main questions: First, is the root environmental problem anthropocentrism (human-centeredness), an assumption of Deep Ecology, or androcentrism (male-centeredness)? Second, is deep ecological practice, particularly EarthFirst!, an expression of gender, race, class, and geographical privilege? Third, does Deep Ecology presuppose a masculinist psychology? Fourth, is the Deep-Ecological platform male-gender biased? (also a question not addressed here). Fifth, are the principles of biocentric egalitarianism-in principle and Self-realization problematic from an ecofeminist point of view?

Ecological feminists have provided different answers to these questions. Ariel Salleh (1984, 1993) argues that androcentrism, not anthropocentrism, is the source of the worldview that posited a firm ontological divide between culture and nature. She holds that the notion of Self-realization is an objectionably abstract, transcendental view of becoming one with nature, with no recognition of women's lived experience of being in both culture and nature. In her view the goal of biocentric egalitarianism-in principle cannot be achieved without attending to sexism, racism, classism, and the complex "interlocking issues, economic and ideological." For these reasons, she continues to be an opponent of Deep Ecology.

Other ecofeminists (Cheney 1987, Cuomo 1994, Doubiago 1987, Hallen 1999, Kheel 1990, Plumwood 1993, Sessions 1996, Slicer 1995, Sturgeon 1993, and Warren 1999) have offered clusters of similar criticisms. In varying ways, they claim that Deep Ecologists do not adequately do any of the following: engage sufficiently with feminism; acknowledge different versions of ecological feminism; adequately integrate theories of gender, race and class oppression with that of the undifferentiated, indiscriminate human domination of nature; recognize the male-gender bias in their positions; conceptualize ecological feminism as a separate position from Deep Ecology; appreciate that dualisms are the main ideological strategy of patriarchal domination**;** politicize identification with nature; recognize that the Deep Ecologist's notion of the Self is masculinist, all encompassing, totalizing and detached from social and political realities, problematically transcendent and indistinguishable from nature; adequately critique the rationalist tradition or appreciate the value of the personal, embodied, productive and reproductive self; and show sensitivity to the notion of wilderness as having indigenous inhabitants.

Many Deep Ecologists criticize different versions of ecological feminism (Fox 1998, Naess 1999, Tobias 1983). The more common criticisms are that ecofeminism: falsely essentializes women as better nurturers and "closer to nature than men"; loses focus on the natural world in its preoccupation with social justice issues; reinforces harmful and apolitical gender stereotypes of "mother earth"; tends to privilege white women's experience of the world and fails to see forces in addition to patriarchy that contribute to unjustified dominations of human groups and nature.

Since the early 1990s many versions of ecofeminism have been developed that are not, or are far less, susceptible to Deep Ecology's criticisms. During the same period, however, Deep Ecology did not develop into a main stage player in environmental ethics and philosophy—as was expected. though Its main influence now is in various forms of environmental activism, from Earth First!ers, who are also on the wane, to conservation biologists who are in ascendency.

ECOLOGICAL FEMINISM AND ESSENTIALISM

Sherry Ortner's 1974 essay "Is Female to Male As Nature Is to Culture?" asks whether women are closer to nature than men. Ecofeminists who answer "yes" are vilified by other ecofeminists as biological determinists, conceptual essentialists or, to use the language of Victoria Davion "ecofeminine" rather than "ecofeminist" (Davion 1994). Some ecofeminist philosophers have argued that the question is malformed, since it presupposes the legitimacy of the false "culture verses nature" dualism. Ecofeminist philosophers also have argued that both "women" and "nature" are socially constructed concepts for which there is no set of essential properties or characteristics about members of either category. This means that there is no meaningful understanding of women *simpliciter.* Every woman's identity is socially constructed by such factors as race/ethnicity, socioeconomic status, affectional/sexual orientation, geographic and material location, age, and marital status. Furthermore, the category *women* is destabilized by the different roles and positions women occupy as mothers, daughters, wives, partners, lovers, workers, sexual and materially embodied beings. Accordingly, it is neither possible nor desirable to seek an essence shared by all women—what one would have to do to take seriously Ortner's question or engage with deep ecologists who criticize those (early) select ecofeminists who seem to say "yes."

Note that saying "nature" and "women" are socially constructed concepts does not mean that no references to, or generalizations about, women are possible. A rejection of conceptual essentialism (the view that there are some properties that apply, for example, to all and only women) is compatible with endorsement of strategic uses of "women" in order to make defensible generalizations about women "on the average"—such as that women grow at least half of the world's food in Africa (they

produce almost 90 percent). Well-placed, strategic claims about women, including claims about differences among women in connection with disproportional effects of environmental degradation on the health and livelihood of different groups of women, are necessary to any feminist or ecofeminist analysis. The main point is that a strategic use of the concepts "women" and "gender"—so-called "strategic essentialism"—does not imply or accept a conceptually essentialist notion of either. Gendered perspectives will continue to permit some useful generalizations: those that pass what Warren calls "the 4 R test" will continue to be theoretically and strategically important. "The 4 R test" specifies that the samples which are the basis of generalizations must be *r*andom, *r*epresentative, the *r*ight sample size, and *r*eplicable (or, *r*epeatable).

CONCLUSION

Ecological feminism is a cluster of theoretical perspectives, not a monolithic philosophy. It also is a social movement that offers novel solutions to contemporary environmental and feminist issues. Nearly every academic discipline now harbors a body of ecofeminist scholarship within that discipline. The commitment of ecological feminism is to develop strategic explanations and conceptual analyses of interconnected environmental and feminist issues that generate creative, healthy and sustainable relationships among us all with each other and with the earth.

SEE ALSO *Deep Ecology; Ethics of Care; Plumwood, Val; Queer Theory; Shiva, Vandana; Social Ecology; Warren, Karen J.*

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ECOLOGICAL RESTORATION

The term *ecological restoration,* which often is used interchangeably with *restoration ecology,* refers to the science and social practice of re-creating ecosystems that have been damaged or destroyed by human activity or natural events. Ecological restorationists have attempted to recreate a wide variety of ecosystems, including tall-grass prairies, oak savannas, wetlands, forests, streams, rivers, and coral reefs. These projects can range from small-scale urban park reclamations, such as ongoing restorations in urban parks in New York and Chicago, to huge wetland mitigation projects encompassing hundreds of thousands of acres, such as the $8 billion project to restore the everglades ecosystem in Florida. Also included in ecological restoration are attempts to reintroduce species, principally to save those which are endangered, and the removal of exotic species thought to be a threat to native biodiversity.

ACADEMIC BACKGROUND AND FIELD PRACTICE

As a scientific practice restoration ecology has its background primarily in academic disciplines such as field botany, conservation biology, landscape ecology, and adaptive ecosystem management. As an exercise in environmental-design practice most restoration in the field is orchestrated by landscape architects and environmental engineers. However, a range of other academic disciplines, including philosophy, have been attracted to restoration both as an object of study and as an opportunity to apply their ideas on the ground (Gobster and Hull 2000). Some of the first tall-grass prairie restorations in the United States were initiated by Aldo Leopold at the University of Wisconsin Arboretum and on his own land on the Wisconsin River (Meine 1988).

Environmental philosophers attracted to restoration initially focused principally on the issue of whether a restored ecosystem could be an adequate substitute for the original ecosystem it was emulating and, as part of that inquiry, whether restored ecosystems were really natural or instead humanly produced artifacts. The most influential and widely discussed work by environmental philosophers on this topic is that of Robert Elliot (1982, 1997) and Eric Katz (1996, 1997, 2002, 2007a and b),

Wetland Restoration, West Virginia, 2005. *In addition to re-creating a wide variety of ecosystems, ecological restorationists attempt to reintroduce species and remove exotic species thought to be a threat to native biodiversity.* **PHOTO BY TODD HARLESS/U.S. FISH AND WILDLIFE SERVICE.**

both of whom argued that ecological restorations do not produce natural entities and that restorations may harm naturally evolved systems, especially if one considers those ecosystems a subject worthy of moral consideration in their own right.

THE THEORIES OF ELLIOT AND KATZ

The initial concerns of Elliot and Katz were based on their objections to the claims of some professional restorationists and, for Elliot, some corporations that suggested that a restored environment could replicate the value of the original environment it was replacing. Elliot began an article on restoration titled ''Faking Nature'' by identifying an Australian corporation that claimed that it should be allowed to mine ore from a pristine environment on the grounds that it could restore that environment fully at a later time. Elliot called that view the restoration thesis and stated that it consists of the claim that ''the destruction of what has value [in nature] is compensated for by the later creation (re-creation) of something of equal value'' (Elliot 1982, p. 82). Elliot rejected the restoration thesis by using an analogy based on the relationship between original and replicated works of art. Just as we would not value a replication of a work of art as much as we would value the original we wouldn't value a replicated bit of nature as much as we would the original thing. What gives value to a work of art, for Elliot, is its origins (who produced it, at what time, and in which artistic milieu and its respective importance in that milieu); equally, what in part gives value to nature is its origins, most importantly the fact that it is not human-made. In light of their anthropogenic origins, restorations are not natural entities if one understands nature as having non-human origins.

Elliot supplemented that general claim through a series of thought experiments that show how a person who placed high value on wilderness could find fault with a series of humanly produced simulacra, including a restored environment modeled on a naturally occurring wilderness. That argument is expanded and given a stronger philosophical foundation through the development of a subjectivist account of intrinsic value in Elliot's 1997 book, which also was titled *Faking Nature*.

Katz went much further than Elliot in making a case against restored environments. He used a similar distinction between the natural and the nonnatural—specifically between the natural and the artifactual—as a starting point. For Katz it is not just that ecological restorations are artifacts but that they are artifacts whose existence demonstrates human hubris (people presume the ability to replicate and replace natural environments and therefore may be inclined to destroy as much as they want of such environments on the assumption that they can recreate them) and exemplifies a form of domination over the natural world by imposing people's will on it. People restore nature to the form they want it to take, make it perform the functions they want it to perform, and in doing so constrain natural systems from evolving as they would without human interference. In this view restored ecosystems are an embodiment of everything that is wrong with anthropocentrism. Katz makes the point that "the practice of ecological restoration can only represent a misguided faith in the hegemony and infallibility of the human power to control the natural world" (Katz 1996, p. 222).

REACTIONS TO KATZ AND ELLIOT

The initial concern of many other environmental ethicists who added to the literature on restoration was to respond to what might be called the Elliot-Katz view (Gunn 1991, Scherer 1995, Throop 1997, Lo 1999, Light 2000). Those responses took the form of general criticisms of the distinction between the natural and the nonnatural (the nature-culture dualism) in those accounts (Gunn, Scherer, and Lo), questions about the propriety of Elliot's analogy between the value of nature and the value of art (Gunn), and criticisms of the potential lack of appreciation in the Elliot-Katz literature for specific restoration practices with a particular focus on the necessity of removing exotic species of flora and fauna to maintain biological diversity and ecosystem integrity and health (Throop and Light).

In addition, many restorationists wrote about the kinds of issues raised in the Elliot-Katz literature, responding in large part to the publication of a version of Katz's 1992 influential paper on restoration "The Big Lie: Human Restoration of Nature" (reprinted in Katz 1996) in one of the two main journals in the field of restoration ecology, *Ecological Restoration,* then called *Restoration and Management Notes*. In large measure the responses took the form of claims that restorationists could avoid the concern that restorations are not natural by strictly prescribing that ecological restorations would have to reproduce as closely as possible the exact ecosystems that had existed at the same locale in an identified natural state. Although that answer does not address the ontological claims in the Elliot-Katz view, it began what has become known as the authenticity debate among restorationists.

Discussion of the original propositions advanced by Elliot and Katz has continued (Vogel 2003). However, in the first decade of the twenty-first century the philosophical debate on that topic went beyond the criticisms raised by Elliot and Katz. On the one hand, earlier philosophical focus on restoration has led to increased critical questions about the conceptual foundations of restoration without entailing a wholesale rejection of restoration as an environmental practice. On the other hand, some of those who have rejected the criticisms of Elliot and Katz have gone on to make a positive case for the moral or social value of ecological restoration.

CONTEMPORARY ISSUES

The issues discussed above can be divided into three categories: defining what restoration is (something that has plagued the Society for Ecological Restoration [SER], the principal international organization of restorationists and those studying restoration), distinguishing between native and exotic species (which in part drives the activity of restorationists who define the practice in part around the removal of exotic species and the maintenance of native biodiversity), and determining the period to which people should endeavor to restore a place, with attention to the specific question of whether the goal should be pre-Columbian or presettlement. None of these issues could be considered settled, but each has been the subject of interesting work. Eric Higgs (2003) contributed important work on the first and third topics in his scholarly publications on the distinction between restorations and good restorations and as a president of SER. Mark Woods and Paul Moriarty (2001) argued that the second issue should be resolved through a defensible set of distinctions concerning what makes an exotic species exotic, and Mark Sagoff (2000) encouraged abandonment of the distinction. Numerous philosophers have weighed in on the issue of the alleged naturalness of the pre-Columbian ecosystem as part of a general criticism of the idea of wilderness (Callicott 1995).

Among those who have made positive cases for restoration that have been discussed and criticized are

Wildflowers at American Camp, Washington. *The American Camp prairie, located in the San Juan Islands National and Historical Park, underwent an extensive retoration beginning in the early 2000s. The area is one of the last surviving natural prairies in the region. Without such a restoration, park officials belive that encroaching nonnative plants would overcome native ones, and over time the prairie would become completely forested.* **PHOTO BY MIKE VOURI.**

Higgs, William Jordan (2003), and Andrew Light (2000, 2002). Higgs (2003) combined an understanding of the philosophical questions at the heart of restoration with field experience in the design of restorations. In one important respect, Higgs fully embraced the cultural aspects of the practice, arguing that the reference ecosystems for restorations of necessity have cultural components insofar as humans have evolved a variety of modes of interaction with different places that have shaped their coevolution. A well-designed restoration not only contributes to the ecological integrity of a site but also helps improve the human relationship with particular places. Jordan (2003), one of the founders of the modern science of restoration, argued that the practice of restoration not only can improve people's relationship with the natural world but also overcome the ''existential shame'' that humans have in relation to the natural world insofar as their existence relies on and is maintained by the destruction of nature. Light (2002) argued that the positive value of restoration lies in its ability to provide opportunities for direct public participation in environmental management and thus serve as a foundation for building ecological citizenship.

New critical work on these figures and others has led to a reassessment of the original arguments by Elliot and Katz as well as potential new directions in the moral dimensions of restoration practice (Katz 2007a, 2007b, Throop and Purdom 2006). A new subfield of restoration appears to be emerging in response to climate change. This subfield focuses on the necessity of designing so-called novel ecosystems by constructing ecosystems in places where they have never been before as a way of adapting to global climate change. The development of this field is sure to spark further philosophical debate.

SEE ALSO *Biodiversity; Ecology; Intrinsic and Instrumental Value; Leopold, Aldo; Wetlands.*

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ECOLOGY

This entry contains the following:

I. OVERVIEW

The distinctive subject matter of the science of ecology was first identified by the English naturalist Charles Darwin (1809–1882). He recognized that the struggle for existence that was the engine behind natural selection was, although extremely complicated, amenable to scientific investigation. Darwin did not give a name to this distinctive study; it was the German biologist Ernst Haeckel (1834–1919) who first christened this area of scientific inquiry as ecology in 1866.

Neither Darwin nor Haeckel did much by way of direct investigation of these processes; the latter part of the nineteenth century, however, did see a number of biologists actively investigating "conditions of existence" of various kinds of organisms. For the most part these early studies focused on the interactions between organisms and the physical conditions of their environment. In aquatic environments, for example, much effort was devoted to the impact of factors such as pH and salinity on the fates of organisms. The tendency in these early studies was to focus on individual species. It was plant ecologists who took the lead in moving inquiry in the

direction of the patterns and mechanisms of organization among communities of organisms.

The beginning of the twentieth century saw the introduction of the first widely influential theoretical perspective in ecology: the superorganism view of the community introduced by the American plant ecologist Frederic Clements (1874–1945). Two decades later the English zoologist Charles Elton (1900–1991) provided a comprehensive theory from the perspective of animal ecology. Although the superorganism ideas of Clements have been largely superseded, the theoretical approach of Elton, which focused on the factors that limit community membership, has remained influential. In 1935 the English botanist Arthur Tansley (1871–1955) introduced the ecosystem concept into ecology; a decade later, following seminal contribution by American ecologist Raymond Lindeman (1942), a robust research program of ecosystem studies was underway. By the middle of the twentieth century, ecology was moving forward as a coherent scientific discipline with its familiar hierarchy of individual, population, community, and ecosystem ecology in place.

The hierarchy of levels of organization of ecological phenomena provide natural topical partitions. At the basic level is the Darwinian struggle for existence that each organism must wage. One level up is the aggregation of individual organisms into populations. Populations themselves come together to form communities, and communities exist in a physicochemical context that is shaped by climatic, geological, and other physical processes—the level of the ecosystem.

APPLIED ECOLOGY AND ACADEMIC ECOLOGY

There is an important difference between applied ecology and academic ecology. Applied ecology is concerned primarily with the conservation and management of natural resources. In the United States both the federal government and all the states have a division of government directed toward this end. This governmental body is typically further subdivided into programs in fisheries, wildlife, and forestry. The applied ecologists that populate these programs usually receive their training from academic programs in the relevant fields. Academic ecology focuses on scientific understanding for its own sake, pursuing research programs for the ecological insights they reveal, irrespective of any potential practical utility.

The American ecologist and forester Aldo Leopold (1887–1948), one of the seminal figures in the early history of applied ecology, neither made nor exemplified such a distinction. Nevertheless, these two traditions of ecological inquiry have developed along independent trajectories, with little interaction even though management activities represent a form of experimentation that could, if properly integrated, inform the more academic side of the discipline (Norton 2005).

Although the development of applied ecology owes much to the natural-resource management tradition, its goals are much broader, and the horizons of its practitioners extend well beyond the various governmental agencies. The vibrant field of conservation biology—concerned primarily with protecting the planet's biological diversity—involves a significant degree of application of ecological ideas. Applied ecologists are also concerned with issues such as ecological restoration, integrated pest management, and a host of other land-use concerns.

INDIVIDUAL ECOLOGY

Much of the ecology that takes the form of natural history focuses on the ways in which individual organisms of a species interact with their environment. In part the fascination of Leopold's *A Sand County Almanac* (1966 [1949]) stems from his excursions into the processes whereby various individual organisms in a habitat are both shaped by and give shape to the land. He contributed to a venerable natural history tradition in ecology that focuses on the various life-history patterns and requirements of organisms. For example, the Wisconsin Department of Natural Resources publishes a brief pamphlet titled "The Ecology of the Black Crappie." The black crappie is a fish species of some recreational significance in the state. The pamphlet details various features of the life history of the species: its habitat requirements, the water temperature that induces spawning, and major predators and prey. This is ecology at the level of the natural history of the species. Although not very glamorous, this kind of inquiry is significant in the overall development of ecological understanding. As G. E. Hutchinson once said of Robert MacArthur (1930–1972), perhaps the most influential theoretical ecologist in the history of the discipline, "MacArthur really knew his warblers" (1957, p. 427).

Not all individual-level ecology is natural history, however. There is a significant theoretical movement that seeks to ground ecological phenomena in processes that take place at the level of individual organisms (Grimm and Railsback 2005). These individual-based models have the virtue, when they work, of providing a more mechanistic understanding of emergent population phenomena. Furthermore, because the responses of organisms to their environments are usually adaptive (i.e., they are responses to the selection pressures the environment imposes), individual-based modeling supplies a framework for understanding the Darwinian idea that the ecological struggle for existence is the engine of natural selection.

Aldo Leopold in Rio Gavilan, Mexico, 1938. *Aldo Leopold to this day remains one of the best-known figures of applied ecology. The field of ecology, which began with Darwin's scientific study of individual species, has now branched out into several more specific research areas, including population ecology, community ecology, and ecosystem ecology.* **COURTESY OF THE ALDO LEOPOLD FOUNDATION ARCHIVES.**

The natural history of individual species is ethically and philosophically significant in at least three related ways. First, sound natural history is a prerequisite for the development of accurate population models for individual species. Because responsible environmental decision making often depends on a thorough understanding of the demographics of particular populations, natural history is important. Second, natural history can enhance aesthetic appreciation. Often people's aesthetic dispositions exert a strong influence on their land-use decisions and policy preferences. Yet there is significant controversy among theorists about the aesthetic appreciation of the natural world (Carlson and Lintott 2008). One of the more prominent, Leopold-influenced views is that ecological understanding paves the way for aesthetic appreciation of the natural world in much the same way that ''art appreciation'' enhances the capacity for the aesthetic appreciation of artistic creations. Third, Leopold once said that his objective in his wildlife ecology class was to teach his students how to ''read the land'' (1966 [1949], p. 336). By this he meant the capacity to bring together a deep understanding of natural history and the powers of observation to make inferences about the environmental history of a site. Reading the land in this way is important because it enhances aesthetic insight and serves as a prerequisite for the kind of husbandry that Leopold regarded as the core of sound conservation.

The ecology of individual-based modeling is primarily a proposal for a distinctive research program in ecology—an alternative way to do population ecology. As such, its significance for environmental philosophy remains uncertain. There is one area of immediate relevance, however. Individual-based modeling is a type of simulation modeling, and its potential is a function of recent advances in computing technology. Analytic modeling, the traditional approach of ecological theories such as competition theory, involves writing equations that will describe the behavior of the system. Simulation modeling involves specifying the interactions between individuals and then studying the time-evolution of the system via computer simulation. Conservation biologists often do not know how to write the dynamic equations needed to model certain populations. They are better able to specify the parameters of individual interaction. Thus individual-based modeling has the potential to make significant practical contributions in this domain (Sarkar 2005).

POPULATION ECOLOGY

The core of ecological inquiry is at the level of the population. The most widely accepted definition of *ecology* is that provided by Charles J. Krebs in his influential textbook, *Ecology: The Experimental Analysis of Distribution and Abundance* (1978). Krebs defines ecology as the study of the distribution and abundance of populations. Population ecology has been preeminent since at least the beginning of the twentieth century. There have been fundamental and long-running controversies, such as the extent to which populations in nature are governed by density-dependent factors or by density-independent factors such as the weather and whether organismic interactions, especially competition, are more important than the interactions between organisms and their physical conditions of life. Nevertheless, the population has remained the central focus of ecological inquiry.

Population ecology is relevant to environmental ethics and philosophy in a number of ways. One central area of relevance concerns efforts to understand and influence the population biology of economically significant and endangered species. Many of the activities of government-based natural-resource programs focus mainly on the population dynamics of specific species, although there is an increasing emphasis on community-level restoration efforts and emerging trends toward ecosystem management. Single-species management is also an important focus of conservation biology. Keystone species (e.g., the American alligator) are species that influence the population biology of many other species in an assemblage. Flagship species (e.g., the panda) are usually charismatic megafauna that may not be ecologically influential but have the capacity to capture the public imagination and can thus serve as a rallying point for preservation efforts. Umbrella species (e.g., the spotted owl) are species that have such extensive habitat requirements that managing for their persistence promotes, as a side effect, the preservation of numerous other species. As the examples indicate, conservation biologists have directed their efforts at species in all three categories. Management at the single-species population level, although politically popular, is controversial, and many conservation biologists argue that resources are better deployed at the level of ecosystem management (Simberloff 1998).

The controversies surrounding the prevalence in nature of density-dependent population regulation and the importance of competition are also relevant at a more conceptual level. Those who urge the dominance of competition-mediated regulation are committed to what might be called the balance-of-nature paradigm (Cooper 2003). Some argue that those on the other side portray an ecology of chaos or radical historical contingency (Worster 1993; Kingsland 1995). Some scholars argue, however, that this conclusion mischaracterizes certain novel theoretical approaches—such as chaos theory (Solé and Bascompte 2006) and/or certain macroecological perspectives on the relevance of biogeographical history (Ricklefs and Schluter 1993)—as the mainstream issues of population ecology. These balance-of-nature themes have oscillated in and out of favor for more than a century, but the debate has not been about order versus chaos, or even about repeatable mechanisms versus historical contingency. It has been about the nature of the order that population phenomena exhibit and the kinds of mechanisms responsible for it. These debates about the balance of nature have complicated philosophical discussions about when and where it might be appropriate for humans to simply get out of the way and let nature take its course.

COMMUNITY ECOLOGY

The next level up in the organizational hierarchy, the community, has also been a prolific source of controversy. Perhaps the most ambitious approach to community ecology was the superorganism view of Frederic Clements (1905). One of the most famous debates in the history of ecology was between the Clementsian perspective and the "individualistic hypothesis" of H. A. Gleason (1926). In Gleason's view community boundaries are largely indeterminate, with notable exceptions such as ponds and other ecological situations in which there is a relatively sharp demarcation between habitat types. The debates continued largely unresolved until, in the middle of the twentieth century, the work of Robert Whittaker (1975), John Curtis (1959), and their students settled the matter,

at least to the satisfaction of most of their contemporaries. This research revealed that most communities do not possess discrete boundaries. Populations of different kinds of organisms respond to environmental gradients such as average annual rainfall in an individualistic way.

The revelation that communities lack the kind of distinct boundaries found, for example, in organisms challenged the superorganism view. Nevertheless, there were alternative approaches to community organization that were more resilient. Charles Elton's (1927) way of thinking about communities in terms of available niches has remained influential. As recounted in Sharon Kingsland's history (1995), this Eltonian idea of limited membership was elaborated in the 1960s and 1970s by influential ecologists such as G. E. Hutchinson and Robert MacArthur in terms of competition for resources. At its zenith this research program posited community-level assembly rules that governed the composition of ecological communities. These purported assembly rules pertained mostly to the ways in which community membership is dictated by competition for limited resources and the limits to similarity in resource use among coexisting species. Although the search for assembly rules has continued (Weiher and Keddy 1999), they have been proved hard to pin down. This competition-based approach to community organization is not central to contemporary community ecology. Nevertheless, the search for community-level organizational structure continues, although shorn of its heavy emphasis on competition. It remains a potential organizing principle even though ecologists have turned to other ideas such as complex adaptive systems theory.

The feasibility of identifying ecological communities as an independent level of causal organization hinges on where communities stand along three important dimensions (Sterelny 2001). The first we have already seen: the idea of boundedness. If communities have causally salient properties, then they must have discrete boundaries. A second dimension is internal organization—organizing mechanisms that give communities an internal structure that is analogous to that of organisms. Organisms have cohesion and integration because they are subject to the organizing forces of natural selection; they respond as unitary entities to natural selection as an organizing mechanism, and selection is the reason that they have many of the properties that they do. Finally, the causally salient community-level properties must be identified. Certainly ecological communities exist in the sense that it is possible to observe community types such as a beech-maple forest or a temperate rain forest. For the community to exist as an independent level of causal organization, however, some of these community-level properties—what philosophers would call emergent properties—must play a causal role in shaping ecological phenomena. Scientists do not know how the various kinds of ecological communities will be placed along these three dimensions; it is possible that different kinds of communities will end up in different places. In the meantime, much of the work that proceeds under the label of community ecology is a kind of multispecies population ecology. Two or three (sometimes more) interacting populations are analyzed for their population-level effects on one another. The interactions modeled include competition, predator-prey relations, mutualism, and parasitism. Daniel Simberloff call this "traditional community ecology." (2004, p. 787).

The relevance of traditional community ecology to environmental problem solving has been a matter of controversy. J. H. Lawton (1999) argues that it has been a disappointment and that the focus should be on the lower level of population ecology and from there should ascend to macroecology. Simberloff (2004) disagrees, arguing that there are clear success stories in which traditional community ecology has contributed to the achievement of environmental goals (e.g., efforts to rescue the red-cockaded woodpecker from extinction). Both authors agree that traditional community ecology is destined to be a largely local, system-specific enterprise (Shrader-Frechette and McCoy 1993). Given the small likelihood that broad, community-invariant generalizations will emerge, the most promising alternative lies in investigating the mechanisms of multispecies assemblages.

The local, idiosyncratic nature of community organization is yet another sign that the more holistic aspirations of some community ecologists are problematic, which has implications for environmental ethics and philosophy. A prominent strain in environmental ethics, tracing its roots back to Leopold, holds that communities will emerge as the kind of holistic entities to which one may properly attribute intrinsic value and thus moral standing (Callicott 1999). The state of community-level inquiry at the beginning of the twenty-first century appears to cast some doubt on this enterprise. It may turn out that the current picture of ecological communities is mistaken or that the attribution of intrinsic value does not require such holism. There are resources within ecology, such as complex adaptive systems theory (Solé and Bascompte 2006), that provide grounds for arguing the former; and there are resources within environmental philosophy, such as an appeal to ecological integrity understood in terms of coevolutionary relationships (Karr 2000) for arguing the latter as well.

MACROECOLOGY

The 1930s has been called the golden age of population ecology (Scudo and Ziegler 1978). Perhaps the 1960s was the golden age of community ecology, with its

themes of niche and of limiting similarity. That decade yielded another important theoretical development: the equilibrium theory of island biogeography developed by Robert MacArthur and Edward O. Wilson (1967). The theory explained the number of species on islands as an equilibrium between extinction and colonization, with these two processes themselves depending on the size of the island and the distance from the mainland, respectively. This new theoretical approach represented an expansion of the scale of ecological inquiry both in space and time. Accompanying this shift in scale was a shift in methodology away from a more reductionist, often experiment-based, and mechanistic understanding of the dynamics of populations toward the discovery of broader-scale statistical patterns and correlations. This approach has emerged as the field of macroecology (Brown 1995).

Macroecology differs from more traditional approaches to community ecology in two fundamental ways. The first difference, already mentioned, pertains to scale and the kinds of generalizations pursued. Macroecologists are usually concerned with regional patterns of species abundance and biodiversity and with how those patterns change over long periods. The other significant feature of macroecology is its interdisciplinary nature. As Brown puts it, "[M]acroecology explores the domain where ecology, biogeography, paleobiology, and macroevolution come together and thus has the potential to forge synthetic links among these disciplines" (Brown 1995, p. 19).

Macroecology offers a number of distinct advantages for tackling environmental issues. First, by expanding the scale of inquiry in both space and time, it opens up the possibility of recognizing patterns and processes that might not be apparent from a more mechanistic and reductionist perspective. Second, as already indicated, traditional community studies usually require significant investments of both cognitive and economic resources. Uncovering and quantifying the mechanisms of interaction among a group of populations is often a significant challenge. Furthermore, the local relevance of the results means that, for large-scale processes, the efforts will have to be replicated across a range of situations. Macroecology can, at times, deliver a level of understanding relevant to policy deliberations without such massive investments of time, money, and energy. For example, K. A. McDonald and J. H. Brown were able to generate a prediction about extinctions among small terrestrial mammals living on mountaintops in the Great Basin of western North America that would be expected with a three-degree Celsius increase in global temperature. They based the prediction mainly on three variables: (1) data on the expected elevation shifts in montaine forest that would accompany such change in average global temperature; (2) information on current mammalian distributions at these sites; and (3) the species/area relationships of island biogeography. As Brown points out, tackling this problem with the methods of traditional community ecology would have required dozens of time-consuming studies of individual communities.

ECOSYSTEM ECOLOGY

The next level in the organizational hierarchy of ecology—beyond the individual, population, and community—is the ecosystem. The term *ecosystem* was introduced in 1935 by Tansley. He proposed the term as an alternative to the Clementsian concept *superorganism*, which was, in his view, causing significant confusion within the discipline. He intended the term to refer not just to the particular complex of organisms occurring at a site (the organismic community) but also to the physical environment. Tansley's ecosystem concept received its first detailed empirical development at the hands of Lindeman. His "trophic-dynamic concept" (1942) put flesh on the idea of an ecosystem by focusing on structural elements and the functional relationships among them. Structurally ecosystems are divided into trophic levels, each with its own function: Primary producers (plants) capture solar energy and turn it into biomass; herbivores consume the plants; and first-level carnivores consume the herbivores. Decomposers represent the trophic level responsible for disassembling the organic material into its constituent parts, thus recycling crucial elements such as nitrogen within the system. Lindeman's unique contribution was in quantifying these relationships.

In the wake of Lindeman's pioneering work, ecosystem studies have developed into a distinctive field of scientific inquiry (Golley 1992; Hagen 1993). Some (e.g., Schlesinger 1997) argue that it is a distinctive discipline in its own right: biogeochemistry. Others see it as one of two fundamental perspectives within ecology, the ecosystem perspective focusing on temporally extended processes (such as primary production of biomass) and functions (such as nutrient cycling), and the population-community perspective focusing on spatially extended entities and the ways in which they form groups and interact. Population/community ecology emphasizes patterns of distribution, the abundance of organisms, and the mechanisms responsible for these patterns. Ecosystem ecology conducts its business in the language of physics and chemistry. Although there have been numerous calls for a unified ecology (e.g., Allen and Hoekstra 1992), these two approaches analyze the natural world from two distinct points of view.

Although full-blown unification may not be likely, there have been numerous successful efforts at integrating the two perspectives. Moving from organisms to ecosystem

processes leads toward research that suggests that biodiversity can have a stabilizing effect on ecosystem productivity (Tilman 1999). In the other direction a large body of evidence indicates the various ways in which ecosystem processes impose constraints on the population biology of organisms (Sterner and Elster 2002).

Another subfield, landscape ecology, strongly resembles macroecology (Turner 1989). Like macroecology it focuses on ecological processes at broader scales, especially spatial scales. Landscape ecology, however, is also more likely to incorporate both organismic and ecosystem perspectives into a single study (Holling 1992). It thus provides further opportunities for bringing together the organismic and ecosystem perspectives.

Ecosystem ecology has influenced environmental ethics and philosophy in at least three important ways: First, the ecosystem perspective encourages the use of the evaluative concept of ecosystem health. Although the issue has been controversial, there appears to be an emerging consensus that it makes sense to conceive of ecosystem health in terms of the sustainable delivery of ecosystem goods and services (Daily 1997, Callicott and Mumford 1997). Ecosystems provide the resource inputs for various economic activities. They also provide other less readily apparent but no less valuable services, including the purification of air and water, pollination of crops, stabilization of climate, mitigation of floods and droughts, and maintenance of biodiversity. Radical changes in ecosystem structure and disruptions of ecosystem function can interrupt this flow of goods and services. In healthy ecosystems these structural and functional elements remain intact.

It is also possible to think of ecosystem health in a less instrumental way. Although there are reasons to doubt whether ecological communities can sustain attributions of intrinsic value, ecosystems may fare better. A number of environmental ethicists, sometimes called ecosystem holists, have argued for the moral standing of ecosystems. Holmes Rolston, for example, talks about "duties to ecosystems" on the basis of their "systemic" value—their status as natural systems that both create and sustain biodiversity at the species level (1991). Other environmental ethicists, such as Laura Westra (1994) and Eric Katz (1997), see in ecosystems a capacity for self-realization that commands moral respect.

Ecosystem ecology introduces the important practical perspective of ecosystem management into environmental decision making. Ecosystem management directly addresses the issue of sustainable delivery of ecosystem goods and services. Although it has its controversial elements, as Simberloff (1998) points out, ecosystem management has several attractive qualities. By focusing on entire systems, it is better able to cope with ecological complexity. Key elements that might be ignored by a more reductionist approach are implicitly included. Also, many environmental issues are scale-dependent; the ecosystem approach makes it easier to calibrate to the appropriate scale. Finally, ecosystem level approaches more readily accommodate the incorporation of the most ecologically influential species on the planet: humans.

SEE ALSO *Biodiversity; Conservation Biology; Darwin, Charles; Ecology: II. Community Ecology; Ecology: III. Ecosystems; Ecosystem Health; Leopold, Aldo; Rolston III, Holmes.*

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II. COMMUNITY ECOLOGY

The fundamental idea behind community ecology in the modern sense was expressed by the nineteenth-century English naturalist Charles Darwin (1809–1882) in his image of the entangled bank:

> When we look at the plants and bushes clothing an entangled bank, we are tempted to attribute their proportional numbers and kinds to what we call chance. But how false a view this is! Everyone has heard that when an American forest is cut down, a very different vegetation springs up; but it has been observed that the trees now growing on the ancient Indian mounds, in the Southern United States, display the same beautiful diversity and proportion of kinds as in the surrounding virgin forests. What a struggle between the several kinds of trees must here have gone on during the long centuries, each annually scattering its seeds by the thousand; what war between insect and insect—between insects, snails, and other animals with birds and beasts of prey—all striving to increase, and all feeding on each other or on the trees or on their seeds and seedlings, or on the other plants which first clothed the ground and thus checked the growth of the trees! Throw up a handful of feathers, and all must fall to the ground according to definite laws; but how simple is this problem compared to the action and reaction of the innumerable plants and animals which have determined, in the course of

> centuries, the proportional numbers and kinds of trees now growing on the old Indian ruins! (Darwin 1962 [1859], p. 86)

This remarkable passage is testimony to the daunting complexity of ecological systems. It also reveals a vision of ecological communities as deeply ordered. According to the Darwinian image, if one cuts down the forest something vastly different appears in its place. But if one waits long enough, as with the Indian mounds, the forces responsible for this order will reassert themselves, and the community will return to its original state. But what are these forces? And is this tendency toward community reassembly true of all ecological communities, or are the forest of the American South a special case? The historical approaches to community ecology can be sorted in terms of the answers they seek to give to these questions.

THE SEARCH FOR COMMUNITY-LEVEL ORGANIZATION

The skeptical answer to these questions draws a distinction between two kinds of factors that might influence population behavior. Darwin placed a great deal of emphasis on the interactions among organisms (what ecologists call *synecology*). There is, however, a long tradition of ecological thought that views the interactions between organisms and the physical or abiotic conditions of life as the most important influence on the fates of organisms (what ecologists call *autecology*). The synecologist emphasizes the degree to which the entangled bank is shaped by biological interactions among organisms. The autecolgist emphasizes the impact of abiotic factors like the weather. Each perspective recognizes that both kinds of processes are at work; however, each emphasizes one type over the other—the type that it believes to be doing most of the work. It appears that inclinations on this issue correlate with the kinds of organisms studied. For example, ecologists who study birds tend to focus on synecological factors, whereas insect specialists often emphasize autecological influences. Their shared insight is that different kinds of processes are likely to be at work in shaping the demographies of different kinds of organisms. This is clearly an empirical question that can only be settled by understanding population behavior. That ecologists have been so determined to take a position on this issue before all the evidence is in attests to the importance of background knowledge—what the philosopher Thomas Kuhn might call the power of paradigm (1962).

One skeptical response should now be clear. For autecologists such as Andrewartha and Birch (1954), there is not much to be done in community ecology if it is about studying the population interactions that shape the entangled bank. Autecology, however, does not entail skepticism about the second Darwinian question: whether the southern forests are the exception or the rule. It might be that the unique species mix and relative abundances of the southern forest—the community type—are determined by pervasive physical factors such as the climate. This was the view of Frederic Clements (1905). But Clements had an additional idea: Communities experience their environments in much the same way in which individual organisms do. On this view ecological communities are a kind of superorganism to which scientists can apply the same kind of developmental analysis they apply to organisms. For Clements the community is a natural kind (a search for natural kinds seeks to classify things in terms of their causal influence) that is itself part of the causal structure of the biological world.

This appeal to communities as natural kinds brings forth the second skeptical objection. The skeptic worries that the cohesiveness of the southern forest, and most of the other community-types in Clements's typology, is illusory. As early as the 1880s, before ecology was even recognized as a discipline, European plant ecologists were debating this issue. The Danish botanist Eugenius Warming (1841–1924) urged a focus on the individual (1895); the German botanist Oscar Drude (1852–1933) championed a community-level perspective that Clements himself regarded as among his intellectual precursors (1890). Perhaps the most famous clash was between Clements and H. A. Gleason (1926). Gleason propounded what he called the "individualistic hypothesis," the view that congeries of populations do not come packaged with cohesive and coextensive boundaries but are spread out along environmental gradients, such as soil moisture. Only in special circumstances, such as the edge of a pond, do we find relatively crisp edges between community types. Here again an empirical question is being treated more like a presupposition.

The question of community cohesion was finally tackled empirically beginning in the 1950s with the work of the Cornell ecologist Robert Whittaker (1975), John Curtis's (1959) team at the University of Wisconsin, and others. The evidence suggests that, like so much else in ecology, there is an element of truth to both sides of the debate. Certainly communities come in kinds. There is such a thing as the long-leaf/loblolly pine biome type—just the kind of thing that Darwin had in mind. Furthermore, the Clementsian idea of succession terminating in a distinct community type (i.e., the process that led, for Darwin, from the clearing of the Indian mounds to the reestablishment of the "virgin forest"—what Clements would call the climax community) has a solid hold on the ecological canon. When the details are supplied, however, ecological communities usually lack the

cohesiveness and uniformity that would be required of a Clementsian superorganism.

Another possibility is that communities cannot be individuated as distinct natural kinds by mapping the distributions of individual organisms. But it does not follow that there are no community-level processes giving structure to the entangled bank. In a very influential book, *Animal Ecology*, Charles Elton (1927) developed a view of community organization that he thought might hold for all communities. He observed that all biotic communities exhibit a trophic pyramid of numbers: Plants, at the base of the food web, must be much more numerous than the herbivorous animals that feed upon them; but those herbivorous animals must be much more numerous than the omnivorous and carnivorous animals that feed upon them; and at the apex of the food web are the large carnivores that are very few in number. Further, constraints such as the limit to food-chain lengths shape the available niches in a community, and the available niche structure of the community limits the number of organisms that can coexist. Inspired by central figures such as G. Evelyn Hutchinson (1957) and Robert MacArthur (1972), Elton's program was elaborated by others into a pluralistic theoretical ecology, with features such as niche theory, the theory of limiting similarity, and island biogeography (Morin 1999).

These efforts to locate a kind of universal community structure have been met with skepticism (Strong et al. 1984). Like Clementsian succession, thinking in terms of the niche, the partitioning resources, and competitive exclusion (Gause 1934) has remained useful to most ecologists; but the idea that the ecological community is itself an independent level of causal structure has proved more difficult to defend.

THE EVOLUTION OF COMMUNITY ECOLOGY

Although none of these efforts to establish an independent level of community organization above the population level has really taken hold, community ecology is nonetheless a well-established domain of ecological inquiry. It has emerged in two distinct forms. One takes its cue from the Darwinian vision of the entangled bank—a vision in which synecological interactions among populations play the major role. These biotic interactions—competition, predation, and mutualism—have long been the focus of ecological study. This study of population interaction is itself a kind of community ecology, focusing not on entire communities but on component populations, typically only of two or three species at a time. Such an approach predominates in influential texts on community ecology (Morin 1999). The views of Hutchinson (1957) and MacArthur (1972) on community ecology have been influential as well. In an important book, James Brown describes the situation: "My colleagues who call themselves ecologists are virtually all reductionists. . . . On the other hand, my colleagues who call themselves biogeographers, paleobiologists, and macroevolutionists tend to be holists. They use inductive, nonmanipulative methods to study whole systems or emergent characteristics of large, complicated assemblages of many species distributed over geographic spatial scales and evolutionary time scales" (Brown 1995, p. xi). Much of the spirit and some of the letter (e.g., the theory of island biogeography) of this earlier vision is embodied in this higher-level study of ecological systems—what Brown calls macroecology.

There is a significant relationship between community ecology and the two related fields of ecosystem ecology and landscape ecology. In 1935 Arthur Tansley introduced the concept of the ecosystem—essentially the organismic or biotic community viewed in conjunction with its physical surroundings. Some ecologists, most notably Eugene Odum (1953) and Howard Odum, saw in the ecosystem that elusive higher level of causal organization that has been the holy grail of community ecology. Not surprisingly, this outlook has engendered controversy, and the holistic vision of the Odums remains the minority view.

Ecosystem ecology, however, has emerged as a distinct and robust field. It might be best to call it biogeochemistry because its defining feature is the analysis of ecological systems in physicochemical terms. The emergence of this new field has resulted in efforts to unify ecology, to embed the ecosystemic and organismic perspectives within a single conceptual framework (Allen and Hoekstra 1992). A complete unification seems unlikely, however, because one field uses the language of physics and chemistry and the other the language of organisms and populations. Nevertheless, there is a natural synergy between the two fields, and the development of studies at the interface between them has been a growth area in ecology (Tilman 1999).

One significant trend in ecology since the mid-1980s has been an increasing focus on matters of scale—especially spatial scale. In the case of the community ecology of interacting populations, this trend has led to the emergence of metapopulation ecology (the recognition that many populations are themselves composed of interacting subpopulations) and even a metacommunity approach that recognizes spatial structure among communities (Holyoak et al. 2005). At a more holistic level this focus on spatial structure, and especially spatial heterogeneity, has led to the emergence of landscape ecology (Turner 1989), which is concerned with the influence of spatial heterogeneity on biotic and abiotic processes. This variant is usually more focused on applied questions (such as the ecological consequences of human impacts) than are

its sister disciplines of population/community ecology and biogeochemistry. It bears close affinities to both, however, and much of the work in landscape ecology lies at the interface with these two fields.

COMMUNITY ECOLOGY AND ENVIRONMENTAL ETHICS

Community ecology relates to environmental ethics and environmental philosophy mainly in two areas: (1) pragmatic issues that pertain to environmental decision making and (2) conceptual issues that relate to the formulation of moral obligations to the natural world.

Sound environmental policy formulation and decision making require a sound understanding of how ecological systems work. Community ecology, especially those studies that focus on the population consequences of multispecies interactions, has played an important role in enlightening policy decisions. For example, Robert Paine (1966), through his seminal work on marine intertidal communities, demonstrated that removal of a species can have dramatic effects on an ecological community. In a classic experiment Paine showed that the removal of a predatory starfish enabled a competitively superior barnacle to dominate the community, thereby significantly reducing biodiversity. This simple and elegant experiment clearly demonstrated the magnitude of the impact of such a disappearance. Peter Karieva and Si Levin (2003) detail the importance of species to ecological processes; Simberloff (2004) describes the birth of a new field: invasion biology. This style of community ecology, which examines the population interactions of multispecies assemblies, is a key element in the development of effective environmental policy.

Another style of community ecology—macroecology—has also made important contributions to sound environmental decision making. Island biogeography was, perhaps, the first ecological theory to be applied systematically to biodiversity conservation. The macroecological perspective has also been useful in understanding how populations differ in their vulnerability to extinction, identifying regions of maximal biodiversity, and providing a perspective on the spread of introduced species as a consequence of human activities.

Beginning with the seminal work of Aldo Leopold (1966 [1949]), environmental ethicists have been tempted by the idea that ecological communities have a moral standing in their own right. Leopold's famous formulation of his land ethic calibrates the rightness or wrongness of an action in terms of its impact on the stability, integrity, and beauty of the biotic community. Leopold was heavily influenced by the holistic Eltonian view of community organization. Whether he was committed to the extension of moral standing to ecological communities has been a matter of significant controversy, but such efforts have proceeded apace, in the claimed recognition of human membership in the ecological community (Callicott 1999) or the idea of community self-realization (Katz 1997, Westra 1994), notwithstanding persisting skeptical counterclaims regarding the boundedness, cohesion, and self-organizing capacities of communities.

Given these skeptical challenges, some environmental ethicists with holistic, extensionist sympathies have turned their attention away from ecological communities and toward ecosystems as the entities of higher moral significance (Callicott 1999, Golley 1993, Rolston 1991). These scholars argue that, given the structural and functional characteristics of ecosystems, they are better suited to ascriptions of moral standing, with ecological integrity as the normative ideal. Ecological communities have integrity in this sense when the various kinds of organisms that coexist at a site share an evolutionary history. According to James Karr (2000), a community's ecological integrity has been compromised if it has undergone significant anthropogenic species extinctions and introductions. If communities lack sharp boundaries, then a shared evolutionary history obtains mainly at the population level. This outlook may not attain the degree of integrity that some ecosystem holists had hoped for, but for some thinkers it remains a workable criterion for valuing communities that are evolutionarily intact.

SEE ALSO *Darwin, Charles; Ecology: III. Ecosystems; Environmental Policy; Land Ethic; Leopold, Aldo; Odum, Eugene.*

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III. ECOSYSTEMS

The *ecosystem* is a basic unit of ecological research and ecological management. One scholar has even defined the whole science of ecology as "the study of the structure and function of ecosystems" (Odum 1962, p. 108; Odum 1964). Ecosystems are commonly used as baseline criteria of conservation and environmental protection, as expressed in various kinds of "ecosystem approaches" in conservation and natural-resource management, most notably in the Millennium Ecosystem Assessment (Millennium Ecosystem Assessment 2005; see also CBD 2008).

The term *ecosystem* was coined as a scientific way of encompassing the groups of interacting plants and animals, which were previously designated metaphorically as "communities" or even "superorganisms." Despite its scientific origins, *ecosystem* has become a buzzword, indiscriminately applied to many things that people associate with ecology. In the scientific sense of the term, an ecosystem is a unit composed of an assemblage of organisms together with its inorganic (waters, minerals) environment (Krebs 1985, Likens 1992). To this basic definition of *ecosystem* a multitude of other meanings have accrued, even within scientific ecology. That multitude of meanings—and philosophical problems to which it gives rise—is of more than merely academic interest: It has implications for conservation policy and environmental ethics as well.

HISTORY AND CURRENT USAGE

The term *ecosystem* was coined by the eminent British plant ecologist Arthur Tansley in 1935. He took sides in a long-standing debate about the nature of the plant "community" and its extension, the "biotic community," which is composed of animals as well as plants. He argued against the use of the term *superorganisms* to characterize groups of interacting plants and animals, viewing it as a kind of reification. This "reified" view had been expressed most ardently by the leading American plant ecologist of the early twentieth century, Frederic Clements, who conceived of interacting groups of plants and animals as "an organism" that "arises, grows, matures and dies" (Clements 1916, p. 3). In contrast, Clements's most prominent opponent, Henry Allan Gleason, considered the (plant) community as "not an organism, scarcely even a vegetational unit, but merely a *coincidence,*" its structure

originating from the "environmental sorting" of individual organisms and their specific migration patterns within a site (1926, p. 16; emphasis in original). Tansley, calling the community a "quasi-organism" (1935, p. 289), traveled a road in between these two extremes. He argued that biotic communities (or biomes) were not the fundamental units of nature. Instead, he proposed that

> the whole *system* (in the sense of physics), including not only the organism-complex but also the complex of physical factors forming what we call the environment of the biome—the habitat factors in the widest sense.... It is the systems so formed which, from the point of view of the ecologist, are the basic units of nature on the face of the earth.... These *ecosystems,* as we may call them, are of the most various kinds and sizes. They form one category of the multitudinous physical systems of the universe, which range from the universe as a whole down to the atom. (Tansley 1935, p. 299; emphasis in original)

Tansley thus placed living and nonliving elements on the same level: a system, in the sense in which that term is used in physics. This definition of the term *ecosystem* was not the first to express the idea that groups of organisms (communities) and their environments were closely interrelated "systems" (compare the *holocoen* concept of Karl Friederichs 1927 and other concepts described in Jax 1998). Nor were its details, in particular Tansley's emphasis on the epistemological status of the concept (about which more shortly), retained in later definitions and applications.

If ecosystems, comprising biotic and abiotic elements, are the "basic units of nature," just *what* are they? For Tansley an important part of the answer was that they were abstractions, mental isolates formed according to the purpose of the (particular) investigation:

> The whole method of science....is to isolate systems mentally for the purpose of study, so that the series of *isolates* we make become the actual objects of our study, whether the isolate be a solar system, a planet, a climatic region, a plant or animal community, an individual organism, an organic molecule or an atom.... The isolation is partly artificial, but it is the only possible way we can proceed. (Tansley 1935, p. 299)

Note, however, that Tansley did not consider ecosystems to be mere abstractions, as he remarks in a footnote: "The mental isolates we make are by no means all coincident with physical systems, though many of them are, and the ecosystems among them" (Tansley 1935, p. 300).

Tansley's approach avoided reification of the concept and at the same time allowed a very broad use. For many later investigators, however, ecosystems had more specific properties (e.g. self-regulation and information networks—see, e.g., Odum 1969, Patten and Odum 1981, Jørgensen et al. 1992). It is often not clear, however, whether these are really meant as definitions in a strict sense—as criteria that have to be fulfilled to attribute the term *ecosystem* to some physical object—or if these were just derived (or postulated) properties of units defined by much simpler criteria such as topographical boundaries (Jax 2006).

Nowhere in his defining paper did Tansley mention the word *energy.* In a subsequent paper, "The Trophic-Dynamic Aspect of Ecology," Raymond Lindeman (1942) employed Tansley's ecosystem concept in his study of the flow of energy through an aquatic community—Cedar Bog Lake in Minnesota. He calculated the amount of solar energy falling on the pond's surface and then measured the amount converted by photosynthesis to chemical energy by the pond's plants; he then calculated how much of that energy herbivores converted to their own biomass and so on up the food chain to the top carnivores in the ecosystem. Just as Tansley had added the inorganic or abiotic components to plants and animals (the biota), so Lindeman added a major force that drives the dynamics of ecosystems: energy.

This historical development led to an understanding within the scientific community of ecosystem ecology as dealing with energy flow and nutrient cycling (Evans 1956, Likens 1992). This predominant view resulted from the first implementations of the concept under the influence of G. Evelyn Hutchinson. In addition to the work of Hutchinson's student Raymond Lindeman (1942), also that of another of his students, Howard T. Odum (1951) was a major figure for developing and popularizing this approach (Taylor 1988, Hagen 1992, Golley 1993, and Jax 1998, 2006).

Ecosystem ecology is sometimes described as a process-functional approach to ecology as opposed to a population-community approach, which emphasizes the biological components (O'Neill et al. 1986, Vogt et al. 1997). Some of the key terms used in describing ecosystems in the process-functional approach are *energy budgets*, *trophic levels* (or slightly more refined functional groupings of organisms), *flows* and/or *cycles* of various chemical elements, and *information networks*. From this perspective the components (plants and animals) are important to the extent that they are moments in ecological processes within ecosystems. Their specific identities as this or that species are less important than the roles they perform in channeling energy and information and cycling materials.

On the one hand this focus on flows of energy and cycles of matter has led to a less ambiguous and mathematically

more tractable definition of *ecosystem*; on the other hand it has eclipsed alternative views and risks omitting important aspects of natural objects, especially the specificity of particular species. This problem is especially important in connection with ecosystem management and conservation. Ecosystem research of this kind became so specialized that many ecologists felt a need to reconcile ecosystem research with other approaches to ecology, especially those emphasizing particular populations and species (Allen and Hoekstra 1992, Jones and Lawton 1995).

VARIOUS DEFINITIONS OF THE CONCEPT OF THE ECOSYSTEM

Notwithstanding the typically narrow use of *ecosystem* in process-functional ecology, controversies and methodological ambiguities persist. Both in the older and in later literature the reader has to be careful to extract the intended meaning, which is often merely implicit.

Obtaining a precise definition means posing and answering several key questions (Jax et al. 1998). One important question, for example, is whether ecosystems are defined by topographical boundaries (that is, by criteria that are visible in space) or by functional boundaries (by process relations among the elements of the system). A topographical definition of an ecosystem is often determined by the boundaries of a watershed, which might be useful in the study of the movement of a pollutant. A functional definition might be determined by the home range of a population of bats, an approach that might be useful in the study of the pollination of plants, the control of noxious insects, or the spread of a disease like rabies. The methodological problem is that functional boundaries or those determined by concrete topographical criteria often do not coincide. There is no simple way to infer one from the other.

Definitions also differ in the degree and kind of internal relatedness involved in constituting an ecosystem. At one extreme the parts of an ecosystem need not display any interrelations at all—they qualify as an ecosystem merely as happenstance assemblages of organisms (just ''coincidences,'' as Gleason argued). At the other extreme an object is called an ecosystem only if the parts of that unit give rise to self-regulation, equilibrium states, and relative functional autonomy in relation to other units of the same type (Jørgensen et al. 1992). Between these two extreme views ecosystems are characterized as displaying clearly defined relationships between the various parts but not necessarily with equilibrium or self-regulation. Such differences in definitions can even lead to contradictory assessments about which material systems should be called ecosystems.

An ecosystem cannot simply be ''found.'' Different definitions delimit different parts of the world as an ''ecosystem'' (Ahl and Allen 1996, Jax et al. 1998). Hence what qualifies as an ecosystem is not fixed in external reality but varies with the research questions posed and even the social implications assumed (Pickett and Cadenasso 2002, Jax 2006). The implementation of the concept of the ecosystem is thus far from simple.

Beyond such technical definitions the term *ecosystem* is frequently used in a generic manner that connotes more a perspective or general heuristic idea than a clearly delineated object in nature. The generic definition is the ''basic definition'' of *ecosystem* given in the introduction of this article. Although narrow, technical definitions are required for theoretical generalizations and for implementing the ecosystem concept in the field, the generic definition, which emphasizes the interrelatedness of natural phenomena, helps to describe and structure modes of ecological research (Jax 2006). In a similar way Pickett and Cadenasso describe the use of the ecosystem concept as ''meaning, model, and metaphor'' (2002, p. 1). The first dimension (''meaning'') comes close to the generic use of *ecosystem*, the second (''model'') comes close to the technical definitions, and the third (''metaphor'') describes an informal and symbolic use of *ecosystem*, mainly in a management or policy context. This variation in usage corresponds to the observation that the *ecosystem,* in contemporary ''ecosystem management,'' functions as both object and perspective, the latter describing a kind of policy or philosophical approach that extends beyond the empirical realm of the hard sciences and into the interpretive realm of the social sciences.

ECOSYSTEMS, CONSERVATION, AND ETHICS

The ecosystem concept has become an essential part of many normative concepts in conservation (Callicott et al. 1999). In the last two decades of the twentieth century, conservation efforts increasingly shifted from single species and populations to the conservation of whole ecosystems (Walker 1995, Christensen et al. 1996). This latter, more comprehensive, approach raises questions about the moral status of ecosystems (Cahen 1988, Salthe 1989) and poses the risk of conflicts between competing targets of conservation.

Various definitions of ecosystems put different aspects of the material world in the foreground or the background. In some extreme process-functional definitions of *ecosystem*, species populations become completely interchangeable and ''invisible'' because only their functional roles are relevant (O'Neill 1976, Mclntosh 1981). Thus the protection of the whole ecosystem (as understood in a process-functional sense) is no guarantee of the protection of specific species populations; they could, in theory, be replaced by others with no loss whatever to the ecosystem as a whole.

Hence, with implicit differences in the definition of *ecosystem,* the targets of protection can vary widely. Some of these definitions are compatible with species protection, whereas others are not. The notion of protecting "ecosystem functioning" and "ecosystem services" (as a preconditions for human well-being), especially since applied in the Millennium Ecosystem Assessment, has become a prominent point of international discussion. The idea that ecosystem processes and "services" depend on specific actors to perform them in specific places can help to bring the issue of biological diversity (as a precondition for sustained ecosystem functioning) into the awareness of a broader public.

Nevertheless, scientific, philosophical, and ethical questions persist: Just how much does the identity of the species performing a functional role in an ecosystem matter for the successful discharge of the ecosystem process and/or service? Can one species be substituted for another without a significant impairment of ecosystem processes and services? The protection of ecosystem services and the preservation of a specific biodiversity are distinct tasks that can dovetail only if the conservation of species is deemed to be important. From a nonteleological evolutionary point of view, is it metaphysical nonsense to impute any function or role at all to a population of organisms? Earthworms, for example, are not designed to aerate soil and decompose detritus; they are naturally selected to burrow through soil, digest dead organic matter, and make more earthworms. From the very beginning ecosystems were conceived to be as much theoretical as natural objects. Are ecosystems and all their purported functional processes mere figments of the ecologists' imagination? Should an ecosystem approach to conservation serve only utilitarian purposes (protecting those parts of nature that are useful to humans)? Or is it also compatible with other approaches of environmental ethics—those that advocate protecting nature (or parts of nature) for its own sake?

The selection of an appropriate definition of *ecosystem* for management purposes depends on values, decisions, and societal choices (Jax and Rozzi 2004). The demands of such choices raise the need for interdisciplinary work and participatory, transparent, and democratic forms of decision making. Ecosystem management is not a matter of science alone.

SEE ALSO *Adaptive Management; Ecology: V. Disequilibrium Ecology.*

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Kurt Jax

IV. DIVERSITY-STABILITY HYPOTHESIS

The idea that biological diversity enhances ecological stability has inspired a huge body of scientific research. It has also played an important role in environmental ethics, especially in Aldo Leopold's land ethic. According to Leopold, biodiversity is essential for "a food chain aimed to harmonize the wild and the tame in the joint interest of stability, productivity, and beauty" (1949, p. 199). Potential links between diversity and stability have helped to spur conservation efforts.

Nevertheless, ecologists have at times shown what Samuel McNaughton called a "marked instability of attitudes regarding diversity-stability relationships." He attributed this to a "low diversity of empirical tests of the hypothesis" (1977, p. 523). In this respect scientists are now in a much better position to assess the diversity-stability hypothesis (henceforth merely "the hypothesis"), with more than forty direct experimental trials on the books and more in progress. But another reason for changing attitudes has been that stability is a multivocal concept, and evidence suggests that not all types of it vary positively with biodiversity. Thus, the plausibility of the hypothesis has varied as different kinds of ecological stability have come into vogue.

Three interrelated trajectories have been discernible in the years since World War II. First, scientists' confidence in the hypothesis plummeted in the early 1970s; but then it steadily rose again, beginning in the mid-1990s. Two other trends help to explain this recovery: Emphasis has shifted from the stability of individual populations to that of entire communities or ecosystems, and ecologists have come to focus on forms of stability that are both empirically measurable and theoretically tractable.

In the 1950s, three of the twentieth century's most influential ecologists argued that the hypothesis was plausible enough to warrant further study (Odum 1953, MacArthur 1955, Elton 1958). They reasoned that if a given species preys on several others, its population size will fluctuate less in response to environmental variations affecting one of its prey than it would if the species in question ate fewer prey species. Similarly, if a species has many predators, its population will vary less in response to exogenous changes in one predator's population size. As empirical support for these ideas, Eugene Odum and Charles Elton cited the dramatic oscillations experienced by many populations in the Arctic but not in the far more species-rich tropics; they further noted the tendency for pest populations to undergo more frequent and severe "outbreaks" in simplified agricultural systems than in complex natural systems. Although MacArthur's paper was more conceptual than empirical, he also conceived the hypothesis in terms of population stability.

The few empirical studies of diversity-stability relations conducted in the 1960s and early 1970s yielded a confusing mix of positive, negative, and ambiguous results (Goodman 1975). But the coup de grâce came from a purely theoretical exercise, on the basis of which May claimed that "simple mathematical models with many species are *in general* less stable than the corresponding simple mathematical models with few species" (1973, p. 49; italics added). This is not actually a general theoretical result, since it depends on *particular* and, indeed, quite debatable assumptions about whether and how certain other variables (e.g., the number and strength of interactions between species pairs) change as the number of species increases (McCann 2000). Nevertheless, the idea that diversity destabilizes ecological systems quickly became a "new paradigm" despite a continued dearth of empirical tests of the hypothesis (Loreau et al. 2002).

Direct experimental tests finally got under way in the mid-1990s as preliminary evidence came to light that, when it comes to diversity-stability relations, the whole may not be predictable from a knowledge of the parts. (In "direct" experiments of this kind, the number of species is manipulated independently of other independent variables, such as soil fertility.) In some grasslands where diversity *decreases* the stability of individual plant populations, it nevertheless *increases* the stability of the ecosystem as a whole. This is because in the more diverse ecosystems upsurges in some populations are more often offset by declines in others (Tilman et al. 2006).

Along the way to this discovery, a key conceptual stumbling block was overcome: the mathematically convenient but empirically inapplicable definitions of *stability* used by May and many others. Such definitions often assume infinitely small perturbations of population size from equilibriums that most actual populations never reach, among other potential problems (Mikkelson 1997). Ecologists eventually settled on two empirically meaningful types of stability amid the great majority of direct experimental tests of the hypothesis: resistance to invasion by new species and temporal stability—the mean value of a variable (usually biomass or productivity) divided by its standard deviation, both calculated over time. The latter measure respects the pre-1970s emphasis on variability and can be applied to entire ecosystems as well as to component populations; moreover, it can be explored through a broad range of theoretical tools (Lehman and Tilman 2000).

The upshot of the direct experimental tests performed so far is that diversity does indeed enhance both invasion resistance and the temporal stability of ecosystem biomass or productivity (Ives and Carpenter 2007). Although these authors did not review direct experimental tests of the diversity-*population*-stability hypothesis, it seems that the evidence about it is more mixed (Romanuk et al. 2006). One possibility is that Odum, MacArthur, and Elton were right about the positive effects of prey and predator diversity on population stability. But they did not take into account the point that having numerous prey and predator species allows numerous competitor species to also "fit" into the ecosystem (Chase and Leibold 2003). If competitor diversity, in turn, has negative effects on population stability, then the overall diversity-population-stability relationship may depend upon a highly contingent balance between the effects of diversity at these different trophic levels.

To sum up, then, a period of relatively unconstrained theorizing led most ecologists to reject the diversity-stability hypothesis by the 1980s. A much more experimentally driven research program, along with a shift in focus from population to ecosystem stability, then led to the rehabilitation of the hypothesis, starting in the mid-1990s. There is reason to hope that knowledge of diversity-stability relations will help in mitigating contemporary human-induced mass extinctions. As this knowledge improves, however, it is important to keep in mind that effects of diversity on stability and other aspects of ecosystem function are only some of the many reasons—among them moral, intellectual, and aesthetic—for protecting and promoting the variety of life on earth. As Elton put it, "conserving the variety of nature" is also simply "a right relation between man and living things" (1958, p. 145).

SEE ALSO *Biodiversity; Land Ethic.*

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V. DISEQUILIBRIUM ECOLOGY

Since its foundation as a discipline, ecology has been dominated by an equilibrium view of nature. According to the historian Frank Egerton, the idea of "balance of nature" is present in most "primitive" cosmologies and is inherent in humans' ancestral worldviews. In ancient Greek philosophy, together with the concepts of the "great chain of being" and the "microcosm-macrocosm analogy," the balance of nature remained a fundamental if untested assumption of natural history (1973, 1993).

These assumptions, inherited from an equilibrium worldview, were incorporated without questioning or testing into the most influential ecological theories of the twentieth century, ranging from populations and communities to ecosystems. Examples include the idea of "climax" as the steady-state endpoint of plant succession theory (Clements 1916); W. C. Allee's (1949) notion of balanced animal communities; "the equilibrium theory of island biogeography," which predicts the number of species on oceanic islands as a balance between immigration and extinction (MacArthur and Wilson 1967); and Eugene Odum's (1969) "strategy of ecosystem development," which postulated that all ecological systems progress toward homeostasis. Based on studies on vertebrate and invertebrate social animals, the University of Chicago professors Allee, A. E. Emerson, O. Park, T. Park, and K. P. Schmidt, in their influential book *Principles of Animal Ecology* (1949), concluded that

> the community maintains a certain balance, establishes a biotic border, and has a certain unity paralleling the dynamic equilibrium and organization of other living systems. Natural selection operates upon the whole interspecies system, resulting in a slow evolution of adaptive integration and balance. Division of labor, integration, and homeostasis characterize the organism and supraorganismic intraspecies population. The interspecies system has also evolved these characteristics of the organism and may thus be called an ecological supraorganism. (p. 728)

According to these authors, the theory of evolution by natural selection, pioneered by the English naturalist Charles Darwin (1809–1882), provided a mechanism that, through interspecific interactions and evolutionary processes, gave rise to equilibrium at supraorganismic levels, which is analogous to the process of "homeostasis" at the individual level.

Accordingly, twentieth-century ecologists retroactively imparted greater heuristic power to the eighteenth-century century notion of the economy of nature as pioneered by the Swedish botanist, zoologist, and physician Carl Linnaeus (1707–1778). Both Linnaeus and Allee (1949) held that there is an essential analogy between the organs in an animal and the species in a community. In turn, Linnaeus based his *Oeconomia Naturae* notion on the work of seventeenth-century naturalists and theologians and on ancient Greek natural philosophers. The creation myth in Plato's *Timaeus* affirms that the creator made the world as "one visible animal comprehending within itself all other animals of a kindred nature" (30 c-d). Plato's dialogues have had a pervasive influence in European and North American thought, integrating the microcosm-macrocosm analogy with the image of the parts of an animal body as a representation of the different parts of the universe; Plato held that the diversity of species of living beings are the organs of a supraorganismic being and that the universe as a whole is a super superorganismic being.

Such ancient organismic perspectives influenced Linnaeus, who in turn influenced nineteenth-century biologists and thinkers concerned with "organic wholeness" (Jax 1998). In the early twentieth century the German ecologist Karl Friederichs affirmed, "In the same way in that the world is a dynamic system, which actively persists in a delicate state of equilibrium by means of self-regulation, this is also valid for naturally delimited parts of the biosphere (e.g., pond, fen, beach . . .)" (Jax 1998, p. 117).

Friederichs coined the term *holocoen* to refer to "a forest, a lake, a fen"—perceivable habitats that exist as delimited living systems within a nested hierarchy of nature.

Friederichs's view contrasts sharply with that of Arthur Tanlsey (1935), who understood an ecosystem as an operational distinction made by scientists. Charles Elton (1930) was even more radical in his criticism of the organismic and equilibrium views of nature when he affirmed,

> "The balance of nature" does not exist, and perhaps never has existed. The numbers of wild animals are constantly varying to a greater or less extent, and the variations are usually irregular in period and always irregular in amplitude. Each variation in the numbers of one species causes direct and indirect repercussions on the numbers of others, and since many of the latter are themselves independently varying in numbers, the resultant confusion is remarkable. (p. 17)

With the work of Tansley, Elton, and others in the mid-twentieth century, the assumptions of natural equilibrium and balance of nature came under critical scrutiny. H. G. Andrewartha and L. C. Birch (1954) rejected the idea that density-dependent factors (endogenous

factors within the ecological system) alone controlled populations in ecological communities. They emphasized, instead, the importance of allogenous disturbances (external factors such as volcanic eruptions, flooding and hurricanes) as drivers of population fluctuations.

The alternative tenets of equilibrium vs. disequilibrium ecology have implications not only for the scientific understanding of nonhuman nature but also for the relations that human societies establish with their environments. From the perspective of public understanding, equilibrium views that draw on the traditional metaphor of "the balance of nature" have had profound implications for the broad application of ecological theories to resource-management and conservation issues (Botkin 1990, Wu and Loucks 1995).

RELATED CONCEPTS

Related to the idea of natural equilibrium are the notions of "stability" and "resilience" that have been ubiquitous in community ecology during the twentieth century (Wu and Loucks 1995). Stability is a condition that enables the system to tolerate or resist external perturbation without significant structural and functional change. Resilience is the ability of the ecological system to return to its previous equilibrium state after a disturbance. Both notions have proved to be problematic when empirically tested in diverse aquatic and terrestrial environments (Wu and Loucks 1995).

In the last quarter of the twentieth century, equilibrium-centered theories were gradually supplanted by alternative conceptions stemming from the increasing awareness that frequent disruptive events (or disturbances) on both land and in water lead to the reorganization of ecosystems in often-unexpected directions (Simberloff 1980, Pickett and White 1985). Under this new probabilistic understanding, equilibrium or stable conditions are viewed as special transient cases or as consequences of applying a narrow spatial or temporal gauge in examining large-scale ecosystem dynamics (Wu and Loucks 1995). Nonequilibrium models and empirical studies of fire and pest-outbreak effects on biotic communities, on the other hand, have increasingly demonstrated the existence of multiple equilibriums and have emphasized the role of stochastic and probabilistic processes in ecological systems (Simberloff 1980).

PARADIGM SHIFT: RESULTS AND PROSPECTS

The turn from equilibrium to disequilibrium conceptions of ecological systems since the late 1970s has been considered by many (Simberloff 1980; Pickett et al. 1992, 2007; Wu and Loucks 1995) as a "paradigm shift" in the science of ecology. *Paradigm* here connotes the constellation of concepts, ideas, and approaches shared by a working community of scientists (Kuhn 1962). This paradigm shift questions, on empirical grounds, the previous tenets of ecological theory (i.e., equilibrium assumptions) and obliges a rethinking of the application of theory to environmental problems such as the design of nature reserves (Pickett et al 1992), the management of wild populations, and the perception of disturbance regimes (Botkin 1990). It also calls into question the traditional view of humans as agents of the destruction and/or restitution of natural "harmony" and "balance" and urges us to reformulate the goals of biological conservation and ecological restoration practices.

According to Pickett and his coauthors (1992), the old equilibrium paradigm of ecology, embodied in the traditional metaphor of "the balance of nature," was replaced in the late twentieth century by a nonequilibrium view, best expressed in the new metaphor "the flux of nature." Such metaphors are essential elements in the understanding of scientific theories and are closely linked to cultural worldviews. Implicit in the old metaphor are (a) the closed character of ecological systems; (b) the predominantly autogenic origin of ecosystem structure and function determined by species and genetic diversity, life histories, biomass accumulation, and other internal biological and physical properties; and (c) the existence of a predictable condition (in the sense of Odum's homeostasis), often called the climax state, that is resistant to occasional external disturbances (Pickett et al. 1992). In turn, the new metaphor, representing the nonequilibrium concept of ecological systems, denotes (a) the open nature of most ecosystems; and (b) their dependence on both exogenous forces (such as fire, climate change, or pollution) and autogenic forces (such as species life histories). A high frequency of disturbances relative to the life spans of the organisms in the local community may drive the system to (c) multiple possible endpoints, theoretically possible stable states notwithstanding. In the nonequilibrium view, a metaequilibrium is possible on a broad spatial scale that examines the collective dynamics of multiple patches in the landscape, although single patches are constantly changing.

The paradigm shift in ecology (from equilibrium to disequilibrium concepts and theories) brings a philosophical turn to the notion of disturbances as destructive or catastrophic forces, usually disrupting the orderly trajectory of ecological systems toward homeostasis. Disturbances are sudden events altering ecosystem or community structure and processes, destroying biomass and releasing resources for the survivors or newcomers (Pickett and White 1985). Ecological studies have demonstrated that "disturbance regimes" can be an intrinsic component of the ecological system under study, depending on the selection of spatial and temporal scales. Under this

perspective apparently destructive forces such as wildfire become necessary for an ecosystem to sustain its characteristic species composition, structure, and productivity (Botkin 1990). Exclusion of fire from such ecosystems through preventive management impoverishes their performance in the long term because of losses of species and changes in structure that drive the system to a state that diverges markedly from its historical patterns. Repeated disturbances such as volcanism and landslides that recur over several millennia maintain the characteristic age structure and species composition of many Andean *Nothofagus* forests in southern South America (Veblen et al. 1996). Hence disturbances can foster conditions (e.g., open patches, resource hot spots) that facilitate the regeneration of species and increase local species richness.

An important corollary of this view of disturbance as a driving force for patch dynamics is the realization that such perturbations can be integrated into the definition of ecosystem insofar as they are seen as products of the interaction between the system's structure and exogenous physical factors. Several examples show how the onset and effect of disturbances can be modulated by species traits and the structure of a community (Pickett and White 1985). For instance, the rates at which trees fall in a forest canopy depend on individual tree longevity and species composition, which in turn influence species diversity and tree regeneration (Johnson and Miyanishi 2007). Species composition and ecosystem structure and processes hinge on a continuous interplay of both endogenous and exogenous forces that lead to multiple possible end points. This perspective challenges the idea that "there is only one point at which balance occurs, and that balance is normally static," thereby affirming Aldo Leopold's (1939) insights into the flux and diversity that inhere in an equilibrium.

SEE ALSO *Ecology: III. Ecosystems; Ecology: VI. Patch Dynamics.*

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VI. PATCH DYNAMICS

The history of the concept of patch dynamics can be traced back to the classic work of A. S. Watt (1947), who described the dynamic mosaic structure of vegetation, with patches constantly dying and regenerating in different areas of the landscape. In a variety of plant communities, including peat lands, grasslands, and forests, Watt analyzed temporal succession of pioneer, building, mature, and degeneration phases. Watt emphasized that

there are frequent departures from unidirectional, ordered sequences and that the spatial mosaic of patches can be interpreted in terms of their temporal relations: "The community consists of patches, each of limited area, and differentiated by floristic composition, age of dominant species and by habitat" (Watt 1947, p. 16). This view of the community as a dynamic mosaic of patches differing in a succession of ages has become known as "the pattern and process hypothesis," which emphasizes the relations between structure and function (Wu and Loucks 1995). The term *patch* refers to a discrete unit of space differing in nature and appearance from the surrounding landscape (Wiens 1976). Patches may be identified at different spatial scales, from an island surrounded by ocean or a tract of forest surrounded by pastures to a tree-fall gap in the forest canopy to an aggregate of barnacles on a rock of the intertidal zone. In landscape ecology (Forman and Godron 1986) patches are the basic functional units of the landscape. Usually the area of habitat surrounding a recognizable patch type is termed the ecological "matrix," although a matrix may itself comprise different patches (Pickett et al. 2000).

Patches differ in area, shape, structure, species composition, duration, structural complexity, and boundary characteristics. Some patches may be sharply bounded (e.g., a lake, a remnant woodlot within a cultivated area); in other cases boundaries may be diffuse (e.g., the transition from steppe to forest). Patches may differ greatly from the species composition and abundance in the surrounding matrix, or the differences may be subtle. Patch shapes may be regular, approaching Euclidian geometric figures such as a circle or square, or they may be irregularly shaped, which demand the use of fractal geometry.

MECHANISMS OF PATCH FORMATION

Patches are originated by a variety of physical and biological mechanisms, including patch creation and habitat fragmentation by humans. Physical mechanisms of patch origination in unmanipulated landscapes include disturbances such as lightning-caused fires, tree windfalls, hurricanes, droughts, floods, landslides, volcanic eruptions, earthquakes, and climate change. There is a striking example of remnant patches caused by climate change along the Pacific margin of southern South America, where fog-dependent rain-forest patches on the summits of the coastal hills of semiarid Chile (annual rainfall below 150 millimeters) became segregated from their main temperate latitudinal range by more than 1,000 kilometers because of incremental aridization during the Quaternary (Núñez-Avila and Armesto 2006). On a smaller scale, the north-facing and south-facing slopes—sometimes separated by just a few meters—of the coastal and Andean mountains of central Chile also exhibit contrasting patches characterized by differences of temperature, solar radiation, and humidity. This physical microheterogeneity, in turn, generates sharp differences in plant composition, flowering periods, pollinator ensembles, and genetic differentiation among populations of the same species (Armesto and Martínez 1978; Rozzi et al. 1997).

Biological mechanisms of patch origination include animal effects (e.g., burrowing activities, building of dams, defoliation of trees, trampling, and wallowing) plant effects (e.g, allelopathy, accumulation of organic matter, shading effects), resource distribution (e.g., soil types, large fruit crops, nutrients under bird perches), aggregation patterns (e.g., marine mammal congregations, limited seed dispersal, vegetative propagation), and migratory routes and dispersal patterns (e.g., bipolar distribution of plant species found in subarctic and subantarctic regions because of seed dispersal by migratory birds and similar climatic conditions). Human creation of patches include historical land use change, such as the creation of bodies of waters through the building of dams or open land by the clear-cutting of forests; introduction of exotic animal and plant species involving monocultures for husbandry or crops; gardening and planting seeds in cultivated patches such as the "islands" of palms planted in Amazonian savannas by indigenous peoples; and the creation of barriers to dispersal of animals and plants, such as those imposed by highways, channels, fences, or the application of pesticides or herbicides.

PATCHINESS

Patch mosaics of a given landscape can be described in terms of patch composition (patch types and their relative abundances), the spatial configuration of patches, and the connectivity among patches. Connectivity can be a function of both the nature of boundaries (the transition between patches and the surrounding matrix) and the permeability of the matrix to the transit of organisms moving between patches. Patch connectivity is a critical yardstick for biodiversity conservation and is thus an important source of information for conservation policy at the landscape scale because of the negative effects of isolation on mating probabilities (Sieving et al. 2000; Díaz et al. 2006), population sizes and gene flow, and the facilitation or impeding of the movement of exotic invasive species or pests (Fahrig 2003).

The descriptive parameters and scale of patchiness are both organism-dependent because different species have varying capacities for filtering heterogeneity in a given environment (Wiens 1976). Accordingly, patchiness varies

for organisms with different degrees of mobility (e.g., immobile plants vs. mobile animals), physiological tolerance of environmental stress (e.g., mammals vs. frogs, because the latter have higher skin permeability, making them more dependent on moisture), life-history characteristics (e.g., bamboo species with single mass flowering events vs. oak trees with annually recurrent flowering events), and perception mechanisms (e.g., bumble bees that can see ultraviolet wavelengths but not red colors vs. hummingbirds than cannot see ultraviolet wavelengths but can see red, a flower color for which they have a preference). In many cases it will be necessary for ecologists and conservation policy makers to adjust the scale of observations to the heterogeneity perceived by the target organism and the ecological processes under study or under adaptive management.

Patchiness can change as a consequence of patch dynamics. Patch dynamics are the result of the simultaneous operation of various physical, biological, and human patch-generating mechanisms (Pickett et al. 2000). How do patches and ecological systems persist in the presence of destabilizing forces? In the traditional ecological view of disturbances, a clearly exogenous factor occurs at a single time—creates a ''patch'' with abrupt or clearly defined boundaries—and increases the resources available for new growth through decreased biological use, increased decomposition, or both (Pickett and White 1985). Nevertheless, disturbances can be caused not only by exogenous factors (originating from outside the ecosystem) but also by endogenous factors (originating from within the ecosystem) such as synchronous aging of cohorts of trees or insect outbreaks. In practice exogenous and endogenous factors interact. For example, insect infestation of trees increases vulnerability to windfall, and, in turn, windfall might facilitate insect infestation.

The term *disturbance regime* is used to characterize the spatial scale and temporal patterns of exogenous and endogenous disturbances and the subsequent response and recovery of ecosystems. Patchiness within a landscape reflects the types of disturbance and their frequencies and magnitudes; landscape elements of topography, substrate conditions and organisms, and resource base available to organisms; and life histories and assimilative capacities of species present or potentially available to colonize a disturbed site (Forman and Godron 1986). Disturbances vary in magnitude, depending on the intensity and severity of the disrupting event. The eruption of Mount St. Helens in 1980, the Yellowstone fires of 1988, and Hurricane Hugo in 1989 are examples of intensive and large scale disturbances that captured public attention (Turner et al. 1997). Both large- and small-scale disturbances operate simultaneously and generate, within a landscape, mosaics with patches of varying size, species composition, and age structure (Pickett and Thompson 1978). For example, in forest ecosystems small-scale disturbances such as falling trees usually favor shade-tolerant plant species, whereas larger-scale disturbances such as landslides favor shade-intolerant plant species.

In ecological systems stability has been characterized mainly through four properties (Wu and Loucks 1995):

1. resistance (capacity of a system to resist an external perturbation),
2. resilience (rapidity with which a system returns to a previous equilibrium after a perturbation),
3. persistence (ability of a system to remain within defined limits despite perturbations),
4. and invariability or constancy (uniformity of system properties over a given period).

Resistance and resilience presuppose an equilibrium from which the ecosystem may depart or to which it may return. Persistence and invariability, however, do not necessarily imply equilibrium. Nonequilibrium models emphasize openness, transient dynamics, and stochastic processes of ecosystems. In 1987 ecologist Zev Naveh contrasted the static notion of homeostasis (maintenance of a static structure), by introducing the concept of homeorhesis (Wu and Loucks 1995, p. 444). Under a homeorhetic perspective, resilience can be understood in nonequilibrial terms: After a perturbation systems may return to their original trajectory or rate of change rather that to equilibrium.

Patches can vary at different temporal and spatial scales in the same landscape (Wu and Loucks 1995) because of disturbance, species interactions, and propagation modes. Consequently, understanding and modeling patch dynamics in a given landscape and making decisions about resource management and conservation policy require a recognition of the diverse causes and mechanisms of patchiness in various spatial and temporal scales.

ANTHROPOGENIC PATCHINESS

Spatial patterns and temporal heterogeneity created by humans are often qualitatively and quantitatively different from unmanipulated ecological heterogeneity. Landscapes are rarely homogeneous, but human monopolization of the landscape for urban settlement, farming, or forestry can greatly reduce heterogeneity and alter ecosystem and landscape patchiness. The drivers of ecological change will produce new configurations and compositions of patches that will affect organisms over a spectrum of scales, generating novel spatial patterns and trajectories of change. Landscape contexts can strongly influence local ecosystems; the consideration by environmental policy makers of spatial and temporal heterogeneity, which are constantly

changing as the products of natural and anthropogenic patch dynamics, is necessary to support biodiversity, maintain ecological and evolutionary processes, and provide multiple ecosystem services to humans (Kolasa and Pickett 1991). The role of patchiness and patch dynamics in ecological and evolutionary processes has led to the development of metapopulation theory which examines the dispersal and isolation of individuals between patches in heterogeneous landscapes. This theory is relevant to the persistence of species in fragmented habitat patches created by human land use.

The ubiquity and persistence of the spatial legacies of past disturbances underscore the importance of the historical dimensions of natural and anthropogenic patch dynamics. Knowing that landscapes are dynamic mosaics composed of various kinds of interdependent patches, humans can no longer manage a park or reserve as a homogeneous unit (Biggs et al. 2003). Moreover, the spatial patchiness of a given landscape, whether natural or anthropogenic, must be maintained in order to conserve biodiversity. This approach has been called the "minimum dynamic area" concept (Pickett and Thompson 1978).

CONCLUSION

Patch-dynamic concepts offer a contemporary unifying framework for ecology, evolution, and conservation practices under a nonequilibrium view that appreciates the spatiotemporal variability of "shifting mosaics" (Wu and Loucks 1995). The patch-dynamic perspective has largely supplanted traditional succession theory (Clements 1916), which assumed an orderly, repetitive, and deterministic sequence of change tending toward equilibrium. Alternatively, vegetation dynamics can be represented by a hierarchical patch-dynamics theory (Pickett et al. 1987) that accepts multiple end points starting from the same initial condition (but varies with stochastic and probabilistic events) (Simberloff 1980) and does not require the assumption of a stable "climax" stage.

SEE ALSO *Ecology: V. Disequilibrium Ecology.*

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VII. PHILOSOPHY OF ECOLOGY

The philosophy of ecology, broadly understood, converges with environmental philosophy. In a narrower, more technical sense, it is a subfield of the philosophy of science. The philosophy of ecology in this sense is a branch of the philosophy of biology. It is concerned primarily with two kinds of questions: (1) epistemological questions about the manner and degree to which ecology meets the general standards of successful science, as classically specified in twentieth-century philosophy of science, and (2) foundational questions about the discipline's deep and guiding empirical presuppositions.

ARE THERE LAWS IN ECOLOGY?

There is disagreement about whether there are laws in ecology. Lev Ginzburg and Mark Colyvan argue (2004) that there are; Daniel Simberloff (2004) and Kristin Shrader-Frechette and Earl McCoy (1993) exemplify the more skeptical view. Why is this question important? From the standpoint of traditional philosophy of science, laws are important because they are prominent in scientific explanations. One of the earliest and most influential accounts of the role of laws in scientific explanation was the covering-law model developed by Carl Hempel (1965). To explain a given phenomenon on the covering-law model is to show (by deductive argument), given the laws of nature and certain initial conditions, that a phenomenon was inevitable. Thus, on Hempel's view, laws are important because without them there would be no explanation.

A significant number of ecologists, probably a majority, doubt that there are the kind of exact quantitative laws in ecology that Hempel's covering-law model of explanation presupposes; yet they do not doubt that ecology offers genuine explanations This suggests that the conventional philosophical portrait of science as necessarily involving crucial notions like law (along with the covering-law model of scientific explanation) might not capture the science of ecology. If the tail (conventional philosophy of science) wags the dog (ecology), then ecology is not a science. If it is the other way around, then conventional philosophy of science is parochial and incomplete. Thus, the question here is whether philosophers of science need to rethink what a law is.

In the early days of the philosophy of science, the guiding image of successful science was physics; thus the image of a successful law incorporated high standards of invariance. The laws of physics are not easily transgressed. John Beatty (1995), Sandra Mitchell (2000), and several other philosophers of biology have developed suggestions about how to rethink the idea of a scientific law in terms that are more applicable to biology. What these views share is a tendency to relax the standards of invariance expected of a genuine law. The laws of biology may have more exceptions than the laws of physics, but they are still laws. A natural outcome of this process is to recognize that the necessity or invariance of laws is a matter of degree—they have differing degrees of *nomic force*. A significant project in the philosophy of ecology is to apply this notion of nomic force to the generalizations of ecology. This project also gives rise to an important philosophical question: Do the generalizations of ecology have sufficient nomic force to underwrite the explanatory claims of the discipline? The answer to that question depends on how one views the explanatory claims.

EXPLANATORY VIRTUE

Philosophical theories about the nature of scientific explanation often share two deep intuitions. One concerns covering laws. As Gilbert Ryle (1949) long ago suggested, laws are a kind of inference ticket; they license the transition in belief from one set of facts to another. The second intuition is that explanation is a matter of telling the causal story. To explain a phenomenon is to elucidate the causal mechanisms responsible for that phenomenon. These two explanatory virtues are at the core of two influential theories of scientific explanation: Philip Kitcher gives prominence to the covering-law intuition in his unificationist approach, and Wesley Salmon emphasizes the importance of elucidating causal mechanisms.

Ecology appears to manifest both explanatory virtues. Some explanations in ecology are more mechanistic than others, and some generalizations license stronger inferences than others. Moreover, there is no reason to think that being good at one will mean being good at the other. In ecology it appears that just the opposite is true: The more fidelity one seeks in the description of causal mechanisms, the more likely the account developed will hold of only a restricted group of situations. Thus there appear to be two independent dimensions of explanatory success in ecology: explanation as unification and explanation as telling the causal story. Gregory Cooper (2003) develops an account that judges explanatory success to be a mixture of the two virtues.

THE BALANCE OF NATURE

What does "the balance of nature" mean? Is there such a thing? Such questions move from the epistemological to the ontological. Questions about the balance of nature concern the deepest empirical presuppositions of the discipline. Because of its foundational role, the idea of the balance of nature tends to guide inference rather than be guided by it. Thus, a belief in the balance of nature and an understanding of what that term really means must be inferred from the overall arguments that ecologists make. Cooper (2003) identifies one form that this commitment often takes: the idea that populations in

nature are regulated by density-dependent factors mediated primarily by the mechanism of intraspecific competition. A. J. Nicholson uses the metaphor of a steam engine. Competition is like the governor on the engine; if population density gets too high, it throttles down population growth, and if density is too low, it relaxes its intensity so as to induce more population growth.

When spelled out explicitly, it is clear that the balance-of-nature assumption—in this narrowly defined instance of that much broader concept in ecology—really is an empirical claim. Is it true? At the population level, whether a population is so regulated seems to depend a great deal on the kinds of organisms one examines. It is more likely to be true of birds, for example, than insects. At the community level the clearest manifestation of the balance of nature was Frederic Clements's (1905) conception of succession to climax. As the articles on disequilibrium ecology and patch dynamics amply demonstrate, succession does not terminate in a predictable climax state of equilibrium. Another kind of balance of nature was attributed to ecosystems by Eugene Odum in the middle of the twentieth century; on his view balance was purportedly manifest as a kind of cybernetic, self-organizing characteristic.

A twenty-first century manifestation of the balance-of-nature idea is the complex adaptive systems approach to communities as developed, for example, by James Drake and his colleagues (1999). Are these plausible manifestations of the balance of nature? As indicated in the previous section, there are two questions to ask of such accounts. Does it function as an effective inference ticket, taking us reliably from one set of facts to another? Does it elucidate the mechanisms behind the phenomena? When it comes to the balance of nature at the levels of community and ecosystem, a special problem emerges with the second question. To suggest that there is a balance of nature implies some sort of functionality. The homeostatic mechanisms of an organism represent the operation of balancing mechanisms in the functional sense—when dogs get too hot, they pant. But how does such functionality come to be? How do such regulatory mechanisms get established in systems? In the case of human artifacts and organisms, we know the ultimate answer. In the former, such as heating/cooling systems, they are the product of design. In the case of organisms, they are the product of natural selection. Although many biotic communities and ecosystems—for example, gardens and agroecosystems—are designed by humans, many are not. But natural selection apparently does not occur at the level of the community or the ecosystem. If not, and we are to continue to attribute functional characteristics to them, then there must be an alternative mechanism for generating functional characteristics, and it is not clear what that is for nonartificial communities and ecosystems.

LEVELS OF ORGANIZATION

If no coherent account of the origin of functional characteristics of communities and ecosystems is forthcoming, then there is reason to doubt the existence of these functional properties. Clearly we do say such things as the function of decomposers in an ecosystem is to break down organic compounds so as to facilitate the cycling of nutrients through the system. Which organisms accomplish this, or whether it is done by organisms at all, is of no real significance for the putative functionality of the system. If there are such functions as decomposition, and if they are carried out by functional components such as fungi and bacteria, then a new and independent level of biological organization beyond organisms will also necessarily exist. On the other hand, such putative functions may only be the fortuitous side effect of the independent activities of coexisting organisms, each doing what organisms do—eating, growing, reproducing. One central question of the philosophy of ecology is an ontological question: Do communities and ecosystems actually exist as transorganismic levels of biological organization, or is the functionality attributed to these systems explainable at a lower level of organization?

Although the existence of communities and ecosystems as independent levels of biological organization depends on finding the mechanisms responsible for biological function at that level, that is not the only ontological issue central to the philosophy of ecology. Two others are salient: (1) If communities and ecosystems exist as such, it seems necessary that they exhibit identifiable and nonarbitrary boundaries similar to other biological entities such as cells (which have bounding membranes) and organisms (which typically have skin, bark, or other identifiable surfaces). But communities are notoriously fuzzy, and ecosystem ecologists themselves determine the boundaries of ecosystems depending on the ecosystem processes they are investigating; ecosystems exist more in the eye of the beholder than as observer-independent units in the natural world. (2) If communities and ecosystems exist, they should be causal entities that affect other entities, including their component organisms. In the case of communities, there is some hope in this line of investigation. Niche theory in community ecology holds that species adapt to niches in communities; if this is true, then the community is causally efficacious as an entity to which species evolve adaptive characteristics. On the other hand, reductionists might counter that niches are resolvable into their organismal and abiotic components and that other species adapt to each of them severally.

Both the epistemic and ontological questions raised by ecology remain unresolved, offering much future work for philosophers of science. Although the philosophy of

science may help ecologists think more systematically about the epistemic and ontological conundrums of their field, as philosophers of science begin to take ecology seriously, the philosophy of science will be transformed.

SEE ALSO *Conservation Biology; Ecology: II. Community Ecology; Ecology: III. Ecosystems; Ecology: V. Disequilibrium Ecology; Ecology: VI. Patch Dynamics.*

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Gregory J. Cooper

VIII. INTEGRAL ECOLOGY

Today, experts agree that because environmental problems are very complex, the perspectives afforded by many different research methods and disciplines are needed to analyze and solve such problems. What are those perspectives, however, and how do they relate to one another? Integral ecology (IE) proposes to answer these questions. IE is a comprehensive, meta-perspectival, and postdisciplinary framework for characterizing ecological phenomena and resolving environmental problems. IE is comprehensive in that it both draws upon multiple perspectives, including those in the natural and social sciences, the arts and humanities, and also provides a theoretical scheme for showing the relations among them. IE is meta-perspectival because it unites, coordinates, and enriches knowledge generated from at least four different major perspectives and eight foundational methodologies (see below). IE is postdisciplinary by virtue of its applicability within, between, and across disciplinary boundaries. For example, IE can be applied

- within a discipline (e.g., by integrating various schools of ecology);
- as a multidisciplinary approach (e.g., by investigating ecological phenomena from several disciplines);
- as an interdisciplinary approach (e.g., by using social science methods to shed light on economic or political aspects of environmental values);
- as a transdisciplinary approach (e.g., by helping numerous approaches and their methodologies interface through a well-grounded metaframework) that transcends disciplinary boundaries.

The IE framework draws on integral theory (IT) as developed by the American philosopher Ken Wilber (2006). According to IT, there are at least four irreducible perspectives—objective, interobjective, subjective, and intersubjective—that must be consulted in an attempt to understand and to remedy environmental problems. Each of these perspectives can be studied through two major methodological families: the interior (i.e., a first-person perspective) or the exterior (i.e., a third-person perspective). The *objective* perspective examines the composition and exterior behavior of phenomena such as individual organisms, including humans, bears, salmon, and beetles. The *interobjective* perspective examines the structure and exterior behavior of collective phenomena, ranging from socioeconomic systems to ecosystems, on various spatiotemporal scales. Data generated by these third-person, objective perspectives are valuable, but they do not provide an exhaustive understanding of the problem at hand and do not provide motivation for action. Technical information alone cannot persuade people to

act. Motivation arises when people experience a given environmental problem through two additional perspectives—*subjective* and *intersubjective*. Academic and public environmental discourses only infrequently approach phenomena in terms of how they manifest themselves within these interior perspectives, including those pertaining to aesthetics, psychology, and culture.

IE labels these four irreducible perspectives as follows:

terrain of experience (subjective, first-person);

terrain of culture (intersubjective terrain constituted by first-person/second-person exchanges);

terrain of behavior (objective, third-person singular);

terrain of systems (interobjective, third-person plural).

The perspectives are irreducible because, for example, a first-person perspective cannot be reduced to a third-person perspective. When someone says, "I feel devastated as I look at this polluted stream," that person is speaking from the first-person perspective. The perspective informing my assertion cannot be simply replaced by a third-person perspective, which would take the following form: "That person over there is saying that the stream in front of him is polluted." Likewise, the cultural significance of a religious ceremony cannot be equated with the socioeconomic function that the ceremony may have. Finally, there is the assertion that animals have subjective perspectives that make possible experiences of their own, in ways that are analogous to human first-person perspectives and experiences. Individual animals, then, can be understood from one perspective as functional units in an ecosystem, but such an understanding is incomplete. Animals have experiences and cultures of their own that should be taken into account when describing them in their habitat.

In an IE context the classical definition of ecology (the study of the objectively ascertainable interrelationships between organisms and their environment) becomes the mixed-methods study of the subjective and objective aspects of organisms in relationship to their intersubjective and interobjective environments. Introducing first-person perspectives and collective (cultural) perspectives complicates matters but provides a much richer understanding of the phenomena under investigation. A wide variety of ecologists, environmentalists, urban planners, wilderness guides, and activists recognize the theoretical comprehensiveness and practical efficacy of IE.

IE also examines developmental stages in both nature and humankind; it examines how nature shows up to people operating at differing psychological and/or developmental stages. IE does not employ a new definition of ecology but rather uses an integral interpretation of the standard definitions of ecology, whereby organisms (including humans) and their environments are recognized as having interiority. This expanded definition has allowed IE researchers to identify more than 200 varieties of ecological thought (including eighty schools of ecology), ranging from acoustic ecology to zoo semiotics and occupying various positions within the four major perspectives.

In affirming the differences among, as well as the importance of, each of these major perspectives, IE avoids both gross and subtle reductionism. Gross reductionism views all reality, including first-person interiority, in terms of individual objects without interiority (experience) of any sort. Subtle reductionism interprets all things as interobjective phenomena, thus treating the "I" and "we" (interior perspectives) as components of interwoven objective systems. Subjective and intersubjective perspectives—including beliefs, values, norms, religious traditions, and ethnic self-identification—must be included in characterizations of environmental problems. Marshaling, coordinating, and assessing pertinent perspectives require *integral methodological pluralism* (IMP), which contrasts with methodological hegemony, according to which one's own perspective (e.g., one's preference for a particular school of ecology such as community ecology) is more important than any other perspective that might be brought to bear on the problem at hand (e.g., ignoring insights from other schools of ecology).

Proper utilization of IMP presupposes a high level of cognitive, moral, and psychosocial development if one is to follow its three principles of *inclusion* (consult multiple perspectives and methods impartially), *enfoldment* (prioritize the importance of findings generated from these perspectives), and *enactment* (recognize that phenomenon are disclosed to subjects through their activity of knowing it). As a result of these commitments, IE is considered to be *postmetaphysical* (i.e., it avoids postulating a priori structures by highlighting the perspectival nature of enacted reality). In other words, a particular phenomenon can show itself—and in that sense *be*—only within a perspective or world space consistent with the features of that phenomenon. For instance, ecosystems subsisted long before ecologists conceptualized them, but, in another sense, ecosystems could become manifest only when people established the cognitive world space necessary for such manifesting to occur.

After using IMP to develop a solution to a particular environmental problem, IE must communicate that solution in ways consistent with the developmental worldviews of a given audience. Extensive psychocultural research indicates that about 30–40 percent of the adult population of the United States is centered at the premodern stage (e.g., conservative Christian), 30–50 percent is centered at the modern stage (i.e., people committed to democratic

individualism and science-oriented rationality), and 10–30 percent is postmodern (e.g., environmentalists concerned with ending sociocultural hierarchy and the domination of nature) (Kempton et al 1996, Ray and Anderson 2001). IE respects individuals and organizations that adhere to the values associated with each of these worldviews and addresses them in terms consistent with how proposed solutions show up for and thus matter to them.

SEE ALSO *Ecology: VII. Philosophy of Ecology; Environmental Philosophy: V. Contemporary Philosophy.*

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Sean Esbjörn-Hargens
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ECONOMIC DISCOUNTING

One of the difficulties in comparing the costs and benefits of different policies or actions involves time. Uncertainty about the future effects of actions is a problem, but the time at which a future effect is realized can be relevant to an understanding of its value. To illustrate, one can compare a prospect in which a person pays $100 today and receives $100 ten years from now with a prospect in which that person receives $100 today and pays $100 ten years from now. If one ignores the timing of the cost and the benefit, the prospects are equivalent, but the second prospect is clearly better than the first. It is better now, when one has the money to use, and it is better ten years from now. This is true whether the person wants to use the money to increase consumption now or invest it to increase consumption later. The value of money, as well as the value of commodities, is partly a function of time.

When economists evaluate different actions or policies, therefore, they apply a discount rate for time. Discounting allows them to compute a present value for costs and benefits that occur at different times that makes them comparable. A discount rate for monetized costs and benefits is similar to an interest rate. If one applies a 5 percent discount rate to an outcome that would produce $100 in benefits five years from now, its present value is $78.35. That is the amount which, if invested today at 5 percent interest, would yield $100 in five years.

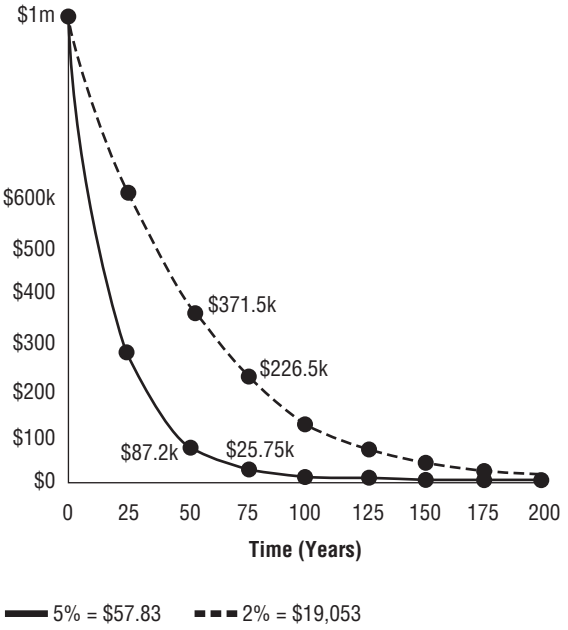
To get a sense of how much the choice of a discount rate matters, one can consider the value of $1 million in 50 years. At a discount rate of 2 percent the present value of that amount is $371,528, but at a rate of 5 percent the present value falls to $87,204. Using a 5 percent discount rate, for example, the present value of $1 million 200 years from now is only $57.83. Clearly, the choice of a discount rate for proposals with costs and benefits that extend into the distant future has significant implications (see Figure 1). One economist remarked about the impact of climate change, "It is not an exaggeration to say that the biggest uncertainty of all in the economics of climate change is the uncertainty about which interest rate to use for discounting" (Weitzman 2007, p. 705).

Analysts offer different reasons for discounting. The one described above is related to the opportunity costs of capital. Some others have to do with the benefits of consuming sooner rather than later; the uncertainties of predicting the future effects of an action or, for that matter, the uncertainty that humans will exist in the future to experience those effects; and what some call pure time preference, which states that the value of any outcome is greater if it occurs sooner rather than later. These are very different kinds of reasons, and they must be examined separately.

EFFICIENCY

The first reason involves efficiency. Money, resources, and some commodities have opportunity costs; that means that they can be consumed now or invested to produce more in the future. Discounting is a way of taking these costs into account, as the examples described above illustrate.

A different kind of efficiency argument rests on two empirical assumptions about the future. The first is that the economy will continue to grow in the future, just as it grew in the past. Economic growth means that the average wealth per person increases over time. The second assumption is that there is decreasing marginal utility of the value of resources or commodities. The first car a family purchases may lead to a large benefit; a second car will give them some additional benefit but less than the first. The



The graph shows the present value of future costs or benefits worth $1 million. The solid line shows the effect of a 5% discount rate; the dotted line shows the effect of a 2% discount rate. Notice the sensitivity to the choice of discount rates: the present value of $1 million in 50 years is about $371,500 at 2% and $87,200 at 5%. Notice also how the present value of costs and benefits in the distant future count for very little, regardless of the discount rate chosen. The present value of $1 million in 200 years is $19,053 at 2% and $57.83 at 5%.

Figure 1. CENGAGE LEARNING, GALE.

assumption of decreasing marginal utility implies that a specific amount of money will benefit a poorer person more than the same amount will benefit a richer person. The better off people become in terms of well-being, the less efficient they are in converting additional resources to further increases in well-being. Most experts accept this assumption as a general although not universal truth.

Economic growth implies that people in the future will be better off than people currently are. They will have more commodities or resources, and their level of well-being will be higher. Decreasing marginal utility implies that people living today will benefit more than people in the future from the same increments of resources or wealth. Saving for future generations thus involves a redistribution of wealth from those who are worse off to those who are better off. To maximize the value of resources, therefore, people should discount future costs and benefits. Discounting thus is justified as a way of maximizing the value of commodities or resources over time.

If it is reasonable to deny that the economy will continue to grow in the future, perhaps because global climate change will have profound negative impacts on the economy, the discount rate should be set at zero or perhaps be negative. The empirical assumptions behind efficiency arguments may be controversial, but the logic of arguments for discounting for this reason is hard to resist.

Those arguments are not based on controversial ethical assumptions; they are compatible with most ethical theories. Most theories of justice, for example, do not call for redistributing wealth from those who are worse off to those who are better off. Efficiency reasons for discounting are also compatible with utilitarianism, which focuses only on aggregate well-being and is insensitive to how well-being is distributed among individuals or groups. Efficiency reasons for discounting are intended to maximize aggregate well-being in a way that is neutral in regard to when well-being occurs. It is important to realize that these reasons for discounting future costs and benefits do not discount the well-being of people or generations as a function of time.

JUSTICE: CURRENT VERSUS FUTURE WELL-BEING

A second reason for discounting, which is ethically more significant, considers the well-being of people who will live in the future less important than the well-being of people alive today. Different arguments are given to justify this reason for discounting. One argument rejects utilitarianism and appeals to considerations of fairness. If people living in the future will be better off than people are today, then policy makers should give priority to those who live now because people today are worse off than people in the future will be. Someone who defended discounting for this reason might claim that it is unfair to impose large sacrifices on people who are worse off as a means of increasing total well-being.

To illustrate this reason for discounting, one can consider the evidence that people's activities today are causing climate change that will have profound effects that will extend for a very long time. Economists working with the best current estimates of the costs of mitigating those effects have estimated that if people do not discount the value of changes in the well-being of future generations, even if they discount for efficiency, the present generation will have to save up to 97.5 percent of its income to mitigate those costs. Partha Dasgupta concluded that this means that "the current generation in the model economy ought literally to starve itself so that future generations are able to enjoy ever increasing consumption levels" (Dasgupta 2007, p. 6). Dasgupta suggests that under the same economic assumptions discounting the well-being of future generations at a rate of 3 percent per year would

imply that the current generation should save or invest 25 percent of its net output, which is far more than people do save but might be neither unreasonable nor disruptive. Also, if people in the future are better off anyway, discounting their well-being is not unfair either.

TIME PREFERENCE

The most controversial reason for discounting is pure time preference, which most economists endorse but some have rejected. Pure time preference states that things that happen in the future are less valuable than things that happen now simply because they happen in the future. The main argument for basing a discount rate on time preference appeals to democracy or citizens' sovereignty. When most people think about their own lives or about government spending, they prefer to get benefits sooner and defer costs to a later time. Most economists believe that cost-benefit analysts should try to be ethically neutral, which they take to mean that they should base the values in their analyses on citizens' preferences or what people are willing to pay.

Critics of time preference have argued that to evaluate policies on the basis of what people happen to prefer, whatever reasons they may or may not have for their preferences, is not democratic but irresponsible because some preferences may be unjustifiable or, especially in complicated matters involving time, irrational. Thus, Roy Harrod claimed that "pure time preference [is] a polite expression for rapacity and the conquest of reason by passion" (Harrod 1948, p. 40). F. P. Ramsey dismissed time preference as "a practice which is ethically indefensible and arises merely from the weakness of the imagination" (Ramsey 1928, p. 543).

How should people think about time preference? Interpreted objectively, it means that if one compares two states of affairs, A and B, which are identical in all respects except that B occurs later than A, B has less value or counts for less than A. Interpreted this way, time preference implies that the death in 2020 of a 30-year-old is better than the death in 2010 of an otherwise identical 30-year-old. It means that the loss of 100 Union soldiers in the Battle of Gettysburg in 1863 is much worse than the loss of 100 American soldiers at Iwo Jima in 1945 simply because the American Civil War occurred much earlier than World War II. If these implications seem unjustifiable, as they do to many philosophers, people should reject time preference or find another way to interpret it.

Economists who have defended time preference on grounds other than democratic deferral to citizens' preferences typically reject the objective interpretation in favor of one that applies discounting from the temporally relative perspective of the present. Their aim is to constrain the implications of pure utilitarianism, which can require unlimited sacrifice of the present generation to produce benefits that will affect countless future generations. In this interpretation time preference does not apply to the value of events in the past, which the actions of people today cannot affect. It applies instead from a time-relative perspective to events that are in the (relative) future. The time-relative interpretation of time preference that rejects neutrality has some controversial implications. Consider an individual who applies time-relative time preference to her own interests. In deciding what to do today, she would discount the effects of her action on her well-being in the future, but she also would be aware that as time passes and she applies the same principle, the relative value of different states of affairs will change. Thus, she may make a decision that is best from her present perspective while recognizing now that it will not be best from some future perspective.

This implies a strange dissociation in an individual's judgments (Broome 1994). The analogous problem for social decisions is intergenerational conflict. When economists talk about time preference, they often make simplifying assumptions that allow them to consider generations as discrete and separate entities. In reality, however, the world always contains members of overlapping generations. If different time perspectives are appropriate for members of different generations, the interests of a 60-year-old today may lead him to discount the welfare effects of a policy that are expected to occur in thirty years, whereas the interests of a child today may suggest that those effects should not be discounted. If one does not ignore the perspectives of future generations, one must figure out a way to reconcile the inconsistencies and dissociation or reject the interpretation of time preference interpreted as temporally-relative.

UNCERTAINTY ABOUT THE FUTURE

Another reason for discounting is uncertainty about the future. If one is trying to evaluate the consequences of a policy far into the future, one may want to take into account the possibility that war or an astronomic catastrophe will bring an end to life (or human life) on earth. One may want to estimate the chances that humans will not be around to bear the costs or reap the benefits of actions today. Whatever the likelihood of extinction may be, it probably increases with time and thus may constitute another reason for discounting.

PRACTICAL EFFECTS OF CHOOSING A DISCOUNT RATE

The practical effects of choosing a discount rate may be of the highest importance. In 2007 a team of British scientists and economists published a report on the

economics of climate change. That report described the state of scientific knowledge about climate change and some actions that might be taken in response to it. The report gives a careful assessment of reasons for discounting costs and benefits over time. It accepts discounting for efficiency and for uncertainty but rejects time preference. The result is that the report uses a discount rate of about 1.4 percent per year. It concludes that the case in favor of taking strong and costly actions today to mitigate the effects of climate change is overwhelming.

These conclusions have been rejected by some American economists who insist that neutral analysts should apply a discount rate for time preference, and so the discount rate should be somewhere around 5 to 6 percent per year. Using that discount rate allows these critics to conclude that the most reasonable response to climate change that people can take now is a wait-and-see approach, hoping that it will be possible to reduce the costs by deferring them to the future. This example illustrates an important general point. When people are thinking about actions or policies that will have important consequences far into the future, the choice of a discount rate can swamp all other considerations and drive the decision.

SEE ALSO *Cost-Benefit Analysis; Future Generations; Global Climate Change; Intergenerational Justice; Utilitarianism.*

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Douglas MacLean

ECONOMICS, ECOLOGICAL

Economics as a modern academic discipline focuses on the exchange of goods and services, with little attention to the effects of these activities on the natural environment. *Ecological economics,* by contrast, views the natural context as of crucial importance.

In 1988, largely under the leadership of Robert Costanza, a student of Howard T. Odum, the International Society for Ecological Economics (ISEE) was established, with Costanza as its first president. Its membership includes a few professional economists and a larger number of people in the field of public policy. Its journal began publication in 1989, with Costanza as its first editor. Costanza also established the Institute for Ecological Economics at the University of Maryland.

The ISEE has shown steady growth. In 2004 it had more than 2,400 members in nineteen countries. There were eight regional societies. It remains committed to new forms of economic thinking based on different assumptions rather than simply to the application of mainstream theory to new problems, as is the case with "environmental economics." But the latter approach is not excluded, and as more people with a mainstream education in economics join the society, the line separating the environmental and ecological approaches may fade.

MAINSTREAM ECONOMICS

Modern economics originally included land among the distinct factors of production. This view originated with the physiocrats, a school of eighteenth-century economics that held a nation's wealth came exclusively from the value of land, whether from agriculture or development. Adam Smith, however, initiated a shift toward industry. Capital and labor became the focus of attention. Land was increasingly considered as a commodity or a form of capital. Although Smith and his successors recognized that industrial production requires natural resources, they analyzed the value of these resources primarily into the capital and labor involved in making them available. Treated simply as physical givens in the natural world, natural resources all but disappeared from consideration in standard economics. The issue that was seriously debated between the mainstream of classical economists and Marxists was whether capital should be considered a

distinct factor of production or should be understood as ''congealed labor.''

The absence of the natural world from economic theory is accompanied by the presence of the implicit aim of growth. The growth in question is of human production and consumption, especially on a per capita basis. This growth is achieved by efficient organization of human labor and by replacing much of it with fossil fuels—in short, by industrialization. Economists also showed that the larger the market, the more efficient production becomes.

Many observers have noted the costs of industrialization and the enlargement of markets to nature and to human community. In *The Great Transformation* (2001 [1944]), Karl Polanyi mourned especially the widespread erosion of human community. These losses, however, did not figure into the mainstream economists' calculations of progress. They noted that far more goods and services were available to far more people than ever before. Many people in nonindustrialized societies longed to achieve the affluent lifestyle of the industrialized ones. After World War II there was wide agreement in the general public and among those charged with third world development in both the developed and the developing countries that the goal must be the economic growth of the former colonies and other countries that were not yet industrialized. This shared objective led to the globalization of the economy.

CRITICISMS OF GLOBAL CAPITALISM

Two forms of criticism of the new global economy arose. First, there was an increasing recognition especially in the seventies of the problems brought about by typical development policies. The gap between rich and poor countries grew as did the gap between the rich and the poor within both developing and developed countries. In the 1970s and 1980s the many international agreements to reduce tariffs and other obstacles to trade typically benefited only the rich.

In 1976 Susan George wrote a powerful book, *How the Other Half Dies,* that showed how rarely the third world people who were supposed to benefit from economic growth actually did so. She depicted most so-called development as exploitation.

Economists claim that most of these failures are due to distortions introduced by unequal power or poor governance rather than to inherent flaws in the policies they recommend. The breakdown of efforts to push the global market even further, beginning in the 1990s has been due primarily to the injustices built into the global trade system by the unequal power of first and third world countries. For example, farmers in third world countries, which are under pressure not to subsidize their agriculture, often cannot compete with imports from the United States and Europe, which continue to subsidize their farmers generously. Fundamental rejection of the economic theories supportive of free trade have played only a secondary role.

Second, critics have also focused attention on the importance of the natural environment. Kenneth Boulding in 1966 stimulated thinking about economics in this context by contrasting a desirable ''spaceship'' economy with the existing ''cowboy'' one. The latter, supported by mainstream economic theory, ignored the degradation of the natural environment, the exhaustion of resources, and pollution.

Mainstream economists respond that when income levels rise, nations enact laws protective of the environment, so that growth is the solution to the environmental problem. They contend that capital, in the form of technology, can replace one resource with another, so that the problem is not the shortage of resources but of capital. Technology can also reduce pollution. Mainstream economists, therefore, do not ignore nature altogether. In fact, some mainstream economists specialize in the study of natural resources. Moreover, in response to concern about environmental issues, mainstream economists have developed the new sub-discipline of environmental economics.

The views of mainstream economists on these topics merit serious attention. Desperately poor people cannot afford to consider the sustainability of their survival strategies in the way that the economically secure can. Also, technology can often replace one resource with another or curb the output of pollutants: For example, there are many proposals for replacing petroleum with more sustainable sources of energy, and automobiles are far less polluting than was once the case thanks to the use of catalytic converters.

Most of those who criticize mainstream economic thinking, and especially the reliance of political leaders upon it, are ecologically concerned persons outside the official precincts of academic economics. Recognizing the importance of economic thinking in our world and their own lack of expertise, they have appealed to economists to adjust their theories to encompass ecological concerns. Although many economists continue to resist interdisciplinary approaches, Kenneth Arrow has recognized that interdisciplinary are important. He headed a group of distinguished economists and ecologists who worked together for four years. They published their conclusions in 2004. While employing standard economic concepts and methods, they developed a measure of ''inclusive wealth'' that measures natural as well as social and financial capital. Their findings did not suggest radical changes in policy in the developed world, but they did

show that ''development'' policies in third world countries sometimes impoverish them, especially when there is too little investment in human capital.

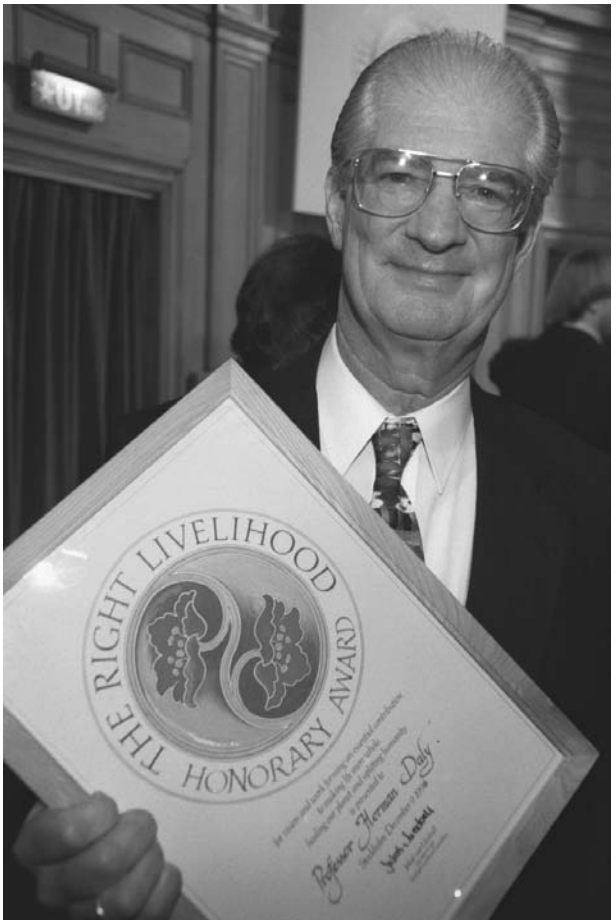
Global climate change is a particularly important test of economic thinking. President Bill Clinton sought the advice of a leading economist, William Nordhaus, who had engaged in extensive studies of the probable economic effects of global climate change in 1991. Nordhaus concluded that the loss from global climate change would amount to around 1 percent of gross domestic product. No shift from the goal of growth was indicated.

EMERGENCE OF ECOLOGICAL ECONOMICS

Despite the apparent reasonableness of the claims of these academic economists, many ecologically aware critics are not convinced of the soundness of mainstream proposals for dealing with the world's problems. Replacing what is natural with what is artificial makes for an increasingly precarious situation. For example, replacement of the natural fertility of the soil and natural defenses against insect pests with petroleum based fertilizers and insecticides, renders the future of agricultural production less secure. Similarly, increasing production by hybridizing grains renders farming more dependent on increasingly scarce water and petroleum and in greater danger from blight. In the view of these critics, the theories of academic economists ignore the complex interconnections among things, proposing to solve each problem separately. Further, the critics think that organizing the world for the sake of increasing human production and consumption is the problem, not the solution. They see the typical responses of economists as expressing a narrow and fragmented worldview.

The most important proposal for a different approach to these issues came from the ecologist Howard T. Odum. He proposed studying both ecosystems and human society in terms of energy flows and analyzing economic issues in this context in *Environment, Power, and Society* (1971). Some of his students have been leading founders of the discipline of ecological economics. In the same year the economist Nicholas Georgescu-Roegen, published a fundamental challenge to the ideal of limitless growth, *The Entropy Law and the Economic Process* (1971). He called attention to the increase in entropy that always results from the human use of resources.

The economist who has taken the natural context of the human economy most seriously is Herman Daly (1977). Assuming the correctness of Georgescu-Roegen's points, he has argued that organizing the world for undifferentiated growth leads to fundamentally unsustainable consequences. He argues that, although there are forms of growth that are thoroughly sustainable, such as the arts, an endless increase of production from farms and factories is not possible, and the effort to sustain it has devastating consequences.



The Alternative Nobel Prize. *Professor Herman Daly, of the University of Maryland, holds his Right Livelihood Award, which he received December 9th, 1996, in Stockholm Sweden. Daly is known for his work in ecological economics, a field that studies the exchange of goods and services in a natural environment.* **AP IMAGES.**

Daly points out that one of the founders of modern economics, John Stuart Mill, upheld the goal of a stationary-state economy. This idea presupposed ample production but not continuing increases beyond that point. The real goal should be to meet human needs without endless growth. For mainstream economists this proposal was so radical that Daly was no longer viewed as a serious economist. He was excluded from ''the guild,'' but he became the primary founder of ecological economics as a distinct discipline.

Because growth economics controls university departments of economics, the first task of ecological economists was to create an alternative constituency. Daly has excelled

at promoting convincing ways of looking at the economy. For example, he describes the human economy as a subset within the larger natural economy. This view posits an inclusive economy composed of both natural and artificial capital; artificial capital grows at the expense of natural capital and thus cannot grow forever.

In standard economics texts the economy is depicted as a circular flow of income and expenditure between households and firms. By shifting attention to the larger context, Daly encourages us to view industrial production in terms of "throughput"—that is, the natural resources that go into it and the human creations that emerge from it. In this process entropy increases, and an endless increase of entropy cannot be a desirable goal for humanity. Rather, the goal should be meeting human needs with a minimum of throughput.

In 1989 Daly and John B. Cobb Jr. coauthored *For the Common Good.* They analyzed the assumptions underlying mainstream economics and proposed alternative assumptions that seem more realistic to them. The book emphasizes the contrast between the self-enclosed *Homo economicus* of standard economics and "person-in-community." In the former model individuals are understood to relate only through contracts and exchange. According to the proposed alternative model, relations with other human beings and the wider environment are constitutive of human existence. On this view economics should aim at the improvement of both human communities and the wider ecological system. By ignoring the most important human relationships, the authors argue, mainstream economics encourages practices that have destroyed thousands of human communities and degraded the biosphere.

MEASURING ECONOMIC PROGRESS

Mainstream economics promotes increasing throughput. Its standard measure of progress is the gross domestic product (GDP), which measures market activity rather than economic well-being. Economists assume enough of a connection between markets and well-being to justify continuing use of GDP as their chief yardstick of economic health. Ecological economists, however, dispute the connection. Redefining Progress, a public-policy think tank dedicated to promoting sustainable economic approaches, issues an annual report based on its genuine progress indicator (GPI), which shows that sustainable economic well-being has actually declined in the United States as the GDP has risen (2008). Results are similar in other developed countries.

The GPI and similar measures in other countries mostly use the same indices as those that mainstream economists employ. But they include household work and leisure as contributions to economic well-being, and they subtract "defensive expenditures," those that increase as market activity increases. The cost of armies, police, courts, prisons, and hospitals all add to the GDP but not to GPI.

Studies of self-evaluated happiness by mainstream sociologists and psychologists have shown that, beyond a certain threshold, happiness does not increase with income. Some ecological economists conclude that the goal of the economy should be to increase happiness rather than income or wealth. Hence, they call for fundamentally different ways of evaluating the economy. Mark Anielski has done extensive work on alternative indices (2007).

Another influential approach that focuses on sustainability has emerged from the work of William Rees, Mathis Wackernagel, and Phil Testamale. In 1995 they published *Our Ecological Footprint: Reducing Human Impact on the Earth.* They examine the area from which a city or a nation must draw in order to meet its demands for resources. This analysis yields a vivid image of the unsustainability of contemporary urban society. It highlights the problem of population growth as well, which Daly treats under the heading of "carrying capacity."

CONCLUSION

Although ecological economics today is not read in graduate departments of economics, it is affecting the thinking of a broader public. In public policy discussions it is beginning to play a small role. As concern about environmental issues such as global climate change increases, ecological economics is likely to grow in importance.

SEE ALSO *Limits to Growth; Precautionary Principle.*

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John B. Cobb Jr.

ECONOMICS, ENVIRONMENTAL

Environmental economics applies the theories and methods of economics to problems in environmental policy and management. Viewed from one perspective, economics may be understood as a descriptive science that aims to model and predict the behavior of economic systems (Robbins 1932). More broadly, however, environmental economics builds on the normative principles of welfare economics, an approach developed by Pigou (1920), Samuelson (1954), and others in the early to mid-twentieth century. Environmental economists seek both to predict the effects of policy decisions and to design optimal policies that reflect individual and social values. In this sense, environmental economics is closely linked to the field of applied ethics.

THE THEORETICAL BACKGROUND

Modern economic theory emphasizes a behavioral model in which human beings are assumed to be well-informed and rational. The rationality assumption is grounded in the nineteenth-century utilitarianism of Jeremy Bentham (1789) and John Stuart Mill (1863). The idea is that people derive utility from the consumption of market goods and services plus an inclusive array of nonmarket amenities that contribute to the good life. Utility may be understood in terms of happiness, well-being, or the satisfaction of preferences. In principle, the emphasis on preferences leaves open the prospect that people might rationally make choices that sacrifice their own happiness based on motives of altruism and/or the promotion of moral goods such as environmental conservation.

In an ideal world characterized by rational behavior, perfect information, complete markets, and perfect competition, economic theory suggests that voluntary exchange between economic actors would give rise to an *economically efficient* outcome in which potential gains from trade are exhausted. In technical terms, a resource allocation is economically efficient if there is no available alternative that is preferred by at least one member of society and that leaves no individual or group worse off. This theoretical finding formalizes Adam Smith's (1776) concept of the "invisible hand," in which the market mechanism both maximizes the total value of goods and services produced in an economy and guides those goods and services to their highest-valued uses in the absence of central planning or government regulation.

As emphasized early on by Pigou (1920), however, environmental problems have central characteristics that depart from the ideals of an efficient, competitive market. In particular, there is typically no market in which people can buy goods such as clean air, biodiversity conservation, and climate stabilization. Using formal economic reasoning, Pigou showed how the existence of *externalities* can lead to inefficient resource allocation and a need for corrective public policies.

An externality exists when an action taken by one party imposes costs (or confers benefits) on third parties in the absence of consent or compensation. The pollutants emitted by a coal-burning power plant, for example, inflict environmental harms on thousands, millions, or even billions of people through their effects on ecological systems and human health. Because the owners of the power plant do not bear these costs, they have an economic incentive to ignore these effects in making business decisions. This incentive prevails even when the private costs of pollution control are less than the monetary value of the associated environmental benefits. In principle, this means that both the polluter and the victims would benefit if pollutant emissions were cut and the victims compensated the polluter for any foregone profits. The absence of a functioning market, however, rules out this possibility.

Ronald Coase (1960) reasoned that the existence of externalities provides opportunities for the victims and beneficiaries of environmental degradation to negotiate contracts that efficiently balance the interests of each party in the absence of policy intervention. Coase's argument, however, is based on the assumption of minimal transaction costs—the cost of gathering information and negotiating and enforcing contracts. In the real world, environmental externalities persist because environmental problems involve large numbers of parties whose actions are too costly to coordinate through private negotiations. Stated somewhat differently, environmental resources

generate widely shared benefits to many members of society. Although market goods can be efficiently allocated by competitive markets, goods that provide shared benefits must typically be provided through collective action. One example is a legislative process that establishes regulations that balance the costs and benefits of pollution control to promote collective welfare.

Pigou (1920) argued that the social costs of environmental degradation could be internalized through the use of corrective taxes. In the Pigouvian framework, polluters pay a fee on each unit of pollution that is set equal to the marginal cost that pollution imposes on society. Marginal cost is defined as the incremental damage that would be caused by increasing pollution by one additional unit, measured in monetary units. In intuitive terms, Pigouvian taxes place a price on environmental degradation, thereby providing incentives for polluters to cut pollutant emissions. From an ethical perspective Pigouvian taxes have two key properties. First, they result in an economically efficient level of pollution that maximizes total net benefits to society, including both environmental benefits and the costs of pollution control. Second, they ensure that the public is compensated for the use of environmental resources. In this sense Pigouvian taxes are linked to the Public Trust Doctrine, which holds that certain types of natural resources (such as clean air) are the shared property of all members of society.

PRACTICAL ISSUES

Although appealing from a theoretical perspective, Pigouvian taxes are relatively uncommon in practice. Instead, governments typically address environmental externalities by implementing technology-based standards or tradable emissions permits that cap pollutant emissions at a specified level. In political terms, pollution taxes are often opposed by polluters because they require polluters to both bear the costs of pollution control and pay the government a per-unit fee on each residual unit of pollution. In societies where polluting industries exert significant political influence, this reduces the political feasibility of the Pigouvian approach (Nelson 1987).

Economists are often critical of technology-based standards that require the use of systems such as catalytic converters in cars in order to achieve environmental objectives. This view is supported by the argument that market mechanisms and incentives provide polluters with the flexibility to reduce pollution at the lowest possible cost. In this perspective, requiring a coal-burning power plant to install expensive pollution-control equipment (such as "scrubbers") would be inefficient if emissions could be cut at a lower cost through a switch from high- to low-sulfur fuel.

This line of reasoning rests on the assumption that economic actors are well-informed and rational. Although this is a workable hypothesis in some decision-making contexts, there are cases in which imperfect information and/or bounded rationality impedes the adoption of least-cost pollution abatement technologies. Engineering studies, for example, find that energy use and (by extension) energy-related pollutant emissions could be reduced significantly through the full adoption of energy-efficient technologies that are cost-effective at prevailing market prices (IPCC 2001). The existence of such market failures provides a rationale for the direct regulation of automobile fuel economy and the technical efficiency of energy-using equipment, provided that such regulations target the adoption of technologies that provide overall cost savings to businesses and consumers.

COST-BENEFIT ANALYSIS

Cost-benefit analysis plays a central role in environmental economics because designing environmental policies to maximize net monetary benefits results in an economically efficient outcome. In the 1930s economists such as Nicholas Kaldor (1939) and John Hicks (1939) reasoned that maximizing net monetary benefits was equivalent to maximizing social welfare. This argument, however, has been subjected to rigorous critiques (Persky 2001).

One critique is based on the observation that (in most applications) cost-benefit analysis attaches equal weight to net monetary benefits that accrue to each member of society. Since the time of John Stuart Mill (1863), however, utilitarian theorists have argued that the utility a person derives from incremental monetary gains and losses is a decreasing function of his or her income. Based on this premise, Mill called for the redistribution of income from the rich to the poor. In the context of environmental policy, utilitarianism might justify actions that imposed costs on affluent members of society while conferring benefits on the poor and/or disadvantaged, even if the net monetary benefits associated with this action were negative. Although it is fair to identify cost-benefit analysis as a consequentialist approach to social choice, it is consistent with utilitarianism only if prevailing public policies ensure an optimal distribution of welfare between members of society.

Cost-benefit analysis is, however, useful in identifying potential improvements in economic efficiency. If net benefits (defined as benefits minus costs) are positive, then the winners from a proposed action could compensate the losers so that all members of society were made better off. If compensation were actually paid, then the action in question would lead to an unambiguous increase in social utility. In addition, the payment of compensation would ensure the voluntary agreement and fair treatment of those bearing the costs of actions aimed at benefiting society as a whole. As such, cost-benefit analysis can be linked

instrumentally to both utilitarian and rights-based ethical theories of policy evaluation. The method is useful as a means to identify potential gains from trade and to gauge the incidence of costs and benefits between stakeholders.

NONMARKET VALUATION TECHNIQUES

Environmental economics focuses closely on the value of nonmarket goods and services. Accordingly, nonmarket valuation techniques play a central role in this field (Pearce 1993). So-called "revealed-preference" methods infer the value of environmental quality from people's observed behavior in markets. One example is the hedonic pricing method, which measures willingness to pay for environmental amenities based on the statistical correlation between environmental variables (such as air quality) and housing prices. A second approach is the travel cost method, in which the value of an outdoor recreation site such as a park, wilderness area, or scenic locale is inferred from the expenses people incur in visiting the site.

A third revealed-preference method employs data from labor markets to estimate the monetary value that people attach to health and safety risks. This approach builds on the observation that, all else being equal, workers in high-risk occupations are paid higher wages than people in safer jobs requiring similar skills and effort. Current estimates suggest that workers receive between $1 to $10 million in extra pay for each on-the-job fatality (Robinson 2007). Such estimates provide one way to balance the costs and benefits of health risks in the evaluation of environmental policies. On the other hand, assigning a monetary value to human life is in tension with the moral judgment that the taking of life is fundamentally wrong. Attempts to resolve this paradox have focused on whether health risks are accepted freely by the affected persons or whether they are imposed involuntarily by third parties (Shrader-Frechette 1991). The imposition of involuntary risks can conflict with the notion that people have a right to self-determination in the absence of coercion by others.

In contrast with revealed preference methods, so-called "stated-preference" techniques measure environmental benefits using modern survey and interview methods. These include contingent valuation, in which respondents directly answer survey questions about their willingness to pay for nonmarket goods. Choice modeling—in which respondents are asked to evaluate tradeoffs between hypothetical choice options—also falls in this category. Proponents argue that stated-preference methods are the only way to assign a monetary value to nonuse goods—things such as biodiversity conservation that people value even though the good in question seems remote from their personal experience (Mitchell and Carson 1989). Critics charge that stated-preference methods seek to reduce moral values concerning duties to nature or toward future generations into the language of commercial exchange, thereby committing a category mistake (Sagoff 2004).

LONG-TERM ENVIRONMENTAL ISSUES

Long-term environmental issues such as biodiversity conservation and climate stabilization pose special challenges to environmental economics. In standard cost-benefit analysis, net monetary benefits that accrue in the future are discounted (i.e., receive less weight) relative to the present. Discounting is based on the fact that people demand a positive return on investment in their observed economic behavior. From this some economists reason that investments in environmental quality are justified only if they generate returns equivalent to those available in financial markets. In the United States the federal government employs a standard 7-percent discount rate in the evaluation of most proposed regulations (Office of Management and Budget 1992). A 7-percent discount rate, however, implies that no more than $1.15 should be spent today to avert $1,000 in environmental damages that would occur just one century into the future. Because this approach implies that little or no weight is attached to the interests of future generations, discounting techniques have been sharply criticized by philosophers (Parfit 1984).

To address this concern environmental economists have extended their framework to operationalize the concept of "sustainable development" as set forth by the World Commission on Environment and Development (1987). Under one interpretation an economy is "sustainable" if it ensures that the welfare of a typical member of society is maintained from each generation to the next (Pezzey 1992). Given this definition, environmental economists have explored how forecasting and accounting methods can be used to gauge the impacts of current choices on future well-being.

A second approach views "sustainability" in terms of maintaining the effective freedoms or life opportunities available to future generations (Page 1983). This approach attaches importance to the conservation of environmental resources unless resource depletion would confer greater benefits on future generations. It rests on the moral premise that the environment is the joint property of present and future generations and that present decision makers have no right to impose uncompensated costs on posterity.

Viewed narrowly, the policy prescriptions advanced by environmental economists can conflict with the insights provided by environmental ethics if maximizing net monetary benefits is taken as a sufficient definition of

social optimality. Environmental economics, however, is a flexible field of inquiry with deep ties to theoretical and applied ethics. Viewed broadly, environmental economics has contributed richly to debates over the design and evaluation of environmental policies and institutions.

SEE ALSO *Cost-Benefit Analysis; Economic Discounting; Economics, Ecological; Energy; Environmental Policy; Future Generations; Pollution; Sustainability; Utilitarianism.*

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Richard B. Howarth

ECONOMISM

The term *economism* refers to the view that problems of social policy, particularly environmental policy, can best be understood as economic problems, and that solutions to them are best justified in economic terms. A century ago, this approach applied intuitively to public investments in large-scale projects such as dams. In the United States, the River and Harbor Act of 1938 required a board of engineers to weigh the commercial benefits, such as irrigation and hydroelectric power, of any water project against its costs, for example, in labor and materials. Hence, major water projects, such as flood-control projects that the Corps of Engineers undertook early in the twentieth century, gave rise to cost-benefit analysis. In this initial stage, cost-benefit analysis appealed to the same commonsense ideas of profit and loss as would characterize a child's lemonade stand. The price the project receives for its products (lemonade) should at least equal the prices it pays for input (labor, lemons, sugar, etc.). This approach to cost-benefit analysis, which still offers a defense against pork-barrel projects, served as "an administrative device owing nothing to economic theory," as one commentator has written (Hammond 1960, p. 3).

THE ETHICAL BASIS OF ENVIRONMENTAL LAW

The 1970s saw an outpouring of environmental legislation, such as the Clean Air Act and the Endangered Species Act. These statutes had less to do with providing goods than with protecting rights, in particular, the rights of persons and property to be free of the coercion or trespass implicit in pollution. For this purpose, economic analysis—the measuring of social costs and benefits—seemed less relevant. Society tried to find its conscience on matters affecting public safety and health, which is quite different from making a profit, that is, balancing benefits and costs.

The Occupational Safety and Health Act of 1970, for example, orders the secretary of labor to set, for hazardous pollutants, standards "that most adequately assure, to the extent feasible, on the basis of the best available evidence, that no employee will suffer material impairment of health

or functional capacity even if such employee has regular exposure to the hazard dealt with by such standard for the period of his working life.'' This requires industries to treat workers and their safety as ends in themselves, rather than as merely means to maximizing profit, efficiency, or any other economic objective.

Similarly, the Endangered Species Act requires federal departments and agencies to ''insure that actions authorized, funded, or carried out by them do not jeopardize the continued existence'' of any endangered species. This statute, among others (wilderness acts, for example), seeks to institute a public sense of duty toward preserving spiritually, aesthetically, or ecologically important aspects of nature. Insofar as environmental and other decisions respond to moral, aesthetic, and other judgments made as a community—often through deliberative political and legal processes—they cannot be assimilated to the subjective preferences that represent personal wants as distinct from community obligations or objectives. Insofar as environmental statutes serve ethical, aesthetic, and cultural goals rather than primarily economic purposes, ''the cornerstones of federal environmental policy in the United States explicitly prohibited the weighing of benefits against costs in the setting of environmental standards,'' as two economists pointed out (Cropper and Oates 1992, p. 675).

Eight major federal pollution-control statutes enacted between 1969 and 1978 created a quandary for society. These statutes in general treated hazardous pollution as a social evil to be minimized, not as a diseconomy to be optimized; as a trespass to be enjoined against, not as a cost to be offset by benefits. In other words, these statutes recognized pollution as a form of coercion, that is, as a moral problem, rather than as a bad side effect or external (involuntary) cost passed on to society, that is, as an economic problem. If someone throws trash in your yard (or deposits toxic substances through the air or water into your body), you may demand that the offense cease, even if it can be justified by some economic argument. To regard pollution as an assault or trespass is to treat it as a moral wrong, not as a market failure. Yet even if pollution is a moral wrong, it is also to some extent a necessary evil, since an economy cannot function without causing some emissions or effluents. If society prohibited pollution regardless of the economic costs of controlling pollution, it could bring the economy to a screeching halt, and this might be the worst outcome for everyone.

Even if (contrary to the view of economism) pollution is in principle not an economic but an ethical problem, many methods may legitimately be used to bring costs into consideration in environmental regulation. According to one well-known principle, the law may overlook risks that are so small they are hardly detectable. Governmental agencies such as Environmental Protection Agency generally regard as de minimis (so minimal as to be not worthy of consideration) a one in a million increased risk of a bad outcome to a person exposed to a hazard over a seventy-year lifetime in a large population.

German Police Enforcing Environment Checks. *Several German cities introduced environment zones in January 2008, requiring cars to display stickers to confirm that they meet particle emission standards. In February, vehicles without these stickers were fined 40 euros. Some economists believe a measure called "Willingness to Pay" can be used to create and enforce environmental standards.* **SEAN GALLUP/GETTY IMAGES.**

A second way to consider costs is to use a benchmark amount, say $6 million, to test different regulations to see if they require society to spend more or less than that amount for each statistical life saved or death avoided. If a set of regulations entail significant cost differences, these have to be defended by some moral argument or reason. Such defenses are often possible, since some risks are more odious to society than others. A benchmark figure, a sort of average number, may be necessary to make sure cost differences can be explained. A cost-effective approach secures the greatest public safety and health possible for the sacrifice of resources.

Third, in many industries, initial gains to the environment are inexpensive, but eventually the cost of controlling an incremental unit of pollution increases. At some given state of technology, one can often find an inflection point or knee of the curve—a point at which the cost of controlling the next or marginal unit of pollution rapidly increases, and returns to the environment rapidly diminish per dollar spent. A morally acceptable approach (for example, through cap-and-trade markets for pollution allowances) continually encourages or prods industry to improve its processes and technologies so as to move the knee of the curve—the point at which control costs may become asymptotic—ever farther out along the pollution-control axis. To the extent

that the government, through incentives and threats, can move industry to invent environment-friendly technology, it can assure environmental progress while allowing, at a given stage of technology, the minimum amount of pollution necessary for economic growth.

THE ECONOMIC RATIONALE FOR ENVIRONMENTAL LAW

Many economists would assert that environmental problems are essentially not ethical but economic, and therefore that these methods of bringing costs into consideration may fail to achieve what they regard as the goal of environmental regulation. The goal of environmental protection, as these economists understand it, is not based on moral principles about person and property rights or on aesthetic or spiritual concerns about protecting the natural world. Instead, the goal of environmental regulation should be understood in terms of economic concepts such as utility, net benefit, "being well off," efficiency, and welfare—all of which are defined as theoretical constructs within economic theory. Environmental problems, on this view, are problems of maximizing net utility, welfare, or benefit, as economists explain or seek to explain these terms.

Stokey and Zeckhauser, for example, assert, "Individual welfare is all that counts in making policy choices" (1978, p. 262). Freeman concurs: "Society should make changes . . . only if the results are worth more in terms of individuals' welfare than what is given up by diverting resources and inputs from other uses" (1993, p. 6). In a widely used textbook, Goodstein states, "Economic analysts are concerned with human welfare or well-being. From the economic perspective, the environment should be protected for the material benefit of humanity and not for strictly moral or ethical reasons" (1999, p. 24).

To understand the current theory of cost-benefit analysis, which epitomizes economism, we need to examine the concept of welfare to which it appeals, including equivalent concepts such as well-being, utility, being well off, value, and benefit. All these concepts are measured by willingness to pay (WTP) and are defined as whatever WTP measures. Pearce observes, "Economic value is measured in terms of willingness to pay" (1998, p. 221). Goodstein writes, "One can measure the benefits of environmental improvements simply by determining people's willingness to pay. . . . An alternative approach would be to ask an individual their minimum willingness to accept (WTA) compensation in exchange for degradation in environmental quality" (1999, pp. 88–89). Another text says, "Benefits are the sums of the maximum amounts that people would be willing to pay to gain outcomes that they view as desirable" (Boardman, Greenberg, Vining, and Weimer 1996, p. 76).

IS WTP NORMATIVE?

To understand cost-benefit analysis in its current highly theorized form, one must first ask whether it has a normative basis, whether it prescribes what we ought to do. How do economists justify the relation they posit between WTP and normative-sounding concepts such as welfare? Is WTP a measure of value of a kind one can understand, or is it simply a measure of itself and of concepts that it defines and that serve as no more than proxies or stand-ins for it (concepts such as well-being and the rest)? In other words, does WTP correlate with any goal, such as perceived happiness, that makes sense, or is it simply a crochet of economic theory. No one has measured benefit (or welfare) separately from WTP to show that an empirical correlation holds between them. If welfare, along with proxy terms such as economic value, refers to WTP, then WTP has no normative significance but correlates only with itself.

Second, even if we suppose that WTP has a normative aspect, can it be measured? Is WTP any more observable than the utility that it is supposed to define? People pay market prices for the things they want, but these prices reflect the minimum people have to pay for some good, not the maximum they would be willing to pay for it if they had to. Can economists tell how much less of a good a person would buy—or more a person would pay—in the hypothetical case of a price spike? Let us consider these questions.

The first thing to understand about welfare or well-being as economists use these terms is that it has no known or explicable relation to human happiness or satisfaction as these ideas are commonly understood. As Richard Posner has written, the "most important thing to bear in mind about the concept of value [in the economist's sense] is that it is based on what people are willing to pay for something rather than the happiness they would derive from having it" (1981, p. 60). In fact, if one takes income as a surrogate measure for WTP (because the greater one's income, the more one can pay) and if one takes reported happiness as a measure of welfare, then one finds scores of studies that show that once basic needs are met, WTP does not correlate with welfare in the sense of contentment or happiness. Possibly the most often shown result of social-science research is that money (and therefore WTP) does not buy happiness.

Welfare economists often try to connect WTP with benefit by suggesting that people choose and are willing to pay for goods that they believe will benefit them. Empirical research consistently shows, however, that in many choices (particularly those concerning social policy) people are motivated by moral commitments, aesthetic judgments, and political convictions, not by their expectations about how a policy or outcome will affect them or

add to their well-being. Even in the mind of the individual, WTP may have nothing to do with expected benefit. Kenneth Arrow has written, "The individual orders all social states by whatever standards he deems relevant" (1963, p. 17).

Amartya Sen has discussed "the reasons that may lead a person to have different goals from what she sees as her own welfare, or to choose behavior and conduct that go beyond pursuing her own goals." In such cases, "a person's choice behavior may be constrained or influenced by . . . rules of conduct (for reasons that Immanuel Kant and Adam Smith described so well)." "One way of defining commitment," Sen writes, "is in terms of a person choosing an act that he believes will yield a lower level of personal welfare to him than an alternative that is also available to him" (2005, pp. 5–6).

If people favor, prefer, and are willing to pay for things for disinterested reasons—ethical, religious, political—what is the relation between WTP and welfare? It is clear that economists use value terms, such as *benefit* and *welfare*, for their normative connotations, but WTP is the whole story. To say that WTP measures value (benefit, welfare, and the rest) is only to say that WTP measures itself, because it defines all these terms. People are willing to pay for those goods for which they are willing to pay. But what makes this tautology relevant, indeed basic, to environmental or social policy?

To be sure, people should be free to try to satisfy their own preferences in open and fair markets and other institutions as long as they respect the same freedom of others. To be sure, public policy should help with and support certain kinds of preferences, such as those for basic needs (because of a theory of justice), security (because of any political theory), and merit goods (goods that the government thinks the public ought to value, such as the sciences, the arts, historical monuments, and the magnificent aspects of the natural world). The basic premise of cost-benefit analysis asserts, however, that environmental and other social policy should be based on the satisfaction of preference—any and every preference—weighed by WTP, and WTP should be taken as it comes. Insofar as WTP is arbitrary—insofar it has nothing to do with what society has a good reason to provide or individuals have a good reason to want—why should WTP be the basis of social policy? Economists have no answer. They cannot justify the assumption that preference satisfaction per se, measured by aggregate WTP, is a good thing.

CAN WTP BE MEASURED?

Economists define *value* in terms of the maximum amount people are willing to pay for a good, not the minimum amount they can get it for. One can see why. People pay the lowest prices they can conveniently find for consumer goods, no matter how much they need them. For example, even if you are desperate to fill up your tank, you will go to the cheapest gas station within reach. Competition among suppliers tends to drive prices down to costs. The price of a medicine, to give another example, has more to do with its patent than its efficacy. If price varied with benefit, then the government could never approve inexpensive drugs, nor could doctors prescribe them, because they could not be effective.

When economists seek to measure maximum WTP, especially for environmental goods with which people may not be familiar, they encounter many fascinating technical and methodological problems. These have been the subject of much research. To show that they can measure maximum WTP, especially for goods that may not be familiar, investigators working independently should be able obtain roughly the same results. Replication is vindication. So far, there is no evidence to suggest that different teams of economists would independently arrive at anything like the same WTP measurements for a given environmental good. For example, in a legal dispute concerning emissions from a power plant, two teams of economists paid by opposing sides tried to assess WTP for visibility in the Grand Canyon. The resulting estimates differed by an order of magnitude (Deck 1997, pp. 267–301).

SEE ALSO *Cost-Benefit Analysis; Economics, Ecological; Economics, Environmental; Environmental Law; Environmental Policy; Pollution.*

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Mark Sagoff

ECOSABOTAGE

In the mid-1980s, Dave Foreman, one of the founders of the Earth First! movement, published a manual for radical environmental activists with clear instructions on how to spike trees, sabotage construction equipment, destroy power lines, and remove signs posted along snowmobile trails. Here is one illustrative passage under the heading of "condo trashing":

> The following method has been suggested for use against environmentally objectionable construction projects such as condominiums and shopping centers. . . . After the concrete slab foundation is poured, the connections for the plumbing (especially sewer) are exposed. Usually these connections are covered by duct tape to prevent foreign objects from being accidentally dropped down the pipes. Should someone remove the duct tape and deliberately put foreign materials into the pipes, and then replace the duct tape, the results are interesting. The material put in the pipes should be designed to cause a permanent stoppage (e.g., concrete or epoxy). (Foreman and Hayward 1993, p. 190)

This environmentally motivated property destruction is sometimes called *monkeywrenching*, and sometimes *ecosabotage* (or just *ecotage*). The term *monkeywrenching* comes from Edward Abbey's 1975 novel, *The Monkey Wrench Gang*. The main characters in that book carry out a campaign of ecosabotage in the southwestern United States: They set fire to billboards, disable construction equipment, and pull up survey stakes.

Since the early 1980s, ecosabotage has been associated with Earth First!, an activist movement based on the philosophical/religious outlook of deep ecology. Within Earth First!, however, there has been considerable disagreement about tactics, with some members at times calling for ecosabotage, and others favoring more moderate approaches. Since the 1990s, a number of acts of ecosabotage have also been carried out by activists identifying with groups such as the Animal Liberation Front (ALF) and the Earth Liberation Front (ELF), resulting in millions of dollars in damage. The attacks have included arson at a ski resort in Vail, Colorado in 1998, and the destruction of SUVs at a car dealership in West Covina, California in 2003. The U.S. government regards the ELF and ALF as domestic terrorist groups. For discussion of the history of these groups, see Bron Taylor's 2005 article "Earth First! And the Earth First Liberation Front."

Proponents of monkeywrenching stress that they take great care not to injure or kill anyone, and that this distinguishes their activities from more familiar kinds of terrorism. Instead, they target property, with the aim of making it prohibitively expensive for humans to despoil the natural environment. In other words, they see property destruction as a way to counteract the perverse economic incentives that lead to environmental destruction.

Some authors (Martin 1990; Welchman 2001; Hettinger 2001) have compared monkeywrenching to civil disobedience. One problem with the comparison, as these authors note, is that monkeywrenchers operate clandestinely and anonymously while seeking to avoid capture by the authorities. By contrast, activists who take their inspiration from Socrates, Henry David Thoreau, Mohandas Gandhi, and Martin Luther King Jr. advocate open and public violation of laws that they take to be unjust or immoral, without any attempt to evade the consequences of doing so. Jennifer Welchman (2001), however, defends a more expansive conception of civil disobedience that could encompass some forms of ecosabotage.

ETHICAL ARGUMENTS

Common sense moral thought suggests that destroying someone else's property is prima facie wrong, and those who recommend ecosabotage need to do the work of justifying such activity. The arguments in favor of ecosabotage fall roughly into two families: (i) *consequentialist* arguments, which appeal to the good environmental consequences of such actions, and (ii) *ecodefense* arguments, which appeal to a right of self-defense (or a right to assist other victims of an attack).

The consequentialist line of argument faces a number of obstacles:

1. One problem is that acts of ecosabotage may have a number of costs in addition to the damage done to property. For example, they may have a negative impact on the general public's perception of the environmental movement, thus making it more difficult to protect the environment using more conventional means. They may erode people's respect for the law, or for other people's property rights. They may provide encouragement to others (for example, abortion clinic bombers) who wish to use similar tactics to promote different causes. These bad consequences may be difficult to estimate, but they should figure in the overall cost/benefit analysis. (See, however, Young 2001 for some responses to these concerns.)
2. Would-be ecosaboteurs need to give some reason to think that ecosabotage is better than the alternative tactics (including, and perhaps especially, traditional civil disobedience).
3. The amount of property damage done needs to be proportional. Would-be ecosaboteurs need to be able to show that they have not destroyed property excessively—that is, that they have not done more damage than is necessary to create a sufficiently strong disincentive for individuals and corporations engaged in environmentally destructive activities.
4. Finally, one might think that the only way to address the problems just mentioned is to do a detailed cost/benefit analysis. But proponents of ecosabotage must somehow accomplish this without revealing themselves or their plans to the authorities (Turner 2006).

Suspicious Fire in Woodinville, Washington, 2008. *Firefighters douse water on houses in this Seattle suburb, where four multi-million dollar homes were set aflame. An official at the scene reported finding a sign with the initials ELF, the initialism of environmental group Earth Liberation Front. The ELF is one of a number of activist groups reported to employ ecosabotage methods to protect the environment.* **AP IMAGES.**

In one important 2001 article on the ethics of ecosabotage, Thomas Young suggests that the success of the consequentialist approach may depend on which version of consequentialism one endorses. He argues that *rational preference utilitarianism* is the moral theory that is likeliest to provide justification for particular acts of ecosabotage. This theory differs from other versions of consequentialism in two ways: First, it takes into account the desires and preferences of sentient nonhuman animals; second, it does not include irrational human preferences (such as, say, the desire to sell or to purchase a Hummer) in the calculation of costs and benefits.

As it happens, proponents of ecosabotage seldom try to justify their activities by appeal to consequentialist arguments. More common is the *ecodefense* argument, which appeals to the idea that environmental activists have a right to come to the defense of non-human nature. There are several versions of this argument. The ''unjust war'' version proceeds from the assumption that the human species is waging a war of conquest against nonhuman nature. According to this picture, nonhuman nature is an innocent victim of unjustified human aggression, and activists are entitled to render assistance by making it more expensive for other humans to prosecute this war (see Turner 2005 for more discussion of this argument). The ''home invasion'' version begins with the idea that the wilderness is our home, and that wilderness is under attack by individuals and corporations. Just as we are entitled to defend our homes against intruders, activists are entitled to defend wilderness from economic development. The ''self-defense'' version is closely associated with deep ecology's idea that fulfillment requires one to identify with (or become one with) nonhuman nature. If activists come to identify with a natural area, they may reason that ecosabotage is literally a form of self-defense, or a defense of that with which they have become one. Finally, there is the ''biocentric'' version, which appeals to the idea (endorsed by some biocentrists, especially deep ecologists) that every living thing has ''an equal right to live and blossom.'' On this version of the argument, the ecosaboteur is simply defending the rights of plants and nonhuman animals.

The ecodefense arguments have the merit of tapping into some widely shared intuitions about the right of self-defense, and about the right to intervene on behalf of innocent victims. Derek Turner (2006) argues that they also have the defect of proving too much—that is, that they would sanction destruction of other people's property in cases in which any reasonable person (including the most enthusiastic ecosaboteur) would think that we ought to respect one another's property. Philosophers have only begun to look seriously at the connections between these arguments and biocentric and ecocentric environmental thought.

THE "TERRORISM" LABEL

Whether ecosabotage should be considered a form of domestic terrorism is a controversial question to which philosophers have given scant attention. The question has important legal ramifications. For instance, in one highly publicized case, *United States v. Thurston* (2007), Federal District Court Judge Ann Aiken applied "terrorism enhancements" to the sentences of several ecosaboteurs who had pleaded guilty to a number of crimes committed between 1996 and 2001. The question also has ethical ramifications, since virtually everyone agrees that terrorism (however it is defined) is a prima facie moral evil. Ecosabotage is an important test case for philosophers wishing to clarify the concept of terrorism. To date, most of the discussion of terrorism in journals dedicated to moral and political philosophy has proceeded without much regard for questions about environmentally motivated actions.

Those who think that ecosabotage is not a form of terrorism often cite the following considerations:

1. Proponents of monkeywrenching have insisted all along that their efforts target property only, and that activists should take care to avoid killing and injuring persons. This seems like a significant departure from standard cases of terrorism (for a helpful characterization of standard cases, see Sheffler 2006). Indeed, the actual track record of Earth First!, and even the ELF and ALF, is consistent with this stated intent to avoid injuring or killing anyone.
2. There are also strong parallels between the activities of ecosaboteurs and other historical cases that no one would regard as instances of terrorism, such as the Underground Railroad or the Boston Tea Party. Both of these actions were illegal; both were undertaken clandestinely; and both had the effect of depriving other people of their property.
3. Perhaps the only clear-cut example of an ecoterrorist that one can point to today is Theodore Kaczynski, known as the Unabomber. Although Kaczynski seems to have shared some of the antitechnology views of those on the left wing of the environmental movement in the United States, there are important differences between his actions and those of ecosaboteurs. For example, Kaczynski targeted people rather than property. (For discussion of Kaczynski's relationship to the radical environmental movement, see Taylor 1998.) One concern is that applying the term *ecoterrorism* to the activities of monkeywrenchers could create the mistaken impression that they are no different, morally speaking, than the Unabomber.
4. One related worry is that if we are too liberal in applying the term *terrorism,* we will no longer be able to use that term to capture what is distinctively bad about actions such as the September 11, 2001, attacks, or the 1995 Oklahoma City bombing.

Alternatively those who do think that ecosabotage is a form of terrorism can point to undeniable structural similarities between the activities of some ecosaboteurs and those of more traditional terrorists. For example, the ELF activists who destroyed several buildings and ski lifts at a ski resort in Vail, Colorado, in 1998, subsequently issued a statement saying, "For your safety and convenience, we strongly advise skiers to choose other destinations" (cited in Taylor 1998). This is a clear case of using threats to modify people's behavior. What's more, some might think that the terrorism label captures an important moral difference. Consider the following two cases. In the first, some apolitical pranksters destroy an SUV at a car dealership. In the second, environmental activists commit exactly the same crime, but they spraypaint the letters *ELF* at the scene and issue a communiqué advising car dealers not to sell SUVs. Some people who have the intuition that the second case involves a more serious crime than the first, even though the damage done to property is exactly the same, might wish to use the word *terrorism* to capture what is worse about the second case. The difference is that the second case involves property damage plus a threat, whereas the first case involves property damage alone.

The question about whether to apply the terrorism label is complicated by the fact that the term *ecosabotage* can refer to a wide range of illegal activities. Many of these activities (such as pulling up survey stakes) will almost certainly not qualify as terrorism. Discussions of whether to apply the terrorism label tend to focus on the more extreme forms of ecosabotage, especially arson. Finally, it is important to bear in mind the current historical context. The U.S. government regards itself as being involved in an open-ended war on terror; one of many things at stake in this discussion is whether certain environmental activists ought to be considered enemies in that war.

SEE ALSO *Abbey, Edward; Biocentrism; Civil Disobedience; Deep Ecology; Earth First!; Ecotage and Ecoterrorism; Environmental Activism; Shepard, Paul.*

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ECOSYSTEM HEALTH

Ecosystem health is an instance of the extension of the concept of health beyond its core reference to the optimal state of living organisms. In addition to healthy ecosystems people often speak of healthy economies or a healthy body politic. Health sometimes is called a "thick descriptor" because it integrates a scientifically measurable state or condition with a positive value judgment. In the case of human health a body temperature of 98.6 degrees Fahrenheit and a pulse rate between 60 and 70 beats per minute are healthy, and to be healthy is good. Similarly, the concept of ecosystem health enables conservationists to evaluate, at once scientifically and ethically, the states or conditions of ecosystems.

ORIGINS OF THE CONCEPT

The attempt to articulate the concept of a "healthy" nature was popularized by Aldo Leopold with his notion of land health. Leopold argued on behalf of the preservation of wilderness for the last thirty years of his life, but his arguments changed over the course of those years. In the 1920s his arguments for designated wilderness areas were based on their value as recreational assets. However, in 1941, in his essay "Wilderness as Land Laboratory," Leopold argued that wilderness should be preserved as a measure or "base-datum for . . . land-health" (Nelson/Callicott 2008, p. 93). Evoking the Ancient Greek word *autopoeisis* (literally self-making, more loosely self-renewing), Leopold defined land health as the ability of the land to maintain the capacity for "self-renewal." Some have suggested that Leopold's famous summary moral maxim—"A thing is right when it tends to preserve the integrity, stability, and beauty of the biotic community. It is wrong when it tends otherwise" (Leopold 1949, p. 224–225)—should be read as a call to preserve the health of ecosystems. A close analysis of Leopold's use of the term *beauty* elsewhere in his writings indicates that he used the word to refer to land health. Healthy ecosystems are beautiful ecosystems.

The precedent for this type of argument for wilderness preservation goes back to the early 1930s or even the late 1910s. In a 1916 essay titled "Animal Life as an Asset of National Parks," the ecologists Joseph Grinnell and Tracy Storer went beyond the typical recreation arguments for the preservation of so-called protected areas. Although they seem to be interested mainly in preservation as a means to provide important areas of "scientific research," they at least hint at the object of that research: They refer to untoward human impact as a kind of "disfigurement" (Nelson/Callicott 2008, p. 24) of nature and suggest that in these places there still exists a "finely adjusted balance" (Nelson/Callicott 2008, p. 8) that scientists might study and come to understand. Although Grinnell and Storer never explicitly suggested that protected areas provide a standard of land or ecosystem health, their colleagues in the 1930s did. George Wright saw those areas as a source for healthy wildlife populations.

Ecologists such as Victor Shelford argued for the preservation of certain areas that would "serve among other things to show what natural fluctuations in abundance are like" (Nelson/Callicott 2008, p. 92). Those early twentieth-century ecologists used the terms *natural* and *normal* to mean both a descriptive state of affairs and a positively valuable condition without expressly employing the term *health* and apparently were arguing in favor of the preservation of certain land types (Nelson and Callicott 2008). Early twentieth-century ecology was dominated by the superorganismic paradigm propounded by Frederic E. Clements, who conceived of what later came to be called ecosystems as third-order organisms: Just as multicelled organisms evolved from closely associated single-celled organisms, superorganisms evolved from closely associated multicelled organisms. Because ecosystems were conceived

literally as organisms of the third kind, to think of them in terms of health was not far-fetched.

The superorganismic paradigm no longer dominates ecology. Hence, one must ask whether ecosystems sensibly can be said to be autopoeitic or healthy (or even natural or normal). If they can, what does this imply for human obligations toward ecosystems and for conservation?

Contemporary philosophical issues surrounding the concept of ecosystem health are of two varieties: metaphysical and ethical. First, the two main, and intertwined, metaphysical questions concern the form of the existence of ecosystems. In what way do ecosystems exist: as merely socially constructed and therefore metaphorical entities or as mind-independent and therefore genuine or real entities? In what way is it possible to press the notion of health onto an ecosystem? Are ecosystems healthy in the same way an economy can be said to be healthy (i.e., metaphorically) or in the same way an individual human organism can be said to be healthy (i.e., literally)?

Second, environmental philosophers and ethicists, as well as conservationists, are interested in the notion of ecosystem health for a number of reasons. The concept apparently combines scientific/descriptive elements and evaluative/normative elements. That is, as was noted above, health is both an objective state of a specific entity and a condition that is positively valuable and implies an obligation to act in ways that maintain that state or condition. Hence, interest in ecosystem health is premised on the assumption that if humans can determine what an ecosystem is and determine that an ecosystem can be healthy or unhealthy, along with what its state of health is, they have established a set of obligations to maintain healthy ecosystems.

CRITICISMS

Critics of ecosystem health attack it on both metaphysical and ethical grounds. Some believe that the category ecosystem has no independent reality beyond that created for it by humans and that the notion of ecosystem health therefore is an ontological, ethical, and conservation nonstarter. If ecosystems are a scientific artifact, a useful fiction of ecology constructed by ecologists to isolate parts of nature artificially for scientific study, the notion of health can apply to them in only a metaphorical way. Some of these constructivists believe that health still can serve as an object of environmental management strategies, whereas others do not. Finally, some believe that ecosystems exist in a robust, mind-independent fashion, that they have a good of their own, and that humans can make sense of the notion of ecosystem health in the same way they can make sense of human health.

In their 1993 book *Method in Ecology: Strategies for Conservation,* Kristin Shrader-Frechette and Earl McCoy summarize this dilemma:

> Some researchers have argued that one can measure biotic health by means of factors such as the ability of ecosystems to recover their equilibria after a disturbance; their not losing sensitive species; or their resistance to disease. . . . Using such factors as indicators of health, however, presupposes accounts of equilibrium or stability that are question-begging and unconfirmed. Ecology has no clear, unambiguous norms for when a community is normal or healthy and, as a consequence, positing a goal for ecological practice is quite difficult. (Shrader-Frechette and McCoy 1993, p. 102)

ECOSYSTEM HEALTH AS A GOAL FOR CONSERVATION

Despite the fact that it is a controversial notion, ecosystem health might be viewed as a worthy goal for conservation. First, many environmental thinkers who comment on the application of health to ecological entities such as ecosystems note that in addition to health describing a purported objective state of affairs, health also comes with a positive value connotation. Thus, there is the assumption that healthy ecosystems are worthy of preservation and unhealthy ones are worthy of restoration. Second, an ecosystem (or watershed, or species, or Leopold's land) is perhaps a more tangible conservation unit than is something such as nature or the biosphere. Therefore, conservation might be more precisely focused than it would be if the preservation of nature were its goal. Third, since it might be possible to describe both a wilderness ecosystem and an agricultural ecosystem as healthy or unhealthy, ecosystem health might provide a way to account for the good of a variety of environments—from the natural to the seminatural. This would allow conservation to avoid charges of elitism and misanthropy. Finally, conservation efforts focused on ecosystem health might facilitate the confluence of anthropocentric environmental efforts such as sustainability and nonanthropocentric or ecocentric efforts such as wilderness preservation. The current natural resource management scheme of ecosystem management may be seen as a direct reaction to the assumption that ecosystems exist in a tangible fashion and that they count morally, although proponents of ecosystem management do not always articulate it in this way.

Apart from the advantages the concept of ecosystem health may offer conservation, it remains to be seen whether that concept can withstand philosophical scrutiny. Philosophers vary widely on whether ecosystems have the necessary qualities such as "a good of their own" that would make sense of the idea of ecosystem health. In her 2004

essay "Ecosystem Health" the philosopher Katie McShane concluded that "ecosystems *are* the kind of thing that can be healthy or unhealthy in a fully literal sense" (p. 245), and in his 1995 essay "The Value of Ecosystem Health," the philosopher J. Baird Callicott argued that "ecosystems may not be so well integrated that they can be thought to form mature, persistent superorganisms . . . the concept of ecosystem health is at best a metaphor, since 'health' may be predicated literally only of organisms" (Holland 1995, p. 347).

The International Society for Ecosystem Health (ISEH) was formed in 1994 to "engage scholars from a variety of fields to transcend the natural, social, and health sciences . . . [and] to encourage the understanding of the critical linkages between human activity, ecological change and health." The society published the journal *Ecosystem Health* from 1998 to 2001 and hosted a number of major international conferences. David J. Rapport, a leading figure in the field, served as both president of the ISEH and editor-in-chief of the journal *Ecosystem Health*.

SEE ALSO *Callicott, J. Baird; Ecology: III. Ecosystems; Economics, Ecological; Land Ethic; Leopold, Aldo; Preservation; Wilderness.*

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Michael P. Nelson

ECOTAGE AND ECOTERRORISM

The terms *environmental terrorism*, *ecotage*, and *ecoterrorism* have generated intense controversies—about both their meaning and their ethical implications. Debates over these terms have been an important part of the ferment in environmental philosophy since it emerged as a distinct field of study in the early 1970s.

ENVIRONMENTAL TERRORISM

Environmental terrorism, as the term is usually understood, involves causing serious damage to the ecosystems upon which a group of people depends. The term can also apply to an attempt by a state or corporation to damage some natural resource for political or economic reasons: for example, the Iraqi dictator Saddam Hussein setting oil fields on fire during the first Gulf War in 1990. Because of this political undertone, some claim that environmental terrorism is primarily an activity of either nation-states or organized terrorist groups, such as Al-Qaeda.

Others use the term to describe the behavior of corporations that, through negligence or maliciously indifferent behavior, destroy or damage ecosystems and all who depend upon them. One example often cited by environmental activists is a case in Nigeria where Royal Dutch Shell Oil Company purchased mineral rights to land occupied by the indigenous Ogoni people, subsequently heavily polluting their lands and suppressing dissent. The company allegedly supported the 1995 execution, at the hands of Nigeria's military, of one of the most charismatic of their opponents, Ken Saro-Wiwa, after a widely condemned, irregular tribunal convened by the Nigerian government.

ECOTAGE (MONKEYWRENCHING)

Ecotage is a term that combines the words *sabotage* and *ecology* to capture the idea of extralegal property destruction or sabotage committed in an effort to protect nature. It is often deployed by radical environmentalists who consider all species to be intrinsically valuable (and/or the earth to be sacred in some way) and believe that humans have precipitated an environmental crisis so grave that civil disobedience

Kuwaiti Oil Fields Set Ablaze. *During the Persian Gulf War (1990–1991), Iraqi dictator Saddam Hussein employed a method of environmental terrorism, or ecotage, by setting oil fields on fire. The aftereffects of this act were vastly destructive: More than 500,000 tons of air pollution was created, and 460 million gallons of oil contaminated the Persian Gulf. Because this was one of the first large-scale efforts of ecoterrorism, many today still think of such acts as tied to large-scale terrorist organizations.*

and even sabotage are morally permissible—if not obligatory—tactics in arresting the destruction of nature.

A synonym for *ecotage* is *monkey wrenching*. This term was coined by the writer Edward Abbey in his (in)famous 1975 novel *The Monkey Wrench Gang*, which portrayed a group of angry but spirited environmentalists cutting down billboards, destroying bulldozers, and contemplating the liberation of the dammed Colorado River—by the use of dynamite to breach Glen Canyon dam.

Although the novel was fictitious, it drew on real-life sabotage campaigns, dating back to the 1950s, when activists cut down unsightly billboards and desurveyed (removed survey stakes from) development sites and otherwise sought to thwart urban sprawl and the destruction of wilderness. Abbey himself participated in some of these activities, including efforts to prevent Peabody Coal (later renamed Peabody Energy) from mining Black Mesa, an area in New Mexico considered sacred by many American Indians and environmentalists. Abbey and many of his comrades found a part of their rationale for extralegal action in anarchist philosophy; they considered nation-states illegitimate, in part because they promote plutocratic and oligarchic interests and the exploitation of nature.

The Monkey Wrench Gang inspired the formation, in 1980, of Earth First!. This group soon began publishing the *Earth First! Journal,* publicly promoting tactics such as tree spiking, road blockading and spiking, the toppling of power lines, and the destruction of bulldozers and logging equipment. Three years earlier, in 1977, the Earth Force Society (which became the Sea Shepherd Conservation Society in 1981) had been founded by one of the original founders of Greenpeace, Paul Watson. Watson left Greenpeace when some of its members orchestrated his removal from the board, claiming he had become too aggressive in his tactics. The initial Sea Shepherd campaigns included ramming whaling ships, intervening to prevent the clubbing of baby seals, and the cutting of drift nets to prevent dolphin deaths, actions that were later labeled by the Federal Bureau of Investigation in the United States as

the first cases of ecoterrorism. Watson has steadfastly defended his tactics, arguing that rather than breaking the law, he is enforcing international environmental laws that nation-states fail to enforce.

The tactics pioneered by Sea Shepherd and Earth First! activists were criticized as violent or counterproductive even by some of those sympathetic to these new forms of environmental militancy. For example, Pete Dustrud, the first editor of *Earth First! Journal*, resigned in 1982 when Dave Foreman, one of the cofounders of Earth First! and its most charismatic and influential leader, insisted on promoting tactics in the journal that Dustrud considered violent. Dustrud especially took exception to an article explaining how to spike roads with metal to deflate tires and thereby delay pursuers of those engaged in acts of ecotage.

In 1982, Gary Snyder, the anarchistic Buddhist-animist writer who contributed significantly to the bioregional and Deep Ecology movements, criticized what he considered to be Foreman's romantic naiveté about violence and the state. In a letter to Foreman, Snyder prophetically warned that in all likelihood, ''Earth First! is already well-infiltrated,'' and argued that sabotage would only provide ''the excuse the government needs to begin to crack down.'' (Snyder 1982, pp. 2–3). Shortly afterward, Eugene Hargrove, the founding editor of *Environmental Ethics*, criticized what he considered to be the new movement's penchant for violence, labeling it terrorism. This critique led to rejoinders from Foreman and Michael Martin in the pages of *Environmental Ethics,* and from many activists in radical environmental publications, including by Christopher Manes in *Green Rage* (1991). Later, Bron Taylor argued that the term *terrorism* rarely was an apt description and that some extralegal tactics could, in certain cases, be justifiable (1997, 1998).

ECOTERRORISM

From the early 1980s *terrorism* or *ecoterrorism* was the preferred term of denunciation favored by movement adversaries, including law-enforcement authorities and partisans of extractive enterprises. Ron Arnold became the best-known nongovernmental figure making accusations, serving as a spokesperson for the so-called ''Wise Use Movement.''

Foreman famously rejected the label ''ecoterrorist'' in a 1989 *60 Minutes* interview that was conducted soon after he had been arrested, with four others, for involvement in a plot to topple electrical power-line towers carrying electricity from a nuclear power plant in Arizona to nearby cities. (Foreman and the others eventually were convicted of one or more charges; all but Foreman served jail or prison sentences. The longest sentences were more than three to six years, while two others were sentenced to about a year each.) Foreman stated during this interview that, to him, terrorism was the harpoon blowing up in a whale or the chainsaw ripping through an ancient tree, and that although monkeywrenching might precipitate fear, it was a nonviolent and justifiable tactic given the magnitude of the human assault on nature.

Unfortunately for the movement, on the same program, Darryl Cherney, an activist involved with the Earth First! campaign to save California's remaining redwood biome, reinforced the growing public perception of the movement as terrorist. Earning the ire of many of his comrades, he claimed that if he knew he had a fatal disease, he would blow up the Maxxam corporate headquarters building after it shut down for the night. Maxxam owned a Northern California logging company that Earth First! activists were battling. Shortly after the *60 Minutes* interview was aired, in May 1990, Cherney was the passenger in a car with Redwood forest activist Judi Bari when a bomb went off directly under her seat. The incident, which occurred in Oakland, California, permanently injured Bari. Bari and Cherney were soon charged with possession of an explosive device and labeled terrorists by the authorities, confirming in the minds of many that they and the movement they were involved with was terrorist. The bombing set back significantly the Earth First! campaign to save some of the last unlogged redwood groves. Many years later the Oakland Police and FBI settled a lawsuit by these activists claiming they had been slandered and their civil rights violated. Movement activists took this as a vindication and as a refutation of the terrorism charge, and some alleged as well that the authorities were behind the bombing and were the true ecoterrorists (illustrating how the label remains in use in multiple and contradictory ways in environmental politics).

Politicians and officials of the U.S. government have repeatedly labeled as terrorists those who engage in ecotage; one FBI official testifying before Congress in 2002 suggested that special interest terrorists, like those in the Earth and Animal Liberation Fronts, had become among the most significant domestic terrorism threats. Such allegations began early in the 1980s in response to the emergence of the concerted use of ecotage to prevent deforestation and other environmentally destructive practices. Critics who labeled ecotage ''ecoterrorism'' initially focused especially on tree spiking, a practice that seeks to prevent logging by driving metal or ceramic spikes into standing trees in order to make it more costly to harvest and mill them. They claimed that the practice either had caused injury to loggers or mill workers or that it could cause injuries or even death. There certainly were risks to workers, although they were overestimated by the critics of the practice and underestimated by its advocates. Tree fellers face little risk largely because they must cut the tree low to the ground (a fact learned from a contract logger

and lobbyist who is ardently opposed to tree spiking), and tree-spiking instructions emphasize that spikes should be placed chest-high or higher to prevent such injuries (as urged by Dave Foreman in *Ecodefense*). There is greater risk to mill workers, for a saw blade can shear into shrapnel when it hits a spike. Although safety regulations require mill workers to be behind barriers to prevent injury during milling, sometimes they are not. Some advocates of the practice are unaware of or callous to such risks, whereas others argue that risking injuries is morally permissible because environmental decline must be arrested and social-change movements always involve risks to both activists and their adversaries, even when nonviolence is a governing commitment. Defenders of the practice also note that no one has yet to be injured by a spike placed in a tree that has been traced to an environmentalist cause; this argument rarely acknowledges that the longer tree spiking is practiced, the more likely it is that injuries to workers will result.

The accusation of terrorism, however, gained new ground (1) after the invention of the term the Earth Liberation Front (by Earth First! activists in the United Kingdom in 1992) as a trope for those willing to engage in even more radical acts of ecotage than most Earth First! activists had countenanced, especially arson; (2) as a core of Earth Liberation Front activists fused their more ecocentric views with those of animal-liberationist activists, who had shown greater willingness to risk or intend violence or provoke fear as a tactic; and (3) as radical environmentalism assumed an even more overtly anarchist and self-consciously revolutionary posture than the movement had in the 1980s.

"Green anarchy" and "anarchoprimitivism" came to guide the revolutionary ideology of the radical environmentalists most willing to deploy arson and other tactics that could cause injuries or death among adversaries and bystanders. Some of the activists who considered themselves partisans of such movements discussed whether it might be time to take up arms or use explosives. Some even expressed affinity or sympathy with Theodore Kaczynski, also known as the Unabomber, a reclusive mathematician and anarchist who believed that technology erodes freedom and that technological societies should therefore be destroyed; Kaczynski's method for bringing this about was the attempt to maim, kill, or destroy as many technologists as he could. Kaczynski, who killed three and injured another twenty-three people during a bombing campaign conducted from the late 1970s to the mid-1990s, came to identify with the most anarchistic elements within the radical environmental movement. After his apprehension, conviction, and incarceration (arrested in 1996, he pled guilty in 1998 to avoid the death penalty and received a life sentence), he communicated with a number of radical environmentalists, including the anarchoprimitivist writer John Zerzan. Some anarchists defended Kaczynski, including writers for *Green Anarchy*, which published an interview with him.

The intensification of resistance to the war against "Mother Earth," which is how such activists often frame their task, included major acts of arson that began in the mid-1990s and continued into the twenty-first century. These acts precipitated the revision of federal law to make the suppression of these movements easier. The definition of "domestic terrorism" does not require, for example, intent to kill or maim. It requires, rather, only that such terrorism involve crimes occurring primarily in the United States that are "dangerous to human life" and that seek to "intimidate or coerce a civilian population; to influence the policy of a government by intimidation or coercion; or to affect the conduct of a government by mass destruction, assassination, or kidnapping" (Title 18, of United States Code, section 2331[5]). This broad definition allows prosecutors to seek terrorism charges (or enhancements at sentencing) and thus to seek life imprisonment of activists who engage in many acts of ecotage such as arson. This in turn makes it easier to secure the cooperation of suspects.

A good example of the radical environmentalists willing to use arson and other destructive tactics are a group of nineteen activists who, operating primarily under the Earth Liberation Front banner (some of the actions also were claimed in the name of the Animal Liberation Front), were implicated in a string of fires at corporations, research facilities, automobile dealerships, and corrals, where captured wild horses were awaiting slaughter. Their activities, scattered across the western United States, included an October 1998 fire at a lodge that was under construction at a Vail, Colorado, ski resort; the blaze resulted in $12 million in damage to facilities and millions of additional dollars in lost revenue. This case serves as one example of the arsonists' strategy: They hoped to force the resort to reverse its decision to expand into an area considered by wildlife biologists to be critical habitat for the elusive and endangered lynx.

In early December 2005 federal authorities arrested seven of the nineteen who would eventually be implicated through their investigation, dubbed "Operation Backfire." One of the first arrested was William C. Rodgers, whom authorities considered the leader of the Vail arson and one of the principal leaders of the group. Aware that his crimes were considered terrorist acts by the U.S. government and that he was facing life in prison, Rodgers wrote these words shortly before committing suicide in an Arizona jail:

> Certain human cultures have been waging war against the Earth for millennia. I chose to fight on the side of bears, mountain lions, skunks, bats,

> saguaros, cliff rose and all things wild. I am just the most recent casualty in that war. But tonight I have made a jail break—I am returning home, to the Earth, to the place of my origins. (Bernton 2006)

By 2008 fourteen of the remaining apprehended defendants had been convicted of one or more charges levied against them in Federal Court, with most drawing sentences of three to eight years. Four remained fugitives and only four of those prosecuted refused to testify against their comrades. Despite these prosecutions and convictions, ELF actions have continued in the United States and Canada; more than a dozen ELF activists face prison or have already been jailed for similar acts.

This history suggests that, however vilified by anti-environmental partisans, politicians, and law-enforcement officials, and criticized by a wide variety of other members of the public, including many environmentalists and environmental philosophers, ecotage is now likely to remain a long-term feature of contemporary environmental politics, despite the controversies that rage about the ethics of the movement's tactics. Much of this debate will persist between those who believe nature has intrinsic or inherent value and those who take a more anthropocentric and pragmatic approach to environmental ethics (although many who believe that nature has such value do not condone ecotage). Controversies will continue to swirl about whether environmental degradation is so severe that extreme tactics are necessary and justifiable.

Such debates ought not to turn on exaggerated assertions about the motives of those engaged in ecotage. With the possible exception of Theodore Kaczynski (depending on whether one considers his motivations to be environmentalist, anarchist and antitechnological, or both), and another incident when it appeared that an environmentally motivated saboteur may have returned a security guard's gunfire at a saw mill (no one was injured), in more than twenty-five years there have been no cases where environmental activists have sought to kill or maim anyone. Despite the fears that the movement will grow more violent, even developing weapons of mass death, there is little evidence for such fears based on the record and the avowed intentions of the activists. Nevertheless, the ecotage does risk causing death or great harm to humans (especially to first responders after arson attacks) and to other living things.

A small number of radical environmentalists refrain from intentional violence not because of moral scruples but because they do not think the time is ripe for it. For some, the only reason violence is not undertaken is fear of apprehension, the power of the state, a belief that it would be counterproductive to movement building to deploy such tactics, and/or a belief that the revolutionary moment is simply not yet at hand. Given the risk that some psychologically disturbed individual could be drawn to radical environmental movements, the possibility remains that an unambiguously terrorist individual or group could emerge from this movement. It is also possible that their business or governmental adversaries could promote such excesses through infiltrators to discredit their causes or environmentalism in general, or even frame these movements in terrorist crimes. Many radical environmentalists believe both have already occurred.

Perhaps the likelihood of the emergence of environmental terrorism will increase in proportion to the desperation that often has accompanied the collapse of ecological and social systems. It is even more likely that partisans in environmental conflicts will pursue their ecopolitical objectives while framing the actions of their adversaries as violent and terrorist, and their own as permissible and beneficent.

SEE ALSO *Abbey, Edward; Civil Disobedience; Deep Ecology; Earth First!; Ecosabotage; Environmental Activism; Hargrove, Eugene; Snyder, Gary; Technology.*

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Bron Taylor
Todd J. LeVasseur

ECOTHEOLOGY

Ecological theology and religious environmental ethics have roots in the late 1960s, though earlier signs of this perspective may be found in the writings of some theologians. One of the first stirrings of an ecotheological perspective appeared in the work of Joseph Sittler in the mid-1950s and early 1960s. A Lutheran pastor and professor of systematic theology at the University of Chicago, Sittler lamented Christian theology's lack of engagement with earthly concerns and its tendency to value nature on utilitarian grounds, if at all. Sittler called attention to, and presented a Biblical basis for, the inseparability of the spiritual from the material. His early call to resacralize the material—the body as well as the natural world generally—is a prominent theme in contemporary ecotheology.

The spark that ignited ecotheology came not from within Christian theology but from a historian of technology, Lynn White Jr. In 1967, in an essay titled "The Historical Roots of Our Ecologic Crisis," White pointed to Christianity (or more broadly, the Judeo-Christian tradition) as the world's most anthropocentric religion, and as a primary source of our modern environmental crisis. White claimed that a central dogma in Christianity had gradually displaced ancient pagan worldviews that understood spirits as inhabiting and animating the natural world. This dogma, White charged, consists of a dualistic worldview that separates spirit from matter and devalues the latter; an assumption that nature is a mere backdrop and temporary stage for the real drama of humans, who, created in the divine image, ultimately leave this world to return to their true home with God; and a divine mandate for humans to exploit nature for their own ends.

White did not hold Christianity solely responsible for promoting negative views of nature. He maintained that science and technology, as expressions of the Judeo-Christian worldview, supported a widespread belief that human mastery of nature is synonymous with progress. White contrasted this worldview with Asian perspectives, which lack the fundamental spirit/matter dualism of Christianity and a linear notion of time presupposing an endpoint to the existence of the physical world. He did not recommend abandoning the Judeo-Christian tradition. Rather, he suggested Saint Francis of Assisi, protector of animals, as the patron saint of an alternative, yet authentic, greener form of Christianity.

EARLY ECOTHEOLOGY

The body of ecotheological work that grew up in response to such critiques encompasses a variety of distinct forms and approaches. Many theologians take issue with White's interpretation of the term *dominion* as human domination of nature, and interpret it, rather, to mean responsible stewardship, not despotism. In 1970 the evangelical Francis Schaeffer published *Pollution and the Death of Man*, which rejected White's interpretation of dominion but warned against a pantheistic and potentially idolatrous form of Christianity that would confuse nature with God. The degree to which God may be seen as coextensive with nature remains somewhat controversial in ecotheology. Some argue for a less transcendent deity, envisioning God as more interconnected and interactive with the natural realm and natural processes than the traditional Christian God. Indeed, the Christian belief in the incarnation—God taking bodily form in Jesus—illustrates the profound interpenetration of the spiritual and physical in Christianity. Some theologians have highlighted this core event to stress Christianity's nondualistic elements and to demonstrate the value the tradition confers on the physical. The Protestant theologian Sallie McFague, for example, suggested new metaphors for thinking about God in *Metaphorical Theology* (1982) and *Models of God* (1987). She urged Christians to imagine the world as

God's body, a physical extension of God's being that suffers along with creation and is vulnerable to human-inflicted harms. The traditional model of God as an otherworldly, kingly figure, McFague argued, contributes not only to devaluing nature but also to Christians feeling like aliens on earth.

PROCESS THEOLOGY

Following the philosopher Alfred North Whitehead, process theologians such as John Cobb also posit a deity who interacts with and is affected by natural processes. They affirm, in contrast to omnipotent and transcendent conceptions of God, a deity whose actions in the world are persuasive but not coercive. That is, God lures creation forward, allowing it to develop along diverse and novel lines but never forcing it into particular, preordained directions. In this account, all entities are seen as potentially capable of experience and creative response. The path that evolution takes results from the combined activity of God and the self-willed activity of individual organisms. One implication for environmental ethics is that all entities have some degree of value, by virtue of their capacities for rich experience and subjecthood. Similarly, in McFague's account, envisioning the earth as God's body suggests that all beings in nature have intrinsic value.

ECOFEMINISM AND ECOTHEOLOGY

Ecofeminists stress parallels between human oppression of nature and powerful males' oppression of certain classes of humans, most notably women and minorities. As McFague argues, models of God as a distant, male lord or monarch contribute to the oppression of both women and nature. Along with other Christian ecofeminists, McFague wishes to redirect the healing, saving ministry of Jesus toward this world. Salvation is not about humans fleeing this world for eternal life elsewhere. Rather, salvation refers to the life and death of the earth as a whole, here and now. In *Gaia and God* (1992) the Catholic and ecumenical theologian Rosemary Radford Ruether also urges a retrieval of environmentally positive, but neglected or forgotten, strands within the Christian tradition that can counter an earth-fleeing spirituality. She argues that deeply rooted Christian conceptions of sin that link it to human mortality and a corrupted creation, and the association of goodness with immaterial, immortal life, are not wholly tenable. Biblical and historical materials support different interpretations of sin and evil—interpretations that make valuing the body and the created world consistent with Christianity and render Christianity a less woman-blaming and more egalitarian tradition.

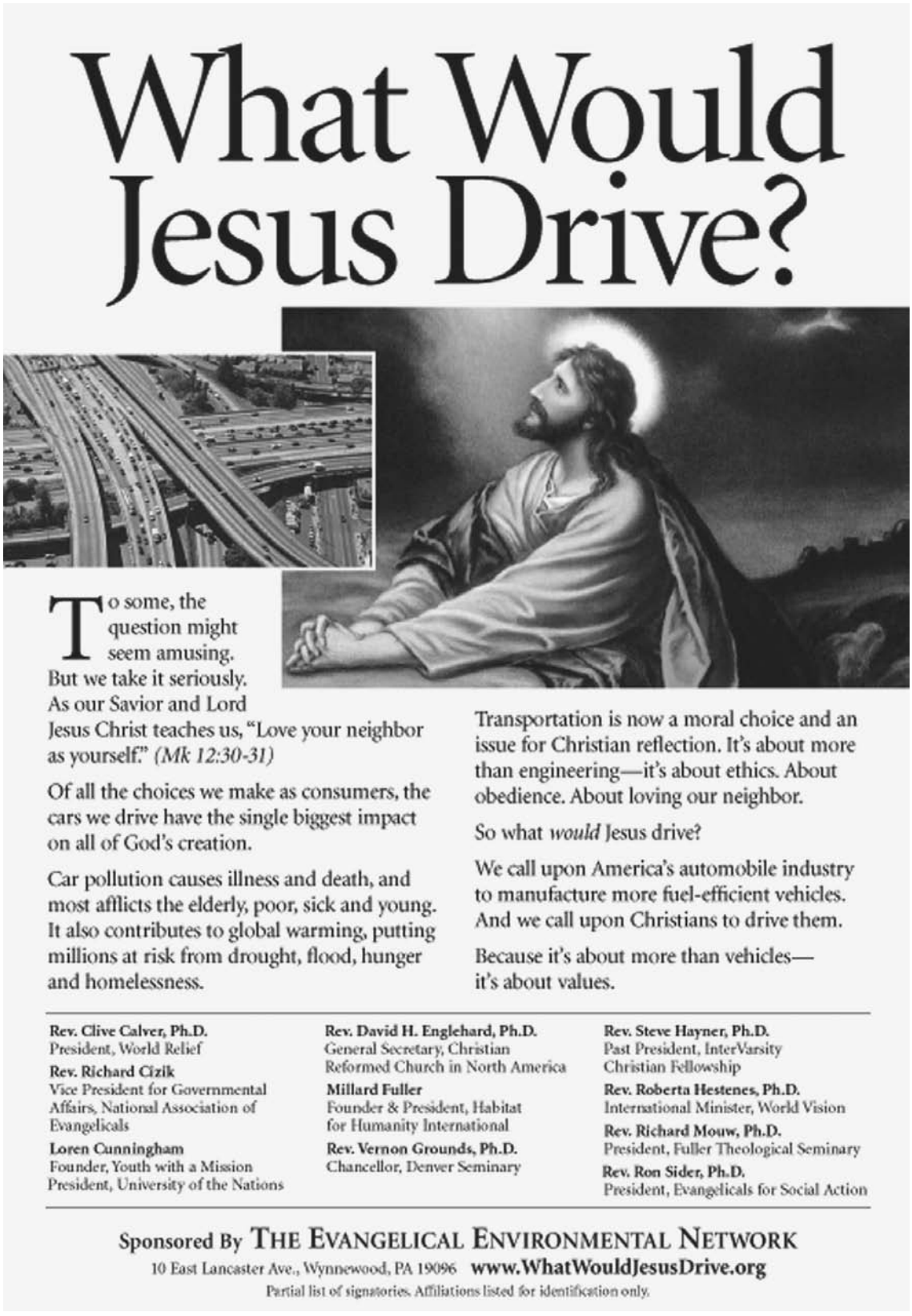
LIBERATION THEOLOGY AND ECOTHEOLOGY

Ecofeminist and process approaches further resonate with a strain of liberation theology extended to the earth and its nonhuman inhabitants. Liberation theology, which emerged among Roman Catholic Clergy in Latin America in the 1960s, interprets the ethic of Jesus to be solidarity with the oppressed and preference for the poor. Popularized by Gustavo Gutiérrez's *Theology of Liberation* (1973 [1971]), the movement endeavored to translate Christian teaching into practice to address the concrete struggles of certain groups against oppression. Combining the gospel of Jesus with Marxist perspectives, liberation theology interprets and applies scripture to economic, political, and social realities that contribute to oppression and discrimination. For ecotheology, this means understanding the environmental crisis, a crisis produced largely by white elites in capitalist countries, as an extreme form of oppression of impoverished creatures, both human and nonhuman. Since the foundation of Christian ethics is care and concern for the suffering and oppressed neighbor, it seems plausible that we include among our neighbors the many life-forms with whom we share the planet. Leonardo Boff, for example, understands both Christianity and ecology as indicating that relationships and interdependence are central in community. In *Ecology and Liberation* (1995), Boff applied this expanded form of liberation theology to all life, extending the preference for the poor to all beings and situating human communities within a larger ecological community.

Some ecotheologians interpret liberation as freedom not only from oppressive social and economic structures but also from oppressive modes of Western thought, including modern scientific enquiry. Charles Birch and John Cobb (1990) call for the liberation of all life from objectifying conceptions and categories stemming from and perpetuated by science. Scientific investigation, they allege, treats living beings as mere objects or machines, rather than as subjects. Such green critiques of science often combine elements of process thought, feminist criticism, and liberation theology. As an alternative to objectifying models, many ecotheologians offer what they call an ecological model, which embraces radical relationality, interconnectedness, and an updated, or postmodern, form of scientific inquiry.

SCIENCE AND ECOTHEOLOGY

Clearly, science plays a complex role in shaping and supporting ecotheological ethics. In *The Death of Nature* (1980) Carolyn Merchant has devoted sustained attention to the argument that modern science—science since the scientific revolution of the sixteenth and seventeenth



Evangelical Environmental Network Ad Campaign. *This print advertisement from the Evangelical Environmental Network plays on the popular initialism "WWJD" (What Would Jesus Do), in order to encourage Christians to drive more environmentally friendly vehicles rather than sport-utility vehicles.* **PHOTO BY THE EVANGELICAL ENVIRONMENTAL NETWORK/GETTY IMAGES.**

centuries—has promoted ecologically disastrous models of nature that perceive matter as essentially inert and valueless. Merchant particularly pointed the finger at mechanistic models of nature and aggressively masculinist attitudes toward nonhuman life perpetuated by René Descartes and Francis Bacon. Ecotheologians have also been influenced by works such as Fritjof Capra's *The Tao of Physics* (1975) and *The Turning Point* (1982), which discern parallels between physics, particularly quantum theory, and Eastern mysticism. Capra maintained that adopting a holistic framework that dispenses with subject/object and fact/value dichotomies is not only better for the natural world but consistent with cutting-edge science.

Such ambivalence toward science often pervades ecotheology. On the one hand, much of ecotheology has not fully integrated aspects of evolutionary theory into its environmental ethic. For example, a focus on healing and liberating animal subjects from suffering and oppression seems out of place alongside a frank recognition of predation and other harsh processes in nature that necessarily operate at a physical cost to some, especially weakened or sick individuals. On the other hand, many ecotheologians have enthusiastically and uncritically embraced postmodern physics, which entails appreciation of extreme interrelatedness and continuity among all entities and the potential subjecthood of all.

REINTERPRETING AND RETAINING TRADITION

In keeping with White's critique, many ecotheologians reinterpret the Christian tradition in ways that implicitly or explicitly generate parallels with less dualistic traditions, such as Buddhism and Hinduism. But to what extent is White's account of the Christian tradition a crude or unfair caricature? Have ecotheologians conceded too much to White? It is doubtful that any strand within Christianity consistently holds to a radically transcendent deity and wholly devalued earthly realm. That said, however, much of ecotheology grew out of Protestantism, perhaps because it is Protestant Christianity that bears at least some similarities to the worldview assailed by critics such as White. Features of Christianity such as the centrality of scripture and an intimate connection between religious worldviews and the rise of technology and capitalism appeared to implicate Protestantism in particular. The environmental crisis seemed to some to be a crisis brought about by Protestantism, and it was Protestant theologians who led the response.

But not all of these responses involve radical reinterpretation of traditional symbols and beliefs. Michael Northcott, an ordained Episcopal priest and ecotheologian, understands concepts such as covenant and natural law as supporting human moral obligations to nature, as well as the existence of a moral order within natural patterns and processes themselves. Northcott, in *A Moral Climate* (2007), was also one of the first ecotheologians to address climate change as a moral issue that can and ought to be addressed within a traditional theological framework. In this endeavor, his work finds support among some conservative Christians. Some evangelical groups have enthusiastically embraced the environmental agenda. Foremost in these efforts is Calvin DeWitt, who promotes a strenuous form of earth stewardship rooted in understanding humans as created in the image of God. DeWitt helped to found the Evangelical Environmental Network, which promotes a form of "creation care" modeled on the example of Jesus and based on Biblical teachings. Evangelicals remain wary of pantheism and idolization of creation, holding firmly to a transcendent God who is intimately involved with, but wholly other than, creation. The Evangelical Environmental Network has become a significant political and ethical voice on issues such as climate change and global environmental justice. Their much publicized educational campaign against sport utility vehicles (SUVs) titled "What Would Jesus Drive?" points to the relevance of Jesus's ministry to lifestyle choices that negatively impact life on earth.

Calls for global justice and sustainable lifestyles emanate from Catholic circles as well. Thomas Berry, whose work (2006) was strongly influenced by the French Jesuit priest Pierre Teilhard de Chardin, has garnered worldwide attention. Berry considers himself a "geologian," that is, one who studies the history of the earth and its processes. His language often departs from traditional theological language, but it bears definite marks of a spiritual movement. Berry urges an "enchanted" reading of cosmogenesis—a resacralization of the scientific narratives that recount the birth and evolutionary unfolding of the cosmos. Combining earth spirituality and reverence for life with knowledge of evolutionary processes and cosmology, Berry presents a "New Story" as our common creation myth. The New Story is intended to replace our modern, destructive myths of progress and enchantment with technology with a myth that is more energizing and enriching. Berry hopes thereby to effect a dramatic change in worldview, inspiring ways of life that are more sustainable and conducive to social justice. Humans, as a uniquely self-reflective and complexly conscious species, have a special role in the evolutionary process, an obligation to guide and safeguard its unfolding.

THEORY AND PRACTICE

On the whole, the extension of Christian theology and ethics to nature and nonhuman life has proven fruitful as a way of connecting Christianity with environmental concerns. But to what extent can practical Christian ethics, and

particularly the healing ministry of Jesus, be made compatible with biological notions of suffering and death as integral to the evolutionary process? These approaches raise the question of whether differences between humans and animals ought to be respected even while we regard animals and other forms of life as deserving moral consideration. As Michael Northcott has observed, ecotheology has a tendency to homogenize all life-forms and their moral claims to a degree that is unhelpful in terms of practical application. Imperatives to respect an alleged equal intrinsic value of all life-forms render real-world decision-making extremely difficult, if not impossible. How can all these claims be met without fundamentally altering the character of the natural world and the relationships that constitute it? Conversely, approaches that value capacities for rich experience and complex sentience may give ethical priority to organisms that share humanlike capacities without sufficient regard to the ecological context and evolutionary role played by less sentient or even nonsentient species. Too often ecotheological ethics seems inordinately concerned with the needs and the value of individual organisms at the expense of collective entities such as species and ecosystems. Because many of these ethical approaches grew out of paradigms initially directed toward human suffering and injustice, they may be ill suited to nature's realities. In this context, some ecophilosophers and ecotheologians, most notably Holmes Rolston (1988), have argued for different ethical duties toward human culture and domesticated life-forms on the one hand and native or wild species on the other. Rolston views natural suffering as an inherent and useful feature of evolutionary processes, not as an evil to be redressed by human ethics. Values inhere in and are generated by evolutionary processes themselves. But more work is needed to bring Christian environmental ethics and evolutionary, ecological science into meaningful dialogue.

BROAD IMPLICATIONS OF ECOTHEOLOGY

Ecotheology has the potential to have a significant impact on theology more broadly construed. Many of the questions raised by ecotheologians have profound significance for Christian theology as a whole: How is God to be defined; what are the core divine attributes? How does God relate to nature? How central is scripture to Christian ethics? Can Christianity remain Christ-centered without being overtly human-centered? How much can Christianity shift its focus to this world without losing its distinctiveness? There are no simple answers to these questions, and the answers given by some ecotheologians might be perceived as far too radical, or simply too abstract, for many practicing Christians. While ecotheology and religious environmental ethics now have a strong presence in academic departments and university course offerings, it is not clear how much impact this work has on Christian congregations or the public at large. However, a number of academic ecotheologians, such as Mary Evelyn Tucker and John Grim, who helped found the international and interreligious Forum on Religion and Ecology, are devoted to spreading the message outside the academy and around the globe. Grass-roots religious environmentalism and increasing activism even within evangelical and conservative circles may help bridge the gaps between the academic study of the religion-environment intersection and the behavior and beliefs of average Christians.

SEE ALSO *Bacon, Francis; Bible; Christianity; Descartes, René; Ecological Feminism; Paganism; Pantheism; Process Philosophy; Stewardship; White, Lynn, Jr.*

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Lisa Sideris

ECOTOURISM

Ecotourism is a relatively small sector of tourism, accounting for only 2 to 4 percent of international travel. It has aroused interest because it represents an attractive alternative to mass tourism that has transformed the social and ecological conditions of destinations throughout the world, but it also has stimulated controversy because many feel that it has not lived up to its potential as a more environmentally responsible form of travel. Ecotourism is a type of tourism that is founded primarily on a specific interest in the natural history of a region. It has been defined as "a sustainable, non-invasive form of nature-based tourism that focuses primarily on learning about nature first-hand, and which is ethically managed to be low-impact, non-consumptive, and locally oriented (control, benefits, and scale). It typically occurs in natural areas, and should contribute to the conservation of such areas" (Fennell 2007, p. 24).

Its core variables of sustainability, ethical planning and development, education, and a focus on community development and conservation make ecotourism different from the more broadly based but closely related nature-based tourism. Nature-based tourism, which includes an array of consumptive activities (e.g., hunting and fishing) as well as less consumptive activities (e.g., boating or four-wheeling), can be defined as any form of travel for the purpose of enjoying undeveloped natural areas or wildlife (Björk 2007).

ORIGINS

Ecotourism emerged from the ecodevelopment literature of the 1970s and was based on harmonization of social and ecological objectives, wise management of the environment, and the just treatment of individuals and communities. In the second half of the 1980s those ideas were crystallized as sustainable development (SD), a model for structural change within society. SD quickly entered the tourism lexicon, with a growing market of travelers who were dissatisfied with the mass tourism industry that by the 1980s had had an adverse effect on many of the most beautiful and sensitive regions of the world, harming communities and the natural world. Ecotourism as an alternative to mass tourism was designed to ensure that tourism policies no longer would concentrate on economic and technical necessities but would emphasize the demand for an unspoiled environment, the needs of local people, and the elimination of outside influences (e.g., external stakeholders) on decision-making powers.

Although the term was coined in the mid-1980s, *ecotourism* has actually been with us for much longer (e.g. the American Museum of Natural History has conducted natural history tours since 1953). Some of the popular destinations for ecotourism include protected areas in Costa Rica such as the Monteverde Cloud Forest Reserve, the Galapagos Islands of Ecuador, Iguaçu Falls, the Amazon basin, the Patagonian region of Argentina and Chile, Antarctica, hill tribe trekking in Southeast Asia, Ayers Rock and the Great Barrier Reef in Australia, the Milford Track in New Zealand, the Serengeti Plain, Kruger National Park in South Africa, and polar bear watching in Churchill, Canada. Ecotourism has thrived in all environments, including rain forests, mountain regions, polar areas, islands and coasts, deserts and grasslands, and marine regions. Practices in these and other ecotourism destinations include the watching of specific animal groups such as cetaceans, birds, and bears.

ANTHROPOCENTRIC AND ECOCENTRIC TOURISM

Many ecotourists desire a more "shallow," or anthropocentric, ecotourism experience; this can be characterized as a business-as-usual attitude toward the natural world in which nature is seen as a resource to be exploited to maximize human benefits, management decisions are based on utilitarian reasoning, and sustainability is viewed from a weak or very weak perspective. Far fewer ecotourists prefer a "deep," or ecocentric, ecotourism experience characterized by intrinsic value, small-scale development, community identity, community participation, and the notion that materialism for its own sake is wrong (Acott, LaTrobe, and Howard 1998). The shallow approach has been criticized for valuing nature and natural resources far less than its counterpart, in which more consumptive practices have been included within ecotourism. For example, moose hunting in Sweden has been referred to as ecotourism when certain cultural and social aspects are taken into consideration (e.g. sustainable harvests). In other cases, billfishing (sport fishing for marlin and sailfish) has been referred to as ecotourism because it directs economic assistance to the local community and has economic advantages over other uses.

Theorists argue that such activities cannot be ecotourism because of (1) the intention to catch the animal (ecotourism should be about minimum disturbance in all cases); (2) the pain and stress that result from catching

Monteverde Cloud Forest Reserve, Costa Rica. *A man stand on a hanging bridge overlooking the rain forest in the Monteverde Cloud Forest Reserve, one of the most popular destinations for ecotourism vacations. The premise of ecotourism is to provide a more environmentally responsible form of travel. It is differentiated from nature-based tourism because of its emphasis on sustainability, ethical planning and development, education, and community development and conservation.* **JERRY DRIENDL/THE IMAGE BANK/ GETTY IMAGES.**

the animal; (3) consumptiveness (catch-and-release practices may be viewed as consumptive); and (4) values, such that ecotourists have a different set of values in relation to sport and the intrinsic and extrinsic motivations surrounding participation in those activities. It follows that the treatment of animals cannot be based on healthy populations (i.e., it is acceptable to catch animals because of the healthy state of the population) but that respect must be shown to the individuals that constitute those populations (Fennell 2000).

The development and use of weak ecotourism definitions thus has opened the door to a great deal of misrepresentation and the prospect of anthropocentric values superseding ecocentric ones. The rationale for including activities such as hunting and fishing under the ecotourism umbrella is not clear. One hypothesis is that the ecotourism label offers those activities social acceptability in the face of declining participation. Accordingly, the best way to increase participation is to make an activity more socially acceptable through normative measures related to sustainability and ethics (i.e., catch and release or contributions of meat, skins, bones, and ivory to local people for commercial reasons).

RESPONSIBLE TOURISM

One way to ensure that ecotourism lives up to its reputation as a more ecocentric form of tourism is through the emerging concept of responsible tourism, which emphasizes the fair distribution of benefits to local people and the safeguarding of the natural world. Responsible tourism is not a form of tourism but rather a way of practicing tourism. Taking a Kierkegaardian view of responsibility, this means having ecotourism stakeholders exercise the will to move beyond a focus on the aesthetic realm of life (the focus on the bodily, temporal, finite, and necessary) through an effort to know the self better by searching for the authentic self in reaching for a higher ethical existence (Fennell 2008). It is a lack of understanding of the self, Søren Kierkegaard would argue, that predisposes people

to acts of irresponsibility (a lack of appreciation of others or other things that leads to impacts, in the tourism vernacular).

By demonstrating a willingness to choose for nature and for others, people can step outside of instrumental rationality—the crowd or horde mentality—in which actions are deemed worthy as a function of what Heidegger termed the calculative mind-set: People value nature and the world in general on a functional level on the basis of efficiency, productivity, technology, and short term cost-benefit calculations. However, by first understanding themselves—not only their internal conflicts but also how they as individuals fit into the complex web of life—people may be able to respond to the needs of others. Collectively, this emerging ecotourism community of responsible individuals may begin to agitate against dominant instrumental values and codes of practice in making the prevailing social order of tourism more responsive to entities they should protect instead of exploit.

SEE ALSO *Environmental Philosophy: V. Contemporary Philosophy; Sustainable Development.*

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David A. Fennell

EHRLICH, PAUL
1932–

Paul R. Ehrlich was born in Philadelphia on May 29, 1932. His pioneering research contributions and public outreach have made him one of the world's best-known public scientists, opening and informing discussion of environmental values and policy. As the author of *The Population Bomb* (1968), he brought world demographics to the forefront of environmental discourse. In addition to overpopulation, he has publicly addressed overconsumption and human migration; racial, gender, and economic equity; the ecological effects of nuclear war; and the importance of ecosystem services to humanity. With his spouse Anne and colleague John Holdren, in the 1970s he produced a series of classic books and research papers (culminating in the text *Ecoscience* [1977]) that shaped the entire area of environmental science and policy.

Ehrlich's involvement with ethical issues began in the mid-1950s, when he and H. Ralph Barr led a successful effort to desegregate the restaurants of Lawrence, Kansas (where Ehrlich was a graduate student). In the course of analyzing the role of population growth in environmental deterioration, he was led to consider a complex of ethical issues, many of which remain contentious: Is it ethical for a rich person to have more than one or two children, in view of the pressure that consumption by those children is likely to place on human life-support systems? How should the welfare of future generations be considered in such calculations? Do individuals have a right to have as many children as they want, or are social considerations (including the fate of those children) a more important consideration? Under what circumstances can a woman ethically have an abortion? What are the responsibilities of rich nations to help poor nations develop and preserve their natural capital, a fundamental basis of human well-being? How should blame for carbon dioxide emissions be apportioned? Does a nation such as the United States have the right to invade an oil-rich country to gain access to oil to support what Ehrlich considered environmentally disastrous overconsumption?

Often in collaboration with Anne and other colleagues (especially economists), Ehrlich brought these and many other ethical and scientific issues to the general public in some 40 books (such as *The End of Affluence* [1974], *The Population Explosion* [1990], *The Stork and the Plow* [1995], *Human Natures* [2000], *Wild Solutions* [2001], and *One with Nineveh* [2004]), over 900 articles, and numerous public appearances (hundreds of lectures and thousands of radio and TV shows, including 20 appearances on Johnny Carson's *Tonight Show*).

Ehrlich's best-known scientific work was his founding (with Peter H. Raven) of the field of coevolution. Ehrlich and Peter H. Raven's classic paper on coevolution (1965), possibly the most significant research at the interface of ecology and evolution since Darwin's *Origin of Species*, spawned dozens of books and thousands of articles. This area of research is important to issues concerning the preservation of biodiversity, since biologists now look to ways to conserve not just species but also coevolving sets of species.

Ehrlich's nearly fifty-year long investigations of the structure, dynamics, genetics, ecology, food-plant coevolution, and conservation of Checkerspot and other

butterflies—as summarized in *On the Wings of Checkerspots* (2004; edited with Ilkka Hanski)—has become a paradigm of using a model system to understand the basic functioning of natural systems. Partly based on these studies, Ehrlich and several colleagues founded the now exploding discipline of conservation biology. These are only part of Ehrlich's scientific contributions. His work has ranged widely: from the procedures and philosophy of taxonomy, the evolution of DDT resistance in fruit flies, and the behavior and ecology of birds and reef fishes, to the effects of crowding in human populations. His most recent area of research has been into the mechanisms of human cultural evolution, especially the evolution of norms and ethics.

Ehrlich has increasingly claimed that the major scholarly input on environmental issues should switch from the domains of natural sciences to social sciences and philosophy. He has stated that more than enough is known about the science of the human predicament to start taking ethically appropriate actions; the problem lies in getting those actions taken. In support of that view, he and former Stanford University President Donald Kennedy urged that a millennium assessment of human behavior be undertaken to see if the necessary cultural changes could be initiated.

For his efforts, Ehrlich has received numerous awards and honors, including the Crafoord Prize of the Royal Swedish Academy, an explicit substitute for the Nobel Prize in areas where the latter is not offered.

SEE ALSO *Conservation; Conservation Biology; Environmental Policy; Population.*

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Gretchen C. Daily

EMERSON, RALPH WALDO

1803–1882

Ralph Waldo Emerson was born in Boston, Massachusetts, on May 25, 1803, and educated at Harvard College and Harvard Divinity School. In 1832 he resigned his ministerial pulpit, having lost faith in Christian doctrine and being eager to pursue a career as a writer instead. After his move to Concord, Massachusetts, in 1835 and with the publication of *Nature* in 1836, Emerson emerged as a central figure in the American Transcendentalist movement.

Emerson's transcendentalism enabled him to pursue a spiritual life despite his distaste for Christian orthodoxy and his religious skepticism, the latter encouraged by modern science. He sought to confirm his intuitions about the vital relationship of the spirit to nature by reading the work of Romantic poets like William Wordsworth and exploring the idealist philosophical tradition culminating in the work of Immanuel Kant. However, Emerson knew Kant's work largely at second hand and was never a systematic student of philosophy, much less a systematic philosopher. Nor was he ever a disciplined natural historian, despite his lifelong enthusiasm for plants, birds, and unspoiled landscapes.

Emerson's lack of interest in philosophy as a system (as a search for valid premises, a painstaking justification of belief, and the like) is evident in his essays, especially in the seemingly carefree way in which he contradicts himself. However, this self-contradiction is arguably both a weakness and strength of his work. According to Emerson, "A foolish consistency is the hobgoblin of little minds, adored by little statesmen and philosophers and divines" (2003 [1841], p. 265). Those looking to *Nature* for a vision of the earth that may lead them to greater environmental awareness, for example, will find some statements dismaying and others inspirational. His idealism leads Emerson to suggest that nature, which is impermanent and mutable, is less real than ideas, which are eternal. He calls nature a "great apparition," "the vehicle of thought," "the symbol of spirit," and "an appendix to the soul" (1983 [1844], pp. 7, 20, 37). All this would

seem to hobble environmental thinking from the outset, as would the statements that nature is "made to serve" (1983 [1844], p. 28) and that "all the facts in natural history taken by themselves, have no value, but are barren, like a single sex" (1983 [1844], p. 21). Statements like these have led some critics to dismiss Emerson as a booster of American expansion and enterprise, and as an idealist of an objectionable kind—one who dismisses the natural world as merely phenomenal and illusory.

However, Emerson also writes in *Nature* that he has "no hostility to nature, but a child's love to it. I expand and live in the warm day like corn and melons" (1983 [1844], p. 38). And his later essays (on a wide variety of topics) are punctuated by similar evocations of the delight he took in sensual, earthly life. There thus seems to be a fault line running through Emerson's thinking on the subject of nature, one perhaps best explained by his willingness, despite his distrust of criticism, to think critically and therefore negatively about all subjects, including his own pet themes. Supporting this suggestion is Emerson's statement in his 1844 essay "Nature" that one can "hardly speak directly" of nature, especially landscape, "without excess." He adds, "It is as easy to broach in mixed companies what is called 'the subject of religion,'" and suggests that nature worship, unchecked by doubt and unguided by the critical faculty, results in false "euphuism" or purple prose (1983 [1844], p. 545).

In view of the paradoxical character of the thoughts expressed in his essays, Emerson seems to be a writer who does not think contradictorily but instead thinks deliberately *through* (or *about*) contradictions. This does not mean, however, that he tries to resolve them. In 1844, again in "Nature," he raises the skeptic's question "Are we tickled trout, and fools of nature?" (1983 [1844], p. 553), only to answer it, once again, in idealist terms. "The world," he concludes, "is mind precipitated" (1983 [1844], p. 555). So it is unsurprising that opinion of Emerson's place in the history of American environmental thought is evenly divided, some readers believing his philosophical idealism ultimately disqualifies him as an environmental thinker, and others taking delight in the tensions and apparent contradictions of his writing and arguing that his heart was, after all, in the right place.

It should be noted that Emerson served as a mentor to Henry David Thoreau, author of *Walden* (1855), taking long daily walks with him in the woods of Concord and encouraging him to write about the natural world. Emerson's essays also inspired John Muir, founder of the Sierra Club. However, Emerson came to feel that Thoreau had frittered his life away in the study of natural history. Ironically, Emerson himself was something of a disappointment to Muir when they met on a camping trip in California in 1871, as his enthusiasm for wilderness was no match for Muir's own. Hence, Emerson's contributions, both direct and indirect, to the development of American thought about nature, while indubitable, remain debatable.

SEE ALSO *Muir, John; Romanticism; Sierra Club; Thoreau, Henry David; Wordsworth, William.*

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Dana Phillips

ENDANGERED SPECIES ACT

The Endangered Species Act (ESA) is widely regarded as the United States' strongest environmental statute. It has been both touted and condemned as "the pit bull of environmental law." The act dates from the foundational period of modern environmental law in the United States—a time when the National Environmental Policy Act, the Clean Air and Clean Water Acts, and the Marine Mammals Protection Act were all adopted, and when a

new cabinet-level department, the Environmental Protection Agency, was created to safeguard nature.

The period can be dated from February 1965, when President Lyndon Johnson sent a lengthy message to Congress urging it to join him in forging a ''new conservation.'' Technology and growth, he wrote, ''have a darker side'' that imposes a responsibility to preserve and restore ''the beauty of our country'' as a means of conserving ''not just man's welfare but the dignity of man's spirit'' (Johnson 1966, pp. 155–156).

The following year Congress enacted the first endangered species act, the Endangered Species Preservation Act of 1966. The statute's first section echoed Johnson's message: ''One of the unfortunate consequences of growth and development in the United States has been the extermination of . . . native species.'' Despite Congress's assertion that the purpose of the act was ''to provide a program for the conservation, protection, restoration, and propagation'' of species ''threatened with extinction'' (sec. 1(a)), the Endangered Species Preservation Act established at best a very modest program of habitat acquisition. Three years later Congress amended and renamed the act the Endangered Species Conservation Act. This more comprehensive but still limited act regulated foreign commerce in species listed by the secretary of the interior as ''threatened with worldwide extinction'' (sec. 3).

A broad consensus quickly developed that the Endangered Species Conservation Act was also inadequate to the task at hand. In his 1972 environmental message, President Richard Nixon wrote that federal law ''simply does not provide the kind of management tools needed to act early enough to save vanishing species''; he proposed that legislation be enacted that ''would permit protective measures to be undertaken before a species is so depleted that restoration is impossible'' (1972, pp. 223–224). Representative John Dingell offered a similar analysis when he introduced the bill that became the Endangered Species Act of 1973: ''The existing laws are sound, as far as they go, but later events have shown that they do not go far enough'' (1973, pp. 162–163). The new statute again echoed Johnson's language: ''Various species of fish, wildlife, and plants . . . have been rendered extinct as a consequence of economic growth and development untempered by adequate concern and conservation'' (ESA, sec. 2(a)(1)). Despite its current status as a lightening rod, the Endangered Species Act was among the least controversial bills enacted by Congress in 1973. The Senate passed the legislation without a dissenting vote, and the House of Representatives adopted it by an overwhelming vote of 355 to 4.

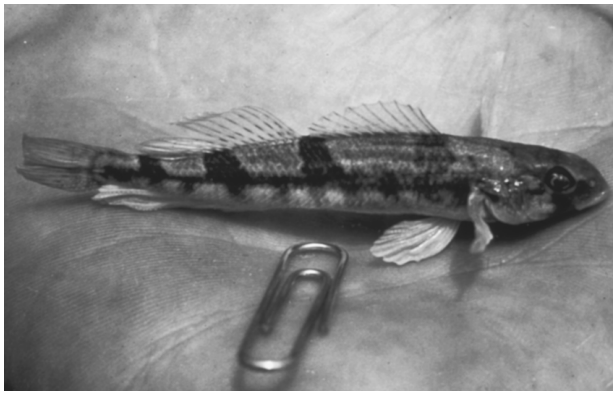
The values underlying this consensus—that preservation and restoration are a responsibility that the current generation has to the future because what is at risk is irreplaceable—are captured in an analogy from the *House of Representatives Report* on the bill:

> A certain humility, and a sense of urgency seem indicated. . . . One might analogize the case to one in which one copy of all the books ever printed were gathered together in one huge building. The position in which we find ourselves today is that of custodians of this building, and our choice is between exercising our responsibilities and ignoring them. If these theoretical custodians were to permit a madman to enter, build a bonfire and throw in at random any volume he selected, one might with justification suggest that others be found, or at least that they be censored and told to be more careful in the future. So it is with mankind. Like it or not, we are our brothers' keepers, and we are also keepers of the rest of the house. (1973, pp. 4–5)

CONTENT

The 1973 act mandated two types of actions to preserve and restore species: risk assessment and risk management. The federal fish and wildlife agencies charged with implementing the act (either the Fish and Wildlife Service in the Department of the Interior or the National Marine Fisheries Service of the National Oceanic and Atmospheric Administration in the Department of Commerce) are directed to assess the risk of extinction that a species faces by evaluating whether it is ''endangered'' (that is, ''in danger of extinction throughout all or a significant portion of its range'' [ESA, sec. 3(6)]) or ''threatened'' (that is, ''likely to become an endangered species within the foreseeable future throughout all or a significant portion of its range'' [ESA, sec. 3(20)]). If the agency concludes that the species is either endangered or threatened, it is listed—an action that triggers the act's risk-management actions. Actions of this second type are either extinction-prevention or recovery actions.

Extinction-prevention actions prohibit activities that threaten the continued existence of listed species. Section 7 requires any federal agency that proposes an action (including funding or permitting private action) to consult with the relevant federal wildlife agency to ''insure that [the] action . . . is not likely to jeopardize the continued existence'' of the species or ''result in the destruction or adverse modification'' of the species' critical habitat (ESA, sec. 7(a)(2)). Section 9 prohibits any person (broadly defined to include governmental and business entities [ESA, sec. 3(13)]) from taking (broadly defined to include harassing and harming [ESA, sec. 3(19)]) or engaging in commerce involving an endangered species (ESA, sec. 9(a)(1)). Section 11 contains civil and criminal penalties applicable to violations of these prohibitions.



Snail Darter. *The fish, declared an endangered species in 1975, became an icon for the effects of the Endangered Species Act. The discovery of the Snail Darter interrupted an expensive Tennessee dam project, and the decision to classify the fish as endangered was finally decided in the Supreme Court, remaining one of the earliest and most important environmental law cases. The Snail Darter's classification was later reduced to a threatened species.* **U.S. FISH AND WILDLIFE SERVICE.**

The second group of risk-management actions comprise recovery actions. This group was largely ignored in the 1973 act, arguably because the drafters believed that extinction-prevention actions would suffice to preserve and restore at-risk species. The only recovery action mandated in the act was the obligation of all federal agencies to "utilize their authorities in furtherance of the purposes of this Act by carrying out programs for the conservation of [listed] species" (ESA, sec. 7(a)(1)).

The drafters of the statute thus envisioned a linear process: When a species is determined to be sufficiently at risk of extinction, it is listed as either threatened or endangered. After listing, the species is protected from actions that jeopardize its existence. With this protection, the species rebounds because threats have been removed, and it can then be delisted. Implementation of the act over the past thirty-plus years has demonstrated that preservation and restoration of at-risk species is far more complicated.

IMPLEMENTATION AND AMENDMENTS

Implementation of the act—the political and institutional interactions of Congress, the agencies charged with its administration, the courts, and the competing public interests—have also complicated the initial clarity of the statute's values. The *first* Endangered Species Act of 1973, the one just outlined, was a remarkably rare legislative creature. Eschewing the normal balancing of interests, Congress enacted a "prohibitive policy" (Yaffee 1982) that reflected a simple ethical conclusion: The preservation of other species is a moral imperative that takes precedence over other societal goals. The breadth of the Endangered Species Act and its moral force set it apart from other wildlife conservation statutes, and turned the snail darter into the urban myth of the little fish that stopped the big dam. In *Tennessee Valley Authority v. Hill*, the Supreme Court held that Congress meant what it said:

> One would be hard pressed to find a statutory provision whose terms were any plainer than those in section 7 of the Endangered Species Act. Its very words affirmatively command all federal agencies "to *insure* that actions *authorized, funded,* or *carried out* by them do not *jeopardize* the continued existence" of an endangered species or "*result* in the destruction or modification of habitat of such species . . ." (p. 173).

"This language," the court concluded, "admits of no exception."

The broad, bipartisan consensus on the importance of environmental protection that produced the Endangered Species Act began to crumble in the late 1970s—a victim of the growing mistrust of government and its solutions that began with the Vietnam War and was heightened by Watergate, of the systemic economic changes caused by the war's inflation and the oil embargo of the Organization of the Petroleum Exporting Countries, and of the growing attacks on environmental protection by industry-funded groups such as the Sagebrush Rebellion. *Tennessee Valley Authority v. Hill*, decided in 1978, fed into these developments, and the Endangered Species Act suddenly became the statute that was going to shut the country down, or so its opponents branded it.

The Supreme Court's decision presented Congress with a dilemma: Endangered species were a powerful political symbol, but public-works projects are central to congressional politics. There were three positions in the ensuing congressional debates. The sponsors of the bill eventually adopted—Senators Howard Baker (Rep., Tennessee), John Culver (Dem., Iowa), Jennings Randolph (Dem., West Virginia), and Malcolm Wallop (Rep., Wyoming)—argued that increased flexibility was needed. Although "in the vast majority of cases" the existing process had been successful in resolving conflicts between preservation and development, there were situations, they argued, "in which a Federal activity, if it is to achieve its stated purpose, simply cannot avoid a direct impact to a species or its critical habitat." There thus was a need for a mechanism to resolve these uncommon, unresolvable conflicts. Their bill established a cabinet-level Endangered Species Committee (the "God Squad") empowered to exempt agency actions from the act's prohibitions.

There were two groups of opponents to this proposal: those who felt that the amendments did not go far enough and those who thought no changes were needed. The advocates of fundamental change supported an amendment offered by Senators John Stennis (Dem., Mississippi), Jake Garn (Rep., Utah), James Eastland (Dem., Mississippi), Orrin Hatch (Rep., Utah), Paul Laxalt (Rep., Nevada), Milton Young (Rep., North Dakota), Carl Curtis (Rep., Nebraska), and Barry Goldwater (Rep., Arizona) that would remove the act's categorical prohibition by authorizing the agency proposing the harmful action to balance the competing interests. These senators rejected the Endangered Species Act's fundamental policy that all species of plants and animals were entitled to protection, and their rhetoric disparaged "useless," "esoteric," and "insignificant" species. Quoting Genesis, Senator William Scott (Rep., Virginia) argued, "People should have dominion over fish, wildlife, and plants. Only where the lower species are of benefit to mankind are they important." These senators believed that ultimately a utilitarian calculus was the appropriate measure for resolving all conflicts, that "considerations of convenience and comfort . . . should take precedence" over the preservation of species. Their amendment was rejected by a vote of 76 to 22.

Although it is common to speak of the Endangered Species Act of 1973, the act has been changed substantially since its enactment. The 1978 amendments created the *second* Endangered Species Act of 1973. In addition to adding the God Squad, Congress also amended the listing process—or, more accurately, burdened it—by substantially increasing its procedural complexity and also specifying that listings not completed within two years were to be withdrawn. The consultation procedures were also substantially expanded (and complicated). The slightly more than 100 words in the original section became the first subsection of a new section that expanded to fill nearly eight pages in *Statutes at Large*.

Congress also amended the risk-management side of the act by adding a requirement that the appropriate wildlife agency develop a recovery plan for listed species. This requirement reflected the emerging understanding that recovery requires more than simply removing threats. It also requires restoration of the conditions a species needs to thrive.

The 1978 amendments focused largely on procedure. What had been a relatively simple statute was transformed into a procedurally complex one. Courts are required to defer to substantive decisions of agencies, the principle of judicial deference. As one court put it, "In this case, . . . a federal judge sitting in Washington, D.C., is asked to speculate on whether there are any grizzly bears in a portion of Montana and whether holes drilled into a mountainside will frighten those bears away. That is not a task judges are equipped to perform, and, in any event, it is not a task they should perform" (*Cabinet Mountain Wilderness v. Peterson*, pp. 1190–1191). Judicial deference does not, however, extend to agency decision-making procedures. As a result, procedural complexity increases the likelihood that the agency's decision will be reversed for a procedural misstep. By modifying its procedures, Congress restructured the act without modifying its substantive standards. In the process, the statute's original prohibitive stringency was substantially softened. The most significant changes to the act were produced by the 1982 amendments, which resulted in the *third* Endangered Species Act of 1973. The dominant concern in 1982 was discretion. The detailed, time-consuming procedures added in 1978, particularly when coupled with the Reagan administration's (1981–1989) emphasis on economics, especially cost-benefit analyses, had effectively stalled listings. As a result of the two-year time limit imposed in 1978, the Fish and Wildlife Service withdrew proposals to list 1,876 species in December 1982. Moreover, the fact that James Watt, Reagan's secretary of the interior, was openly hostile to preservation of endangered species (Snow 1996) was a concern for Congress. In response, Congress moved in more than one direction.

First, the 1982 amendments restricted the secretary's discretion by specifying that the listing determination was to be made "solely on the basis of the best scientific . . . data available" (ESA, sec. 4(b)(1)(A)); economics are not to be considered in determining whether a species is biologically at risk. Section 4 was also amended to restructure the listing procedure into a three-step process, with specific deadlines for each step. These steps were intended to get the secretary back in the business of listing species.

Second, Congress also added new provisions that relaxed the strictness of the substantive requirements. Most significantly, the act was amended to permit "incidental take" of listed species. For actions requiring consultation under section 7 (actions that have some federal involvement, such as issuing permits), Congress added a provision authorizing the wildlife agencies to include an "incidental take statement" that permitted the take of listed species as long as the action would not jeopardize the species' continued existence (ESA, sec. 7(b)(4)). Under section 10, Congress also established an incidental-take-permit process that authorized the issuance of permits if the secretary found that the take would not "appreciably reduce the likelihood of the survival and recovery of the species in the wild" (ESA, sec. 10(a)(2)(B)(iv)). These provisions effectively authorize the killing of endangered species if the killer has a permit (Ruhl 1999). This is an all too common legislative tool. The Clean Water Act, for example, makes it illegal to discharge a pollutant into a body of water—unless the discharger has a permit to do so.

Since 1982 Congress has played a more limited role in the evolution of the Endangered Species Act. In 1988,

The Mexican Wolf (*el Lobo*). *The species, endemic to northern Mexico and the southwestern United States, was declared endangered in 1976 following a period of intense eradication by hunters and trappers. Efforts have since been made to reintroduce the Mexican wolf to the wild.* PHOTO BY JIM CLARK/U.S. FISH AND WILDLIFE SERVICE.

for example, it amended the act by expanding the provisions on recovery planning and adding a section on candidate species. Yet the most significant congressional actions have been those least likely to attract attention. Congress has slowly starved the wildlife agencies by denying them funding to fulfill their statutory obligations (Miller et al. 2002).

With Congress unable to muster majorities to amend the act since 1988, actions by the wildlife agencies have been the primary source of change. The *fourth* Endangered Species Act of 1973 was a result of the Clinton administration's (1993–2001) response to Republican congressional victories in 1994 and the hostility to the act reflected in several bills that would have fundamentally reduced protection for at-risk species. Secretary of the Interior Bruce Babbitt sought to "save" the Endangered Species Act through a series of "incentive-based strategies to try and reconcile endangered species conservation with economic development" (Berry 1998). The centerpiece of this initiative was a series of permits created to provide private landowners with assurances that the Fish and Wildlife Service would impose no additional restrictions on the landowner—the no-surprises policy. Although the permits—Habitat Conservation Plans, Candidate Conservation Agreements, and Safe Harbor Agreements—varied in detail, they were intended to make the Endangered Species Act more developer-friendly by balancing two competing goals: flexibility (to adapt to changing biological circumstances and new information) and certainty (to allow the permittee to make economic decisions). Of course, certainty for developers comes at some expense in preservation and restoration.

During the George W. Bush administration (2001–2009), formal administrative modifications of the act gave way to refusal to implement the act except when forced to do so by court order. For example, fewer species have been listed in the nearly eight years of that administration than the average annual listing during the George H. W. Bush administration (1989–1993) (Eilperin 2008). The agency has also been forced to relist species (including wolves and bald eagles) that it had delisted (see, for example, *National Wildlife Federation v. Norton* and *Defenders of Wildlife v. Norton*).

ASSESSMENT

This, then, has been the evolution of endangered-species preservation since 1966. The act has been buffeted by forty-plus years of politics. At this point, what values remain? Most fundamentally, the act is a statement that our species has an obligation to consider the impact of our actions on the other species with whom we share this planet. However, this statement no longer "admits of no exception" (*Tennessee Valley Authority v. Hill*). It has been qualified and limited. It has also been quietly desiccated by Congress's failure to fund, by administrative willingness accommodate habitat destruction, and by judicial deference to administrative expertise. Yet something still remains of Johnson's original goal of preserving and restoring nature as a means to enhancing the "dignity of man's spirit" (Johnson 1966, p. 156)—the noble statement that our species has an obligation to limit its impact on nature.

SEE ALSO *Biodiversity; Conservation Biology.*

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Dale D. Goble

ENERGY

An enormous release of energy, the Big Bang, is credited with beginning the universe as we know it some 14 billion years ago. The general trend of energy since then has been toward dispersal, which increases the condition known as entropy. Because energy can perform work only when it is concentrated, complete entropy (uniform energy levels throughout the universe) would entail complete stasis.

Usable energy on the earth derives mostly from the sun, in which the nuclei of hydrogen are fused to form helium. In addition, energy also comes from nuclear fission, ocean tides, and the molten core and mantle of the earth, which is still dispersing energy, sustained by the decay of radioactive elements, after more than 4 billion years of the earth's cooling.

Life on the earth depends on energy and delays the process of entropy. Living organisms use the energy of the sun and of the earth's core to create large molecules, whose energy can be released later through oxidation. The sun's radiant energy is converted to chemical energy through the process of plant photosynthesis.

The pioneer ecologist Aldo Leopold compared an ecosystem to a fountain of energy. At the bottom of the fountain, green plants capture the energy of the sun through photosynthesis. All animals get their energy ultimately from these green plants, some animals eating plants directly, others consuming the energy of plants indirectly by eating animals. Fungi get their energy by breaking up the complex organic molecules of dead organisms. The biological material produced in these ways is called biomass. Unoxidized biomass can become stored over millions of years with its chemical energy intact. Such stored forms of biomass are fossil fuels and include coal, oil, and natural gas.

HISTORY OF HUMAN CONSUMPTION OF ENERGY

At the dawn of human existence, the only energy people controlled was from the food they consumed. Early in the course of human evolution—no one knows exactly when—people domesticated fire to warm themselves, cook their food, and enhance their hunting and gathering. About 10,000 years ago, people began dramatically to increase their access to energy by developing agriculture, a human intervention in ecosystems designed to promote the growth of plants suitable for human consumption. Some 7,000 years ago, people began using draft animals, thereby controlling the energy those animals had available through their food intake. People started obtaining energy from flowing water about 3,000 years ago, when watermills came into use. In 1185 the first practical windmill was used.

Water power depends largely on the sun's energy to evaporate water and move water vapor to higher elevations, where it condenses and falls as water. The sun generates wind through differentials in temperature and air pressure. In addition to the sun's energy, the earth's rotation affects prevailing winds. The attraction of the moon, combined with the earth's rotation, produces moving water in the form of ocean tides.

The stage was set for widespread use of coal, a fossil fuel, when the first practical steam engine was developed and then improved in 1698 and 1721. The first sustained production of electricity took place in 1831. Electricity is a form of energy but not a source of energy. It can be produced from such sources as moving water, fossil fuels, sunlight, and nuclear fission. The first controlled nuclear fission took place in 1942.

By the early twenty-first century, the main sources of nonfood energy being used by human beings were the fossil fuels—coal, oil, and natural gas—as well as hydropower and nuclear power. All of these were used to generate electricity, but oil was used primarily for transportation, and natural gas largely for heating, although its role in electricity generation is increasing. In 2005 humanity used nearly 70 BBOEs (billion barrels of oil or equivalents), about half of it in oil.

ENERGY CONCERNS OF THE EARLY TWENTY-FIRST CENTURY

Energy concerns of the early twenty-first century are about diminished supplies and the environmental disruption

Coal Basin near Wright, Wyoming, 2003. *Huge trucks loaded with coal from the Black Thunder Mine can carry from 240 to 360 tons. Unlike other natural resources, coal remains abundant. It has been used to create synthetic gasoline, and can also be converted to electricity.* **AP IMAGES.**

and pollution that result from obtaining and using these supplies. The most immediate worry about diminishing supplies concerns petroleum, since there is good evidence that, regardless of whether environmentally controversial drilling in Alaska and other locations is allowed, annual worldwide production will peak in the first two decades of the twenty-first century. Annual production of natural gas is expected to peak two to five decades later. The enormous reliance of industrial countries on these two fossil fuels and their dramatically increased use in China, India, and some other developing countries raise fears of economically crippling shortages as annual supplies remain steady or decline while demand continues to increase. The result could be economic depression or international violence.

Coal and uranium (the main fuel in the nuclear generation of electricity) remain abundant, although most uranium ore may be of such poor quality that it would require more energy to mine and refine than it would produce. Resource optimists, often called cornucopians, believe human ingenuity will forestall shortages as increasingly clever methods of discovery and extraction make new supplies available. For example, coal has been used to create synthetic gasoline, and oil may become available through extraction from tar sands in Venezuela and Canada, which are said to contain 3,000 BBOEs of oil. Pessimists about oil claim that producing synfuels is horribly polluting and too expensive to be economical. Even worse is extracting oil from tar sands, which has been compared to separating tar from sand after they have been mixed in a sandbox.

Apart from considerations of supply, using coal and tar sands is controversial owing to additional concerns about pollution, especially the release of carbon dioxide, which contributes to global climate change. Burying or chemically sequestering the carbon dioxide released when coal is burned to generate electricity may be possible in

the near future. Currently, coal in coal-fired electricity-generating plants is pulverized before being burned. If it is gasified instead, it may be possible to bury or chemically sequester the carbon dioxide so that it never enters the atmosphere.

Nuclear power has never been commercially viable without huge government subsidies. In addition, mining uranium releases unhealthy radiation; nuclear power plants are potential terrorist targets; reprocessing the products of fission risks the proliferation of nuclear weapons; and nuclear waste threatens future generations.

The prospects for additional power from falling water are poor because most sites suitable for hydropower are already being exploited and many unwanted environmental problems result from interrupting a river's flow. These include the erosion of deltas, the silting up of lakes, the spread of disease, and the interruption of fish migrations.

Because problems of supply and/or environmental degradation attend the use of power sources dominant at the beginning of the twenty-first century—coal, petroleum, natural gas, falling water, and nuclear fission—environmentalists propose two different but complementary strategies: increased efficiency to reduce demand and commercial development of more earth-friendly sources.

With continuing efforts to improve automotive gas mileage, replace automobile use with public transportation, install compact fluorescent light bulbs, insulate houses better, and require more efficiency in household appliances and air conditioners, efficiency had increased in most developed countries by the beginning of the twenty-first century, and less energy was consumed per unit of gross domestic product. For additional energy savings, electricity-generating plants can be located close to industrial and residential consumers of heating and air conditioning so that waste heat from electrical generation can be used for heating and air conditioning. Such trigeneration can more than double efficiency.

Because society bears much of the cost of current energy use—costs associated, for example, with illnesses produced by pollution, environmental dislocations caused by global climate change, and military interventions needed to secure petroleum supplies—considerable public effort and expense to increase efficiency are warranted by cost-benefit analysis. These include mandating higher efficiency standards and giving tax credits for trigeneration and for installation of energy-saving devices.

The same cost-benefit considerations warrant government support for more earth-friendly sources of energy. Many ideas and projects are aimed at producing electricity. For example, electricity generation by wind turbines increased worldwide by 29 percent per year around the turn of the twenty-first century. In 2005 Germany produced 6 percent of its electricity in this way. Government support of this technology in the United States and elsewhere includes tax credits for installation of wind turbines and mandates for net metering. Under net-metering mandates, electric utilities buy wind-turbine-generated electricity or credit the electric account of wind-turbine owners to the extent that their wind turbines supply power to the electricity grid.

Environmental controversies regarding wind turbines center on two matters. One is concern that turbines, like tall buildings, interfere with bird migrations. The other is the aesthetic objection to the introduction of turbines in beautiful landscapes and seascapes. The turbines can be 300 feet or more in height and visible from afar.

SOLAR ENERGY

Wind is an indirect form of solar energy because, as the sun heats the atmosphere more at the earth's equator and less at the poles, convection currents are created in the air. Direct solar energy also has much potential. Every forty-five minutes, the energy reaching the earth from the sun equals humanity's total annual use of power. Solar energy has long been used in warm climates to heat water in residential homes; about 40 million homes are thus served worldwide. Solar energy can also be used for home heating. South-facing houses in cool climates can be designed to capture sunlight through windows in winter and, with appropriate overhangs, to avoid direct sunlight in summer when the sun is higher—designs that can meet some heating and cooling needs. This is passive solar heating. The most efficient active solar-heating systems use sunlight to heat water or another liquid, which is then piped through a slab floor that stores and radiates the heat. Such water- and space-heating systems seldom meet all heating requirements.

Solar energy as well is used to generate electricity. One method heats water on an industrial scale to make steam, which turns an electrical turbine. Mirrors concentrate the sun's energy on a tower that contains the water. In addition, through the photovoltaic process, sunlight directly generates electricity when it falls on certain types of silicon chips. This source of power is already widely used in small electronic devices, such as calculators and watches, as well as in extraterrestrial exploration, including the International Space Station. But it can seldom provide all the electricity needs of a home, because sunshine is intermittent and battery storage devices are expensive. As with electricity generated by wind turbines, photovoltaic energy is most helpful and cost-effective when integrated into the electricity grid through net metering. This eliminates the problem of electricity storage. Electricity generated by wind and sun is still more expensive for consumers than that generated by coal-powered plants

because the latter are not required to internalize the costs of (pay for) all the negative environmental impacts that the former avoid. It is unknown which would be more expensive if each system had to pay for all its true costs.

A more visionary project uses the sun's energy to separate hydrogen from oxygen in water in the process of electrolysis. This could be done on an enormous scale in sun-rich areas, such as the American Southwest. The resulting hydrogen could be piped around the country using a distribution system already in place for piping natural gas. Where needed to produce electricity, this hydrogen could be combined again with oxygen—burned, in a word—with water being the only waste product. Electric power generated in this manner could be used for all purposes, including transportation when hydrogen fuel cells are improved.

ENERGY FROM BIOMASS

Energy from biomass (not including fossil fuels) can be environmentally friendly because it is carbon-neutral: The carbon released by burning biomass is equal to that absorbed by plant growth to produce the biomass. However, biomass can never entirely replace other sources of energy, because the world's annual energy consumption already equals 22 percent of worldwide annual plant growth. Still, biomass can contribute to meeting the world's energy needs and currently supplies 3 percent of U.S. energy use, surpassing hydropower.

Much biomass is used for heating. Wood stoves made of iron or masonry are increasingly efficient and clean burning. Biomass is also used to generate electricity. Agricultural waste, wood chips, wood pellets, and switchgrass (a hardy perennial grass) can be used to generate electricity, as can methane, also a greenhouse gas, which must in any case be drawn out of landfills to avoid explosions and reduce the risk of global climate change.

Biomass is used to make liquid fuels, primarily to replace gasoline and diesel fuel, which are currently made from petroleum. The gasoline substitute, ethanol, is a form of alcohol that can be made from several plants, including sugar cane and corn. In the United States, 95 percent of ethanol is made from corn. The major benefit to Americans is reduced reliance on foreign sources of oil. The other benefit, as with biomass generally, is reduced *net* emissions of carbon dioxide. But because the methods of corn cultivation in the United States are energy-intensive, neither reduction is enormous. On average, it takes 1 BTU (British thermal unit) of oil to produce 1.3 BTUs of ethanol. The net reduction in carbon dioxide emissions is about fifteen percent, and is negative when coal is used, instead of natural gas, to refine ethanol from corn. Sugar cane is a more efficient source crop for ethanol because it contains more calories per acre and, as a perennial grass, requires less plowing.

Bio-Diesel Bus. *One of the most immediate energy concerns of the twenty-first century involves the diminished supply and negative environmental effects of petroleum. Bio-diesel is an alternative energy fuel made from biomass, usually made from soybeans or canola.* **NPS PHOTO.**

Environmental problems associated with ethanol include soil erosion and pollution from fertilizers, herbicides, and pesticides used in American corn production. These problems are likely to increase as land currently out of production to conserve topsoil is planted in corn. In addition, greater production of ethanol will cause increases in the price of corn, which in turn will increase the price of dairy products and meat. Subsidies for corn-based ethanol (51 cents per gallon in the United States in 2007) may not be justified as cost-effective. Sugar-cane ethanol promotes destruction of rainforests, as sugar cane displaces forests.

More promising is cellulosic ethanol, made from plants, including grass, that people cannot eat because of their high cellulose content. Enzymes break down the cellulose. Although not yet produced on a commercial scale, such ethanol could be made from switchgrass and other perennials, as well as from the waste products of corn and other food crops. This would improve agricultural efficiency, avoid increases in the price of food, and encourage maintenance of perennials, which build soils. Such ethanol is more expensive because it requires additional ingredients and a more complex process.

Biodiesel is the other main liquid fuel made from biomass. In the United States, biodiesel is made primarily from soybeans, but it can be produced more efficiently from canola (rapeseed). The same issues concerning planting marginal land and increasing the price of food arise with biodiesel as with ethanol. Producing the required oil from algae, still experimental, may solve these problems.

In no case can such fuels replace petroleum, because the earth's capacity for producing the required crops is limited in comparison to current and projected uses of

petroleum. In transportation, it will eventually be necessary to replace much liquid fuel with electricity.

Although falling water offers little promise for increased power generation, sea water may hold such promise. Ocean waves are produced by wind, and wind by solar radiation. Electricity can be generated from waves by tubular structures with joints. The joints move with the wave action, pumping oil through an electric generator. More promising is the use of submerged turbines moved by ocean water as tides come in and go out. This would be a form of gravitational energy because the tides are caused by the gravitational influence of the moon on the earth's oceans. Such turbines would pose none of the avian or aesthetic issues that attend wind turbines. However, the durability of submerged turbines, their effect on marine life, and the cost of the resulting electricity are uncertain.

GEOTHERMAL ENERGY

Geothermal energy is energy from the earth's interior. High-temperature geothermal energy comes from areas where molten matter appears near the earth's surface, such as areas prone to volcanic action. Such heat can be used for direct heating, as in Reykjavik, Iceland, and Boise, Idaho, or it can be used to produce steam, which then generates electricity. The main limitation is the scarcity of places where molten rock is accessible.

Low-temperature geothermal devices take advantage of the relatively constant temperature, between 45 and 60 degrees in most places, of the top fifteen feet of the earth's crust. In the United States, for example, homes can be heated and cooled by burying pipes in the ground next to the home, using a liquid in the pipes to transfer the ground's energy to the home, and using a heat exchanger for heating or air-conditioning as needed. The energy needed to pump the exchange liquid and run the heat exchanger is far less than would be required to heat or cool the home conventionally.

Except for the visionary idea of generating hydrogen directly from sunlight in sun-drenched parts of the earth and piping it to where it is needed, no single energy source or technology promises to provide all the energy people are likely to want in the future. Energy sources and technologies will probably change quickly and often throughout most of the twenty-first century.

SEE ALSO *Alternative Technology; Leopold, Aldo.*

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ENVIRONMENTAL ACTIVISM

Environmental activism takes many forms, including engaging in different types of direct action, signing petitions, writing letters, attending meetings, and contacting political representatives and officials. This activism usually is peaceful, conventional, and noncontroversial, although its targets often suggest that it is illegitimate or the product of malign motives. Nevertheless, such actions fall within the range of normal politics in liberal democracies. However, liberal democracies have become more participatory, and the limits of what is accepted as normal have been extended, especially since the 1960s. Thus, the signing of petitions, which once was considered, like the writing of letters to newspapers, an activity of cranks, has become almost as common as voting in national elections. What used to be seen as a dichotomy between the conventional and the unconventional has come to be recognized as a continuum from the orderly and highly institutionalized to the disorderly and uninstitutionalized.

TRADITIONAL ORGANIZATIONS AND NEW ACTIVISM

Just as the variety of forms of political action commonly engaged in by mass publics in democratic societies has increased, the repertoires of environmental activists have broadened. The advent of a new wave of activist environmental organizations in the 1970s—notably Friends of the Earth and Greenpeace—brought new forms of symbolic direct action to public notice. These often spectacular protests were designed to attract the attention of the mass media and thus, by arousing mass public opinion, put pressure on corporations and governments to remedy environmental ills. Those protests at first were viewed negatively by older conservation-oriented organizations, especially those which had consultative or lobbying relationships with governments and state agencies. However, the seriousness of the new activists and their success in drawing attention to the issues they selected influenced older organizations, some of which began to engage with them and attempt more actively to mobilize their

supporters. As campaigning successes and rising public support conferred legitimacy on the newcomers, the older organizations' fears of losing their established status and access to decision makers were overtaken in some cases by their fear of losing public support. Thus, campaign coalitions uniting the older conservationists and the new environmental activists became more common.

The new environmental organizations attempted to work at the national and transnational levels, but at the local level environmental activism usually was left to its own devices. The extent to which national environmental organizations neglected local activists varied from country to country and from one organization to another. In the United States mainstream conservation- or wilderness-focused organizations such as the Sierra Club resisted broadening their agendas to embrace recurrent and increasing concerns with issues of pollution and hazardous waste, particularly in urban environments. As a result local environmental activists began to fashion an environmental justice (EJ) movement that largely was disconnected from the historical issues of environmental protection and was organized into networks of autonomous local groups without a national bureaucracy. In Europe, where landscapes were so demonstrably the products of human activity that wilderness issues were marginal, broad environmental movements developed to embrace protection of the environmental interests of human populations as well as the preservation and conservation of species and cultural landscapes. Because the ambit of such groups was more encompassing, it was easier in Europe for forms of activism associated with one environmental issue to be adapted to the service of another than was the case in the United States.

Most environmental activism is at the institutionalized end of the activist continuum, but the focus of political and scholarly attention has been on strategic and ethical issues surrounding action at the disorderly and uninstitutionalized end of the spectrum. However, there are ethical dilemmas involved even in strictly legal, conventional, and institutionalized action. Such action may be slow or ineffective in addressing urgent and compelling grievances and may allow the perpetuation and exacerbation of environmental degradation beyond the point where redress is possible. It would be unethical for people who know or believe this to be the case to confine their activities to the slow deliveries of conventional action. The urgency of environmental concerns thus drives many activists to consider less conventional forms of activity, even disorderly actions that in extreme circumstances may transgress norms of nonviolence.

DIRECT ACTION

Forms of direct action that range from boycotts, blockades, and site occupations to more confrontational and sometimes actually or potentially violent actions such as sabotage of facilities and machinery have become more common. Although they are condemned by their targets and by the policing authorities, they often attract public sympathy. Thus, in Britain and France majorities of the public approve of the actions of those who uproot or otherwise destroy genetically modified (GM) crops, the police have been reluctant to act against them, and the courts often have not convicted those who commit them. Public sympathy with and tolerance of direct action, especially when it is associated with environmental issues, has been increasing.

However, in all the countries for which there is systematic evidence the overwhelming majority of environmental protests are nonviolent and nonconfrontational. Despite the media's reporting bias toward spectacular and violent events, during the ten years between 1988 and 1997 violence figured in fewer than 10 percent of the environmental protests reported in leading newspapers in eight Western European countries (Rootes 2007). This is not surprising in light of the fact that the ethics that underpin environmentalism are fundamentally pacific: care for the earth and consideration for the well-being of living things, including humankind. Even dark green activists, who are prone to assert the ecological equality of all living things, are not antihuman so much as critical of what they perceive as the arrogance and careless self-interest that lead humans to subjugate the rest of nature to their own ends.

Their most controversial actions, including ecotage and monkeywrenching—such as the destruction of environmentally offensive buildings in wilderness areas or machinery used in logging, land clearing, or construction and the spiking of trees in logging areas—usually are not designed to cause harm to people but are expressions of protests at and attempts to impede the destruction of the natural environment. Thus, activists associated with Earth First! have insisted on the fundamental nonviolence of their actions and carefully train activists to minimize the likelihood of harm to themselves and others.

The rare occasions on which people who call themselves or have been called environmentalists have deliberately taken actually or potentially violent action against other people almost always have involved the actions of campaigners for animal welfare or animal rights. However, although some animal rights activists may identify themselves as green and in some European countries are accepted as such by those primarily concerned with more unambiguously environmental issues, in the English-speaking world animal rights activists generally are not regarded by environmentalists as part of the environmental movement.

MONKEY WRENCHING

Environmental activism takes a variety of forms. Extreme activist groups such as Earth First! use *monkey wrenching,* a term that refers to blockading roads, sinking ships, bombing power stations, tree sitting, and engaging in other forms of ecotage: the illegal sabotage of industrial development efforts that are seen as damaging to the environment.

RELATED TERMS

Monkey wrenching often is equated with ecoterrorism and civil disobedience; the former association is preferred by its critics, and the latter by its advocates. The Federal Bureau of Investigation (FBI) defines terrorism as "the unlawful use of force or violence against persons or property to intimidate or coerce a government, the civilian population, or any segment thereof, in furtherance of political or social objectives" (*Code of Federal Regulations*). This definition, with its inclusion of violence against property, has been used to justify the application of the term *ecoterrorism* to monkey wrenching tactics. Advocates of monkey wrenching see it as an appropriate form of civil disobedience. In their view nonviolent civil disobedient protest—including the Boston Tea Party, the Underground Railroad, and the civil rights movement—has long been used to foster social change.

ORIGINS AND HISTORY

The phrase "to throw a monkey wrench in the machinery" dates to 1918. Among several books that popularized the term, probably the most influential was Edward Abbey's *The Monkey Wrench Gang* (1975). That 1975 novel traced the travels of four ecologically minded misfits through the Southwestern U.S. as they vandalized bulldozers and destroyed bridges in the cause of environmental protection. Abbey's book both coined the term *monkey wrenching* and inspired the foundation of Earth First! with its motto "No Compromise in Defense of Mother Earth." In *Ecodefense: A Field Guide To Monkeywrenching* (1993) the coeditor Dave Foreman wrote: "Monkeywrenching is nonviolent resistance to the destruction of natural diversity. It is aimed at inanimate machines and tools that are destroying life. Care is always taken to minimize any possible threat to people, including the monkeywrenchers themselves" (Foreman and Haywood 1993, p. 9).

ETHICAL JUSTIFICATIONS

According to advocates of monkeywrenching, the goal of terrorism is always political. Monkey wrenching, they argue, is used to protect the environment. Further, advocates invoke the perspective of deep ecology, which places the protection of nature above that of humankind. From this perspective, the earth is under assault and monkeywrenching is morally required as self-defense on its part.

CRITICISMS

To its critics monkey wrenching is vandalism, potentially life-threatening, illegal, and better termed ecoterrorism. Critics focus on the more dangerous forms, some of which have been denounced by movement leaders. Those critics argue that whatever the motivation, common monkeywrenching tactics such as tree spiking, arson, and the damaging of machines and equipment are illegal and can result in injury or death.

In congressional testimony in 2002 by James Jarboe, chief of the Domestic Terrorism Section of the FBI's Counterterrorism Division, it was estimated that over the previous six years two groups associated with monkey wrenching, the Animal Liberation Front (ALF) and the Earth Liberation Front (ELF), had committed more than 600 criminal acts in the United States, resulting in damages of more than $43 million. In response to such testimony an Animal Rights and Ecological Terrorism Act has been proposed that creates penalties for persons encouraging, financing, assisting, or engaging in acts of animal and ecological terrorism.

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The label *ecoterrorist* often is applied to environmental activists who rarely employ tactics that are in any way violent or threaten physical harm to people or other living things but not to corporations and their agents whose careless or deliberate actions in pursuit of profit damage the health and sometimes threaten the survival of individuals and whole communities. Environmental terrorism might be seen as a fair description of the actions of those who wilfully pollute the air and water on which lives depend and who overtly and covertly act to suppress the protests of their victims. That has been the experience of many of those who complain of environmental injustice or environmental racism as they struggle to survive while living close to hazardous waste deposits whose existence sometimes is denied by those who created them or authorized their creation or downwind of emissions plumes from factories or waste incinerators whose toxic content often is known only to those who control them. Some environmental activists, including Chico Mendes, have been murdered by those whose environmentally exploitative interests they opposed.

NONVIOLENT DIRECT ACTION

The ethic that informs the more radical forms of environmental activism is that of nonviolent direct action (NVDA). Below are several points of significance about environmental NVDA.

Environmental NVDA Is a Matter of Principle Environmentalists protest against the violence done to the environment and to people unable to defend themselves. Nonviolence is thus the form of action consistent with the fundamental philosophical principles that inform environmentalism.

Environmental NVDA Is a Pragmatic Strategy Recognizing the difficulty of achieving practical objectives by any other means while retaining widespread public support, environmentalists work to maximize their gains within the existing system rather than adopting the riskier strategy of radically and violently challenging it. This strategy is more attractive in circumstances in which the environmental movement is organizationally relatively strong and has a large measure of public support than in circumstances in which it is organizationally weak and has only moderate support and thus is unable to anticipate gains as a result of its efforts within the existing system.

Environmental NVDA Is a Defensive Tactic Recognizing their weakness in the face of more powerful forces, especially when confronted by the power of the state at a time when the threat of terrorism has justified increased surveillance and extraordinary preemptive and punitive measures, environmentalists strive to avoid being labeled as ecoterrorists and so being subjected to restrictions similar to those imposed on groups suspected of involvement with political violence. Because of the presence among their opponents of people and organizations that seek pretexts to stigmatize them, environmentalists are concerned with preserving their legitimacy and latitude for maneuver. Even before 9/11 and the war on terror, environmentalists emphasized the nonviolence of their actions as they attempted to avoid guilt by association with animal rights activists, a minority of whom had employed violent tactics and as a result generally were considered extremists. In some countries court-imposed restrictions and newly restrictive public order legislation reduced the margin of latitude for any but unambiguously legal forms of action.

Nonviolence is also a reflection of the identity of environmentalists. Environmentalists are often herbivores rather than carnivores (often literally, as the frequent association of environmentalism with vegetarianism attests) who are averse to physical struggle and favor the congeniality of communitarian utopias. Their nonviolence might be interpreted as a lack of courage, but it is more often a product of distaste for violence. This, however, puts them at a disadvantage in an age in which political and public policy games are played hard and neither noninstrumental reason nor principle is valued by those who hold political power and dominate public agendas.

NVDA goes well beyond the avoidance of violence and conflict. Civil disobedience, which originally was an individual act of defiance of authority, was turned by Mohandas Gandhi into a tactic of mass resistance and later was adopted widely by civil rights, peace, and environmental activists. In that context one of the hallmarks of environmental activism since the 1970s has been the increasing employment of tactics of manufactured vulnerability that expose activists to the risk of injury to emphasize the disjunction between power and principle. Those risks are largely calculated and managed, especially in the actions mounted by professionalized protest organizations such as Greenpeace. Greenpeace protesters who scale incinerator or power station stacks to unfurl banners highlighting pollution are trained climbers who use state-of-the-art safety equipment.

Environmental activists and activist organizations are affected by the dilemmas that confront all challengers of the status quo, forced to choose between strategic effectiveness and the mobilization of supporters and between tactical effectiveness and participatory democratic principles. Many of the differences between environmental movement organizations and groups stem from their responses to those dilemmas. Thus, Sea Shepherd split

from Greenpeace because its founders believed that more radical action was required, and in Britain Greenpeace UK emerged from Friends of the Earth, which had been founded by people unimpressed by the strategies of older nature conservation organizations. Activists such as those who gather beneath the banners of Earth First! or Reclaim the Streets are so fundamentally committed to radical democratic principles that they refuse formal organization altogether, even though this may limit the effectiveness of their actions. Friends of the Earth International has expended much energy on the maintenance of a non-hierarchical organization of autonomous partners, probably at the expense of the effectiveness of its campaigns. Greenpeace, by contrast, is organized more like a corporation than a participatory democracy in order to maximize its efficiency and effectiveness.

NEW FORMS OF ENVIRONMENTAL ACTIVISM: THE INTERNET

New forms of activism have developed alongside new communication media. Thus, in addition to enabling nearly instant mass petitions, the transnational mobilization of protests—physical or virtual—and rarer tactics such as netstrikes on the servers of parties, governments, or corporations that are identified as the perpetrators of environmental ills, the Internet has fostered the development of consumer boycotts. Web sites and e-mail listservs increasingly are used to protest against oil and coal corporations that finance movements against environmental reform and banks that finance environmentally damaging projects. Insofar as many of these consumer actions are individual rather than directly collective, their increasing use has led some to worry about the future of environmental activism. Even the ease that the Internet confers on the organization of protests carries with it the risk that people with little or no previous experience of activism will be drawn individually to protests by Internet appeals but will not be involved in the sustained collective activism by which environmental organizations are built.

SEE ALSO *Animal Ethics; Chipko Movement; Civil Disobedience; Communitarianism; Earth First!; Ecosabotage; Environmental Justice; Genetically Modified Organisms and Biotechnology; Greenpeace; Mendes, Chico; Pollution; Sierra Club; Urban Environments; Vegetarianism.*

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Christopher Rootes

ENVIRONMENTAL AESTHETICS

Environmental aesthetics, a subfield of both aesthetics and environmental philosophy, emerged in the late 1960s and has steadily grown in importance since then. Although discussions of the aesthetics of nature have had a place in philosophy for a much longer time, twentieth-century environmental movements provided the context and conditions within which the discipline of aesthetics began to recognize problems connected to the aesthetic value of the environment and its role in weighing environmental issues.

Environmental aesthetics brings philosophical attention to issues in aesthetics as they relate to environments, natural objects within environments, and natural phenomena and processes (as opposed to artworks). The field has attended mainly to natural environments, but its scope has gradually widened to include mixed environments: those that have been modified or influenced by humans, such as gardens, as well as the human environments of everyday life, such as aspects of the built environment.

HISTORY

The genealogy of environmental aesthetics is traceable to at least three different areas: philosophical discussions of aesthetic appreciation of nature, theoretical and practical discussions of landscape design and landscape tastes (including romantic literature and poetry), and early conservation thought and nature writing. Although significant *philosophical* discussions of aesthetics of nature emerged only in the eighteenth century, the aesthetic appreciation of nature and

landscape would probably have played an important role across cultures throughout human history.

Philosophical Aesthetics Although philosophers such as Plato, Aristotle, and Aquinas were concerned with the relation of beauty and the arts, the inception of the modern discipline of aesthetics is usually traced back to philosophical and literary discussions conducted in the early 1700s by figures such as Anthony Ashley Cooper (Lord Shaftesbury) (1801–1885), Joseph Addison (1672–1719), and Alexander Gottlieb Baumgarten (1714–1762). Treatises by these philosophers widened the scope of aesthetics in important ways. They theorized about nature as an object of aesthetic experience and appreciation in its own right, in contrast to earlier discussions, which gave little attention to nature apart from its representation in the arts. At the same time they widened the categories of aesthetic value beyond the beautiful to include the sublime and the picturesque, which created new contexts within which to discuss nature. Many scholars point to a "subjective turn" in aesthetic theory. Attention turned from understanding beauty as an objective quality to grasping the relationship between the aesthetic object and the appreciator; hence the character of aesthetic experience and appreciation became more important.

Before the eighteenth century, at least in North America and Europe and probably in other cultures as well, wild nature was often feared rather than appreciated for aesthetic qualities such as beauty or sublimity. It was more common to appreciate humanly modified nature or nature as represented through art, music, and literature. Gardens have held an important place in history since ancient times, but, as Marjorie Hope Nicolson has shown in *Mountain Gloom and Mountain Glory* (1959), wilderness and the rugged, great mountains of the world were not formally aesthetically appreciated until, roughly, the late seventeenth century, when many well-to-do travelers took part in the Grand Tour, a new form of tourism that included the great mountains of Europe (and to some extent eastern North America). The Grand Tour is often referred to in the literature as a form of nature connoisseurship that reflected philosophical discussions of the time, and it provided an important impetus for the appreciation of the beautiful and the sublime in practice. This change in landscape tastes opened up a greater potential for valuing wild nature.

Philosophers in the eighteenth century argued that disinterested pleasure lay at the root of the appreciation of aesthetic qualities such as the beautiful and sublime in nature; the concept of "disinterestedness" migrated from moral philosophy into aesthetics. It was Immanuel Kant (1724–1804) who conferred enduring importance on this concept through his analysis of aesthetic judgments in the *Critique of the Power of Judgment* (1790). In his work the term *disinterestedness* pertains to aesthetic experience and valuing that are noninstrumental, directed at the perceptual qualities of an object apart from any personal or utilitarian interests of the perceiver. Some more recent theories in environmental aesthetics recognize the importance of this concept, whereas others object that disinterested appreciation distances the appreciator and blocks full engagement with environments.

Kant's aesthetic theory is especially important to the history of environmental aesthetics because it makes nature the paradigm of aesthetic experience and judgment. More than other writers of his time, Kant privileges nature over art, and interpretations of his aesthetic theory show that the aesthetic appreciation of nature was more significant—even more edifying morally—to human life than the appreciation of the arts. For Kant this superiority of nature applies to both the beautiful and sublime. His theory of the beautiful, like others of the period, argues that beauty is associated with delightful, pleasing perceptual qualities and tranquil contemplation, whereas the sublime is associated with a "negative pleasure" of feeling overwhelmed by the massive, powerful, and seemingly infinite qualities of natural objects and phenomena such as towering cliffs, raging seas, and vast deserts. An experience of the sublime, which Kant believed arises only in the contemplation of nature, induces feelings of human insignificance in the face of natural forces; yet, at the same time, we recognize our place as free, moral, and rational beings in the world.

Kant's ideas influenced romanticism and the "nature worship" expressed through the literature, poetry, music, and visual arts of the nineteenth century. The poetry of William Wordsworth (1770–1850) is especially notable for showing vividly how a deep aesthetic engagement with nature can shape and invigorate human imagination and lived experience. John Ruskin (1819–1900), the artist and art critic, holds a key place in postromantic thought for his criticisms of classical landscape painters, who, he argued, lacked a true understanding of nature. Many scholars and critics admire the aesthetic, scientific, and spiritual sensitivity shown for nature in his major work *Modern Painters* (1873).

Romanticism's reverence for nature influenced writers and artistic movements in nineteenth-century North America, including the transcendentalists and the Hudson River school of landscape painters. These figures lie outside of philosophical aesthetics, but they become relevant to discussions of conservation that arise in the history of environmental aesthetics.

Despite the strong interest in nature in romanticism and its offshoots, the philosophical concern with the aesthetics of nature tailed off in the nineteenth century as the philosophy of art gained a foothold. This trend was precipitated by Georg Wilhelm Friedrich Hegel's

Sutherland, Scottish Highlands. *A wilder landscape with a range of aesthetic qualities: roughness, rockiness, and striking shapes. Early appreciation of the aesthetics of nature focused on the Picturesque, a theory of landscape painting.* **PHOTO BY DAVE MOLLAH. COURTESY OF EMILY BRADY.**

(1770–1831) influential insistence on the primacy of art over nature. For Hegel nature's aesthetic value is realized only when fashioned by the human spirit through the production of art. His ideas signalled a gradual move away from a conception of art as a representation of nature and toward art as the expression of the human imagination.

The move away from nature was also evident in developments in the art world as the influence of romanticism waned; art moved toward expression and abstraction rather than representational or naturalistic depictions of the world. Twentieth-century avant garde movements provided still greater inspiration for philosophers to devote their attention to art rather than nature. In the face of Marcel Duchamp's (1887–1968) *Fountain* (the provocative dadaist artwork that consisted of a urinal turned upside down), and other works that charged past the traditional boundaries of art, philosophy was presented with a formidable challenge: redefining art.

Landscape Theory and Practice Alongside philosophical work on aesthetics of nature, there have been important movements in theory and practice related to landscape that indicate appreciation of nature in one form or another. These movements have raised problems and issues now taken up in contemporary debates in environmental aesthetics.

Interest in nature through classical landscape paintings was brought into the real-world context of gardens and landscape design through theories of the picturesque. The picturesque was developed mainly by William Gilpin (1724–1804), Sir Uvedale Price (1747–1829), and Richard Payne Knight (1750–1824) in the mid-to-late eighteenth century. The movement prized qualities associated with landscape gardening and the paintings of Claude Lorrain (1600–1682) and Salvator Rosa (1615–1673).

The picturesque is sometimes linked to Humphry Repton (1752–1818), who was critical of Lancelot "Capability" Brown's (1716–1783) grand designs for the great manor houses of England, which involved moving earth and trees to create classical landscapes with extensive prospects across lawns, lakes, and constructed

features such as classical temples. Its enthusiasts were keen to mark out a new aesthetic category lying somewhere between the beautiful and the sublime. Among the aesthetic qualities prized by proponents of the picturesque were roughness, sudden variation, mystery, irregularity, and weathering.

Although the picturesque spurred interest in a greater range of natural qualities than previous theories, it has been criticized for promoting an appreciation of nature only as it appears through the lens of art. The theory originated in the idea that the nature lover most deeply apprehends the beauty of landscapes by looking at them in paintings: standing back and beholding the design, forms, and colors of the picture. Connoisseurs of the picturesque in the eighteenth century used a special device through which they viewed natural landscapes: the "Claude Glass," a tinted convex mirror that framed and reflected the view, transforming it into something like a miniature painting (in the manner of Claude Lorrain). Gilpin was among the theorists who believed that art improves upon nature—hence the grand designs of picturesque gardens and the use of the Claude Glass. Theories of the picturesque—and the "scenery model" of aesthetic appreciation of nature they engendered—presented aesthetic and moral challenges to the pioneers of environmental aesthetics as the field emerged in the 1960s.

Conservation The influence of the picturesque was confined mostly to Western Europe, notwithstanding its undeniable impact on landscape practices and tastes in North America, most notably in the work of the great American landscape architect Frederick Law Olmsted (1822–1903). In North America attitudes toward nature in theoretical discussions, the arts, and in practice leaned much more toward a wilderness aesthetic that influenced the ethos of the conservation movement that developed in the United States in the late nineteenth century.

The transcendentalist aesthetic of Henry David Thoreau (1817–1862) was steeped in a reverence for wilderness; his major work, *Walden* (1854), recounts his experiment of living close to nature at Walden Pond. The growing receptivity to untamed landscapes crested in the wilderness worship of transcendentalism, which was a compound of aesthetic and philosophical notions that echoed the spirit of romanticism. Transcendentalists shared the romantic revulsion at the dehumanizing effects of technology and urban civilization; they prized wild nature as a source of spiritual regeneration, a messenger of profound moral truths. The wilderness paintings of Thomas Cole (1801–1848) and Frederick Church (1826–1900) (both Hudson River School artists) depict mountain and river landscapes with little or no human presence. Their canvases dramatically express the wild, sublime, and divine forces of nature.

This wilderness aesthetic is central to the environmental awareness conveyed in John Muir's (1838–1914) classic essay, "A Near View of the High Sierra" (1894). Muir's exploration of the Sierra Nevada mountain range reflects both his deep interest in natural history and his aesthetic and spiritual values. In contrast to the visual artists he meets on his journey, Muir appreciates nature not merely as an aesthete savoring distant scenery as an object but as an engaged environmentalist, an intimate participant in the beauty and sublimity of the mountains who understands them from within. This environmental aesthetic also found expression in the work of the great conservationist and forerunner of environmental ethics Aldo Leopold (1887–1948). In *A Sand County Almanac* (1949) he combines ecological knowledge with aesthetic sensitivity in evoking environments from the typically beautiful to the "unscenic." Leopold's "land ethic" is, perhaps, the first conservationist philosophy that joins ethical and aesthetic concerns in valuing environments.

Another key aesthetic theme running through conservation and nature writing is the idea that all of the natural world is beautiful, that nature untouched by humans is inherently good and aesthetically edifying. The thesis of "positive aesthetics," as articulated by Allen Carlson (2000), is traceable to figures such as John Constable (1776–1837), John Ruskin, George Marsh (1801–1882), William Morris (1834–1896), and John Muir. This outlook, although not without its critics, is a key component of contemporary environmental aesthetics.

CONTEMPORARY DEBATES

Discussions in philosophical aesthetics, landscape theory and practice, and early conservation literature together form the historical foundation of environmental aesthetics. After Hegel aesthetics evolved into the philosophy of art. Apart from some interesting attempts to extend aesthetics beyond art by analytic aestheticians such as Frank Sibley in the 1950s, philosophers focused on art to the exclusion of natural environments. Ronald Hepburn's seminal 1966 article, "Contemporary Aesthetics and the Neglect of Natural Beauty"—widely viewed as marking the emergence of environmental aesthetics as a distinct field—asks why aestheticians should be less interested in natural beauty and the environment than in art. Hepburn sets out to develop an understanding of what an aesthetic appreciation of natural beauty might look like, thus posing a key issue: How does an aesthetic appreciation of nature differ from an appreciation of artworks? This question leads to others: What is distinctive about environments as compared to artworks? What guides aesthetic appreciation of nature in the absence of art history, knowledge of artistic intention, and the conventions that govern the judgment of artworks?

Hepburn's main task is to show the novel perspectives opened up by an aesthetic grasp of nature. Natural aesthetic appreciation can center on discrete objects viewed up close or as part of a scene; more typically, however, the observer is immersed in environments—for example, walking through a forest or standing in the middle of a plain. Hepburn argues that nature, unlike traditional works of art, affords the observer more freedom to explore the range of qualities that are possible in a truly environmental experience. It is not just the position of the observer that is different; environments are not framed or bounded in the way that many forms of art are. These distinctive features of immersion in the environment offer opportunities for an aesthetic experience that draws on a broader range of senses than is commonly used in responding to artworks.

Hepburn's starting point is a comparison of art and nature, whereas Arnold Berleant, another important contemporary environmental aesthetician, argues that aesthetics ought to use the environment rather than art as its starting point and main context. In *The Aesthetics of Environment* (1992) and other works, Berleant argues that aesthetic experience begins with the environment (both natural and humanly modified environments) and extends to art. Berleant is critical of the traditional aesthetic virtue of "disinterestedness"; for him this approach distances the subject from aesthetic object. In its place he reconceives the aesthetic response as an "aesthetics of engagement" that collapses the dichotomy between subject and object through participation in the environment.

These ideas emphasize important distinctions between environmental aesthetics and the philosophy of art. They also signify an important move away from the "scenery model" that dominated earlier nature aesthetics. Many writers have argued that scenic appreciation is narrow, static, and two-dimensional, ignoring the richness of three-dimensional environmental qualities that envelop the observer in dynamic and shifting milieus with the variations of the time of day, tides, weather conditions, and seasons. These critics fault the scenery model for prizing conventionally beautiful landscapes over environments traditionally viewed as "unscenic," such as marshlands, even though the latter may have great aesthetic value (Saito 1998b, Callicott 1983, Carlson 2000). On ethical grounds some have argued that the scenery model's roots in the picturesque make it anthropocentric, viewing nature as if it were a work of art rather as an organic, living, evolving environment.

Cognitive and Noncognitive Theories Environmental aesthetics seeks to understand what makes an environment *natural* rather than something produced by human intentions and actions. In art, experience is shaped by qualities such as harmony, style, and form. Aesthetic judgments consider such qualities in gauging the success or failure of an artwork. Hepburn and others have noted that the freedom of natural environments distinguishes them from works of art, but how does this difference alter experience and judgment?

Answers to this question fall into two camps: *cognitivism* and *noncognitivism*. These terms reflect the role of knowledge in theories of the aesthetic appreciation of the environment. Cognitivists argue that ecology, geology, and other natural sciences structure and guide "appropriate" aesthetic reactions—that is, those that are not shallow or superficial. They advance a standard for determining correct and incorrect aesthetic judgments. Carlson's "natural environmental model," developed in a series influential of papers beginning in the 1970s and culminating in his collected essays (published in 2000), has served as a foil for the many noncognitivists who have written critiques of it. Some cognitivists—as well as noncognitivists—attend to modified as well as natural environments

Carlson seeks the most suitable framework for valuing natural environments as natural. Just as an informed evaluation of art objects relies on an investigation of the categories of art history, so, Carlson argues, by analogy an aesthetic grasp of the environment ought to mine the knowledge provided by the natural sciences. Science, he contends, aids in the discovery of aesthetic qualities and deepens appreciation, and without it we are unlikely to make aesthetic judgments that are *true*. Carlson uses the example of a whale: If viewed under the category of "fish," it might appear awkward and clumsy, but regarded under the correct category of "mammal," it is likely to appear to be magnificent and graceful.

Carlson claims that a reliance on scientific knowledge not only enlightens aesthetic perceptions of nature but also endows them with a measure of objectivity. Leavening aesthetic perceptions with scientific knowledge helps to ensure that judgments are not arbitrary or subjective. This last point, Carlson believes, is especially important in incorporating aesthetic value into environmental decision-making and policy, processes that are often criticized for a reliance on unreliable, individualistic criteria.

Other cognitivists share Carlson's emphasis on the essential role of knowledge in natural aesthetics. Marcia Muelder Eaton, Holmes Rolston, and Glenn Parsons all agree that the natural sciences provide the most reliable framework for appreciation, although they elaborate their positions in different ways. Rolston and Parsons have developed approaches to positive aesthetics, which Carlson makes a central feature of his cognitivist account. Parts of nature that might otherwise seem ugly—such as a rotting animal carcass, for example—can be regarded as beautiful if viewed as a necessary component of a healthy ecosystem.

Noncognitive theories are more diverse, but they push the more subjective aspects of aesthetic experience to the forefront, often giving a backseat to scientific knowledge. Noncognitivists emphasize common features of the aesthetic response to the environment: for example, multisensory engagement, imagination, and emotion. Their typically pluralistic conception of knowledge includes folklore and other "nonscientific" modes of understanding. These positions grew largely out of objections to Carlson's approach. These critics argue that, by making science a necessary condition of aesthetic appreciation, cognitivism (especially the natural environmental model) unreasonably restricts the range of aesthetic perceptions and judgments. On this view the problem stems from according legitimacy to only one epistemological framework—one grounded in scientific knowledge—and thereby stigmatizing nonscientific modes of apprehension because they presumably impose human values onto nature.

Berleant's aesthetics of engagement, which stresses sensory immersion, active participation, and embodied appreciation, is perhaps the longest-standing noncognitivist approach. He takes to task the subject-object dualism he detects at the root of Kant's account and the scenery and natural environmental models. Other noncognitivist approaches emphasize one component of appreciation or combine them. Through a robust account of emotions and their appropriateness, Noël Carroll's "arousal model" (1993) seeks to show that emotional responses can play a legitimate role in the aesthetic appreciation of nature. One of Carroll's aims is to include the subjective side of experience in ways that meet some common objections, such as the problem of sentimentalizing nature and the claim that our emotional responses are not communicable. The role of emotion meets a standard of objectivity, he argues, insofar as it can be shown to be sharable and not wayward or arbitrary.

Emily Brady's "integrated aesthetic" (2003) gives a prominent role to various forms of imaginative engagement, but it also integrates other components of the aesthetic response, including the senses, emotion, disinterestedness, and a pluralistic approach to knowledge. For example, imaginative engagement can involve both visualizing and taking conceptual leaps that open up new ways of perceiving natural objects. In contemplating the smoothness of a sea pebble, one might visualize the relentless surging of the ocean as it has shaped the pebble into its worn form. One might also imagine how it looked before it became so smooth, and this image might contribute to one's wonder and delight in it. Hepburn's theory (1996, 2001) gives a major role to the "metaphysical imagination"—discovery through aesthetic encounters with nature.

These approaches trace some of their roots back to Kant's aesthetic theory, which places imagination rather than knowledge at the center of aesthetic experience. Kant's influence is evident in the work of another important noncognitivist, Malcolm Budd (2002), who embraces aspects of Kant's aesthetic theory, supplementing it with new work from environmental aesthetics, especially the idea of appreciating nature as nature.

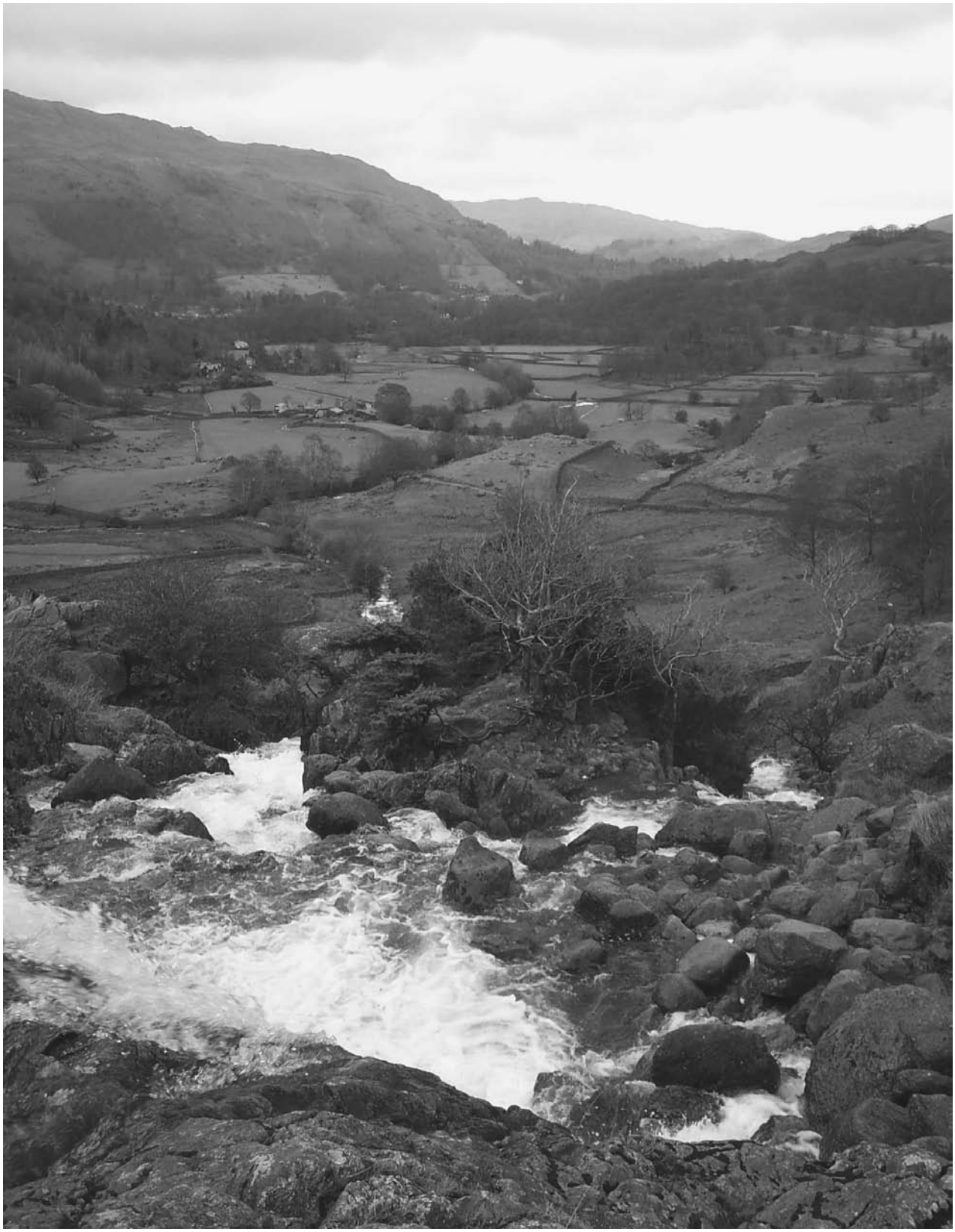
Yuriko Saito's work lies somewhere between cognitivism and noncognitivism. She supports the role of science but challenges its centrality, arguing for a plurality of appreciative frameworks, including other forms of knowledge such as folklore. On her account aesthetic appreciation can be enriched by a range of sources, but it must begin and end with the sensuous surface of aesthetic objects and environments. Saito emphasizes the importance of valuing a range of environments, from the beautiful to the "unscenic" to the everyday (2008). Saito's ideas are informed by Japanese aesthetics, which values such qualities as imperfection, transience, change, and the effects of weathering. Thomas Heyd's approach to environmental aesthetics stresses the relationship between environments and humans and the range of cultural resources they employ. Like Saito, he is interested in exploring a variety of environments, many of which occupy the middle range between wild nature and the urban (see Heyd 2007).

As environmental aesthetics has grown, it expanded its purview from natural environments to the modified environments of gardens (Ross 1998, Cooper 2006), environmental and land art (Brady 2007), and everyday environments (Light and Smith 2005, Saito 2008, Berleant and Carlson 2004). Given the prominence of nonhuman animals in environmental ethics, this topic was oddly neglected until it was addressed by Parsons (2007), who discusses aesthetic value in relation to animals.

AESTHETICS, ETHICS, AND ENVIRONMENT

Most environmental aestheticians consider their principal disciplinary home to be aesthetics rather than environmental ethics. Likewise, environmental ethicists tend to consider theirs to be ethics. Both orientations, however, are acutely aware of the productive and salutary overlaps and intersections between aesthetic and ethical value. For instance, Eugene Hargrove (1989) bases his approach to environmental ethics on the significance of the aesthetic valuing of nature.

In a 1998 article, "Appreciating Nature on Its Own Terms," Saito argues that natural aesthetics should incorporate a moral dimension that regards nature as nature and not merely as a work of art, a scene, or a cultural product (unless, of course, the environment in question is a humanly modified landscape). Hepburn, Eaton, and



Easedale, English Lake District. *A rural landscape shaped by natural forms and agricultural practices. Prior to the eighteenth century, in Western nations, such as those in North America and Europe, nature and the wild was often feared rather than appreciated for its aesthetic aspects.* **PHOTO BY EMILY BRADY.**

others also underline the importance of avoiding distorting, trivializing, and sentimentalizing aesthetic appreciation. Cognitivists claim to avoid such distortion by their reliance on scientific knowledge, whereas noncognitivists try to find various ways to strike a balance between overly serious and trivial appreciation (Hepburn 2001).

In response to worries about the potential distorting power of imagination, Brady shows how its activity can work appropriately, focused on the aesthetic phenomenon in question. She identifies relevant imaginative activity as that which is closely tied to perceptual qualities of the object, and this is bolstered by a disinterested standpoint where attention is directed to the aesthetic object rather than self-indulgent flights of fancy (Brady 2003, Moore 2008).

In an important article, "Icebreakers: Environmentalism and Natural Aesthetics" (1994), Stan Godlovitch takes the importance of appreciating nature on its own terms a step further, arguing for an "acentric" aesthetics that esteems nature as something mysterious and indefinable rather than as something culturally appropriated or determined by human imagination or science. This approach attempts to subordinate human frameworks as much as possible, thereby allowing nature to be valued, as much as possible, as nature.

Environmental philosophers such as Rolston, Hargrove, J. Baird Callicott, Ned Hettinger, and Sheila Lintott have explored more deeply the intersection of aesthetics and ethics. They agree that ecological understanding can enable us to move beyond shallow and biased aesthetic valuing and that environmental education is important in both our moral and aesthetic lives. But this approach suggests that aesthetics and ethics come together only to promote a responsibility for well-informed aesthetic appreciation. The connection has been taken a step further in the view that aesthetic valuing may support a moral attitude toward nature (see Hargrove 1989). Aesthetic attention to nature, from the delicate qualities of an everyday buttercup to the rich diversity of a rainforest, has long been recognized as a way into valuing nature that is immediate, compelling, and pleasurable. The democratic opportunities of aesthetic experience, from young to old and across cultures, may help to encourage people to care for the environment. As Brady (2003) and Lintott (2006) have pointed out, however, aesthetic valuing alone may be an insufficient foundation for environmental ethics in the absence of other concepts such as justice.

Environmental aesthetics has had and will continue to have significance for environmental disciplines and practices. A principal aim of environmental aesthetics is to seek a philosophically informed understanding of aesthetic value and judgment. To this end there is strong agreement that aesthetic value is noninstrumental and therefore distinct from other instrumental environmental pleasures such as recreation. Criticisms of the scenery model have underscored the extent to which aesthetic valuing reaches beyond mere visual enjoyment to encompass a broad range of experiences—knowledge, emotion, imagination, and all the senses. This view presents a "thicker" concept of the aesthetic experience of landscape, which, in much empirical work on the topic, has been limited to aspects that can be objectified or quantified (e.g., visual or scenic value), thus leaving out key qualitative aspects of valuing nature. A thicker concept of aesthetic value can also address criticisms of aesthetic judgment as merely subjective or relativistic (i.e., the idea that "beauty is in the eye of the beholder"). A more nuanced conception of aesthetic value may then come to have a more important role in environmental policy than it currently holds. For instance, the selection of areas to clean up (e.g., Superfund sites) can be made in part on aesthetic grounds. Also, given the surge in proposals for wind farms, with their promise of delivering green energy, a richer understanding of aesthetic appreciation and value can provide an informed way to judge the impact of these projects on the landscape (Briggle 2005, Saito 2004).

SEE ALSO *Built Environment; Environmental Art; Hudson River School; Landscape Architecture, Design, and Preservation; Landscape Painters and Environmental Photography; Leopold, Aldo; Muir, John; Romanticism; Ruskin, John; Thoreau, Henry David; Urban Environments; Wordsworth, William.*

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Emily Brady

ENVIRONMENTAL ART

Environmental art, also called eco-art, is a diverse international movement that encompasses a broad variety of art forms, especially sculpture, installations, and performance art. It can be art that incorporates natural phenomena or events, such as Mount Rushmore, aeolian harps that generate sound when wind passes through them, and the Earthquake Rose that was created by a pendulum tracing in sand. Environmental art that uses natural phenomena is often large in scale, such as Robert Smithson's *Spiral Jetty,* constructed in 1970 on Great Salt Lake, Utah, and Christo and Jeanne-Claude's pioneering work wrapping islands and trees as well as their more recent *The Gates* in Central Park in New York. In its broadest use the term *environmental art* can refer to art that depicts environmental phenomena, though that kind of art is technically called nature art.

Environmental art goes beyond nature art: Ansel Adams's photography is eco-art not just because of its subject-matter but because of its symbolic function in the North American environmental movement. Although

The Gates, Christo and Jeanne-Claude, 2005. *Art and nature intermingle in the urban setting of New York's Central Park. The installation's full title is "The Gates, Central Park, New York, 1979–2005," after the years in which the artist couple conceived of the idea and attempted to bring their design into existence. The Gates consisted of thousands of steel "gates" with orange fabric.* **PHOTO BY EMILY BRADY.**

environmental art often is done in contexts that traditionally are recognized as nature or ecosystems, it also can use built environments. In guerrilla gardening, for example, artists reclaim deteriorated urban spaces and demonstrate citizens' ability to take responsibility for shared environments.

SOCIAL AND POLITICAL ASPECTS

Although Christo and Jeanne-Claude have always claimed that their art is purely aesthetic and lacks deeper significance, environmental art often has a social or political function. It can be educational for schoolchildren, the public, and policymakers. It increases ecological literacy, stimulates awareness of environmental damage and harm, provides remedial models, and raises consciousness. Environmental art also can be problematic from the point of view of environmental ethics and social justice. The faces of four U.S. presidents carved into rock on Mount Rushmore may be regarded as a defacement of a beautiful natural geologic feature. That sculpture certainly was an affront to the Lakota, who named it *Six Grandfathers* (for their most powerful spiritual beings). One also might wonder about the environmental impact of Christo and Jeanne-Claude's wrapping of whole islands in fabric.

At its most radical, eco-art is a revolutionary strategy for making nonviolent political statements and critiquing environmental issues. The Raging Grannies, for example, are ''interveners'' who use humor to teach about environmental problems without overwhelming audience members. The function of environmental art as a force for social change arose from its formative influences in the 1960s. Joseph Beuys, a controversial German artist and environmental campaigner, believed strongly in the revolutionary and healing potential of art. His ''social sculpture,'' in which society itself is considered a malleable work of art, generally is understood as the origin of the movement. Sculpture remains an important form in eco-art, as in Lynne Hull's trans-species installations that aim at habitat enhancement for wildlife and eco-atonement for human ecological impact. Eco-art also has conceptual roots in the work of the American artist Allan Kaprow,

whose Happenings challenged the distinction between art and life and initiated performance art. The British artist Stephen Willats's "behavioural art" undermined the authority of artist, critic, and tradition through participatory projects operating outside institutions in the audience's everyday life, such as the West London Social Resource Project (1974).

The pioneers of environmental art include Newton and Helen Mayer Harrison, American artists whose work since the 1970s in watershed restoration, agriculture, forestry, and urban renewal has influenced policy in the United States and Europe. Hans Haacke's Rhinewater Purification Plant (1972) exposed the role of a sewage plant in degrading a river by pumping its murky discharge, which met government standards, through an additional filtration system. Using the resulting water in the museum's garden was an innovative instance of graywater reclamation. Similarly, Flowforms, developed by a sculptor, a mathematician, and a hydrologist, showed the inner potential for movement of water and remediated water for use in, among other things, swimming pools and beer making. Tim Collins and Reiko Goto's 3 Rivers 2nd Nature Project in Pennsylvania questions whether artists can and should create social change by affecting the ways in which public policy and private capital define ecosystems and urban spaces. Thus, environmental art is useful for informing policymakers on matters of public interest and connecting scientists with communities affected by their work.

Traditionally, art has been understood in terms of the artist's intention, the relationship between form and matter, and aesthetic (sensory) presentation of conceptual content. Environmental art has these features but also complicates traditional debates about the nature of art by challenging them. For example, although Marcel Duchamp's urinal raised the question whether removing something from its functional context and placing it in an institution creates art and René Magritte's *Ceci n'est pas une pipe* challenged the representational function of art by drawing attention to its ontological rupture of instrumentalism, environmental art makes these tensions moot. Thriving independently of institutions and galleries and instead functioning in lived contexts, environmental art is both representational and functional. It is often collaborative or participatory, blurring the line between artist and audience. For example, Daniel Dancer's ZeroCircles Project raised awareness of and objections to the crisis in U.S. forests: Participants used found materials to create a circle symbolizing healing, hope, trust, and wonder at the creative and regenerative power of nature. A reclamation project in low-income urban neighborhoods along the Los Angeles River asked local children to draw their vision of nature parks and used those drawings in project design, and mothers and children decorated fences with the artwork. These are examples of the practical role of environmental art in community greening and reclamation.

AESTHETIC ASPECTS

Eco-art can consist in a lone artist expressing private inspiration but more often involves the artist and critic Suzi Gablik's concept of connective aesthetics. It joins together artists, scientists, policymakers and bureaucrats, and community members of all ages. Eco-art can be and often is aesthetically pleasing, but its treatment of devastated ecosystems and landscapes or cityscapes and polluted industrial brownlands can, like conflict art, challenge traditional conceptions of beauty. On occasion eco-art borrows directly from conflict art. For example, Wilderness Women in Black identify with the Women in Black conflict-resistance movement and use its strategies of dressing in black and holding vigils to draw attention to issues of environmental justice. Environmental art blurs distinctions between theory and artistic practice and between intellectualism and activism.

Environmental art challenges assumptions about what it means to be human. It puts into question the privileging of human being over nature that informs European and North American history. If art does not merely record history but instead opens spaces of lived meaning, environmental art in particular generates possibilities for alternative conceptualizations of nature and human being that may inspire ecologically sound practices.

SEE ALSO *Environmental Aesthetics; Landscape Painters and Environmental Photography.*

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Trish Glazebrook

ENVIRONMENTAL CITIZENSHIP

Environmental citizenship is the idea that each of us is an integral part of a larger ecosystem and that our future depends on each of us embracing the challenge and acting responsibly and positively toward our environment. This idea is about making changes in our daily lives to be environmental citizens all day, every day.

River Cleanup, Wapello, Iowa. *Two men sort trash pulled from the Iowa River as part of the fourth annual Project AWARE. Volunteers for the project travel 99 miles along the Iowa and English Rivers to remove trash. Such projects are one way for individuals to participate in environmental citizenship.* **AP IMAGES.**

The idea of environmental citizenship was first developed by Environment Canada in the context of environmental education. It has been adopted by the United Nations to some degree (Barcena 1997). It is an idea similar to and compatible with environmental stewardship in the Christian, Islam, and Judaic traditions, but is not committed to or associated with any particular religious or cultural tradition.

Environmental citizenship was anticipated in some ways by Aldo Leopold in his essay, "Land Ethic," where he writes, "A land ethic changes the role of *Homo sapiens* from conqueror of the land-community to plain member and citizen of it. It implies respect for his fellow-members, and also respect for the community as such" (1949, p. 204). Here the contrast is between human domination of the environment and membership in it, along with plants, animals, and nonliving elements.

Mark Sagoff introduced citizenship into the environmental-ethics literature as part of his critique of environmental economics in *The Economy of the Earth* (1988), where he contrasts citizenship with consumerism. Sagoff shows that although environmental policy has usually been based on consumer preferences via consumer surveys, citizen preferences based, for example, on voting in referendums may produce completely different results. For example, although the members of a community as consumers may prefer certain kinds of packaging, they may reject this packaging as citizens if their community has a solid-waste-management problem. In such cases, citizen preferences in terms of democratically cast votes may override consumer preferences in terms of interpretations of consumer-survey results by economists. This distinction is similar to Bryan G. Norton's distinction between felt preferences and considered preferences in "Environmental Ethics and Weak Anthropocentrism" (1984), although Norton does not specifically use the term *citizenship*. Norton also seeks social consensus in the political arena (see *Toward Unity among Environmentalists*, 1991).

Environmental citizenship can be associated with Aristotle's ethics, since Aristotle considered ethics and politics to be two sides of the same coin, virtue ethics. For example, Leopold created the land ethic in large measure because of the unwillingness of farmers to write their own soil-conservation rules in Wisconsin in the 1930s (1949, p. 206)—a failure in citizenship. "The answer, if there is any, seems to be in a land ethic, or some other force which assigns more obligation to the private landowner" (Leopold 1949, p. 213).

Although the idea of environmental stewardship has become well established over the years among environmentalists, environmental citizenship is an alternative with more potential, especially internationally. Because stewardship is associated with three world religions—Christianity, Judaism, and Islam—it may be difficult to establish a practice of environmental stewardship in cultures where other religions are the dominant perspective. Citizenship, in contrast, is religiously neutral. In addition, stewardship may not be the best model for environmental action even within the Judeo-Christian tradition, because stewardship owes its prominence in large measure to the fact that dominion was misinterpreted as domination during translation into most European languages. Discussion of stewardship in the Bible mostly concerns examples of bad management (see Steffen 1992). Although the original conception of dominion may be a better model than stewardship, it is probably not a viable approach, owing to its negative association with domination.

Andrew Dobson in *Citizenship and the Environment* (2003) has provided the most detailed analysis of environmental citizenship. Dobson develops a postcosmopolitan conception of environmental citizenship, which he calls "ecological citizenship." This view of citizenship is global and transcends national borders, but is focused on the responsibilities of citizens in Western nations. Cosmopolitan environmental citizenship is unacceptable to Dobson because the environmental situations of people around the world are not the same. The fundamental problem is asymmetrical globalization, in which Western industrialized nations (sometimes called "the North") have a largely one-directional environmental impact on the rest of the world ("the South"). Dobson calls his view "postcosmopolitan" in recognition of this asymmetrical relationship. This asymmetry rules out a conception of citizenship that is reciprocal and contractual because people in various parts of the world are not always in an equal position to

perform reciprocal action. Thus, Dobson's citizens are supposed to act to avoid harm to others because it is the right thing to do, not simply to avoid reciprocal harm from others. Dobson employs Wackernagel and Rees's (1996) notion of an ecological footprint, the total area of the earth that supports any political geographical unit, to define the limits of harm that any given society may do. Because Dobson is concerned with asymmetrical ecological harm, he calls his position "ecological citizenship." Nonetheless, this position is anthropocentric, rather than ecocentric, since the primary object of his conception of citizenship is preventing harm to humans.

Dobson rejects both liberal citizenship (based on rights) and republican citizenship (based on duties) on the grounds that both ultimately share a contractual conception of citizenship. The basis for his ecological citizenship is responsibility, not rights or duties. Freedom too is not as fundamental as responsibility, since asymmetrical global relationships often limit one's ability to act. His focus is more on justice than dialogue and democracy. Thus, ecological citizenship involves unreciprocated and unilateral citizenship obligations, depending on one's asymmetrical ability to act.

Environmental citizenship cannot be reduced to a set of universal principles, because the obligations of individuals are asymmetrical and depend on conditions in specific cultures around the world. Likewise, it is not possible to generate a common set of virtues, since these too will be culture-specific. Nevertheless, framing environmental education in terms of environmental or ecological citizenship may avoid resistance to teaching an environmental ethics, particularly in countries where teaching ethics, values, and virtues as such is viewed with suspicion (see Hargrove 2000, 2004).

SEE ALSO *Economism; Land Ethic; Leopold, Aldo; Stewardship; Virtue Ethics.*

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Eugene C. Hargrove

ENVIRONMENTAL CONFLICT RESOLUTION

Environmental Conflict Resolution (ECR) consists of collaborative efforts to resolve environmental, public land, or natural resource conflicts through direct negotiations and dialogue amongst the disputants. ECR usually involves government agencies working in partnership with representatives of a full range of parties who are potentially affected by an agency decision. Third party neutrals (such as mediators or facilitators) work with agencies and the parties to promote resolution of disputes through consensus.

The four key elements of ECR, then, include: (1) agencies working collaboratively with interest groups, (2) the inclusion of all affected parties (stakeholders) in structured dialogues, (3) the presence of independent, third party neutrals (mediators or facilitators) to manage the dialogue process and ensure its impartiality, and (4) the attempt to achieve consensus amongst all the stakeholders as a basis for making decisions. As such, it differs significantly from traditional processes of public decision making. Instead of agencies first developing policies based on their own professional judgment then seeking public input through public hearings, agencies work with citizens and stakeholders from the beginning to design policies or programs that meet the interests of all the parties.

THE HOPE AND PROMISE OF ECR

While public policy generates conflict in many arenas, it is in environmental policy that conflict resolution is most widely used. Conflict resolution is particularly useful in resolving environmental disputes because the environment interacts with almost everything we do as humans. We often need to protect the environment while at the same time pursuing other social goals. We want, for example, to promote productive and reliable industries,

agriculture, energy, and transportation systems while also protecting the environment from the pollution or displacement of natural resources that these activities often entail. Good environmental policy, then, does not stand on its own, but must be integrated into other fields of economic and social policy.

During the late 1960s and 1970s, with the emergence of the modern era of environmental political activism, public debate over how best to protect the environment became increasingly contentious. While fewer than 25,000 environmental lawsuits were filed in federal district courts in 1969, the number of cases had increased sixfold by the late 1970s. Traditional means of policy-making—legislation, litigation and bureaucratic decision making—often proved incapable of balancing the complex array of interests associated with environmental management.

It was in this atmosphere of intensifying conflict that ECR emerged. ECR offered a new way to draw on the collective wisdom of interested parties and professionals to design more effective and implementable environmental policy. Each party brings considerable knowledge and experience in their own field of interest, as well as an ability to assess whether policies would enhance or detract from those interests. Through open dialogue, exchange of information, and negotiation, parties challenge each other to design solutions that best meet the needs of all the parties, thereby identifying and promoting the public interest through direct participatory democracy.

EARLY PRACTICE OF ECR

Consider as an example the first recorded use of ECR. Between 1958 and 1973, environmentalists, local residents, and farmers fought over proposals to manage flooding along the Snoqualmie River in Washington. The river frequently flooded, and farmers and residents favored a proposed dam for its flood control and irrigation values. Environmentalists opposed the dam because it would induce development in the flood plain, encourage sprawl from nearby Seattle, and destroy one of the most pristine scenic and recreation areas near Seattle. In 1973, Governor Daniel Evans invited mediators to bring the disputing interest groups into dialogue with government agencies and implementing bodies. After seven months of negotiations, the parties agreed on a plan that combined a multi-purpose dam on a different fork of the river with a system of set-back levees, land use controls and floodway easements. Instead of continuing to fight over a mutually unacceptable alternative, the interested parties designed a new set of solutions that more effectively met their mutual interests.

As can be seen from this example, ECR provided a mechanism for resolving long-standing controversies among well-matched disputants who had demonstrated a capacity to block each other's preferred policy options. ECR proved to be cheaper and more efficient at resolving differences than the litigious and politically motivated strategies that predated them. Of the approximately 160 significant cases of environmental mediation that occurred by 1984, more than 75 percent reached agreement, and enthusiasm for both the processes and outcomes of mediated ECR spread widely.

TRENDS IN ECR

While early ECR efforts focused almost exclusively on resolving existing disputes, later ECR efforts became increasingly proactive. By seeking to resolve conflict before major disputes developed and stalemate ensued, these processes focused less on negotiating over specific problems and more on building broader collaborative dialogues that promote community values. Two examples will illustrate these newer forms of ECR.

Like many industrial cities, Lowell, Massachusetts, contains a large number of old industrial sites that are no longer being actively used. These sites, called brownfields, are often located adjacent to poor and working class neighborhoods, contain deteriorating industrial buildings and infrastructure, and are potentially contaminated by industrial pollutants. They are often difficult to redevelop. Yet brownfield redevelopment provides important benefits to the city and its neighborhoods by reinvigorating their economy and quality of life. The City of Lowell therefore hired facilitators to work with community residents, developers, property owners, bankers, and government agencies to develop plans for the redevelopment and reuse of these sites. By helping to bring the many parties together and encouraging a dialogue on all the issues associated with each site, the city built the collaborative teams needed to redevelop many of the properties.

As a second example, the San Francisco Estuary Project (SFEP) is a complex set of processes seeking to resolve highly contentious issues associated with water management in Northern California. The watershed feeding into the estuary covers over half of the state of California. The size of the affected area, the complexity of the issues, the diversity of the stakeholders and the number of local, state, and national agencies involved in watershed management all posed significant challenges to management of the estuary. To design a plan for managing the estuarine system, a consensus-building process was initiated and funded by the U.S. Environmental Protection Agency (EPA). The process was divided into three committees involving over 120 individuals and consisting of state and federal agencies, citizen and interest group representatives, and scientists and engineers. The agency committee was responsible for developing consensus around policy, but these participants were highly affected by both the public and technical

advisory committees. This somewhat loose network of agencies, interest groups, and scientists effectively developed a plan of action and coordinated decision making for the estuary and the rivers feeding into it for over fifteen years, managing conflict through consensus building and directly involving all the interested parties in the management process.

THE INTERNATIONAL USE OF ECR

Although ECR practices developed in the United States and Canada are being internationalized, these practices remain limited in scope in most other countries. The different political and bureaucratic cultures of these countries have proved less fertile for the adoption of formal ECR processes. European environmental activists, for example, can more directly access political decision making (through Green parties) and bureaucracies (through consultation processes) but have less capacity to challenge bureaucratic decisions through administrative and judicial review. Hence, European environmental organizations, although more effectively institutionalized and integrated into political decision making, lack many of the direct-action tools that U.S. and Canadian interest groups use to delay and block official actions. Incentives to negotiate therefore differ. Environmental conflict is managed more politically and less bureaucratically, and agency-based ECR processes are not as useful.

THE BENEFITS AND DRAWBACKS OF ECR

Since the 1970s, the practice of ECR has offered a number of significant benefits and has raised some important questions. Effective participation in ECR often requires considerable resources—in staff time, information, research, and travel—that are more readily available to corporations and government agencies than to environmental activists or community groups. By focusing attention on resolving particular issues, ECR may also promote incremental improvements while distracting environmental groups from more basic concerns. A number of environmental groups have consequently become more cautious about the potential for cooptation through dialogue.

At the same time, well-designed ECR processes can enhance the efficiency and responsiveness of decision making, provide a meaningful voice to concerned citizens, and encourage power-sharing amongst multiple agencies and interest groups. ECR can also promote collaborative analysis, producing environmental decisions that are more thoughtful, more durable, and more easily implemented. ECR retains considerable promise as a mechanism for enhancing environmental decision making under conditions of conflict.

SEE ALSO *Environmental Activism; Resource Management.*

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Michael Elliott

ENVIRONMENTAL DESIGN

Environmental design, design for environment, ecodesign, green design, sustainable design, design for sustainability, cradle to cradle—all these terms refer to integration of environmental requirements in all stages of the product development process, with the aim of reducing the environmental impact of all life cycle steps and maximizing sustainability. Ecodesign ranges from the design of small objects for everyday use to the design of buildings, cities, and the physical surface of the earth. It is a growing trend in architecture, engineering, industrial design, graphic design, interior design, and fashion design.

GENESIS

Ecodesign originated during the second wave of modern environmentalism. The first wave began in 1962 with the publication of Rachel Carson's *Silent Spring* and culminated in the publication of the 1972 Club of Rome report *Limits to Growth*. First-wave environmentalists argued that exponential growth of populations and industrial activity could not continue without exhausting the resources of the planet and overloading its capacity to deal with pollution and waste. The second wave of modern environmentalism, which began with the 1987 publication of the so-called Brundtland Report, *Our Common Future*, initiated a new approach to dealing with environmental problems. The concept of sustainable development was introduced in the belief that economic development and ecological sustainability are not incompatible. "Ecological modernization" and "pollution prevention pays" were the new slogans. End-of-pipe solutions, which focus on waste disposal, gave way to systematic attention to environmental impacts in the early design stages, moving upstream in the pipe.

The first initiatives in the area of ecodesign started in the late 1980s in Europe and the United States. In the beginning of the 1990s a series of ecodesign demonstration projects in different industrial sectors was organized in the Netherlands. On the basis of experiences with those projects, an ecodesign manual called *Promise* was published in 1994. Three years later an updated version was launched under the auspices of the United Nations Environment Program (UNEP). This ecodesign approach has been an inspiration for several other international and local ecodesign manuals.

BASIC PRINCIPLES

Ecodesign is a sophisticated form of *ecoefficiency* in the field of product development. Ecoefficiency primarily means doing more with less: creating more goods and services with fewer resources and less waste and pollution. The term was coined by the World Business Council for Sustainable Development (WBCSD) in its 1992 publication *Changing Course*. According to the WBCSD, ecoefficiency is achieved through the delivery of "competitively priced goods and services that satisfy human needs and bring quality of life while progressively reducing environmental impacts of goods and resource intensity throughout the entire life-cycle to a level at least in line with the Earth's estimated carrying capacity" (Business Council for Sustainable Development 1993). The 1992 Earth Summit endorsed ecoefficiency as a means for companies to put Agenda 21 into practice in the private sector.

The environmental performance of ecodesign will be optimized through the use of a *life-cycle assessment* or analysis that measures the environmental impact of a product or service throughout its life span. It requires the assessment of raw material production, manufacture, distribution, use, and disposal, including all intervening transportation steps. Environmental aspects should be analyzed for every stage of the life cycle, from the consumption of resources (energy, materials, water, or ground) and the emissions to air, water, or the ground through to the waste and waste products and issues such as noise and vibration.

A new and innovative way of thinking about life cycles was launched by William McDonough and Michael Braungart in their 2002 book *Cradle to Cradle: Remaking the Way We Make Things*. This book challenges the "cradle-to-grave" manufacturing model that the authors see at work in the area of ecoefficiency. To them, ecoefficiency works within the same system that caused environmental problems in the first place. "Relying on eco-efficiency to save the environment will in fact achieve the opposite; it will let industry finish off everything, quietly, persistently, and completely" (McDonough and Braungart 2002, p. 62). In their cradle-to-cradle approach, "waste equals food." Products should be designed from the outset so that they will provide nourishment for something new after their useful lives.

PHILOSOPHICAL ISSUES

In the cradle-to-cradle approach nature is taken as model for making things. This idea of learning from nature is present, implicitly or explicitly, in concepts such as the natural step and in new research areas such as industrial ecology. Learning from nature was put forward by Janine Benyus in her 1997 book *Biomimicry: Innovation Inspired by Nature*. Biomimicry (from *bios*, meaning "life," and *mimesis*, meaning "to imitate") is "a new discipline that studies nature's best ideas and then imitates or takes inspiration from these designs and processes to solve human problems" (Benyus 1997, p. iv).

This notion of learning from nature evokes many philosophical questions, particularly at the interface of the philosophy of science and the theory of evolution. In his 2003 article "Nature's Swell, but Is It Worth Copying?," Steven Vogel stated that the theory of evolution provides no justification for assuming perfection in natural design and rejects the belief that natural design is better than human-made technology as overly romantic. "Natural selection suffers from lack of foresight, near impossibility of cross-lineage transfer of innovations, great difficulty making anything but incremental alterations, severe lock-in of established if fundamentally inferior designs, unavoidably multifunctional devices, and limitation to locally available resources, just to mention a few of the constraints under which it labours" (Vogel 2003, p. 404). Moreover, technology does many things with few or no natural analogues, "even things we think might be useful to other organisms" (Vogel 2003, p. 404).

Learning from nature can be no more than an analogy or an inspiring example. Only in a few cases can a real scientific relation be found between human design and evolutionary development. Moreover, there is always a danger that the heuristic use of the learning from nature argument will be accompanied or replaced by rhetorical appeals that are meant to claim cognitive authority or superiority for certain, otherwise unwarranted statements or insights.

SEE ALSO *Sustainability; Sustainable Architecture and Engineering; Sustainable Development.*

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ENVIRONMENTAL EDUCATION

During the first decade of the twentieth century, education scholars concerned about the urban migration of rural youth created a curricular movement called ''nature studies,'' intended for the nation's rural schools. The hope was that if rural students developed an intellectual appreciation for the natural world around them, migration to the city would slow. Curricular guides and teaching strategies were disseminated across the country with the blessing of such notables as Liberty Hyde Bailey and John Dewey. Although the nature-study movement was short-lived, it is fair to call it one of the first concerted attempts to insert environmental education into the public-school experience.

Over time, of course, there have been many extracurricular experiences focused on learning about nature and the physical environment. *Outdoor education* was a popular phrase for decades and a concept conscientiously advanced by such groups as the Boy Scouts and Girl Scouts of America, as well as many other youth and adult groups. As American public education came to be increasingly connected to preparation for an occupation, to jobs and the economy, far less thought was given to experiential learning opportunities of the sort that placed students out in nature to study it. As a result, environmental education was marginalized outside of the core public-school program of instruction.

This situation began to change during the 1960s, when such works as Rachel Carson's *Silent Spring* and Paul Ehrlich's *The Population Bomb* were published. Greater levels of public concern for the environment meant that some curricular attention was paid to the health and well-being of nature, particularly in science and social-studies classes. But concern for the environment was merely one cause among many at a time when civil-rights struggles, antiwar efforts, and the emerging women's movement dominated public attention.

Only after 1985, especially in the wake of David Orr's 1992 classic *Ecological Literacy*, did environmental education emerge as a respected subfield in American curriculum studies. Creative teachers encouraged a kind of curricular activism and in the process contributed to such environmental victories as forcing McDonald's to forego the use of Styrofoam packaging. Hard on the heels of student participation in these efforts, Congress passed the National Environmental Education Act of 1990, essentially creating an education wing of the Environmental Protection Agency. A large part of this effort involved the identification of outstanding environmental-education practices through grants and the dissemination of grant results.

By all accounts, both entities established by the National Environmental Education Act—the National Environmental Education Advisory Council and the Federal Task Force on Environmental Education—advanced systematic curricular and instructional work throughout the 1990s. But this was also a decade that witnessed a significant change in educational policy and practice: a shift to a focus on *outcomes* via the identification of learning standards, and a similar shift to a focus on *assessment* via the creation and implementation of standardized tests used to measure the achievement levels related to those standards. In the wake of this movement, environmental education began to slip out of American public-school curriculum.

That slippage was dramatically accelerated by the No Child Left Behind Act of 2002. Some observers have suggested that this piece of legislation was nothing more than an attempt to move public conversation on education away from inputs, such as per-pupil spending, concerns about equality, and so on, to outputs that focus solely on teachers and students, standards met or not met, test scores achieved or not achieved. Others have suggested that the law was designed to paint public education as a failed endeavor, one that should be supplanted by a system of private, for-profit educational ventures. Regardless of the motives behind this law, it completely ignores environmental education.

By contrast, environmental education has moved much closer to mainstream education elsewhere in the world. The Foundation for Environmental Education, based in Denmark, has focused curricular and instructional attention on the health and wellbeing of the earth's physical environment. It sponsors several programs intended to create this focus in schools around the globe. The organization got its start in 1981, with France, Germany, Spain, and Denmark as founding members. In 2007 the organization consisted of forty-eight member nations from all parts of the globe, though the United States has not sought membership.

Pesticide Protest Walk, 2002. *Students at Chapham College in Pittsburgh, Pennsylvania take part in a walk to protest pesticides. The walk was part of a program at the school to commemorate Rachel Carson's* Silent Spring, *the famed environmental piece. Many schools have been making an effort to bring environmental education back into the classroom.* **AP IMAGES.**

In the United States, environmental education has been relegated to a marginal position comparable to that of the time when it was primarily extracurricular. The heavy pressure to generate acceptable test scores in reading and mathematics severely inhibits the ability of teachers to engage students in environmental-education lessons. In keeping with conservative opinion, the environmental-education advisory groups of the Environmental Protection Agency have promoted the message that environmental education is the concern only of the science classroom and that, as the 2005 report to Congress stressed, environmental educators must possess "the ability to present multiple perspectives on environmental issues without advocating a particular viewpoint" (National Environmental Education Advisory Council, 2005, p. 36). In other words, calls for action on the environment must be balanced with opinions advocating a laissez-faire approach.

The federal position on environmental education does not mean that efforts at environmental education have disappeared; far from it. Advances in learning theory, in understanding how humans come to understand, have sparked increased interest in close study of the world that surrounds students. Put simply, constructivist learning theory contends that understanding develops via the cognitive interplay of new and old information *in a context conducive to making sense of it all*. Sophisticated teachers put students in a context within which lessons can most easily come to be understood. A sterile classroom and a textbook filled with good information lacks context, a necessary ingredient for producing understanding. Students can, of course, acquire information in a classroom from an information-filled text, and that information may be held long enough to be reproduced on a test that measures low-level comprehension, but students may not understand the significance of the information acquired in this way, and such information may not remain useful for long.

The ascendancy of constructivist theory in the scholarly field of learning has helped keep many promising curricular and instructional practices from disappearing in the wake of 2002–2008 federal education policy. Project-based learning, place-based pedagogy, community-based studies, and environmental education all overlap, and all garner legitimation from what we now know about how to produce human understanding.

Though federal education policy prescribed by the No Child Left Behind initiative ignores environmental education, the 1990 Environmental Education Act remains in force. It continues to serve as a rationale for teachers who hope to educate the students in their responsibility for the health and wellbeing of their immediate physical environment. Still, with heavy state and federal pressure for students to perform well on standardized exams, teachers and administrators must weigh the pros and cons of hands-on environmental education of the sort that occurs outside the classroom.

Despite attempts to develop standards for environmental education—attempts to define what it is and what it should be—the area is too political to generate any kind of consensus analogous to, say, standards for mathematics. It is not even possible to identify a typical curriculum outline for elementary-, middle-, or high-school classes. Generally, however, science-focused environmental education tends to center around large concepts: land, ocean, atmosphere, climate, and the like. In contrast, social-studies classes tend to center around specific environmental problems, such as air pollution, global climate change, deforestation, food safety.

Resources for teachers abound. Practically every environmental organization one might think of gets involved in the preparation of lessons or ideas that teachers can use at all levels in public schools. Also, textbook companies have entered the environmental-education market, largely because several states have mandated some student exposure to environmental education. Sometimes this exposure is embedded in various classes, but sometimes it takes the form of a stand-alone class—a fact that creates at least a small market for textbooks. To judge by reviews published by the Environmental Literacy Council, most of these textbooks do a poor job of providing any insight into the connection between the environment and economic activity. This is to be expected, since to maximize sales, publishing companies must avoid becoming labeled controversial in any way. Thus, for instance, arguments that might be interpreted as critical of capitalism are usually omitted.

Most teachers preparing lessons in environmental education use the Internet to acquire lesson plans from such organizations as the North American Association for Environmental Education, the Environmental Literacy Council, or the National Environmental Education and Training Foundation, among many others. Teachers need only google a problem on the Internet, and they will be presented with Web sites such as Stop Global Warming (http://www.stopglobalwarming.org) and Save Our Environment (http://www.saveourenvironment.org), many of which provide sophisticated information in the form of research studies and reports, if not in ready-made lesson plans, that might augment their classroom instruction.

Missing in environmental education in 2007 is any concerted attention to environmental ethics, ethical behavior related to our natural environment. The current policy position on environmental education seems to be that any kind of ethical deliberation must be minimized, if not eliminated, in favor of a general acceptance of all perspectives related to the environment—a position that legitimates environmental degradation in the pursuit of profit and raises it above reproach.

This neutral position is acceptable to the American public because the public-school endeavor has been defined largely in terms of its economic utility, whether at the individual or societal level. Children are sent off to school in the hope that it will help prepare them for a good job someday. U.S. society spends enormous sums on public education so that it will remain competitive in the global economy. As long as a kindergarten through twelfth-grade education is focused on employment, the presence or absence of environmental education will remain a matter of little concern.

When public-school systems were created in the 1830s and later throughout the nineteenth century, their goal was nearly the reverse of what we see today. School systems were created to help citizens fulfill the responsibilities of democracy. In discussing the economic benefits of education, public-school advocates would add a vibrant account of the political dimensions of education. At the beginning of the twenty-first century, less is heard about the contribution of a public education to the political duties incumbent on citizens, but we hear a good deal about the ostensible connection between good schools and a good economy. The success of environmental education probably requires that schools give due attention to the development of what has been called the "democratic arts." Schools offering such instruction would be open to ethical deliberation. Such schools would cultivate the student's ability to create an argument, be persuasive, build and use evidence, listen intently, and work toward compromise. There is likely no better forum for the cultivation of these skills than environmental education. One can only hope that significant progress can be made in this direction before environmental circumstances create untenable and unstable societal conditions.

SEE ALSO *Bailey, Liberty Hyde; Carson, Rachel; Ehrlich, Paul; Environmental Citizenship; Environmental Policy; Environmental Politics; U.S. Environmental Protection Agency.*

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ENVIRONMENTAL HISTORY

Environmental history assumes that human history is shaped to a major extent by the relationship of human culture to nonhuman nature. As a subfield of history, it seeks to understand human beings as they have lived, worked, and thought in relationship with the rest of nature. In *The Ends of the Earth*, Donald Worster, a preeminent American environmental historian, described environmental history as "part of a revisionist effort to make the discipline far more inclusive in its narratives than it has traditionally been" (1988, p. 290). Indeed, established historians have usually treated the natural environment as a given, a static backdrop for their accounts of political and military events and the actions of national, economic, and religious groups. Environmental historians, in contrast, portray nature as an actor that joins in directing the course of human history. They tend also to believe that the contemporary environmental crisis can best be understood by way of a study and elucidation of past human interactions with the natural world.

MAJOR THEMES

Environmental history centers on three major themes. First, it investigates the history of impacts of natural changes—whether geological, climatic, or biological—on human societies. Of course, the natural environment has a history, but the study of its changes, such as volcanic eruptions and ice ages, is usually left by historians to the natural sciences. What interests environmental historians is the effect of such changes on human history. Did they set off migrations, cause competition over resources, or stimulate inventions? Environmental history does not concern itself primarily with the history of the environment but with the interaction of humans and environment. That being said, it is also true that knowledge of what science can reveal about the history of the environment is an indispensable element of environmental history. After all, humans are part of nature, dependent on ecosystems, and not entirely in control of their own destiny. Properly understood, environmental history should be a corrective to the prevailing tendency to see humans as separate from nature, above nature, and masters of nature. Of the themes to be discussed here, however, this first theme—the history of impacts of natural changes on human societies—has been developed by fewer environmental historians than the other two.

The second theme is the investigation of human impacts on the natural environment in various places and in selected periods, as well as the ways in which changes caused by those impacts rebound and cause reciprocal changes in human societies. For example, settlers plowed the North American High Plains, removing the resilient vegetative cover that had protected the soil and thus subjecting vast tracts of land to wind and water erosion. That intervention resulted in the Dust Bowl and the eventual abandonment of the land by thousands of farmers. Studies of resource development, forestry, mining, grazing, agriculture, water diversions, industrialization, energy development, urbanization, air and water pollution, nuclear power and weapons, and the environmental effects of warfare have provided subjects for uncounted studies in environmental history. All these human activities affect the natural environment in many ways, both positively and negatively, from a human point of view. A large coterie of environmental historians has devoted attention to the ways in which governments and organizations have attempted to accentuate positive change and limit damage through pollution control and the conservation of natural resources, including the preservation of sections of land as national parks, wildlife reserves, and other protected areas, and the safeguarding of threatened and endangered species. Others trace the tangled tale of political decision making about the environment, including the battles that have pitted the environmental movement against its opponents and business against government.

A third theme, the one most closely related to environmental philosophy, is the study of human thought about and attitudes toward nature, including the scientific study of nature, especially ecology, and the ways in which popular culture and systems of thought such as religions, philosophies, and political ideologies have influenced human relationships to the natural environment. These aspects of intellectual history can yield insights into the past, present, and future of the earth and its diverse living systems. What individuals and societies believe about nature influences their treatment of it: Temporary economic advantage and sheer basic needs have often trumped high principle.

Closely connected with this third theme is the study of the lives of influential figures in environmental thought, supplemented by commentaries on their works.

Environmental historians and environmental philosophers, when dealing with the same authors or figures, do not always take approaches defined mainly by their disciplines. For example, in *Companion to a Sand County Almanac* (Callicott 1987), a collection of essays on Aldo Leopold—an important mid-twentieth century wildlife biologist and ecological theorist—contributions by environmental philosophers such as J. Baird Callicott and Holmes Rolston III give careful attention to the historical setting of the author and his works, whereas historians such as Susan Flader, Curt Meine, and Roderick Nash emphasize the importance of his ideas to a philosophy of ecology. Historians can use the work of philosophers, and vice versa.

HISTORY OF THE FIELD

In the United States, environmental history first became a distinct scholarly discipline during the 1960s and 1970s; later it spread to the other English-speaking countries, continental Europe, India, and beyond. Many themes of environmental history had already emerged in the works of earlier historians. Also, attention had been given by historians to the American conservation movement, including advocates of nature preservation such as John Muir (1838–1914) and the so-called Progressive Conservation Movement, for the prudent and scientifically based use of natural resources urged by the geologist John Wesley Powell (1834–1902), the forester Gifford Pinchot (1865–1946), President Theodore Roosevelt (1858–1919), and President Franklin D. Roosevelt (1882–1945). Samuel P. Hays provided a critical analysis of this period in *Conservation and the Gospel of Efficiency* (1959), depicting conservation during the so-called Progressive Era, presided over by Theodore Roosevelt, as an emphasis on scientific management and organizational efficiency. Roderick Nash, in *Wilderness and the American Mind* (1967), put conservation in the context of intellectual history, emphasizing preservationist rather than utilitarian thought, and established the wilderness as a leading interest within the nascent field of American environmental history. In subsequent work Hays defined the transformation in American attitudes toward the environment after 1945, when the environmental movement superseded the conservation movement. In his book *Beauty, Health, and Permanence* (1987), Hays noted the emergence of new environmental values, including the desire for environmental amenities, recreation, aesthetics, and health, all of which were associated with rising standards of living. Americans also had become concerned with environmental issues such as increasing smog and the dangers of radioactive contamination by fallout from nuclear bomb tests. Rachel Carson, in her 1962 book, *Silent Spring*, warned of damage from the persistent use of pesticides. Emerging environmental movements reached nationwide awareness on the first Earth Day, April 22, 1970, and ecology, formerly an obscure science, became a household word. That the historians who created the field of environmental history in the 1960s and 1970s were mostly environmentalists no doubt helps to account for their choice of subject. Nevertheless, they strove to do professional historical research, not environmental journalism or environmentalist propaganda.

A group of scholars—mostly historians, a significant number of philosophers involved in what was newly termed ''environmental ethics,'' and scholars studying literature with environmental themes—formed the American Society for Environmental History (ASEH) in 1976, with the U.S. historian John Opie as its first president. The group included Canadian scholars from the start and has held meetings in Canada. The journal of the society began publication in the same year and was successively titled *Environmental Review* (1976–1989), *Environmental History Review* (1990–1995), and *Environmental History* (1996–). The change in titles reflects the gradual transformation of the society's scholarly efforts from a broadly interdisciplinary venture into a subfield of history. Nonetheless, environmental history has remained from its inception a necessarily interdisciplinary endeavor, practiced in all vigorous academic communities. The journal *Environment and History* began publication in 1995 in the United Kingdom, with Richard Grove as editor. Although a European journal, it presents research on every part of the world. The European Society for Environmental History (ESEH) was founded in 1999 and has held biennial conferences since 2001. Both ASEH (2008) and ESEH (2008) have useful Web sites. Other regions with active cooperative work in environmental history include Latin America/Caribbean, which has a society and periodic conferences; South and Southeast Asia; Australia and New Zealand; China; and South Africa.

Although the environmental history began to emerge as an academic activity only in the 1960s, themes of environmental history had surfaced in the work of historians, philosophers, and geographers well before the mid-twentieth century. The idea that climate influences human culture, for example, is ascribed to the early Greek philosopher Parmenides, and is found in the writings of the historian Herodotus and the medical writer, Hippocrates. One can find a more specific explanation of the influence of the environment on human history in the work of the great ancient Greek historian Thucydides (c. 460–404 BCE), who theorized that because Attica, the district around Athens, had soil that was thin and dry, its unattractiveness to potential invaders saved it from war and preserved it from depopulation (1972). Its relative safety

made it a shelter for refugees fleeing from wars elsewhere, further increasing the numbers of residents until they exceeded the capacity of the land to feed them. So Athens, he believed, relieved the pressure by sending out settlers to colonies.

The idea that human efforts cause changes within the environment occurs in the writings of the Greek philosopher Plato (c. 428–347 BCE). He observed historical deforestation of the mountains of Attica, offering archaeological evidence: Large roof beams in buildings that still stood in his own day had been cut from mountains where only "food for bees" (flowering herbs and bushes) remained (trans. R. G. Bury, 1966). Massive erosion had removed rich soil, leaving only the rocky framework of the land, which Plato compares to the bony body of a man wasted by disease.

A comparison may be made between Plato and the Chinese philosopher Mencius (c. 372–289 BCE), who described deforestation in his homeland. A section of his book that has caught attention from modern environmental historians is the description of Ox Mountain which had been denuded of its forests over the years by logging and where grazing made deforestation permanent by preventing the growth of trees (trans. D. C. Lau, 1970).

In the Middle Ages, Ibn Khaldûn (1332–1406), an Islamic philosopher, speculated about the influence of the environment on human history. In his influential work *Muqaddimah* (1958), he described the climatic zones of the earth and ascribed the characteristics of human groups to environmental influence. His most original environmental theory concerns the influence of the desert on the Bedouins in North Africa, whose strenuous life kept them from getting obese, toughened them against famine, and made them more self-reliant than townsfolk. Inhabitants of cities, though derived from desert forebears, gradually shed their traditional attitudes and descended into extravagance and debauchery, while desert tribes that become dependent on cities for necessities of life were subjugated by urban rulers.

Historical thought in Europe during the Middle Ages was shaped by the biblical view that God guides history and that nature is God's creation, given to man to use and to care for. Monastic writers such as Bernard of Clairvaux (1090–1153) observed human efforts to change the landscape, with fields and orchards replacing disordered wild growth; he noted river-control projects that sought to divert the waters for irrigation and tap their energy for milling. These changes he saw as useful and beautiful.

Richard Grove, in *Green Imperialism* (1995), showed that scientists sent out by European powers in the early modern period noted environmental changes on oceanic islands, changes so rapid that they could be chronicled within the span of one human life. Recording evidence of human-induced deforestation and desiccation, they asserted that humans have caused environmental alterations around the world and that many of these represented not progress but degradation.

Scientists argued that it was in the interest of colonial governments to prevent degradation of the environment in the territories they controlled. "The state," as the economist Richard Cantillon (1680–1734) proposed, is "a tree with its roots in the land" (1995, p. 221). But, Grove observes, "States will act to prevent environmental degradation only when their economic interests are shown to be directly threatened. Philosophical ideas, science, indigenous knowledge and threats to people and species are, unfortunately, not enough to precipitate such decisions" (1995, p. 42). Ironically, had those in power listened to the keen observers of nature among their contemporaries, they might have profited in the long run.

A modern writer who presaged environmental history was George Perkins Marsh (1801–1882), a long-time U.S. ambassador to Italy. He observed "the character and extent of the changes produced by human action in the physical condition of the globe we inhabit," and warned, in *Man and Nature*, that "the result of man's ignorant disregard of the laws of nature was deterioration of the land" (1965 [1864], pp. 10–11). Dissenting from the prevailing economic optimism of the times, he saw "man" as the disturber of nature's harmonies, observing that activities such as deforestation deplete the natural resources on which civilization depends. Marsh may be regarded as the first to systematically investigate the question of human-caused environmental deterioration and potential exhaustion of natural resources. Marsh was not a defender of immaculate nature; his salient point is that many of the changes humans make in the natural environment, whether through good intentions or neglect, injure the environment's usefulness to humans. His desideratum is a balance between man and nature in which man's needs are met and nature's harmonies preserved. He believes that man can be a coworker with nature, a restorer of disturbed harmonies.

In the early and middle twentieth century a group of historians based in France, called the *Annales* School (after the title of the journal founded in 1929 in which many of their papers were published), emphasized the importance of viewing history within the context of the environment at a large scale, both temporally and spatially. A founder of the school was Lucien Febvre (1878–1956). Among others prominent in the group were Marc Bloch (1886–1944), Fernand Braudel (1902–1985), and Emmanuel Le Roy Ladurie (1929–). Febvre's book *A Geographical Introduction to History* (1925) is a classic. He is aware that human activities are damaging the earth: "The civilized man directs his exploitation of the earth with a mastery which has

ceased to astonish him, but which, when we reflect on it for a moment, is singularly disturbing." (p. 355). Braudel's study, *The Mediterranean and the Mediterranean World in the Age of Philip II* (1966), offers a magisterial argument for the importance of landscape to history. Philip II, one of the most powerful kings of Spain, ruled from 1527 to 1598. Braudel's work, however, is by no means limited to that period, but ranges widely over Mediterranean history. Changes in the climate, Braudel believed, are often the result of changes caused by humans. A more extensive study of climatic change was undertaken by Le Roy Ladurie in *Times of Feast, Times of Famine* (1967).

Another impetus to environmental considerations in history came from American frontier historians such as Frederick Jackson Turner (1861–1932) and Walter Prescott Webb (1888–1963). Their theory held that the western frontier had kept egalitarian enterprise alive, representing an environmental safety valve that the closing of the frontier around 1890 had closed. Webb described his method as an approach to history through geography and the physical environment. James Malin's *The Grassland of North America* (1967 [1947]) provided awareness of the ecological changes that accompanied the settling of the Great Plains. It is hard to imagine any American historian of the mid-twentieth century who would not have been familiar with the strand of research exemplified by Turner, Webb, and Malin. This is undoubtedly a reason why the United States was the theater for the initial development of environmental history as a self-conscious inquiry in the later twentieth century.

The library of works in environmental history in the United States and around the globe is so extensive that it is possible to give only a brief overview of the field in an essay of this length. Among those that are worldwide in scope are John R. McNeill's "Observations on the Nature and Culture of Environmental History" (2003) and J. Donald Hughes's *What Is Environmental History?* (2006), which contains a bibliography on the historiography and philosophy of environmental history. On a much larger scale is the *Encyclopedia of World Environmental History*, edited by Shepard Krech III, John R. McNeill, and Carolyn Merchant (2004). Peter Coates penned a guide to environmental history in the Americas unconventionally titled "Emerging from the Wilderness (or, from Redwoods to Bananas)" (2004). "Environmental History in Australasia" (2004), by Libby Robin and Tom Griffiths, covers Australia and New Zealand. For the United States there is *The Columbia Guide to American Environmental History* by Carolyn Merchant (2002) and two journal articles by Richard White: "American Environmental History" (1985) and its sequel, "Afterword, Environmental History" (2001). For Europe there is a collected series of essays by Verena Winiwarter and others, "Environmental History in Europe from 1994 to 2004: Enthusiasm and Consolidation" (2004).

ISSUES AND CONTROVERSIES

Some scholars have accused environmental historians of environmental determinism, the theory that history is inevitably guided by forces that are beyond human origin or human choice. Such critics have especially targeted studies that emphasize the roles of climate and disease epidemics. The basic conception of environmental history is that human societies interact with the physical world, without prejudging which factor is dominant; among environmental historians opinions on this causal nexus range from one extreme to the other. Near the environmental determinist end of the spectrum, for example, is the geographer Jared Diamond. In *Guns, Germs, and Steel* (1997) he argues that human societies are thoroughly embedded in the natural matrix and have developed by dealing creatively with it. At the other end of the spectrum—cultural determinism—is William Cronon, who, with other authors in the volume *Uncommon Ground: Toward Reinventing Nature* (1995), argues that untrammeled nature no longer exists because humans have reshaped the planet. Wilderness, he proclaims, is entirely a cultural invention. Cronon argues further that the very idea of nature is a human creation and there is no way of relating to nature without culture. Notwithstanding their disparate perspectives, both Diamond and Cronon insist that they are analyzing an interaction between nature and culture. Diamond argues for the reality of human choice, especially in his later book, *Collapse: How Societies Choose to Fail or Succeed* (2005), and Cronon acknowledges that nature really exists and that there is a meaningful human cultural interaction with it. In *Uncommon Ground*, for example, he says, "the autonomy of nonhuman nature seems to me an indispensable corrective to human arrogance" (Cronon 1995, p. 87). Most environmental historians find themselves in a broad middle ground, although it is always more difficult for a scholar to define a balance than to stake out a radical position.

Other critics of environmental history have raised the charge of anachronism. These critics argue that the perception of environmental problems as such is an ephemeral, contemporary phenomenon, noting that the word *environmentalism* did not come into general use until the 1960s. Is environmental history, therefore, an attempt to read today's concerns back into past historical periods in which they were not operative or in which human participants were not conscious of them? The problem with this criticism is that it is fundamentally an argument against history itself as an intellectual endeavor. Modern problems exist in their present forms

Bare Landscape Outside Petra, Jordan, 1976. *This eroded and desiccated landscape near Petra, Jordan, shows the present results of environmental history in an area that human societies have used and misused over millennia. Terraces visible in the distance formerly bore flourishing agriculture, and the heights once had forests. While the causes are debated, the picture of degradation of the land seems undeniable.* **COURTESY OF J. DONALD HUGHES.**

because they are the results of historical processes. The relationship with nature was the earliest challenge facing humankind. It would take a particularly egregious form of denial not to see a precedent for the market economy in the exchange of a tribal nomad's meat and skins for a village agriculturalist's grain and textiles. The Columbian transfer of Europeans—along with their crops, weeds, animals, and diseases—to the New World in large part explains the history and present state of the Americas, as Alfred Crosby proposed in *The Columbian Exchange* (1972). Neither the European conquistadores and colonists nor the indigenous inhabitants of the Americas were aware of the existence of viruses and bacteria; is it anachronistic, then, for historians such as Crosby to detail the enormous political, social, and cultural effects of microorganisms on both sides of the Atlantic in the sixteenth and seventeenth centuries? The study of past effects of environmental forces on human societies and, conversely, the impact of past human activities on the environment, contributes to an understanding of the dilemmas of the contemporary world.

A third criticism is that narratives written by environmental historians tend to be ''declensionist''—that they invariably see human activity as the precipitant of environmental depredation. For example, the biologically rich forests of Brazil's Atlantic coast were hacked away from the time of conquest by Europeans down to the present, according to an exemplary environmental history by Warren Dean, *With Broadax and Firebrand* (1995). Also, the Mezquital Valley in Mexico, a productive region when farmed by pre-Columbian people, was transformed through overgrazing by Spanish sheep into ''an almost mythologically poor place renowned for its aridity, for the poverty of its indigenous inhabitants, and for exploitation by large landowners,'' according *A Plague of Sheep* (1997, p. 17), a compelling account by Elinor Melville. When expanded to the world scale, such regional examples become a story of global degradation, and it is hard to avoid expecting further catastrophe.

Does declensionist narrative have cautionary value? Today most historians assiduously avoid forecasting the

future, because earlier historians who ventured to describe coming events often turned out to be wrong. Hence the charge of insupportable catastrophism is largely unwarranted. Deterioration of the environment as a result of human activities is, in many cases, a fact revealed by careful research, not an inveterate prophecy of doom.

Historians are sometimes accused of being light on theory by their colleagues in philosophy, economics, and political science. Environmental historians have not escaped this criticism, which is sometimes deserved. There are notable exceptions, such as Carolyn Merchant in "The Theoretical Structure of Ecological Revolutions" (1987), Madhav Gadgil and Ramachandra Guha in "A Theory of Ecological History" (1992), and James O'Connor in "What Is Environmental History? Why Environmental History?" (1998).

Among the many possible dimensions of theory in environmental history, three merit mention here. One such dimension is that its subject includes nature and culture concurrently. In its simplest terms, it requires that a study can qualify as environmental history only if it considers and correlates change both in human societies and in the aspects of the natural world with which they interact. The relationship between the two is in almost every case that of reciprocal influence. A change made by humans in the environment virtually always rebounds and generates change in cultural conditions. A history that does not include both terms is not environmental history. This assertion may seem self-evident, but there are scholars such as A. T. Grove and Oliver Rackham who contend that environmental history is simply the history of the environment and define the environment as including "climate, geology, and geomorphology, not living things" (2001, p. 376). A history that includes living things, they insist, should be called ecological history. Even with the change in terminology, however, they focus attention on changes in the landscape, not social, economic, or other cultural changes. There is no doubt that such observations are useful; an environmental historian needs to know them to help in the reconstruction of the past, but he or she must retain human history and anthropogenic changes as integral parts of the narrative. Some might argue that to frame the inquiry in these terms makes environmental history an anthropocentric enterprise. So it is, but it must never lose sight of human interactions with the environment, including other forms of life.

A second dimension of environmental history has to do with methodology. It involves environmental historians' use of both history and science, their attempt to bridge the gap between what C. P. Snow (1959) called "the two cultures" (science and the humanities) within the modern academic community. Environmental historians, being historians, must be consistent and thorough in their employment of the historical method, searching out all the available written sources, subjecting them to external and internal criticism, and interpreting them carefully. Like all historians, they must pass disciplinary muster with their colleagues. But in order to understand the environment, they must become fluent in the language of natural science, capable of mining the insights of science. As Snow said, the failure to comprehend both sides of the cultural divide "is leading us to interpret the past wrongly, to misjudge the present, and to deny our hopes of the future" (1959, p. 60). The sciences provide much of the needed evidence for that account. Scientific techniques for studying ecosystems, biodiversity, climate, introductions of organisms, diseases, atmospheric chemistry, and many other factors of change are of obvious use to the environmental historian, no matter what period or region constitute the area of study. Environmental history developed in some measure out of the recognition that ecological science has implications for the understanding of the history of the human species, that all human civilizations, even the most technically advanced, are subject to the principles of nature. Ecology places the human species inside the web of life, dependent on it for subsistence and survival. One cannot deny the importance of scientific literacy in principle for environmental history, notwithstanding any practical difficulties this presents for the preparation and continuing education of environmental historians.

A third dimension of environmental history is that of scale in time and space. At its widest and longest, environmental history, as a scholarly effort, assumes a sweeping global perspective, stretching from dim beginnings to the present and even, dangerously, peering into the mist-obscured future. Some environmental histories, all equally scholarly, are narrowly focused on single region, say the Carolina piedmont, over a well-defined period, say during the Great Depression, and thus stand at the other end of the spatiotemporal scale. Environmental history can investigate every period in the human saga, from prehistory to the ancient, medieval, modern, and postmodern eras. The scope of environmental history is limited only by the consideration that human societies have always interacted with the natural environment, not by the idea that there was any particular mode of interaction or any particular form of recognition of that interaction. The common, even if sometimes unarticulated, idea that environmental history should be exclusively concerned with the modern world because of its accelerating rate of environmental change and environmental awareness, is naive. The ancient and medieval periods, in which the majority of human modes of environmental relationships and the institutions that surround them originated and developed toward their modern expressions, also merit careful study.

What holds true of time also holds true of space. Even though specific areas of study are delimited, for the

discipline in general the whole earth is the subject. Perhaps its purview extends even beyond the earth, because energy from the sun, the variability of the earth's orbit around the sun, meteor impacts, and the tides caused by the moon are also important environmental influences. Just as every modern historical moment is connected to a long formative past, so every locality or region exists within the setting of the ecosphere, and historians neglect that fact at their peril. Even to write the environmental history of a single garden requires a sense of its place on the planet. Each study must be limited to a particular place and time, however narrow or wide, because research and writing must have a stop, at least until the next book. But theoretically, serious environmental history by its very nature must recognize the many links to a more inclusive set of systems.

THE FUTURE OF ENVIRONMENTAL HISTORY

A number of issues are worthy of more attention by environmental historians. For example, a forum on the subject "What's Next for Environmental History?" in *Environmental History* (2005) includes brief essays by twenty-nine leading environmental historians, not all from the United States, on directions they detect and/or recommend for future work in this field. John McNeill calls issues like these "paths not (much) taken" (2003), and for him they include military dimensions, history of soils, mining, migrations, and the environmental history of the sea. Others that merit inclusion are growth of populations, the declining power of local communities over their own environments, the history of energy and energy resources, loss of biodiversity, and the effects of climatic change on human societies.

SEE ALSO *Callicott, J. Baird; Carson, Rachel; Ecology: VII. Philosophy of Ecology; Environmental Education; Environmental Philosophy: V. Contemporary Philosophy; Europe: II. Western Europe; Forests; Global Climate Change; Marsh, George Perkins; Muir, John; Pinchot, Gifford; Powell, John Wesley; Preservation; Rolston III, Holmes; Roosevelt, Theodore; Space/Place.*

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J. Donald Hughes

ENVIRONMENTAL IMPACT STATEMENT

Environmental impact statements (EISs) are reports of environmental assessments designed to identify and predict the environmental effects of proposed projects, programs, or policies. These statements usually are required by law for public agencies if their actions may have a substantial impact on the environment. Although primarily written for decision makers, EISs are published for public review and therefore serve as a conduit of information to a wide range of stakeholders.

THE ORIGIN OF EIS

EISs were first required by the 1969 U.S. National Environmental Policy Act (NEPA). Through NEPA, Congress legislated a national environmental policy. Although Congress weakened a proposed recognition that "each person has a fundamental and inalienable right to a healthful environment" (Caldwell 1998, p. 63) to a much weaker formulation—"each person should enjoy a healthful environment"—it nonetheless committed the federal government to "use all practicable means, consistent with other essential considerations of national policy," to act as "trustee of the environment for succeeding generations" and "assure for all Americans safe, healthful, productive, and aesthetically and culturally pleasing surroundings" (National Environmental Policy Act, §101). NEPA further created a three-member Council on Environmental Quality (CEQ). The members were to serve as advisors to the president and the Congress, interpreting environmental trends, appraising the programs and activities of the federal government, formulating national policies to promote and improve the environment, and promoting the use of NEPA's environmental policy by federal and state agencies.

Although NEPA devoted only one of its fourteen sections to the EIS process, EISs have emerged as NEPA's most important legacy. The EIS requirement was unique when enacted because, unlike most environmental laws that required specific substantive outcomes (such as cleaner air), NEPA instead stipulated a process for investigating and reporting environmental impacts. It did not obligate agency decision makers to choose environmentally preferred options, but rather required preparation of a "detailed statement" subject to interagency review, whereby agency officials might become informed of environmental concerns, aware of alternatives and mitigation strategies, and open to hearing the perspectives of the public and environmental agencies. In theory this information would improve agency decision making by enabling agency officials to integrate environmental quality into their decision making. The initial response by agencies to the EIS requirement, however, was tepid. Agencies prepared weak statements that officials largely ignored. Not surprisingly, agency-specific priorities were favored over environmental ones.

PUBLIC-INTEREST GROUP CHALLENGES AND THE COURTS

Whether intended by Congress or not, the EIS requirement significantly strengthened the role of public-interest groups in project assessment. As enacted, EISs were subject to external review and challenge under laws governing federal-agency review processes. A list of EIS elements presented in §102(2)(C)—namely, assessment of environmental impacts of the proposed action, unavoidable adverse effects, alternatives to the proposed action, relationship between short- and long-term effects, and irreversible commitments of resources—served as the basis

for these challenges and allowed EISs to become a vital tool for promoting environmental quality.

Environmental activists were quick to see this potential and, through lawsuits, greatly expanded the impact of the EIS requirement. Cases brought by a wide range of environmental groups, particularly the Natural Resources Defense Council and the Sierra Club, challenged agency interpretations of their obligations under NEPA. The suits focused on procedural questions about the adequacy of EISs, the range of alternatives that must be considered, conditions under which an EIS is required, and the substantive acceptability of decisions that neglected to minimize environmental impacts identified in EISs.

The courts were mostly sympathetic to procedural challenges, requiring strict compliance with specific EIS provisions as interpreted by the courts. Courts were split on questions of whether NEPA intended to substantively change agency decision making until two cases heard by the U.S. Supreme Court in 1978 and 1980. These cases determined that, although NEPA set forth significant substantive goals, its mandate to the agencies was essentially procedural. NEPA did not require agencies to elevate environmental concerns over other goals, nor were the courts empowered to overrule agency priorities.

FEDERAL AGENCY RESPONSE AND THE EIS PROCESS

As a result of early court cases that stopped many projects on procedural grounds, federal agencies increasingly sought to protect their projects from litigation by listing every conceivable environmental concern and impact, with little sense of priorities. EISs were often exceedingly long, with volumes of information presented to decision makers who lacked the capacity to interpret them. Although the CEQ published guidelines for writing EISs in 1970, 1971 and 1973, these guidelines were viewed as discretionary by other federal agencies and did not effectively rationalize the EIS process. Under President Carter's Executive Order 11992, which authorized CEQ to issue enforceable regulations, CEQ published more specific guidelines in 1978. These guidelines dramatically altered the conduct of environmental assessments by codifying EIS processes in ways that focused them on significant environmental issues and improved their usefulness to agencies and the public while reducing paperwork and delay.

Under CEQ guidelines, the initiating agency first conducts a concise, internal Environmental Assessment (EA). The agency may alter the initial proposal to mitigate environmental impacts at this stage. If the agency determines that remaining impacts are not significant, it issues a "finding of no significant impact" (FONSI). Otherwise, it produces an EIS.

The EA and FONSI process has significantly reduced the number of EISs produced each year. A 1993 CEQ survey estimated that while federal agencies prepared 50,000 EAs annually, more than 90 percent of these resulted in a FONSI. From a peak of 2,000 in 1973, the number of EISs declined to 370 in 1989 before rising to approximately 550 per year since the mid 1990s. Although seventy federal agencies are subject to NEPA, half of all EISs are produced by three agencies: the Forest Service, the Army Corps of Engineers, and the Federal Highway Administration.

If significant impacts are expected, the agency conducts a scoping procedure, with input from other agencies, the public, and stakeholders to determine the range of issues and alternatives to be addressed by the EIS. The scoping process allows for early input into the design and implementation of the EIS process. After conducting an Environmental Impact Assessment (EIA), the agency publishes a draft EIS that presents the analysis and the alternatives considered. The draft EIS may include mitigation measures to reduce environmental impacts. The draft EIS undergoes review by environmental agencies and is open to public comment. A final EIS is issued in response to this input.

If other federal agencies disagree with the final EIS, CEQ may arbitrate differences. If public-interest groups disagree, they may seek to block action through the courts. From a peak of 189 cases reported in 1974, approximately 100 cases a year have been filed since the early 1990s. Although early court cases usually strengthened the power of environmental activists vis-à-vis the agencies, later cases have yielded mixed results. Such lawsuits are often strategically used by activists to slow down specific projects, to allow time for political measures to be used to block or alter the project.

As environmental concerns have become more integrated into public decision making internationally and the EIA process has become more rationalized, EIS processes have spread extensively around the globe. EIS processes were established in over twenty-five U.S. states, primarily in the 1970s; in Canada, Australia, and throughout Europe in the 1970s and 1980s; and in nearly all nations outside of Africa and the Middle East since then. In addition, international agencies such as the United Nations Environment Programme (UNEP) have established guidelines, and international funding bodies such as the World Bank often require EISs as part of their approval process.

ONGOING CHALLENGES FACING EIS PRACTICE

Four challenges to EIS practice are particularly significant:

1. First, the emergence of the sustainability paradigm in the late 1980s, with its focus on integrating environmental quality into public decision making, has

called into question the traditional focus of EISs on projects, which precludes more integrated assessments of linked decisions. Systems for strategic environmental assessment (SEA) that apply environmental assessment procedures to more comprehensive policies, programs, and plans are therefore being developed.

2. Second, the environmental-justice movement, with its focus on the unequal impact of environmental decisions across society, has led to more careful consideration of social impacts in environmental assessments.
3. Third, the appropriate relationship between policy goal setting, which is fundamentally linked to values, and EIA inquiry, which seeks to apply principles of science and neutrality, is often hard to sustain in the design and implementation of EIA processes and in political decision making. The role of affected stakeholders in the design, conduct, and use of EIA processes remains of central concern.
4. Finally, although efforts to standardize and bureaucratize the EIS process have allowed agencies to incorporate EIAs into their procedures, they have also largely neutralized the potential of EIAs to promote more integrative environmental policy. Bureaucratic decision making essentially dissects environmental choices into piecemeal decisions, thereby marginalizing efforts to manage the environment more systemically.

To achieve the comprehensive incorporation of environmental quality into national and international decision making envisioned in NEPA, the EIS will need to evolve with and into new governance systems, ones that stretch across bureaucratic lines to encourage participation, information exchange, and collaboration across public, private, and jurisdictional divides. EIS processes will increasingly need to promote more holistic and sustainable policy, integrated into partnerships such as those envisioned for community-based environmental-management systems and natural resource-based planning councils.

SEE ALSO *Environmental Activism; Environmental Law; Environmental Policy.*

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ENVIRONMENTAL JUSTICE

Environmental justice, in theory and in practice, addresses a wide range of issues, combining the concerns of social justice and environmentalism. Scholars in this field typically view the environment not as a purely natural phenomenon but as a set of socially and politically conditioned relationships; hence writings on this subject often examine the social, cultural, and political settings in which people live, work, and play.

Environmental justice encompasses a variety of notions of justice: distributive, participatory, political, and cultural. The field has generated interdisciplinary contributions from scholars in philosophy, legal studies, cultural studies, history, literature, the arts, the social sciences, and the "hard" sciences, especially biology. Citizens and activists have also made major contributions to the literature and activities of the environmental justice movement (EJM), an informal designation that is commonly applied to the international body of theory and practice that has grown up around this concept. For instance, the Soshisho movement of Japan is one example of an EJM, launched on behalf of the victims of Minamata disease, a debilitating intergenerational neurological disorder caused by a chemical factory's release of methyl mercury into industrial wastewater from the 1930s through the 1960s; the toxins bioaccumulated in the local fish and shellfish consumed by the local population. In a similar vein the Latheen Catholica Matsya Thozhilali Federation is a grassroots organization fighting for traditional fishing rights and equal representation of artisanal fishers in Kerala, India. Other examples include the decades-old Australian Aboriginal civil rights movement and the Green Belt Movement in Kenya, led by the 2004 Nobel Peace Prize winner Wangari Maathai. The international scope and gathering influence of this fusion of social-justice and environmental concerns prompted Lois Gibbs (the founder and director of the Center for Health, Environment, and Justice)

to comment that "the EJM is the fastest-growing, largest social movement in the world" (Gibbs 2003).

THEORETICAL DIMENSIONS

Environmental justice movements usually advance issues and principles of distributive fairness. It poses questions such as, How are environmental benefits and burdens distributed across populations? In what ways are citizens compensated for inequities in environmental burdens? What are the acceptable moral, social, and physical criteria for the distribution of environmental burdens? Examples of environmental burdens include exposure to industrial pollution and hazardous materials, unsanitary or unsafe working conditions, the exploitation and loss of traditional environmental heritage, and the depletion of essential natural resources. Environmental benefits include access to clean, safe environments at home and at work, and access to nonindustrial milieus like national parks and forests and regional open-space preserves.

In the United States the EJM or environmental justice movement began to pose issues of distributive justice as it became clear that a disproportionate burden of environmental harms was falling on African Americans, Latino/a Americans, Native Americans, Asian Americans, the working class, and the poor. Distributive-justice analyses not only delineated inequities but also focused attention on the hidden processes of political influence and decision making that have underlain this inequitable distribution of environmental burdens.

ENVIRONMENTAL JUSTICE IN THE UNITED STATES

The modern U.S. EJM environmental justice movement began with the merging of civil rights and environmental concerns in the communities of the poor and people of color during the early 1980s. There were several precursors to this movement. Robert Gottlieb, in *Forcing the Spring* (1993), notes environmental justice concerns reaching as far back as the nineteenth century. Urban environmentalism arose during the Progressive Era of the early twentieth century, which saw efforts like Jane Addams's and Alice Hamilton's Chicago's Hull House, a fusion of ideals of community development and scientific investigation that prefigured environmental sciences such as epidemiology. Their activism also anticipated latter-day environmental concerns about protecting workers against hazardous materials and limiting residential exposure to toxic industrial and municipal waste.

The civil rights movement in opposition to segregation in the South, led by Martin Luther King Jr. during the 1950s and 1960s, gave rise to concerns about the inequitable burdens suffered by African Americans in housing, health, and working conditions. In the 1960s and 1970s the United Farmworkers Union, led by César Chávez and his key negotiator, Dolores Huerta, led the struggle of Chicano and Filipino-American migrant farmworkers against unsafe working conditions, labor discrimination, and pesticide contamination. Native Americans have long fought for land rights, cultural and tribal sovereignty, and healthful living conditions. Another watershed event in the U.S. environmental justice movement was the campaign led by Lois Gibbs and the Love Canal Homeowners Association, which sparked the national antitoxics movement by forcing state and federal agencies to relocate more than 900 families from their neighborhood, which had been built on top of 21,000 tons of buried chemical waste. Gibbs's example inspired many other women to take up the cause of environmental justice as well. Indeed, since the 1970s a vast majority of grassroots leadership in the movement have been working-class women, many of whom are women of color. These movements and events combined to spur journalistic and scholarly investigations into environmental injustices beginning in the 1980s. The combined force of these grassroots movements and academic studies had buoyed the U.S. environmental justice movement EJM to a position of enduring influence by the turn of the twenty-first century.

A critical milestone for the environmental justice movement occurred in 1982, when 500 arrests resulted from nonviolent civil-disobedience protests against a new toxic landfill in Warren County, North Carolina. Located in a community with a largely African-American population, within a county with the highest percentage of African Americans and the second-highest poverty level among North Carolina counties, the landfill initially contained toxic soil laced with polychlorinated biphenyl (PCB), a carcinogen. Despite these protests, the landfill remained open for several decades. Eventually, treatment of the contaminated soil beginning in 2002 lasted over a year; the contaminants of 82,000 tons of soil were shipped to an incinerator, while soil was returned to the landfill. On January 12, 2004, the landfill received a "closure celebration," but Robert D. Bullard, leading scholar on environmental racism, contends the community of Afton is owed both formal apology and $18 to $20 million, according to different reparation formulas (Bullard 2004).

In the wake of the Warren County protests, the U.S. Government Accountability Office (GAO) issued *Siting of Hazardous Waste Landfills and Their Correlation with Racial and Economic Status of Surrounding Communities* (1983), a study of the incidence of hazardous- waste facilities in minority and poor communities in the Environmental Protection Agency's (EPA) Region 4 (composed of eight southeastern states encompassing six Native American tribes). With this study's confirmation of a higher incidence of such facilities in these communities, a spate of follow-up studies appeared, the most controversial of which was the

first nationwide study, *Toxic Wastes and Race in the United States* (1987), undertaken by the United Church of Christ's Commission on Racial Justice (UCC). This study reported that "although socioeconomic status appeared to play an important role in the location of commercial hazardous waste facilities, race still proved to be more significant" (UCC 1987, p. xiii). This conclusion gave rise to concepts like *environmental discrimination* and *environmental racism*, the latter term receiving its widest circulation up to that time in Reverend Dr. Benjamin F. Chavis Jr.'s presentation of *Toxic Wastes and Race* to a 1987 meeting of the National Press Club in Washington, D.C. Chavis described environmental racism as "racial discrimination in environmental policy making, and the unequal enforcement of environmental laws and regulations ... the deliberate targeting of people of color communities for toxic waste facilities ... the official sanctioning of the life-threatening presence of poisons and pollutants in people of color communities for toxic waste facilities ... the history of excluding people of color from the leadership of the environmental movement" (Chavis 1993, p.4).

The study by the UCC invokes three fundamental dimensions of justice: distributive, participatory (decision-making power), and recognition (exclusionary history). The distributive dimension is evident in least-resistance strategies, whereby government officials determine the location of toxic facilities, compensation, and remediation procedures according to the racial, ethnic, religious, and socioeconomic character of communities. For instance, the 1984 report *Political Difficulties Facing Waste-to-Energy Conversion Plant Siting* was compiled by the Cerrell Associates, Inc., a private consulting firm hired by the California Waste Management Board. The report advised the state to target neighborhoods based upon characteristics of high unemployment, high-school (or lower) average education levels, and Catholic congregations. Furthermore, the report insisted "middle and higher socioeconomic strata neighborhoods should not fall within the one-mile and five-mile radius of the proposed site" (Bullard 1993a, p.18). A similar instance was a report that evaluated the political feasibility of siting a low-level radioactive waste dump in North Carolina (Gibbs 1998, p. 2). The North Carolina Radioactive Waste Management Siting Authority hired Epley Associates, a public relations firm, to assist in this process. According to the Epley report likely targets for least-resistance siting are "black populations," and their residential structures are termed "shacks" (Gibbs 1998, p. 2).

A 1992 investigation in the *National Law Journal* published the results of an investigation into every U.S. environmental lawsuit over a period of seven years, as well as every residential toxic waste site over a twelve-year period of the EPA's Superfund program. The investigation was intended to decipher if any significant differences between white and minority communities existed in the EPA's designation, compensation, and remediation strategies. This work uncovered dramatic differences between white communities and people of color communities in the time it took to mitigate hazardous sites; there were also marked disparities in compensation measures, the penalties against polluters and violators of pollution-law, and the stringency of cleanup solutions. The findings, authored by Marianne Lavelle and Marcia A. Coyle, indicated that "racial imbalance ... often occurs whether the community is wealthy or poor," with white communities protected by higher fines and faster and more rigorous cleanups at a time when more and more studies revealed minorities were bearing a significantly larger brunt of hazardous wastes nationwide (Lavelle and Coyle 1993, p.136).

The UCC report also revealed the existence of saturation strategies against people of color and poor communities. Once a community receives a toxic waste facility, the chances for more facilities rise considerably: "In communities with two or more facilities or one of the nation's five largest landfills, the average minority percentage of the population was more than three times that of communities without facilities (38% vs. 12%)" (UCC 1987, p.xiii).

Critics of these studies challenge their methodology, their definitions of community, and the ways in which they define the terms *race* and *racism.* One challenge to methodology concerns the basis used to define a community that is at risk. The UCC report used zip codes to define the communities studied. A University of Massachusetts study by Doug Anderton and others (1994), funded by Chemical Waste Management (CWM), argued that census blocks, as opposed to zip codes, are a better demographic device for determining the distribution of hazardous-waste facilities. The report concluded that industrial workers suffered the most burdens of toxic-waste siting and that an analysis according to race and ethnicity did not reveal any notable trends. This study, however, drew criticisms for flaws in its own methodology. Anderton's group used older styles of census readings that avoided populations over 50,000 people and therefore omitted two of CWM's largest hazardous-waste facilities: one in Kettleman City, California, a community with a population that is 95-percent Latino, more than 40 percent of which speaks only Spanish; the other in Emelle, Alabama, known as the "Cadillac of landfills," well documented in environmental justice literature because of its huge size and location in a predominantly African-American community.

Today census blocks are far more closely specified. The 2007 UCC publication, *Toxic Wastes and Race at Twenty: 1987–2007*, is the first national study to use the 2000 census measurements; the authors, all key veterans of this debate, conclude, "Although the current assessment uses newer methods that better match where people

and hazardous waste facilities are located, the conclusions are very much the same as they were in 1987'' (UCC 2007, p. 12). Another asymmetry between the Anderton and UCC studies is in the subjects themselves. The UCC included five minority groups under its rubric of ''race,'' whereas Anderton concentrated only on Latinos and African Americans.

Other key variables relate to time and markets. The law professor Vicki Been (1994) has observed that studies of the locations of environmental burdens do not indicate whether the residents came to the nuisance or the other way around. Pinpointing these patterns is vital for understanding the distributive dimension of environmental racism, and it sometimes contravenes some of the saturation and least-resistance arguments. Property values are known to decline when industrial facilities, especially hazardous-waste facilities, are located nearby. Poorer citizens may very well be drawn to lower property values, and more affluent citizens may enjoy even greater mobility in moving away from burdens before experiencing the loss of property value and self-esteem. On this account maximizing efficiency and cognizance of market forces are attributed not only to the corporations and agencies siting facilities but also to the average consumer, job seeker, and home buyer: If people have less money, they might be inclined to move closer to work and buy cheaper homes; if they have less education, they might seek out industrial jobs. Been's challenge does not necessarily rule out racism in the market, in zoning decisions for commercial and residential areas, or the institutionalized elements of racism that play out in education, lending institutions, or health care. But she does suggest that these characteristics are secondary to the market dynamics of siting decisions.

Another market-logic challenge in the distributive vein focuses on compensatory packages. Communities could either approach or be approached by corporations and agencies for the locally unwanted land use in order to compete in one of the few markets available to areas with high unemployment or abandonment by industries. Facilities bring jobs and revenue, and corporations and agencies often offer millions of dollars in benefits in exchange for community acceptance of a facility. In the case of Emelle, Alabama, CWM supplies hundreds of jobs and millions of dollars in paychecks and community development. Nevertheless, the question of equitable distribution of burdens persists. For instance, various school districts in Emelle have different racial makeups and do not receive the same amounts of community-development funds; there are also infrastructural differences between black and white neighborhoods. Furthermore, the jobs/revenue-compensation argument must confront the moral issue of whether some communities are so desperate that they are likely to accept burdens (under particular compensatory packages) that more prosperous towns would not accept. The Mescalaro Apache Tribe reportedly sought to host a temporary radioactive waste facility for forty years, but, as Kristen Shrader-Frechette (2005) argues, the options available to the tribe and its history of poverty and isolation left it vulnerable to pressures to yield to steep environmental costs. This echoes the problems of least resistance strategies, but supporters argue to block the voluntary and compensated siting is an act of paternalism against the tribe's wishes. Shrader-Frechette argues that this anti-paternalism argument oversimplifies the vulnerabilities of the tribe to accept, including the lack of state and local environmental enforcement on the reservation as well as the participatory limits of tribal members. In addition, traditional political theory does permit a limited paternalism when third parties could be harmed by the decision. In this case, Shrader-Frechette defends the limited paternalism argument on behalf of third parties, which ultimately kept the facility from being constructed (Shrader-Frechette 2005).

The tendency in market forces logic is to rely on least-resistance strategies and therefore to undermine the extent to which communities (and even city governments) can be fully informed and self-interested political agents. In Emelle, for example, some accounts report that residents believed that the facility was going to be a brick factory. In Kettleman City, hearings and environmental-impact reports dramatically underestimated the resistance of the Spanish-speaking residents, who formed *El Pueblo para Aqua y Aire Limpio* (People for Clean Air and Water) to mobilize against CMW on the grounds that they had not been granted full participation in and knowledge of the process.

Peter Wenz (2001) addresses the issue of environmental racism by appealing to a strict principle of distributive justice—the principle of commensurability—which dictates that, all things being equal, citizens enjoying environmental benefits (pertaining to consumption of resources) should bear commensurate environmental burdens. He proposes to distribute environmental burdens to those who consume the most and who enjoy the most environmental benefits, particularly the most affluent communities in the United States. Wenz argues that this policy would lead the most politically influential citizens to dramatically reduce consumption and/or abate the impact of industrial pollution. Wenz's insight is that it is unjust—even if currently legal—to channel noxious wastes and pollutants to economically disenfranchised populations who do not deserve to suffer burdens imposed by the high consumption levels that others enjoy. Wenz projects that redistributing the waste to those enjoying commensurable benefits would eliminate approximately 70 percent of the environmental racism in the United States. But, this claim depends largely on reducing race and ethnicity of minorities to socioeconomic characteristics, and also overlooks

some of the points made by the studies mentioned above regarding instances where socioeconomic characteristics are secondary to the racial and ethnic demographics of a community. Reflecting on Been's market forces argument, Wenz's proposal underestimates the mobility of affluent communities away from environmental burdens, and the mobility that market forces create for poor and minority communities who may be drawn to the environmental burdens as a result of historical and social stressors that lead these populations to live closer to industries where low-skilled, undesirable jobs are available and transportation and property costs tend to be significantly reduced. It also underestimates the importance of grassroots identity in environmental justice and the charge of *discriminatory environmentalism*, which refers to the dramatic underrepresentation of minorities in the mainstream environmental-organization membership. This point brings out the participatory and recognition dimensions of environmental justice. For instance, people of color, the poor, and indigenous communities have little representation in state and federal environmental agencies, the environmental-science sector, and the environmental-law sector. Thus, while distributive justice may assume equality and rights of citizen participation, without the strong history and place-based identity citizens require, this dimension of environmental justice can also effectively abstract the identity of peoples to a universal context, while the grassroots struggles of environmental justice advocates require much more specific, case-by-case attention to and respect for the lives, identities, and values of community members. Indeed, the *Principles of Environmental Justice*, adopted by the First National People of Color Environmental Leadership Summit, Washington, D.C., in 1991, include only two references to distributive justice in the seventeen principles. The remaining principles emphasize participatory justice and recognition justice, including rights against discrimination, decision-making equality for disenfranchised and marginalized identities, and respect for diverse cultural perspectives. Iris Young's "Justice and Hazardous Wastes" (1983) challenges strictly distributive-justice approaches for failing to take into full consideration the principle of self-determination, which would require that citizens experience the decision-making power over the political actions that would affect them the most—in this case, whether or not it is acceptable to receive an environmental burden. Young further develops her thesis with Christian Hunold over a decade later in 1998, arguing for substantive and procedural conditions of communicative democracy in the decision-making process. Under these conditions, citizens would experience self-determination upon the initial phases of toxic waste discourse, including the location of sites, the scientific and political requirements, the compensatory and safety measures, the ability to decline the burden, and ultimately a substantive voice in the determination of whether or not the very industrial practices that produce the waste should be part of the consumption chain of a society.

ENVIRONMENTAL JUSTICE AND THE LAW

The courts have played a major role in determining the course of environmental justice in the United States. A host of early cases challenging the inequitable distribution of environmental burdens on African American communities were confounded by, on the one hand, defining racism according to constitutional law, in which the Fourteenth Amendment's Equal Protection Clause requires evidence of intentional discrimination on the basis of race and ethnicity; or, on the other, according to congressional law, in which specifically Title VI and other elements of the Civil Rights Act of 1964 includes disparate impacts on different racial and ethnic groups. Appealing to the 14th Amendment is known as the "intent standard," while appealing to the Civil Rights Act of 1964 regards the "effects standard." Environmental justice advocates have long argued that in post-segregation America, where legal and structural racism have been stricken from the law books, unintentional and institutional forms of racism are increasingly significant measures; hence they appeal to Title VI. Echoing Chavis's early definition of environmental racism, Bullard has also offered a preferred definition of "any policy, practice, or directive that differentially affects or disadvantages, whether *intended* or *unintended*, groups or communities based on race"; this definition provides an argument in favor of the effects standard (Bullard 1993b, p. 47). But the courts have not always applied this standard in their rulings.

Despite the U.S. Supreme Court decision in *Griggs v. Duke Power Company* (1971), which called for the evaluation of racism according to the effects rather than the intent, subsequent landmark cases on environmental racism in the Supreme Court and lower courts have consistently ruled according to the intent standard. Most notably, in *Village of Arlington Heights v. Metropolitan Housing Development Corporation* (1977), *East Bibb Twiggs v. Macon-Bibb County Planning and Zoning Commission* (1989), and *R.I.S.E., Inc. v. Kay* (1991) communities pleaded environmental racism on the basis of the Title VI standard of effects, but in these decisions the courts ruled by evaluating racism under the conditions of historically overt racist intent under the provisions of the Fourteenth Amendment. Ironically, using California environmental law rather than federal civil rights law, the court in the Kettleman City case sided with *El Pueblo* against CMW on the grounds that the democratic participation required was obstructed by English-only documentation and an environmental impact

report that failed to account for the accumulation of burdens (its preexisting site, the poor air basin, and the chemical exposure residents experience as agricultural workers). For environmental racism activists the Kettleman City case indicates that language is also a marker for environmental justice and discriminatory practices (Figueroa 2001, Cole and Foster 2001).

Environmental justice advocates continue to press the Title VI interpretation of racism, which explicitly requires the involvement of a federal agency in redressing the pattern of disparate inequities. The primary logic of this strategy is that because the EPA must assess the installation of any legal facility and aforementioned empirical studies such as the *National Law Journal* assessment of EPA practices were building a case at the federal level, Title VI interpretations had legal standing. Involving the EPA, which has representation at the level of the president's cabinet, brought the environmental racism controversy to a level of federal involvement that the EJM had not seen since 1981, when President Jimmy Carter signed the evacuation and buyout order for the Love Canal residents. People of color communities forged networks of environmental justice, and the First National People of Color Environmental Summit (1991) indicated the existence of a much larger collective force than could be mustered by the ad hoc, single-issue community groups that had, until then, been pushing the agenda of environmental justice.

Federal involvement reached into the U.S. House of Representatives Judiciary Committee in March of 1993 at a series of hearings titled "Environmental Justice: Hearings before the Subcommittee on Civil and Constitutional Rights." The hearings heard testimony from key scholarly and activist champions of the EJM; it also heard from advocates of market forces arguments. The hearings led to a consensus view that minority communities and the poor of the nation were indeed bearing the inequitable distribution of environmental burdens, even if there was contention over whether race and ethnicity or socioeconomic status was the key consideration. In response, on February 11, 1994, President Bill Clinton issued Executive Order 12898, "Federal Actions to Address Environmental Justice in Minority Populations and Low-Income Populations." It required every federal commission to take cognizance of environmental justice considerations in matters such as interagency cooperation, policy overhaul, research development, enforcement of right-to-know laws, and judicial review.

A heightened sensitivity to issues of environmental justice from the 1980s onward did not always translate into tangible results. For example, Benjamin Goldman and Laura Fitton's *Toxic Wastes and Race Revisited* (1993) documented worsening conditions and burden disparities for minorities. A more effective federal approach found hope when the EPA initiated the 1998 Interim Policy on Title VI, which explicitly assesses disparate impacts and emphasizes effects rather than intent. The same year the EPA Interim Policy was put into place, residents in Convent, Louisiana, were able to use it against the Shintech Corporation, and force a halt to construction of a highly polluting plant in the town. Nevertheless, the current aggregate risk-assessment standards employed by the EPA still often disregard disparate impacts, as documented in the updated 2007 UCC study. Many analysts have pointed to the federal government's slow and woefully inadequate response to the disastrous consequences of Hurricane Katrina—which afflicted mostly poor African Americans—as a confirmation of this interpretation.

GLOBAL ENVIRONMENTAL JUSTICE

Environmental racism is only one of the concerns of the environmental justice movement. For indigenous and marginalized peoples—not just in the United States but around the world—environmental justice also extends to issues of colonialism, the global environmental commons, and the effects of the corporate globalization. The concerns of global environmental justice began to emerge in the 1970s, when international agencies began to tout the merits of sustainable development. The "Declaration of the United Nations Conference on the Human Environment," issued in Stockholm in 1972 (UNEP 1972); *Our Common Future* (the Brundtland Report) (1987); and Agenda 21, authored at the UN Conference on Environment and Development (Earth Summit) in 1992 (UNDESA 1992) express the sovereign right of nations to manage development practices. These conferences addressed the dilemma faced by the globalSouth nations whose ambitions for industrial development are increasingly constrained by growing concerns about climate change, biodiversity, and dwindling natural resources.

Ironically, the nations of the global North—whose industrial development and overconsumption of resources has contributed so heavily to these problems—are now among the most vehement in advocating pro-environmental measures, which many less-developed nations resent as a curb on their economic development. Appeals to technological solutions complicate the picture by proposing remedies that are affordable only by the wealthier nations. Sustainable development discourse has proved problematic for global environmental justice movements. In order to address issues such as the ecological debt the North's development is owed to the South's restraint upon development, as well as the impending crisis of overpopulation in many areas of the globe in the face of climate change, sustainability discourse has shifted from development emphasis to an increase of "environmental sustainability" (Agyeman, Bullard, and Evens 2003) as "environmentally benign development"

became a catch phrase of these movements. The burdens of climate change are likely to increase environmentally displaced populations (environmental refugees) by a factor of five, affecting as many as 250 million people by 2050. Moreover, the displaced populations will not only be dramatically overburdened, but they will themselves become the environmental burdens to populations who receive the migrations.

Distributive, participatory, and recognition justice are fundamental to environmental justice movements throughout the globe, however much their demands and goals might differ in details. As Daniel Faber and Deborah McCarthy have observed, these movements are "united in the larger struggle for ecological democracy. . . . For the organizations within these various wings all share a passion for linking grass-roots activism and participatory democracy to problem-solving the issues of environmental abuse, unsustainable economic development, racial oppression, social inequality, and community disempowerment" (Faber and McCarthy 2003, p. 46).

SEE ALSO *Chávez, César; Environmental Law; Environmental Policy; Environmental Politics; Food Safety; Hurricane Katrina; Intergenerational Justice; Population; Sustainable Development.*

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Robert Melchior Figueroa

ENVIRONMENTAL LAW

Environmental law deals with two different categories of issues. The first category relates to the protection of human health and welfare and involves primarily issues such as pollution of air and water and contamination of soils. The federal Clean Air Act and Clean Water Act are the best-known examples. In its largest scope this category also includes climate change and the massive impacts it may create, such as rising sea levels and the displacement of large populations, as well as water shortages and/or floods. The Kyoto Protocol, the 2005 international framework treaty for controlling global climate change, is the best-known example. The second type of problem, best known in the form of the federal Endangered Species Act and the Wilderness Act of 1964, involves the protection of nature and is directed toward loss of biodiversity or protection of natural amenities as an aesthetic value. At a much more far-reaching level, environmental claims for protection extend to assertions that the earth is a self-regulating system that has its own imperatives, though such claims have little support in existing laws. Whether environmental law should be viewed as including issues of animal rights and the suffering of individual sentient creatures remains a matter of debate, though laws prohibiting cruelty to or mistreatment of animals have been in effect for generations.

The first category of environmental law, though it takes new forms in modern society and raises a number of complex issues of public policy, falls within the conventional theoretical framework of the law: It may be thought of as nuisance and trespass law writ large. The second category, however, engages a broad range of ethical and philosophical issues that pose novel challenges to jurisprudential thought.

UTILITARIAN CONCERNS

Utilitarian thinking dominates in the first category. There is little if any dispute about the responsibility of the law to protect human health and security. The primary questions involve how the society collectively should deal with risk, a matter in which individual preferences vary. Are nuclear plants safe enough if it is known that there is a one in a thousand, million, or ten million chance of a serious accident? How much should industry be required to spend to save each human life? How much data is needed to prohibit a potentially harmful behavior (the problem of the so-called precautionary principle)? What should people do in the face of inevitable ignorance (for example, scientists lack certainty because they cannot experiment on human subjects)? Another aspect of the problem arises from uncertainty about the future and whether policy should be based on technological optimism or technological pessimism. The classic example, known as Malthusian pessimism, was the claim that an increasing population would outrun the food supply. That concern came to be considered obsolete in view of modern improvements in agricultural productivity. The renewed debate about the ability to sustain growing populations with limited reserves of petroleum or water versus the claim that human ingenuity is the most reliable and inexhaustible resource illustrates the central policy conflict in contemporary society.

The role of science also is subject to considerable debate and often misunderstanding. The ability to respond intelligently to environmental issues is almost always science-dependent but not science-determinative. It is impossible to think clearly about what must be done unless people have some idea of what is at stake. Science usually can provide good data on risk, but it cannot determine how risk-averse people should be. Moreover, the distinctions science makes for its own purposes of research and understanding do not necessarily conform to distinctions that the law should make. For example, it may be interesting for research purposes to maintain every possible variation in the salmon spawning habitat, but there may be legitimate cost concerns or competing human needs that make such protection seem unwarranted as a matter of public policy.

Sometimes legitimate values are in conflict. One controversial example is the tension between advocates for free trade and advocates for increased environmental protection. Import restrictions on tuna that were designed to promote dolphin-safe tuna fishing constitute a well-known example. Such efforts usually are opposed by free-trade advocates because of their potential to serve as economic protectionism, insulating domestic industries from foreign competition.

Two Views of the Denver Skyline, 2004. *The same skyline is seen only two days apart, first on a clear day and next on a morning filled with smog. Scientists at the Environmental Protection Agency, among others, continue to look at options for healthier air by tightening smog standards. Over half of the United States breathes in illegal levels of smog, mainly in large cities on the East Coast and West Coast. The greatest challenge for contemporary environmental law is creating precedent in an issue, protection of the natural world, that was rarely before seen as a societal priority.* **AP IMAGES.**

Such debates sometimes are viewed as inappropriate not simply as examples of different perspectives on policy but as ethically tainted. The question then turns to whether environmental protection, at least in some contexts, should be treated as trumping other societal demands in the way constitutional values such as free speech and religious freedom prevail over other claims. From a purely legal perspective that position has no historical support, at least as far as the U.S. Constitution is concerned, and environmental values are not encompassed within any traditional concepts of natural law. Whether law should seek to embody certain environmental values as having such higher-order standing has been debated and remains unresolved.

ADDING AN ETHICAL DIMENSION: LOSS OF BIODIVERSITY

The second category of issues mentioned above, of which loss of biodiversity provides the most familiar example, presents a rich mix of philosophical and ethical concerns that have drawn the legal system into unfamiliar territory. Of course, even the most far-reaching claims for the need to protect biodiversity can be and often are based on utilitarian considerations. The utilitarian approach notes that the biological heritage is a storehouse of potential knowledge that can generate cures for diseases and scientific advances. The basic claim here is that failure to act is imprudence rising to the level of collective gross negligence.

At a more philosophical level those considerations conjoin with concerns about intergenerational equity and are put forward as ethical obligations. The notion is that the biological heritage is the product of the entire evolutionary history of the earth and is effectively essential biological capital. Any decision that imperils that capital, made by a particular group at a particular moment in time, is said to act as a kind of mortal wound to all humanity through all time and is seen as an act of supreme and unjustified arrogance. That idea has been expressed by the scientist Edward O. Wilson in *The Diversity of Life*:

> Humanity coevolved with the rest of life on this particular planet; other worlds are not in our genes. . . . [I]t is reckless to suppose that biodiversity can be diminished indefinitely without threatening humanity itself. Field studies show that as biodiversity is reduced, so is the quality of the services provided by ecosystems. . . . The loss of a keystone species is like a drill accidentally striking a powerline. It causes lights to go out all over. (Wilson 1992, pp. 347–348)

INTERGENERATIONAL EQUITY

Declining biodiversity also triggers debates over sustainability and thus over what is called intergenerational equity: the asserted responsibility of the present generation to the future. In general the law recognizes no such responsibility, though there are rare exceptions, such as the notion that a monarch is merely a trustee of the crown jewels and must pass them on to his or her successor. The usual rule is to the contrary: A rich person can spend his entire fortune and leave nothing to his children; a landowner can cut down her ancient forest and leave the soil bare. There are prudential economic notions that effectively benefit future generations, such as spending only one's income and preserving capital. There also are statutes that call for practices such as sustained-yield forestry, but no extant legal principle that mandates limits on contemporary behavior in order to safeguard resources for future generations.

This issue has generated much discussion, including questions such as whether standard economic discounting techniques should be applied to environmental issues. For example, everyone agrees that the right to get a dollar today is vastly more valuable than the right to get a dollar a century from now. The obvious reason is that because money earns interest that is compounded year after year, it would take only a tiny sum today to produce a dollar a hundred years from now. To apply this reasoning to an environmental issue, one may take the example of a very slowly recharging aquifer containing groundwater that sustains an agricultural area. If people continue to pump at current rates, there will be no water left for their descendants a century from now. Should people pump only at a rate that will make water equally available a century from now, or should they calculate that a gallon used today is so much more valuable than a gallon that will not be used for a hundred years that prudence dictates using it now? The question is whether these two situations are really comparable. It would be foolish to trade today's dollar for a future dollar, but would a person be foolish to trade the current added benefit from pumping against his or her great-grandchild's livelihood?

Perhaps such questions should be seen as variations on the optimism/pessimism divide that was mentioned above. Although one sometimes hears the issue characterized with the dismissive expression "what has posterity ever done for me?" or the claim that no one is here to speak for the future, people do care about the future, though usually with a focus on their own descendants. It may be that the operative divide is between optimists who believe that new discoveries and new technologies have always provided inventive ways to deal with the world as future generations found it and pessimists who see precaution as the only decent course of action. Or perhaps the problem is essentially a psychological one: People tend to focus on satisfactions that come from immediate gratification and to underestimate potential risks that seem distant. Whatever the explanation, it seems unlikely that the problem is simply the absence

of anyone extant who can speak for the future. Surely it goes far deeper than lack of legal standing in court for people who have not been born.

ENVIRONMENTAL JUSTICE

Another issue in which benefits to some may entail harm to others is called environmental equity or environmental justice. The most environmentally unfriendly facilities, such as heavy industry and waste disposal sites, often are sited in areas where poor people live. This is distressing but not surprising. Real estate prices reflect amenity value. One would not expect the richest people to live next to the local landfill while the poorest lived in areas overlooking Central Park. An analogous problem arises on the international level. As richer countries raise their environmental standards, harmful activities tend to migrate to nations that have lesser restrictions but need and want economic development. When that happens, from an environmental perspective the problem is not addressed; it simply is moved to a less resistant location.

The legal question is what sort of remedy is called for. Is the problem lack of equal protection against environmental harm? Or should it be sufficient to demand a minimally acceptable environmental standard for all while accepting some differences growing out of differential wealth or differing luck in where one happened to be born? Nothing at the heart of this issue seems to be unique to environmental law. These are effectively human rights issues that parallel the controversies raised by differential standards for worker safety, educational opportunity, and basic health care independently of wealth or nationality.

BIOCENTRISM AND HUMAN VALUES

The environmental issue that is least familiar to the legal tradition arises from the demand to preserve nature for its own sake regardless of human needs or desires. This issue goes under various names, such as biocentrism and ecocentrism, and the sources for such claims are various, among them the biblically founded assertions of the stewardship responsibility of humankind to safeguard God's creations as well as secular claims built on the view that the natural world has value independent of any benefits it may generate for people. A related view known as the Gaia hypothesis asserts that the earth is a living entity, a self-regulating functioning system that operates by principles that are independent of the goals of human societies. The power of these theories, insofar as they are accepted, lies in their capacity to trump the usual arguments made in favor of balancing interests against one another, for example, reduced harvesting of ancient forests versus the provision of more affordable housing.

NOVEL CHALLENGES TO THE LAW FROM BIOCENTRISM

Once human valuing is removed from the equation, it seems fair to say that the traditional legal system is at a loss about how to proceed. Essentially, the law is structured to implement societal preferences and enforce human rights, whether civil rights such as freedom of speech, property rights in a house or a contract, or entitlements to a pension or an education. People have preferences and goals, and people have rights. Some thinkers believe that at least some animals also should have rights, for example, the right to humane treatment that prevents suffering or avoidable suffering, though at bottom this also may be a human value about how animals should be treated.

But can trees have rights? The issue first was raised by Christopher Stone in 1972 in an article titled "Should Trees Have Standing? Toward Legal Rights for Natural Objects." Although cases have named plants or animals and even rivers as plaintiffs, the courts have never deviated from the traditional view that some human interest (though it may be recreational or aesthetic rather than economic) must be affected adversely for there to be legitimate standing to bring a legal action.

Moreover, however plausible the notion that inanimate objects have existence rights may be as a philosophical position, it presents extraordinary challenges to the legal system. If nature has rights, as opposed to people deciding about the societal desirability or necessity of preserving specified natural values, what would the rights of nature be? Would trees have a right not to be chopped down? Would some trees have more rights than others (rare ancient redwoods versus imported, fast-spreading eucalyptus)? Once one is in a legal milieu, these are the sorts of questions that must be answered. A judge or a legislature would have to decide if anyone, or everyone, cutting down trees, for whatever purpose, must be enjoined. Perhaps the closest the law has come to this notion is the federal Endangered Species Act, which requires protection for species whose continued existence, as determined by scientific studies, is found to be in jeopardy. However, that law does not protect individual animals, and it provides greater protection to endangered animal species than to endangered species of plants. It also does not prohibit hunting so long as a species is not in danger of extinction.

Although the notion that the functioning of natural systems is important and the idea that diminishing biodiversity is a serious problem are undoubtedly matters of great moment for any legal system, it would require a vast leap beyond such concerns to seek to implement, as part of an operative legal system, conceptions such nature's rights, nature for its own sake, and nature as a living system with its own rules.

Laws require specification of knowable rules or standards or some principle of rights that has a generally understood and accepted content. Thus, one might have rules that prohibit timber harvesting within a certain distance of rivers or on certain slopes or rules that prohibit harvesting altogether in certain places or of certain species. A society can provide protection against disturbance of natural systems as broadly as it wishes, but it must provide workable guidance about what is permitted and what is forbidden. Because essentially all human activity, even in subsistence societies, disturbs nonhuman natural systems to some extent, it cannot be sufficient simply to speak of the rights of natural objects or the rights of natural systems without providing some guidance about how the interaction of human living with those systems is to be managed.

Although there are very general and controversial legal principles such as due process and religious freedom, even concepts as broad as those have lengthy histories that have shaped commonly understood meanings for them or at least concretely infused them with social content.

However controversial it may be to speak of the scope of religious liberty that should be afforded to some religious sect (for example, believers in polygamy), or what process is due someone charged with a crime, from the perspective of a legal system there is a vast difference between the difficulty of interpreting the very broad language of some constitutional norms and a claim about the rights of trees or nature's own rules.

THE PERCEIVED INADEQUACY OF THE CONVENTIONAL LAW

The central challenges for environmental law may arise not from the difficulty of treating nature or natural objects as having rights independent of human society but from centuries of legal and economic development in which protecting natural systems was not a societal priority. The following observations may help put environmental legal concerns into perspective.

First, the earth has been organized under a system of property rights designed to facilitate and reward productive human activity such as agriculture, manufacturing, and the production of housing. All those activities necessarily involve disturbance of natural systems. The property system conceives of land as being in a passive state, waiting to be put to human use. Insofar as land is doing something else, such as providing a habitat for wildlife, property law considers such functions expendable. Land has been subdivided and fenced, excluding wildlife so that it could support domesticated grazing animals. Forests and grasslands have been cut and plowed to support agriculture and build cities, and rivers have been dewatered to provide irrigation and drinking water.

Getting rid of the natural, or at least domesticating it, has been a primary task of human settlements and was therefore a primary function of the laws governing natural resources. The system worked very efficiently to bring about those transformations. Nothing in it provided incentives to encourage the preservation of natural systems, nor did any rights exist in anyone to invoke the law to do so. The law thus has been the intentionally efficient cause of ecological destruction.

The second central fact about the traditional legal system is that the elements of the world that have not been cut up into parcels and subjected to the imperatives of the property system, such as the oceans and the ambient air, have been governed as unmanaged commons. They were subject to unrestricted exploitation and to unrestricted use for waste disposal. That arrangement assured similarly deleterious impacts on their capacity to sustain natural-system functioning.

The third fact is that the lines of division by which societies determine separate ownership or separate governmental authority bear no relation to ecologically rational divisions such as watersheds or habitat requirements for animal populations, the boundaries that reflect what is required for natural systems to flourish. States and nations often have their frontiers down the middle of a river, and rivers flow from one country into another so that the pollution caused in one jurisdiction has impacts in another. Animals may be well protected in a public refuge in the summer, only to descend to their winter range and find themselves in a privately owned and newly developed residential subdivision.

The Devil's Hole Pupfish. *The Devil's hole pupfish (*Cyprinodon diabolis*) is an endangered species of fish found east of the Death Valley region of Nevada, in a geothermal aquifer called, unsurprisingly, Devil's Hole. The species, possibly over 20,000 years in existence, was listed as endangered in 1967. The Supreme Court upheld this decision to preserve the species with their ruling in* Cappaert v. United States *(426 U.S. 128), when they denied the Cappaert's request to pump additional groundwater from Devil's Hole.* **U.S. FISH & WILDLIFE SERVICE.**

In short, the legal system has been structured in ways that assure the steady degradation of nature. In an earlier time it seems to have been thought that a sort of separate-zone policy would work, setting aside parks and refuges that had high natural values so that the rest of the land could be put to work to meet human needs. Great faith was put in technology, so that as fish habitat was seen to decline in the age of hydropower, fish hatcheries were established as a substitute. Those approaches, along with an unrealistically optimistic view of the vastness and resilience of nature, seem to have convinced previous generations that the human productivity–based legal system described above could continue to function unmodified while the benefits of fecund natural systems would continue largely unabated. It is known now that none of those beliefs was justified.

POTENTIAL AND EMERGING STRUCTURAL CHANGES IN ENVIRONMENTAL LAW

The central question for environmental law today seems to be whether it is possible to reengineer the legal system so that it can continue to meet human needs while maintaining and restoring functioning natural systems to some desired level of vigor and sustenance. What that level should be is not self-evident, at least so far as jurisprudential thinking is concerned. Moreover, whatever it is or ought to be, it will have to be compatible with a system that is also acceptably functional to meet human needs. Although it may not be possible to describe a system that is perfectly accommodating, some elements of a humanity-sustaining legal order that also highly values the maintenance of healthy natural systems can be identified.

Duties of Property Owners Those holding private property rights will have to bear some affirmative responsibility to minimize adverse impacts on natural systems as they exploit their property for private benefit. In the past such affirmative responsibility was limited by physical boundary notions such as trespass. Under an ecologically sensitive regime it would be recognized that even within one's own borders natural processes of importance to the larger community may be ongoing and justify some public restriction of private uses.

The World as a Common If natural processes, habitat, and biodiversity are recognized as important public values, land and waters will have to be reconceived as in some respects a common in which the society at large has legitimate interests. Such a commons would overlay and coexist with individual, private rights. To some extent that conception already exists in regard to large lakes and rivers, which are understood to be public resources held in public trust open to public uses such as navigation and fishing and subject to legal protection for such purposes, coexisting with private rights of use. The old idea of public rights to navigation can, and to some extent already has, evolved into a public right in the protection of sustaining populations of indigenous fish and a healthy riparian habitat.

Access to the Legal System If these changes are to occur, the means for enforcing public rights will have to be as potent as the established means for enforcing private rights. Government protects many public entitlements through public health measures, fire safety laws, drug testing, and the like. However, individuals can protect their private rights as property owners, tenants, or purchasers. As public rights in the protection of functioning natural systems are recognized, invocation of the law by members of the public to safeguard those rights would have to be on an equal footing with the access rights associated with private entitlements. The presence of global public rights does not suggest that the legitimate interests of local populations in nearby resources would be ignored. Such interests, such as maintaining a viable local economy, would be an important element in the application of a workable environmental legal standard.

An International Legal Regime Many of the most important environmental issues are of international scope, transcending national boundaries just as they transcend individual land ownership boundaries. Although an international regime of governance is appropriate for such issues, the claims made on behalf of national sovereignty undoubtedly will continue to be felt for the foreseeable future. Nonetheless, various international legal strategies can be effective. However strongly nations value their sovereign status, there are often benefits in adopting mutual obligations. The most familiar example is the rules of war, in which each nation agrees to constrain its treatment of enemy soldiers in the expectation of safeguarding its own troops. Some environmental examples are obvious: Two nations may share several rivers, with one country being upstream on one river and downstream on another. Alternatively, a nation may be willing to make environmental concessions to exact concessions in an area where it needs the assistance of other countries. Such practical motives and incentives underlie many bilateral international agreements.

More embracing standards can be articulated in multilateral conventions or treaties by nations that are willing to adopt them. Such agreements can be useful even if they are not adhered to universally, and the presence of those agreements can create an international standard to which laggard nations eventually feel obliged to conform.

International tribunals, where they exist, add a level of legal legitimation to international environmental claims even when they may not be available in domestic law. International legal standards also may provide a basis for

making claims in domestic courts and for bringing domestic enforcement up to international standards. Although international law remains partial and imperfect, it can constitute an essential institutional component of a global ecological commons.

CONCLUSION

Some environmental problems present familiar demands to protect human health and welfare. Others, such as loss of biodiversity, present more novel challenges that have a powerful ethical dimension and raise difficult policy questions about how to harmonize contemporary needs with adequate provision for the future as well as the need to conceive the earth outside its conventional form as discrete tracts of property within arbitrarily drawn political boundaries. Some structural changes in conventional law, focused essentially on exploitation of natural resources, are both necessary and practical. International agreements, though still imperfect, are an important step toward recognition of the earth as a global commons.

SEE ALSO *Biocentrism; Biodiversity; Endangered Species Act; Environmental Philosophy: V. Contemporary Philosophy; Environmental Justice; Environmental Policy; Future Generations; Intergenerational Justice; Private Property; Takings; Utilitarianism; Wilderness Act of 1964.*

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STATUTES AND TREATIES

Endangered Species Act, 16 U.S.C.A. §§ 1531–1544.

National Environmental Policy Act (NEPA), 42 U.S.C.A. §§4321–4370f.

Clean Air Act, 42 U.S.C.A. §§ 7401–7671q.

Clean Water Act, 33 U.S.C.A. §§1251–1387.

Marine Protection, Research, and Sanctuaries Act, 33 U.S.C.A. §§1401–1445.

Toxic Substances Control Act, 15 U.S.C.A. §§ 2601–2692.

Kyoto Protocol, an Amendment to the United Nations Framework Convention on Climate Change, signed December 11, 1997, effective February 16, 2005 (the protocol has been ratified by more than 170 nations).

Joseph L. Sax

ENVIRONMENTAL LITERATURE

SEE *Ecocriticism.*

ENVIRONMENTAL PHILOSOPHY

This entry contains the following:

I. ANCIENT PHILOSOPHY

Ancient philosophy comprises mostly Greek and some Roman writers who derived their philosophy from Greek precedents, over approximately the eighth century BCE to the second century CE. The intellectual experience of the ancient Greeks offers a background and resource for the contemporary discussion of philosophy relating to the environment. The seminal role of Greek thought as a formative and oft-renewed influence on Western philosophy is widely recognized, so it is not surprising that a number of scholars interested in environmental ethics from the 1970s onward have turned to the ancient world. To use an environmental metaphor, the roots of Western philosophy lie in Greece, and so in some respects do the roots of environmental crises, and therefore the search for the relationship between them merits a reexamination of ancient Greek thinking.

NATURE AS THE THEATER OF THE GODS

Greek philosophy developed in, and reacted against, an intellectual climate where explanations of phenomena depended on the existence of supernatural beings. Traditionally, the Greeks regarded nature as a realm in which the gods, who exhibited many human qualities, were dominant. Since nature manifested activities of the gods, a human action that affected the environment might provoke the reaction of some god or goddess, and presented an occasion for caution. Thus it might be expected that they would treat the environment with awe and care, and this was true to some extent. Practices demanded or prohibited by the gods included some that imply a prephilosophical ethics.

The Greeks perceived order in nature, feeling that the gods, or a principle of justice that even the gods must obey, operated to keep everything in its appropriate place. To overstep the bounds by attempting to change the natural arrangement of land and sea was to demonstrate hubris, a presumptuous pride that challenged the gods and could provoke nemesis, their inescapable retribution. It was believed that Zeus, when he divided the world with his brothers Poseidon and Hades, had established an ordered cosmos and set the limits of its constituent parts, including the land and sea. Herodotus says that when the people of Cnidus began digging a canal through the isthmus that connected them to Asia, flying rock splinters injured many workmen. Seeking the cause, they consulted the Delphic Oracle, who, uncharacteristically, replied clearly: "Do not fence off the isthmus; do not dig./ Zeus would have made an island, had he willed it" (7.141). They stopped immediately.

Earth herself, Gaia, Mother of All, oldest of gods, had her own law, deeper than human enactments and beyond repeal. As Xenophon remarked in *Economy* (5.12): "Earth is a goddess and teaches justice to those who can learn, for the better she is served, the more good things she gives in return." Those who treat her well receive blessings; those who treat her ill suffer famine, disease, and death. Artemis, Lady of Wild Things, was paradoxically both huntress and protector of animals. Her worship included conservation practices by hunters, such as sparing young creatures, and initiation rituals that identified children with bears and other animals.

Greek religion had a strong sense of locality. Great gods and lesser spirits haunted wild locations such as springs, caves, and groves. Some patches of landscape, especially groves of trees, were designated as sacred and protected from mundane activities such as cutting timber, hunting, fishing, cultivation, and building. For instance, custom forbade catching tortoises on Mount Parthenius because they belonged to Pan. Taboos against pollution are common in traditional texts; Hesiod (fl. 700 BCE) cautioned against urinating or defecating in springs or rivers. Rules like this may embody an astute response of the ancestral Greeks to experiences with disease and poisoning.

NATURE AS THE THEATER OF REASON: THE PRESOCRATICS

Greek philosophers formulated the idea of nature (*physis*) as properly an object of rational investigation. This was first done by the natural philosophers among the pre-Socratics, who wondered what the basic elements of the universe were, and how they interacted. At the outset, philosophy rejected the gods as explanations of natural phenomena or as a basis for ethics. Indeed Xenophanes (c. 570–470 BCE) cited the lack of ethical standards in traditional myths as one reason for not believing in the gods portrayed in them. The only remaining role for the gods was metaphorical. When Thales (c. 585 BCE) said, "All things are full of gods" (fragment 22), he was talking about magnetism and energy, not indwelling deities. As an illustration of the assertion, he pointed to the lodestone and its mysterious attraction for iron.

For Thales, the primal matter was water. Others advanced air, fire, and earth as basic elements, alone or in combination. These philosophers shared an assumption about the natural world: that it can be understood by the human mind because it contains rational order. Some thinkers made rationality a creative force; Heraclitus (fl. 500 BCE) called it *logos* (word) and Anaxagoras (500–428 BCE) called it *nous* (mind). But the result of

this initial excursion of the Greeks into natural philosophy was to develop mutually exclusive systems of explanation, all of which were rational, but none of which could defeat the others.

The oneness of nature can be found in Orphic thought, and philosophers such as Pherecydes (c. 544 BCE), Pythagoras (fl. 530 BCE), Philolaus (470–390 BCE), and Empedocles (492–432 BCE) refined this idea. Orphic cosmology envisioned an organic unity of the world and the cyclical interplay and balance of elements and creatures within it. Art and literature show the mythic Orpheus as expressing the harmony of nature; when he played the lyre and sang, animals and even trees in which his song awakened sympathetic attraction surrounded him. Pherecydes, reputedly Pythagoras' teacher, identifies the first principles as Time (Chronos), Life (Zas), and Earth (Chthoniê); the latter two through their union created the world as a winged Tree of Life, a single organism of which all creatures were parts.

The Pythagoreans were pantheists who held that the universe is spherical, animate, ensouled, and intelligent. The British atmospheric scientist James E. Lovelock advanced a hypothesis in the 1970s that recalls this idea. He suggested that the totality of life on Earth, in tending to maintain temperatures, an atmospheric composition, and other conditions that benefit itself, acts as if it were an organism with that intention. Recognizing the Greek roots of the idea, Lovelock named the organism Gaia after the Greek goddess who personifies Earth. Empedocles held that all things share the same elements, so that there is a constant interchange in which every entity comes out of elements that preexisted and are never destroyed. There is a constant process of recycling in a natural cycle that is balanced, not chaotic. Philolaus defined harmony as "a unity of mixed elements that are various, and an agreement of elements that disagree" (fragment 10). The Pythagoreans believed that harmonies could be expressed as mathematical proportions. Since all living things, including humans, have a common origin and natural ties, and are formed of the same components, including the soul, all are related and should be treated with respect. Pythagoreans forbade killing animals or plants, as well as eating food that required killing an organism. Thus they banned eating beans and many other plant foods in addition to meat. Foods that could be consumed without killing, so far as they knew, such as milk, cheese, honey, wine, oil, the flesh of fruits and leafy vegetables, they regarded as permissible. The reason they adduced for not killing was that all living things have the same kind of souls, and after death these souls pass into other bodies. Empedocles said, "In the past I have been a boy and a girl, a bush, a bird, and a silent water-dwelling fish" (fragment 117).

PLATO

Plato (429–347 BCE) was a friend and admirer of the philosopher Socrates (469–399 BCE), and cast him as the leading character in many of his dialogues, which as a consequence form the major literary source for Socrates's philosophical ideas.

In his dialogue *Republic* (10.614b–621d), following the Pythagoreans, Plato used metempsychosis as the basis of the so-called Myth of Er: Souls are reborn in the forms they deserve on the basis of their actions and their achieved levels of consciousness. He asserted in the *Timaeus* (30d) that the cosmos is "a living creature, one and visible, containing within itself all living creatures which are by nature akin to itself." This great entity is "endowed with soul and reason." Harmony and order can be discerned in the visible world, which is an image or reflection of eternal truth and therefore offers clues for human understanding. But for the most part he made human society rather than the natural environment the object of inquiry.

It might be supposed that since Plato placed ultimate reality in the world of Forms and held physical objects to be imperfect manifestations, he would be unconcerned with the environment, but such is only part of the picture. Plato often voiced admiration of nature, notably in the *Phaedrus* (230b), where Socrates remarks: "Upon my word, a delightful resting place, with this tall spreading plane tree, and a lovely shade from the high branches of the willow. Now that it's in full flower, it makes the place ever so fragrant. And what a lovely stream under the plane tree, and how cool to the feet!" However, a few lines after this lyrical description, Plato made Socrates add that trees and open country wouldn't teach him anything, since he was interested only in what he could learn from men in the city. His ethics was concerned with establishing an absolute standard of justice between human beings—a human or culture-centered worldview. Even so, his writings are full of insights about the relationship between human beings and nature, the environmental problems that arise in that relationship, and possible solutions.

In the section of the *Critias* concerning Atlantis (111b–d), Plato described the deforestation of Attica and resultant soil erosion and drying of springs, so "what now remains compared with what then existed is like the skeleton of a sick man, all the fat and soft soil having wasted away, and only the bare framework of the land being left." He clearly blames humans for the destruction of forests, noting that the cut timber still existed as beams in large buildings, leaving only "food for bees" (flowering herbs and shrubs) on the hillsides. In the *Laws*, he urged regulations to prevent deforestation: Goats, which devour small trees, should be watched by keepers (639a); gathering of firewood should be regulated by district foresters (849d); and fires must not be allowed to spread (843e). He advises

the planting of trees to conserve water supply (761b–c). The American diplomat and writer George Perkins Marsh, who postulated environmental reasons for the decline and fall of the Roman Empire, was educated in the Greek and Latin classics and constantly refers to them, including Plato, in his work. Marsh's analysis of deforestation and soil erosion as destructive results of human actions on the natural environment were contained in his book *Man and Nature*, published in 1864, which gave impetus to the conservation movement and the study of environmental history. Although Marsh does not quote the passage in the *Critias* mentioned above, his description of deforestation and erosion in the Mediterranean area contains the same ideas, and he must have been familiar with it.

ARISTOTLE AND THE PERIPATETICS

Aristotle (384–322 BCE) insisted that nature, and all its parts, living and nonliving, are directed by the principle of *telos* (purpose). As he maintained (*Politics* 1256b20), "Nature does nothing in vain." He investigated questions about the natural world in a way that was more systematic and inductive than that of the natural philosophers. He gathered that the living and nonliving merged with one another in gradual stages, but his scheme was hierarchical. Although he thought making sharp distinctions between classes of beings was difficult, so that for example, "in most of the other animals can be discerned traces of the psychical modes which attain their clearest differentiation in man" (*Historia Animalium* 588a13–b17), still, as Anthony Preus (p. 217) explained, "there is one ultimate ruler, and each level is subordinate to the next higher level, as in an army." Aristotle asserted that plants exist for the sake of animals, animals for the sake of humans, and that inferior men are natural slaves of the superior. This doctrine supports use of nature in any way conducive to human good, and has been influential in the history of Western environmental philosophy. Aristotle himself would not have justified misuse of animals, but others derived from his teaching that animals and plants are of lower orders subservient to human needs the corollary that they have no purpose of their own and no intrinsic value.

Aristotle, whose philosophy clearly emphasizes the natural world, was interested in the relationships among living things and between them and the physical environment. He observed in the *Metaphysics* (107a17–20), "All things are ordered together somehow, but not all alike—fishes and fowls and plants; and the world is not such that one thing has nothing to do with another, but they are connected." It is this principle that makes the study of ecology possible, and Aristotle's observations on biological relationships were so perceptive that he receives credit for introducing ecologic considerations into literature. He noted the competition between animals that depend on the same food; he described a spectacular population increase among mice and subsequent crash due to weather. Other ecological relationships described by Aristotle include territoriality among mammals and birds and behavior such as competition within species and migration.

Although Aristotle did not enunciate an environmental ethic, he believed that economy depends on nature, and therefore that conservation was a function of a well-run city, which led him to counsel, for example, that its resources be kept safe by "Inspectors of Forests" and "Wardens of the Country," provided with guardhouses and mess halls (*Politics* 1331a–b).

Aristotle's student Theophrastus (371–287 BCE) did not accept the idea that other creatures exist only to serve mankind. He did not deny that there is purpose in nature; he found the purpose of an annual plant, for example, in production of seed to provide for a new generation. Since the purpose of things in nature is not always evident, he asked in his *Metaphysics* (9.34) for an "effort to determine the conditions on which real things depend and the relations in which they stand to one another" through careful observation rather than the assigning of higher causes. His philosophy seems to have the potential to evolve an ethics of consideration for other forms of life, but he did not elaborate it that far. Paul W. Taylor, an American philosopher, in *Respect for Nature* (1986) develops a theory of ethics regarding living beings that is teleological, and perhaps closer to the idea of Theophrastus than to Aristotle. For Taylor, however, purpose exists in individual organisms, not in species or ecosystems, and each organism has an equal claim to moral consideration.

Theophrastus, whose most important surviving scientific treatises deal with plants, was the most consistently ecological ancient writer. He observed that a plant flourishes best in an appropriate place, which now might be termed its habitat. He discussed the effects of moisture, soil types, slope, exposure to wind and sun, and elevation on the occurrence and growth of plants. He did not consider plants only as individuals, but investigated the effects that they exercise on one another when growing in groups and their interactions with animals—conceptual steps toward the science of ecology. He examined human effects on plants, including cultivation and extinctions, and effects of removal of vegetation on climate. More than half of Theophrastus's botanical writings deal with ecological observations.

THE MATERIALISTS

A contrasting concept came from Leucippus (fl. 440 BCE) and Democritus (c. 460–370 BCE), who maintained that

the world is purely physical, composed of indivisible particles (atoms) whose movements are mechanical and governed by necessity. The aggregations of atoms—the bodies they form—come to be by accident, the outcome of chance. According to Epicurus (341–270 BCE), whose cosmology followed Democritus, there is no creator and nature works through blind physical cause. His ethics, based on anthropocentric hedonism, held little promise as a caution against environmental damage. Still, some Epicureans supposed that animals and plants could not have been created for human use, because so many people are fools, and there is not enough human intelligence in the world to make creation worthwhile. Lucretius (94–51 BCE) thought that Earth was deteriorating and that part of the reason was human destructiveness, including deforestation and killing wildlife.

The Stoic school was founded by Zeno of Citium (335–263 BCE) and taught in Roman times by the slave Epictetus (c. 55–135 CE), his student Arrian (86–160 CE), and the philosopher-emperor Marcus Aurelius (121–180 CE). Like the Epicureans, the Stoics were materialists. The Stoics held that the cosmos is sentient, rational, and pervaded by harmony in which all living things partake. It is self-sufficient because it nourishes and is nourished from itself. The cosmos has unity, order, and cyclical development, and is animated by a fiery soul of which all individual souls are fragments. Within this world, humans have an obligation to act with justice, which is a compact between humans. The Stoics accepted Hesiod's dictum (*Works and Days*, 277–279) that "human beings have no compact of justice with irrational animals," and Aristotle's hierarchy of plants, animals, and man. All decisions regarding the environment, therefore, should be made with respect to the possible effect on other humans. The Stoics argued with the Neoplatonists, who were even more Pythagorean than Plato had been, over the question as to whether beasts are rational or not; the Neoplatonists claimed they were.

An idea of environmental influence derived from ancient thinking is the notion that people who live closer to nature are morally superior to those in urban centers. This is the theme of the *Euboean Discourse* of Dio Chrysostom (40–117 CE), a Stoic-Cynic orator who described the visit of a shipwrecked traveler to a hunter's family in the wilds of a large island. The hunters were self-sufficient, living on what they obtained directly from nature. After describing their idyllic home, where they lived in natural honesty, hospitality, and unspoiled nobility, the author brought them into confrontation with the corruption of "civilized" urban citizens, an idea reflected in the eighteenth century by Jean Jacques Rousseau.

Stoic philosophy recognized human ability to change the environment. The design of the world, Seneca (1–65 CE) noted, required human activities: Metals, for example, are hidden in the Earth, but people possess the ability to discover them. Humans were the natural caretakers of the Earth, and its creatures were placed in their custody. Well-planned efforts make the Earth more serviceable for human purposes; in this view, beauty and utility are synonymous. Mankind improves plants and animals through domestication. In the same way, the extension of civilization was seen as making up a defect of the wilderness, which was a haunt of beasts, a barren waste. Stoic ethics taught that individuals should do the jobs fate had assigned them, performing them well with responsibility to all.

CONCLUSION

To what degree did the ideas held by the Greeks about nature affect their ethical treatment of the Earth and its living inhabitants? There is no simple answer. Philosophers encouraged the rational use of the mineral, vegetable, and animal realms. They not only pointed out problems, but sometimes suggested solutions. Certain ethical systems provided motives for conservation, while others left humans free to exploit the environment.

There remains the undeniable fact that the natural environment suffered considerable damage at the hands of ancient people, though not as serious or widespread as that which has occurred in modern times, and some areas of the Mediterranean survived with relatively little impairment. It is almost impossible to identify a general pattern of environmental effects deriving from the competitive philosophies of the ancient world. Some forms of philosophy, upon elaboration, could have provided constructive environmental attitudes. But these would not have been effective in environmental conservation without knowledge of the workings of nature and the effects of human actions. And as the American philosopher J. Baird Callicott tellingly indicates in *Earth's Insights*, the dominant Greek legacy in environmental philosophy is dualism (Plato), mechanism (Democritus), and hierarchy (Aristotle), none of which is a firm foundation for environmental ethics. Callicott does note, however, that Plato's idea of community good as a basis for ethics has application in the environmental realm.

Science, and ecology in particular, had only small beginnings among the Greeks. It would have been difficult, then, to decide which practices were likely to bring the best results when an environmental problem appeared for the first time, or was exacerbated from a tolerable level to an intolerable one.

SEE ALSO *Animal Ethics; Callicott, J. Baird; Ecology: VII. Philosophy of Ecology; Environmental Citizenship; Environmental Philosophy: V. Contemporary Philosophy; Environmental History; Europe: I. Mediterranean; Gaia Hypothesis; Marsh, George Perkins; Pantheism; Taylor, Paul; Virtue Ethics.*

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J. Donald Hughes

II. MEDIEVAL PHILOSOPHY

The term *medieval* comes from the New Latin *medium aevum,* meaning "the middle age," a phrase that situates this long epoch between antiquity and modernity. Such a view is retrospective, having arisen in the fifteenth century, at a time when it was felt that a new, "modern" epoch was arriving. Just as the "medieval" concept privileges modernity, it also assumes the viewpoint of the Western Roman Empire, the decline of which in the fifth century is usually seen as the beginning of this epoch, despite the fact the Eastern Empire persisted and flourished until its fall to the Ottoman Turks in 1453, during which time its citizens did not think of themselves as "Byzantine" but simply as Romans, embodying an experience of fundamental continuity with antiquity. Terminal dates for the Middle Ages range from 1453 (the fall of Constantinople), 1455 (the Gutenberg Bible), 1492 (Columbus's first voyage to the New World), or 1517 (the posting of Luther's Ninety-five Theses).

The Middle Ages was the period that blended and synthesized the powerful intellectual currents of antiquity, above all Greek philosophy, with the great religious traditions of the Middle East—Christianity (the predominant religion of Europe for 1,000 years), Judaism, and Islam: It was the marriage of "Athens" and "Jerusalem." This synthesis had a profound effect on our view of nature. It was institutionalized with the establishing of Constantinople as the New Rome, the Christian capital of the Empire, in 330, and with the earlier First Council of Nicaea (held across the Bosporus from Constantinople in 325), which drew together the resources of Greek thought with the spirituality of Christianity and its background in Judaism, first establishing Christian doctrine in what came to be called the Nicene Creed. Accordingly, 325 was the approximate beginning of an epoch in which nature was newly understood. The dissolution of the medieval view of nature in later Scholasticism (the philosophical and theological teachings that developed in the cathedral "schools" of Western Europe) during the fourteenth and early fifteen centuries, which is discussed below, signaled the gradual end of this epoch.

MODERN CRITIQUES OF MEDIEVAL VIEW OF NATURE

Any discussion of medieval concepts of nature and their impact on modern attitudes and practices must address three influential critiques that have been readily and sometimes uncritically embraced in various environmental circles. All of them imply that abuse of the natural environment has distinctively Christian, especially medieval, foundations: (1) the claim of Friedrich Nietzsche (1844–1900) that Christianity, particularly in its medieval form, advanced a purportedly Platonic devaluation of the visible and earthly and thus is guilty of not being "true to the earth"; (2) the view of Martin Heidegger (1889–1976) that medieval Christianity pursued a

project of "onto-theology," seeing God as the highest being (*summan ens*) and natural entities as essentially artifactual, as divinely produced or created things (*ens creatum*), thereby obscuring their true naturalness; (3) the claim of Lynn White Jr. (1907–1987), a historian of medieval technology, that medieval Christianity in the Latin West (although not in the Greek East) took literally the charge to humanity in Genesis 1:28 to "subdue" and "have dominion over" the created order, fashioning aggressive technologies with little sense of nature's rootedness in a divine order. Many scholars regard these interpretations as selective and tendentious. Some suggest that it was not medieval civilization but rather the Enlightenment, with its gradual dissolution of medieval religious sensibilities and the attendant, unprecedented rise in secular and mechanistic worldviews, that provided the foundation for environmental degradation.

COMMON ELEMENTS OF MEDIEVAL PHILOSOPHY

It was indeed during that long period from the fourth to the fifteenth century that European thought accrued many of its characteristic features and themes, especially its synthesis of philosophy and religion, of Athens and Jerusalem. Accordingly, physical nature was itself experienced and understood with reference to two sometimes competing outlooks: via Athens, nature was understood as indifferent self-emergence (*physis*), always threatening to overwhelm; and via Jerusalem (and later Alexandria, Rome, and Constantinople), nature was understood as ordered creation (*ktisis*), correlative and proportionate to humanity; its tendency to overwhelm is thus, taken as a manifestation of the glory of the creator. Both views, in fact, were necessary for the rise of modern science, for without the "Athens" perspective there is no compelling requirement to interrogate nature, and without the "Jerusalem" perspective there are no grounds to expect intelligible answers. Common to both traditions, however, is an emphasis on grasping the close interrelation between the visible and the invisible, the temporal and the eternal, the earthly and the heavenly. This common element was further developed in the Middle Ages.

A mainstream or classical view of nature prevailed throughout this period, expressed in both the paradoxical language of mysticism and the precise language of Scholasticism. This view, even if not shared by all philosophers and theologians, was always at least their point of departure. Two central tenets of this shared worldview challenge the claims of Nietzsche and White. (1) Given the litany in Genesis 1 proclaiming that, at each stage of creation, "God saw that it was good," creation must be seen as possessing an inherent, divinely instituted goodness, thereby refuting as heretical any Gnostic or Manichean devaluation of nature as inherently "dark"; (2) nature is seen as revelatory of the creator, its goodness and beauty marking it as an original and continuing revelation of the divine, preceding scripture and prophets, and thus as a foundation of religious piety. Nature is thereby understood and honored as divine epiphany.

NATURE IN EARLY MEDIEVAL PHILOSOPHY

The first major philosopher to draw together the two predecessor schools of thought was the first-century Jewish philosopher Philo of Alexandria, also known as Philo Judaeus (15–10 B.C.E.–45–50 C.E.). Philo saw in the orderliness of nature the workings of divine providence, and he was the one of the first to maintain that the Platonic forms, principles of this manifest order inherent in creation, were the eternal ideas of God. Beyond this, he posits an eternal *Logos*, philosophically a "form of forms," that, like manna, is a heavenly gift, connecting God and world, in which human rationality takes part and by means of which the cosmos itself coheres. This idea of divine principles that inhere in nature and through which the divine order can be apprehended or understood—of a manna-like connection between heaven and earth—runs through medieval philosophy like a golden thread, intact until the fourteenth century. For example, in his *Hexaemeron,* St. Basil the Great (330–379) reflects on how the "beauty and grandeur" of creation—"earth, air, sky, water, day, night, all visible things"—is a "training ground" for the soul to "learn to know God, since by the sight of visible and sensible things our intellect (*nous)* is led, as by a hand, to the contemplation of invisible things." (Hex. 71, 55).

Basil's student Evagrius of Pontos (345–399) was one of the earliest of the Christian "Desert Mystics" and wrote extensively of *theoria physike*, the noetic or contemplative knowledge of nature that becomes possible once the soul undergoes purification *(katharsis)* from passions such as anger and avarice. Monasticism in the Christian east became closely associated with natural wilderness and took inspiration from it regularly—in the deserts of Egypt, Sinai, Syria, and Palestine; in the high plateaus of Cappadocia in Anatolia; and, eventually, deep in the Russian *taiga*. Probably writing as a Syrian monk, St. Dionysius the Areopagite (early sixth century) presented a mystical vision of nature that, as Umberto Eco puts it, "presents the universe as a cascade of beauties springing forth from the First Principle, a dazzling radiance of sensuous splendors which diversify in all creation," advancing within medieval philosophy an influential vision of nature that he calls "*pankalia*, the beauty of all things." Eco goes on to speak of a prevailing "medieval pancalistic sensibility" running throughout medieval civilization (1988, pp. 23–26). In the west,

St. Augustine (354–430) vigorously affirmed the inherent goodness of the world against the Manichean attempt to denigrate it, frequently invoking the beauty of nature as evidence for its creator. Searching in natural things for knowledge of God, he reflects in the *Confessions*: "My question was my gazing upon them, and their answer was their beauty." Later, Boethius (c. 480–525) advanced an essentially aesthetic view of the cosmos, seeing it in a Pythagorean manner as musical and mathematical.

NATURE IN LATER MEDIEVAL PHILOSOPHY

What is this connection, prominently aesthetic, between the earthly and heavenly? What is the link between heaven and earth? Is the relation between them one of ontological participation, the being of the latter sharing in the being of the former, such that the connection might be apprehended or intuited in "noetic" or contemplative seeing? Is it a semiotic or symbolic relation, to be grasped through the imagination? Or is it a relation of cause and effect, to be comprehended through inferential or discursive rationality? All these variants affirm a strong connection between God and world but differ significantly over the degree of externality between God and nature, and thus in their sense of the approachability of God through creation. In what sense does nature exist as theophany, or manifestation of the divine? In the east, the distinction between the radically transcendent and unknowable essence (*ousia*) of God and the all-present, apprehensible divine energies (*energeiai*) allowed for a mystical orientation to nature that can contemplate the divine energies in all things without compromising the transcendent and mysterious nature of the divine essence.

This distinction of essence and energies, however, never took root in the Latin west, where a gradual transition occurred from understanding the relation as predominantly symbolic to seeing it as largely causal. John Scotus Eriugena (c. 810–c. 877) translated many eastern texts, including those of Dionysius, introducing Byzantine elements into Latin thought while leaning toward Augustine's view of nature as symbolic. Throughout the Latin Middle Ages there arose an elaborate complex of symbolic correspondences between heaven and earth that endured even into the Renaissance, with everything in nature referring to something sacred and eternal.

In the Greek east a more immediately mystical and sacramental orientation toward nature persisted. Philosophically, this cosmic mysticism was articulated by the Byzantine philosopher and theologian St. Maximus the Confessor (c. 580–662), who saw the eternal *Logos* mirrored by an infinity of individual *logoi* possessed by every leaf, twig and pebble, thus providing an intuitive or noetic principle of intelligibility and eternal significance for every individual being. St. Symeon the New Theologian (949–1042) developed perhaps the most comprehensive medieval view of the cosmos as theophany, advancing the view that humanity is intended to exercise a cosmic priesthood, consecrating nature through contemplation of the divine energies operating within it.

The Latin tradition reached its culmination in St. Thomas Aquinas (1224–1274), in whose thought the connection between God and nature receives a multifaceted consideration. His cosmological proofs seek to demonstrate the causal connection between creator and creation, providing an inferential link between heaven and earth. In contrast to the thinkers of the Greek east, Aquinas maintains that there can ordinarily be no direct or non-discursive experience of God within this lifetime. Nevetheless, he argues, the order of creation, especially its aesthetic elements, so compellingly points to the divine that Gilson (1955) can suggest as a title for Aquinas's cosmology *De imitatione Dei*. The overall medieval sensibility of proximity between heaven and earth persists in the work of Aquinas. His theory of analogy—according to which we can understand the visible and temporal (such as the finite beauty of a flower or the relative goodness of fresh spring water) through an analogy of proportion with the invisible and the eternal (the infinite beauty or the absolute goodness of God)—serves as a metaphysical and epistemological bridge between these two orders. Thus, it is as not a "singular" exception, as White believes, but as a summit of Latin spirituality that St. Bonaventure says of St Francis of Assisi's befriending of grasshoppers, "he had learned, even in the most insignificant creatures, to admire the wonderful works of the Creator" (1955, p. 82). In the Christian east, stories of saints conversing with animals had been common from the earliest days of desert monasticism in the fourth century.

THE OVERTURNING OF THE TRADITIONAL VIEW OF NATURE

It was, then, not until the work of William of Ockham (1285–1347) emerged that this continuity between visible and invisible worlds was severed. Ockham believed that the traditional view, according to which we can know and even contemplate divine principles or eternal forms in nature, compromised the unfathomable sovereignty of God, which he understood as primarily volitional. The world is how it is not because God has woven universals into it but because God willed it to be just as it is. Ockham's nominalism—his belief that there are no forms or universals or archetypes—is often cited as engendering the empiricism of modern natural science, because it claims that we must learn about nature by

observing it case by case, making generalizations only afterward. At the same time, however, it uproots the cosmos from its deeper moorings, allowing nature to be seen as sheer artifact, as *ens creatum* in Heidegger's sense, an aggregate of natural substances (*natura naturata*) without any deeper, inner coherence or dynamism (*natura naturans*). The willful, almighty deity of Ockham, who cannot be approached through the goodness or beauty of creation but through revelation alone, and for whom (contrary to Socrates in the *Euthyphro*) good things are "good" only because God chooses to will them, became an important influence on Reformation figures such as Luther and Calvin. Ockham's work also inaugurated the nominalistic tradition of British empiricism.

NATURE AND MEDIEVAL PHILOSOPHY

Did medieval philosophy lay the foundation for later environmental ruin? A careful examination of its history suggests that it was not medieval philosophy, but rather its dissolution in the philosophy of William of Ockham and the nominalist school that opened this door by promoting a concept of creation that is radically removed from the divine being: nature as *ens creatum* in Heidegger's sense, no longer intelligible as theophany. Though differing views followed, such as those of Nicholas of Cusa (1401–1464), it was Ockham's vision that prevailed, leading to the deeply desanctified sense of nature in the mechanistic worldview of the Enlightenment, which lay the foundation for environmental domination in modern technology.

Far from engendering the environmental crisis, the medieval sense of nature as theophany has inspired, directly or indirectly, much of modern environmentalism, from European romanticism to American transcendentalism to the work of nature writers such as John Muir and Annie Dillard, all of which have retrieved elements of the medieval experience of a nature that manifests divine energies through the beauty of creation.

SEE ALSO *Bible; Christianity; Environmental Philosophy: I. Ancient Philosophy; St. Francis of Assisi; White, Lynn, Jr.*

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Bruce Foltz

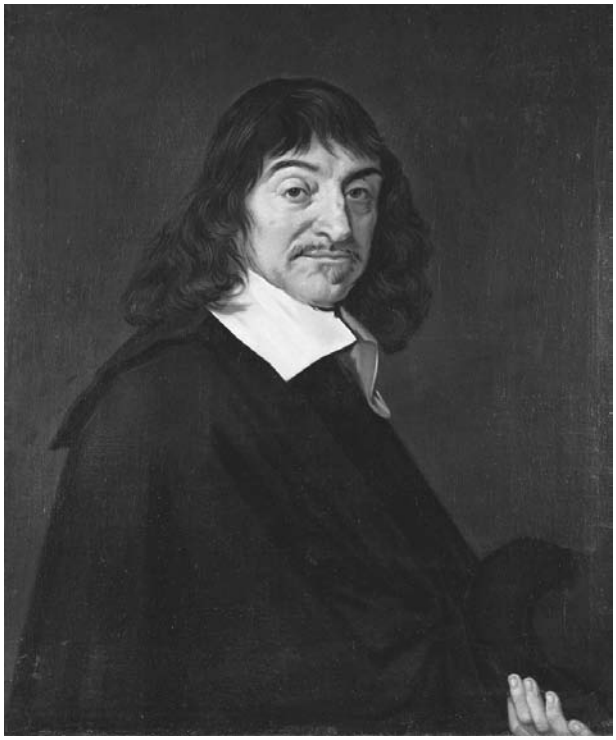
III. EARLY MODERN PHILOSOPHY

Early modern philosophy is the philosophy that accompanied the rise of modern science in the West. Francis Bacon (1561–1626) was the herald; Immanuel Kant (1724–1804) marks the transition to something new, though, as indicated below, that something new took many different directions.

EMPIRICISM

In the medieval period, the project of the learned was to transmit knowledge from authoritative sources to their own times. Learning was important, because sound teaching of correct doctrine contributed to the salvation of humans and their ultimate happiness in the world to come. The beginning of modern thought was marked by the innovative argument that learning might be useful in another way: to make life in this world more comfortable.

Bacon developed this argument in his *Advancement of Learning*, published in 1605. His key point was that knowledge might be practically useful, but he went on to claim that if this was what was wanted, people had to abandon the assumption that had ruled hitherto, namely that all important knowledge was essentially already there in either the Bible or the books of antiquity. And the methodology of learning, which, before modern science,



René Descartes. *Descartes (1596–1650) is an influential early modern philosopher known for his original concept of the mind and his ideas about physicality. Some contemporary theorists believe that the ideas developed by early modern philosophers, such as Descartes, contributed to a later careless attitude toward the environment.* **IMAGNO/AUSTRIAN ARCHIVES/GETTY IMAGES.**

had relied on re-presenting ancient and sacred texts through translations and preparing aids to their correct construal through commentaries, had to be supplemented by a very different approach. One had to use the human senses to observe phenomena and devise experiments to fuel those observations.

Bacon insisted on the importance of the senses because he thought that the new search for knowledge had to focus on "secondary causes"—what we simply call *causes* today—in contrast to the medieval preoccupation with purposes and functions (What was God's purpose in creating the world? What was the function of, for example, "the firmness of the skins and hides of living creatures" [one of Bacon's examples]?). He thought that the way to study secondary causes was through observation and experiment.

PHYSICALITY

Bacon's plea for new knowledge took hold, and as it did so, a new conception of the universe emerged. The backdrop was set by René Descartes (1596–1650), often noticed as the originator of a new concept of mind, but more importantly a sponsor of a new way of thinking

ISAAC NEWTON

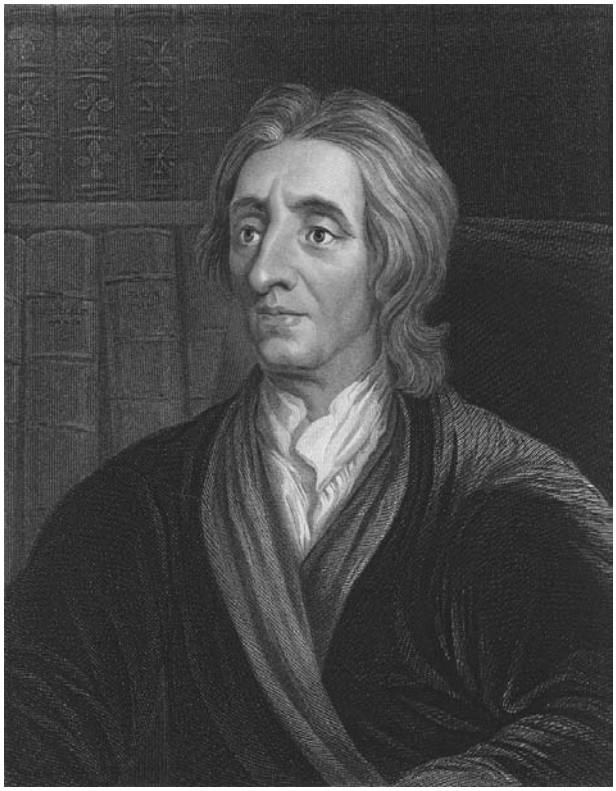
Born in Lincolnshire and educated at Cambridge University, Isaac Newton (1642–1727) was elected Lucasian Professor of Mathematics in 1669 and President of the Royal Society in 1703. His work as a mathematician and physicist was fundamental to the scientific conception of the physical universe that took shape at the end of the seventeenth century and remained broadly intact for two centuries. It was Newtonian physics that underpinned the deterministic vision at the heart of the Enlightenment.

Newton's physics displaced the physics of Descartes, whose plenum theory posited that the idea of empty space is incoherent. On Newton's view, in contrast, material bodies are indeed located in space, and space is otherwise empty. To explain their behavior, he spoke of bodies as being subject to gravity.

The most straightforward construal of his proposal is to have him positing a force acting across the empty space that he thought often separated bodies. Alternatively, he can be understood as describing a patterning among events without saying anything about what underlies that patterning. His formulas, of which the law of gravitation is just one, would then be understood as summarizing certain aspects of the movement of bodies and allowing reliable predictions.

Part of Newton's achievement was to show that one and the same set of formulas covered the movements of bodies of all kinds, wherever they are located in the universe. This did much to consolidate the assumption that everything that happened, whatever it was, happened in a regular, law-governed way.

It is argued that the scientific worldview that Newton did so much to establish (not to be confused with his own worldview) brought with it a distinctive policy toward human dealings with the natural world. There is held to be a link between seeing the world as made up of particles subject to forces and regarding it as open to unrestrained exploitation. Against this view, it is denied that attitudes were less exploitative when the assumption was that the world had been created for the support of human beings and was in any case fully or partially "corrupt." It remains true that when science began to be applied in manufacturing processes in the nineteenth century, it transformed those processes into instruments of globally destructive potential.



John Locke. *John Locke (1632–1704) is known for contributing the notion of mentality to the early modern philosophic tradition. One of his important contributions to modern environmental ethics is the idea that an individual has the capacity to own and acquire land.* **PHOTO BY STOCK MONTAGE/GETTY IMAGES.**

about physicality. The medieval assumption was that everything had a nonphysical aspect called its form. Descartes argued on the contrary that the universe consisted of a material or stuff without any form; adding that in the case of a limited number of small bits of this universal matter there was, associated with each bit, a non-material mental substance. These mental substances, though attached to bits of matter (bodies), were for Descartes the essential core of the human being, the mind.

Descartes posited a number of eddies or whirlpool-like swirlings within the plenum—the single expanse of continuous stuff that was, according to him, the physical universe—and the simplest of these eddies, theorized Descartes, could be regarded as a first approximation of material particles. The material objects of ordinary experience, in their turn, could be regarded as made up of these.

Other theorists arrived at a particle or corpuscularian conception of physical reality along different routes, and the outcome was a consensus among seekers after new knowledge, by the end of the seventeenth century, based on corpuscularianism. Opinions differed over what properties the corpuscles possessed, and over what forces there were that might affect them (see sidebar), but they were generally considered to be lifeless and mindless, inert entities moving under the influence of a limited number of forces. The movements of these corpuscles, and the configurations they got into, were held to be responsible for all the features of the experienced universe.

It has been argued that modern science and early modern philosophy oversaw the elimination of the spiritual from these nonhuman bits of the created universe, the descralization of nature. The restriction of mentality to human beings is also argued to have supported the conclusion that animals have no feeling and are therefore free of any kind of suffering.

MENTALITY

John Locke (1632–1704) developed the notion that mentality, like physicality, consisted essentially of corpuscles—but mental "corpuscles," not physical ones. Just as physics proposed to explain physical phenomena in terms of corpuscles and the forces acting upon them, so the mind was to be scientifically studied with the parallel assumption that everything mental was to be understood in terms of ideas and the mental forces to which they were subject. The theory of mental causation that developed out of Locke's approach was dubbed *associationism*, because of the laws of association that were assumed to govern the linking up of ideas.

Locke considered himself to be in a good position to prosecute the sense-based study of the mind and its workings because he thought a person could look inside him or her self and observe what was going on in their own minds. Introspection was a kind of sense. Expressing the so-called empiricist manifesto that knowledge had to be based on sense experience, Locke insisted that all ideas must come from sense experience—either from the outer senses of sight, hearing, and so on, or from the inner sense of reflection.

RATIONALISM

Bacon advocated experiment and observation as the key to establishing new knowledge, but others placed the emphasis elsewhere. Taking as their model the role of mathematics in advancing knowledge of the movements of heavenly bodies, they thought that the way forward lay with the more general application of reasoning. Descartes was one of these, founding his philosophy on the notion that whenever an idea is "clear and distinct," it is bound to be true. His examples included "I think, therefore I exist" and "God exists."

Benedict de Spinoza (1632–1677) took to its limits the idea that human reason is an instrument of discovery, maintaining that the universe is governed by laws that can be worked out by thinking alone, just as geometrical

theses can be proved by thinking, without resort to observation of any kind. (In a wonderful irony, he earned his living by grinding spectacle lenses.) More important for the Romantics was his suggestion that nature is divine, either because it is infused with God or because it is actually identical with him.

THE HUMAN BEING

For Descartes, the human being is an association of something physical with something mental. By *physical* he meant whatever occupied space. By *mental* he meant that which manifests the capacity for thought. For him, the mental is the key to what a human being is: a thinking thing. A person is to be identified with his mind, and the Cartesian mind became identified with the human soul.

Once the framework of the mental and the physical as two different types of existent had been introduced, different possibilities within that framework were explored. Thomas Hobbes (1588–1679) defended the idea that there was only the physical. George Berkeley (1685–1753) claimed that there was nothing physical, that all was mental. With his wonderful but baffling notion of monads, each representing the whole universe and each a closed windowless world, so may have Gottfried Wilhelm Leibniz (1646–1716).

Giving the key role to observation implied that at birth—before he or she had had a chance to use their senses—the human being was an empty vessel—or in the image Locke used, a tabula rasa, a writing tablet with nothing on it. According to Charles Taylor (1989), on this view the self is dimensionless until made into something by the causal influences that come to bear on it as it matures. Two opposing doctrines exploited this conceptual innovation: Jean-Jacques Rousseau (1712–1778), adopting a reverential attitude toward the world untouched by humanity, argued that the environment of European high civilization served to enchain. In contrast, Voltaire (François-Marie Arouet, 1694–1778), horrified by Rousseau's vision, maintained that a civilized education liberated and enriched.

THEORIES OF ETHICS

Both ancient and medieval philosophers thought that human beings seek happiness, though there were differences about how this was to be achieved and over what exactly happiness is. For Plato, happiness is "contemplation of the Good." While not exactly disagreeing, modern philosophers interpreted happiness as of a state of mind, something that Aristotle, for example, had specifically argued against. Human behavior, according to early modern philosophers, was driven in large part by humans striving to rid themselves of uncomfortable feelings and enrich themselves with enjoyable ones. Locke reached for the term *uneasiness* to make the point. Pain is a species of uneasiness, and so are hunger, lust, and cold. Whenever human beings initiate behavior, they do so to lessen their uneasiness. Jeremy Bentham (1748–1832) spoke simply of "mankind's twin masters, pain and pleasure." David Hume (1711–1776) agreed in seeing these two as "the chief spring and moving principle" of all action.

This perspective on the drivers of human behavior—while not strictly incompatible with an approach that continued to think of morality in terms of commandments issued by God (as defended by Locke and a tradition that continued into the Enlightenment and beyond)—left the door open to deterministic alternatives. The most compelling application of Baconian empiricism to thinking about morality is by Hume. Hume saw morality as a product of the principle that humans try to maximize pleasure and avoid pain, yet even Hume was not fully deterministic in his thinking, since the principle he invokes is teleological. One source of pain, Hume believed, is the suffering of others. Seeing them suffer causes pain in us—a phenomenon he called *sympathy*. It is sympathy, he theorized, that leads to behavior that would otherwise appear to be altruistic.

This idea has been taken up by environmental philosophers since the 1990s. If Hume's theory of morality is correct, the planet will be saved only if human sympathy can be extended beyond family and neighbors and the wider human family to embrace animals and plants and, as may then be necessary, the world itself.

When it came to working out what social policies should be adopted in an individualistic world, it was clear to Bentham what the touchstone should be: Do that which produces the greatest pleasure. In the nineteenth century John Stuart Mill (1806–1873) adopted this perspective as a principle for guiding the actions of individuals, a principle that became known as utilitarianism. The principle continues to recommend itself, as it does to some environmental thinkers, once the happiness (pleasure) to be taken into account has been widened to include that of animals and all other sentient entities.

SOCIETY

The Cartesian emphasis on the conscious experience of the individual, experience that was essentially private according to Descartes, was but one aspect of a developing theme of early Modernity: the rise of the individual.

An early landmark of individualistic thought was *The Prince*, by Niccolò Machiavelli (1469–1527), purporting to be a manual for the guidance of would-be rulers in the new world, guidance based on the assumption that both would-be ruler and prospective subject could be counted on to pursue with total focus their own individual interest. Others began to look at social life not as a given, but as

the outcome of individuals coming together. Hobbes asked, What reason would individuals have for giving up their independence and agreeing to put themselves under the restrictions of communal living? His answer: security. The individual person is prey to every other individual person unless they together agree to set up some kind of authority charged with keeping the peace. One should think of society as bound together by a kind of conditional agreement: individuals agreeing with each other to give up their freedom for effective security. For such security Hobbes thought there needed to be a central authority, which, with some prudence, he declared could be one person, such as a king, or a collective body, such as a parliament. This entity, in pursuit of its mission, was to be thought of as devising both morality and law.

Locke adopted a different starting point. Morality is God-given and hence was in place before society was established. This natural law endowed individuals with rights, such as the right to own property. And in an innovation that had direct implications for conceptions of the environment, Locke endowed the new individual with the capacity to own land—not only to own it, but to acquire it through the simple expedient of using it in some way.

Locke's thinking on this point was the thinking of a European before the beginning of the eighteenth century looking outward to a New World of apparently unlimited natural resources. These unlimited natural resources included land, which, in the European perception, was owned by nobody and there for the taking. Such an attitude—misconceived in more than one way and not completely extinct even today—can be seen with hindsight to have fueled the heedless exploitation that has created the contemporary world and now threatens its end. This element of Locke's political philosophy has been argued to structure environmental attitudes today.

Even though Locke considered all people to be essentially equal, a central authority was necessary, he thought, because rights needed enforcing. His theory was that people transfer what little enforcement power each individual possesses to a single entity, which ends up with sufficient power to do what is asked of it. Unlike Hobbes's sovereign power, Locke's was not the author of all law but the subject of natural laws legislated, prior to society, by God. If these constraints were flouted, citizens were justified in rebelling. The founders, much influenced by Locke, thought that the rebellion of the United States against the British monarch was a case in point.

Rousseau's social contract was another variant on the theme of individuals having reasons to come together. To preserve their essential freedom while setting up a central authority, Rousseau proposed that individuals should think of themselves as contributing their individual wills to a composite General Will, a new entity thereby legitimized as the supreme authority. Napoleon for one thought that the General Will massively shaped the revolution of 1789 and its aftermath.

SECULARISM

The backdrop to the changes in conceptions of the universe and its denizens is the growing secularism within culture. In insisting that what happens in the world is the result of the operation of secondary causes, the early Moderns became committed to the tenet that events are determined by universal laws (see sidebar). Among those who sought to retain their religious commitment, this led to a theology called *deism*: There was a Creator, but what he created was essentially a set of universal laws and a machine that has been running in accordance with them ever since.

This was the creed of Voltaire, one of the group of thinkers known as the *philosophes*. This group drove the great encyclopedia project that did much to define the Enlightenment: *Encyclopédie, ou dictionnaire raisonné des sciences, des arts et des métiers* (Encyclopedia, or a Systematic Dictionary of the Sciences, Arts, and Crafts), under the editorship of Denis Diderot (1713–1784) and Jean le Rond d'Alembert (1717–1783). A register to be made of all the knowledge that could be seen as sponsored by the new science, by then a mighty undertaking, it conveyed the message that the Baconian enterprise had already yielded substantial improvements to the human condition and that, as the enterprise marched on, progress would continue. The encyclopedia was eventually curtailed for its anticlericalism, but not before its anticlericalism had been clearly conveyed. Socializing in the salons of mid-eighteenth-century Paris were a mix of theists and deists, atheists and skeptics and agnostics. Their common ground was not religious commitment, but commitment to the modern project of developing new knowledge in the service of human well-being. In his famous essay "What Is Enlightenment?" (1784), Kant gave powerful encouragement to the growing secular sentiment by answering, the courage to use one's own judgment.

It was the philosopher David Hume who gave the profoundest exposition of the "anticlericalist" case. There are no valid proofs of the existence of God. Our senses, which are the only sources of substantial knowledge, can tell us little indeed, presenting us with only a passing sequence of chaotic, unconnected impressions, and the self to which they make their presentations are only another set of passing impressions. Hume's challenge, of explaining how from these unpromising raw materials we derive our belief that we are persistent beings in a persistent world, is with us today—being addressed most promisingly by cognitive science.

In underwriting the Baconian project, the *philosophes* and their supporters sponsored the profound and far-reaching eighteenth-century program of improvement. Through revolutionary developments across the Western economies, but especially in food production and sea trade, the physical environments in which people lived were transformed, and the exploitation of natural resources worldwide were taken to new levels.

ESCAPE FROM CAUSALITY

At the end of the early modern period, the Baconian plea to concentrate on secondary causation was challenged not from within the now established and flourishing science but by a new turn in philosophy. Kant, fearful of the deterministic implications of Baconianism when applied to human beings, argued that humans live partly in a world not subject to causality. In this domain, the noumenal world, rational beings are free in one sense to pursue goals, although in another sense they are constrained by their rationality, which demands that they avoid inconsistency. This rationality, Kant thought, is the source of morality.

Kant maintained that his grounding of morality in rationality could be expressed in a number of ways, for example, in the formula "You should always treat people as ends and not solely as means." Such a gloss highlights the sharp distinction that he draws between human beings (as creatures with rationality and thus ends) and all other entities of which we humans have experience, including nonhuman animals and natural systems like rivers and oceans and indeed the earth itself. In carving out a place for morality, he thus insisted on a moral boundary between human beings and nonhuman animals, which Bentham and Hume had begun to erode, and buttressed philosophically the disturbing cruelty of farm and laboratory that marked his period and those that followed. In the realm of aesthetics, Kant appears to have thought that the appreciation of works of art and of landscapes relies on regarding them as free, like morality, of the causal nexus—an idea built on in contemporary aesthetics of nature.

SAVING THE FUTURE

It is somewhat received opinion that the early modern outlook, as partially reflected in its philosophizing, nourished the roots of a profligate, careless, and disastrous attitude toward the environment. It is not clear that this charge is justified. Despite some vivid writing, Bacon, at the outset, urged that we should do what we can to improve the world that our children and their children have to live in. This ambition contrasts with the focus of almost all the medieval thinkers, fixed on the world to come, and with that of modern neo-romantics, who seek guidance not from evidence-based science, but from faith-based authorities and intuition. It was, after all, the heirs of Bacon who hoisted the warning flags against the impending disasters that presently threaten us—disasters for a long while ignored by the nonscientific world. And it is they, it may be argued, who have the most promising policy for addressing it.

SEE ALSO *Animal Ethics; Bacon, Francis; Descartes, Rene; Environmental Philosophy: V. Contemporary Philosophy; Environmental Philosophy: I. Ancient Philosophy; Environmental Philosophy: II. Medieval Philosophy; Environmental Philosophy: IV. Nineteenth-Century Philosophy; Europe: II. Western Europe; Land Ethic; Romanticism; Spinoza, Baruch.*

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Vernon Pratt

IV. NINETEENTH-CENTURY PHILOSOPHY

Many nineteenth-century philosophers—including Georg Wilhelm Friedrich Hegel, Arthur Schopenhauer, John Stuart Mill, and Friedrich Nietzsche—held views about nature and animals that are relevant to and sometimes

Georg Wilhelm Friedrich Hegel, 1884. *Hegel (1770–1831) was a nineteenth century German philosopher. Hegel's views about nature fell somewhat between those of his contemporaries: he believed that nature was rational rather than creative, but believed that this rationality was still inferior to that of human beings.* **THE LIBRARY OF CONGRESS.**

anticipate environmental ethics. Their views on these subjects also reflect broader developments in nineteenth-century philosophy.

Until the 1840s idealism in the forms developed by the Germans Johann Gottlieb Fichte, Friedrich Wilhelm Joseph Schelling, and Hegel was the dominant outlook in philosophy. Central to German idealism was the belief that human beings are free, with freedom (or autonomy) defined as the ability to act and think independently of causal determination. From the 1840s onward a range of more naturalist philosophical approaches became dominant. According to those approaches, human beings are natural, part of the natural universe understood as a causal order. The later nineteenth century saw a resurgence of idealism, with many philosophers combining elements from idealism and materialism. Both German idealism and naturalism have mixed implications for environmental ethics.

GERMAN IDEALISM AND NATURE: FICHTE AND SCHELLING

German idealism developed out of Immanuel Kant's philosophy. The German idealists endorsed Kant's view that human beings are autonomous, capable of breaking from causal determination to set their own values and thoughts. However, Kant thought that human beings not only are autonomous but also appear empirically—in everyday experience—to be part of nature, which he understood as the fully determined causal order of Newtonian science.

On the basis of these Kantian views, Fichte held that the self's freedom conflicts with its empirical status as a natural, embodied person whose sensations are causally determined. This conflict prompts the self to strive to overcome its determination by nature and become completely free. The self therefore endlessly strives to dominate and impose its will on nature (Fichte 1987 [1800]). The more the self succeeds in "determining" or shaping the character of nature through its activities, the more the self, in being determined by nature, actually remains self-determined.

Schelling reacted against Fichte's insistence on the conflict between self and nature. Schelling argued that human freedom is possible only if it emerges out of and depends on a preexisting form of freedom within nature. In his *First Outline of a System of the Philosophy of Nature* (2004 [1799]) he maintains that nature is free in the sense that it originally consists in a pure "productivity" or creativity that fixes itself in a succession of particular natural objects.

Schelling devised his account of nature partly through a priori reasoning about what nature must be like for human freedom to be possible and partly by drawing together the results of the empirical sciences of his time, such as contemporary chemistry, which seemed to reveal creative, self-transforming energies in nature. *Naturphilosophie*—"philosophy of nature"—was what Schelling called his partly speculative, partly empirical form of inquiry into nature, which became popular among early nineteenth-century scientists and led to some real discoveries, such as electromagnetism. Although midcentury scientific materialists repudiated *Naturphilosophie*, insisting that scientific inquiry must be purely empirical, *Naturphilosophie* influenced forerunners of ecology such as Ernst Haeckel.

Outside Germany, contemporary environmental philosophers seldom discuss Schelling. However, he anticipated environmental ethics with his rejection of Fichte's advocacy of human domination over nature, contrasting emphasis that human freedom depends on the freedom of nature, and replacement of mechanistic views of nature with the idea of nature as a creative whole.

GERMAN IDEALISM AND NATURE: HEGEL

Hegel's position on nature lies midway between those of Fichte and Schelling. In his *Philosophy of Nature* (1970 [1830]), Hegel sees nature as rational rather than creative. For Hegel the natural world is rational not only in being intelligible to people but also in that natural things in themselves form a rational order in which some things resolve internal conflicts within others. Like Schelling, Hegel reached his conclusions about nature on a partly a priori and partly empirical basis. Also like Schelling, Hegel insisted that human rationality depends on the rationality of nature, and he saw nature not as a mechanism but as a rational whole.

However, Hegel thought that the rationality of nature is inferior to that of humanity because nature is mind that is "outside itself," that is, not self-conscious. As a result, Hegel argued in his political philosophy that human beings should appropriate and impose their will on natural things so that those things will come to reflect the higher, more fully developed rationality that human beings possess. To this extent Hegel, like Fichte, provides a philosophical justification for human mastery over nature.

Thus, German idealism can support the domination of unfree nature by free humanity (Fichte) or can treat human freedom as depending on and requiring the freedom of nature (Schelling). The two philosophical strands can be combined by reinterpreting the freedom of nature as rationality and seeing it as an inferior version of human rationality (Hegel).

During the middle of the nineteenth century, German idealist thought became unpopular with philosophers, but some of its ideas were revived later in the century by the British idealists, including F. H. Bradley and T. H. Green. Green revived aspects of Hegel's political philosophy, while Bradley's metaphysics was influenced by Hegel, among others. However, nature was not a major preoccupation for the British idealists as it had been for the German idealists.

SCHOPENHAUER ON COMPASSION AND THE WILL IN NATURE

Schopenhauer's ethics of compassion, which he developed in the 1810s, has influenced contemporary environmental ethics. His ethics rests on his metaphysics, which shares features with the German idealist systems but also presages the rise of naturalism in the later nineteenth century.

Following Kant, Schopenhauer claimed in *The World as Will and Representation* (1969 [1844], first edition 1819) that the world appears to consist of distinct items causally related in space and time because of the nature of human perception. To explain what the world is like really rather than what it apparently is, Schopenhauer first claims that I perceive my own body as one spatiotemporally located, causally related item among others. However, when I perform actions with my body, I am directly aware that those actions express my "acts of will." I therefore know that those acts of will are the reality underlying and manifesting itself in my body as it appears to me. Moreover, my conscious and deliberate acts of will emerge from my deeper unchosen and unconscious will to live: to stay alive and reproduce (sexually). Yet because there appear to be individual items only because of my mode of perception, my will cannot really be *my* will as distinct from the wills of others. In reality, there can be only one will that all things manifest. The will-to-life, then, occurs in all living creatures, not only all human beings.

Indeed, ultimately, because the will is undivided, it must pervade nonorganic nature too. Schopenhauer drew on strands of contemporary empirical science that supported this view that all natural processes (including gravitation, magnetism, and crystal formation) are pervaded by will. The result is a partly a priori, partly empirical theory of nature that is not unlike those of Schelling and Hegel; this is ironic because Schopenhauer reviled German idealism as pretentious nonsense. Unlike the German idealists, Schopenhauer denied that human individuals are free. His more naturalistic view was that human actions, like those of all living beings, ultimately are determined by the will-to-life. (The will itself, though, is free, because causality applies only to appearances.)

In ethics, Schopenhauer held that all human beings are more or less egoistic because they cannot help pursuing whatever they think will further their survival. The superior ethical attitude, though, is one of compassion for other human individuals and for animals. This attitude rests on the insight that all beings are driven by the same will-to-life as oneself and that these beings—if they are sentient, as humans and animals are—undergo suffering as a result because their endless willing leaves them forever unsatisfied. The ideally compassionate person will be as concerned about reducing the sufferings of other human beings, and to a lesser extent those of nonhuman animals, as about relieving his or her own suffering. The sufferings of nonhuman animals are of less concern because animals suffer less intensely than humans with their "enhanced clearness of consciousness" (Schopenhauer 1969 [1844], p. 372). Consequently, Schopenhauer thought, humans may kill or extract work from animals but may not treat them cruelly or vivisect them. Schopenhauer's metaphysically based ethics of compassion influenced Albert Schweitzer's reverence-for-life environmental ethic, which recommends "practising the same reverence toward all will-to-live [especially that of humans, animals, and plants], as toward [one's] own" (Schweitzer 1989 [1923], p. 33).

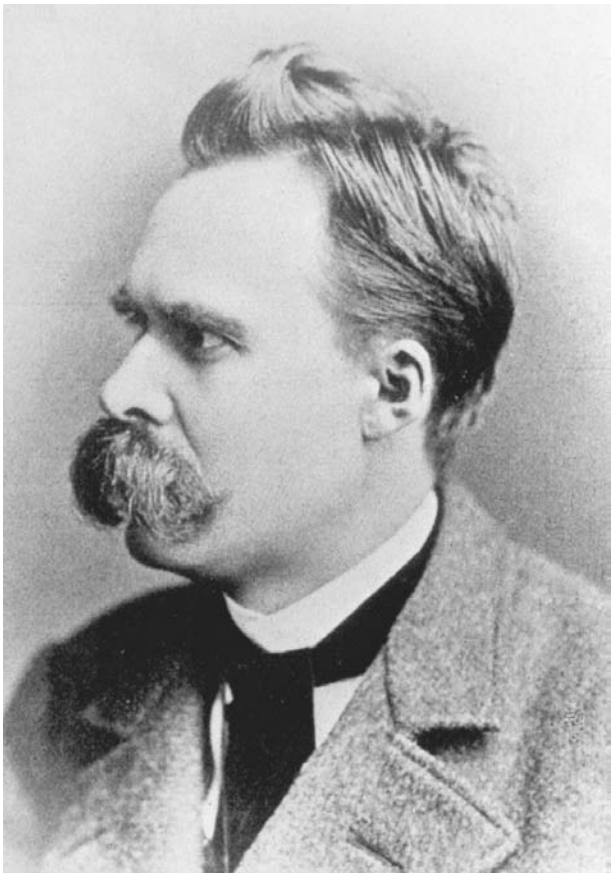
JOHN STUART MILL ON ANIMALS AND NATURE

The middle part of the nineteenth century saw the rise of a variety of naturalist philosophical approaches, including scientific materialism, which treated the natural universe as a vast godless mechanism and Comteian positivism, which considered science rather than metaphysics to be the paradigm for knowledge. The most important naturalist philosopher was John Stuart Mill. For Mill humans are part of nature, sentient creatures who desire pleasure and shun pain, and ethics must be based on these facts.

Mill developed Jeremy Bentham's utilitarianism. According to Bentham's well-known axiom, an action is right if it increases the overall amount of happiness or pleasure. Because nonhuman animals can suffer even if they cannot talk or reason, Bentham held that the pleasures and pains of animals should be factored in when one is calculating the utility of actions and laws. Mill defended Bentham's position on animals against William Whewell's objection that it meant—absurdly in Whewell's opinion—that human happiness sometimes has to be sacrificed for the greater pleasure of animals. Regarding Whewell's objection as little more than a selfish prejudice, Mill replied that an action or institution is wrong if it "causes more pain to animals than it gives pleasure to man" (Mill 1969 [1852], p. 187).

As Mill's opposition to cruelty to animals illustrates, he advocated reconstructing society and laws on a rational, utilitarian basis. He therefore argued in his essay "Nature" (1874) against conservative appeals for people to act "according to nature." For Mill those appeals merely sanctify the status quo, which appears "natural" because of its longevity. To refute those conservative views Mill distinguishes two main senses of the term *nature*. First, in contrast to the "supernatural," nature means "all the powers existing in either the outer or the inner world and everything which takes place by means of those powers" (Mill 1958 [1874], p. 6) or, in short, "all facts actual and possible" (Mill 1958 [1874], p. 5). Second, in contrast to the "artificial," nature means whatever exists or happens "without the voluntary and intentional agency of man" (Mill 1958 [1874], p. 6). In neither sense is nature a moral standard: Under the first sense people cannot not act according to nature, whereas under the second sense people cannot avoid acting unnaturally.

More dubiously, Mill also argued in "Nature" that people positively ought to act against nature (in the second sense)—that is, transform and improve it—because nature is wantonly destructive. He speaks as if nature deliberately acted wrongfully in inflicting hurricanes, diseases, and other ills on humanity. This contradicts both Mill's denial that nature exercises intentional agency and his advice that people should not personify nature. Nonetheless, Mill had valid utilitarian grounds for recommending that people should transform and improve nature. For Mill, this should be done to increase the happiness of humans and other sentient creatures, whereas natural things (nonhuman animals excepted) do not merit moral consideration because they are not sentient.



German Philosopher Friedrich Nietzsche. *Nietzsche (1844–1900) is known for employing a naturalistic philosophical outlook toward the environment. He advocated a "loyalty to the earth" attitude, and is always cited by animal ethicists for his claim that man is not inherently superior to any other animal.* **TIME LIFE PICTURES/MANSELL/TIME LIFE PICTURES/GETTY IMAGES.**

NIETZSCHE AND NATURALISM

The nineteenth-century philosopher most often discussed by contemporary environmental thinkers is Friedrich Nietzsche. His philosophical outlook is largely naturalistic. Nietzsche rejected the traditional Christian devaluation of the natural world in favor of the "beyond" and devaluation of human bodies and instincts in favor of the soul. Summing up this rejection, Nietzsche advocated "loyalty to the earth" in *Thus Spoke Zarathustra* (1883–1885). His this-worldly orientation has commended him to some environmental ethicists.

Nietzsche's this-worldly orientation includes an insistence that human beings are an animal species. Sometimes he suggests that humans are simply a highly evolved species of ape, but elsewhere he suggests that humans' highly developed mental and moral powers indicate that they have evolved beyond being apes. Generally, though, Nietzsche stresses that humans are neither different in kind from nor inherently superior to other animals. These claims—and Nietzsche's copious use of animal imagery—have made his work of interest to animal ethicists.

Despite claiming that humans evolved from apes, Nietzsche was critical of Charles Darwin's account of evolution by natural selection (Nietzsche's understanding of that account was not wholly correct). Nietzsche understood Darwinism to be the "reactive" view that organisms are formed by their interactions with their environment and by their struggle for survival. In contrast, Nietzsche favored the "active" view that the development of organisms is driven by vital, creative forces within them (their "will-to-power"), forces that seek to expand in power, not merely to survive.

Nietzsche and Animality It fell to Nietzsche to give a naturalist explanation for the features that appear to make human beings different in kind from (other) animals, especially humanity's level of moral conscience, culture and self-awareness. In *On the Genealogy of Morality* (1994 [1887]) Nietzsche explained those features by constructing a history of how conflicts between human groups, urbanization, and religion have inhibited human beings from discharging their aggressive, destructive instincts—which they share with beasts of prey—outward in violence toward others. Instead, humans have learned to turn their aggression inward onto themselves, partly by judging, reflecting upon, and cultivating themselves. Thus, for Nietzsche, civilization results from human beings having turned some of their aggressive energies against the rest of those energies. This process has left conformist instincts, which humans share with herd animals, free to become dominant within them.

Nietzsche did not want people to regain the uninhibited cruelty of beasts of prey. Instead, he thought that human beings should turn their acquired capacity for cruelty to themselves against their ingrained moralism and conscientiousness. This would transform (a select, sufficiently "strong" few) people from "camels," burdened with acquired self-cruelty and domesticity, into "lions," at war with their own moral habits, and finally into "children," liberated from morality to create new values playfully (Nietzsche 1961 [1883–1885], pp. 54–56).

As Nietzsche's parable of the camel-lion-child metamorphosis shows, he valued beasts of prey—eagles, serpents, lions—over domesticated and herd animals—lambs, cows, camels. Here Nietzsche seems to rely on traditional stereotypes that associate each animal species with a particular human quality: eagles with pride, serpents with wisdom, lions with courage. Perhaps, then, Nietzsche's real interest was not in nonhuman animals as such but in promoting pride, wisdom, and courage in humans and in rooting out humanity's ingrained meekness, conformity, and resignation.

Arguably, though, Nietzsche thought that animal species have evolved and adapted to acquire particular characteristics, so that when people display, for example, wisdom, they really are adopting a serpentine way of being. Even so, this means that Nietzsche's concern is to promote certain animal traits, such as serpentine wisdom, within human beings rather than to promote the flourishing of nonhuman animals. Indeed, he tended to condemn compassion for animals on the grounds that this attitude bespeaks a person too domesticated and enervated to endure any cruelty. He associated compassion for animals with Schopenhauer, who greatly influenced him but against whom he later reacted. Unlike Schopenhauer, Nietzsche thought that people must affirm and embrace rather than try to alleviate the suffering that life entails and thus must not flinch from their own cruelty

Nietzsche and Nature Nietzsche was largely but not entirely a naturalist. The account of the natural world as a system of interacting forces that he sketched in his posthumously published notebooks *The Will to Power* (1967 [1901]) has idealist aspects, reflecting the late-nineteenth-century trend toward combining naturalism and idealism. According to this account, which is influenced by Schopenhauer's idea of the will-to-life, all things are essentially "will-to-power"; that is, they consist of plural forces, each striving to dominate and harness the others. For instance, human beings are composed of various drives or instincts, including aggressive and conformist ones. Nietzsche maintained that each force interprets the world in relation to its goal and continually adapts and reinterprets its goal to harness other forces to it. He thus regarded forces as self-determining and as having some kind of intentionality.

It has been claimed that Nietzsche's idea of the world as will-to-power anticipates ecological ideas of nature as a living process or self-regulating system. Yet Nietzsche does not suggest that people should respect natural things as self-determining. Because for him everything is will-to-power, humans can do nothing other than pursue enhanced power for some of their instincts, and this often will require harnessing and dominating other natural things.

CONFLICTING IDEAS ABOUT NATURE

Some idealists, such as Schelling, argue that nature is autonomous and therefore should not be dominated. But because for idealists it is autonomy that confers value on natural things, idealists readily reassert the superior worth of human beings, whose autonomy is more apparent or highly developed. In contrast, more naturalistic philosophers such as Mill and Nietzsche place humanity back within nature, as an animal species, and thus tend to reject or at least qualify assertions of human superiority over other animals. However, these naturalistic philosophers also tend to think that human beings should not hesitate to transform nature in their own interests whether because nature lacks the sentience that is the criterion of moral standing (Mill) or because people should embrace the tyrannical pursuit of power that is essential to all things (Nietzsche).

SEE ALSO *Animal Ethics; Darwin, Charles; Environmental Philosophy: V. Contemporary Philosophy; Environmental Philosophy: III. Early Modern Philosophy; Life: Respect/Reverence; Romanticism; Ruskin, John; Schweitzer, Albert; Utilitarianism.*

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Alison Stone

V. CONTEMPORARY PHILOSOPHY

Environmental philosophy in its modern form developed in the late 1960s, the product of concerns arising from diverse quarters: naturalists, scientists and other academics, journalists, and politicians. A sense of crisis and doom pervaded the time, reflecting fears about the Cold War and the threat of nuclear annihilation; this malaise helped to spawn the protest music and countercultural protests of the 1960s. In 1962 Rachel Carson published the best-selling book *Silent Spring*, which documented the accumulation of dangerous pesticides and chemical toxins throughout planetary food webs. In 1968 the journal *Science* published "The Tragedy of the Commons" by Garrett Hardin, who argued that human self-interest and a growing population would inevitably combine to deplete resources and degrade the environment. In the same year another best-seller, Paul Ehrlich's *Population Bomb*, anticipated hundreds of millions of deaths in the coming decades because of the failure of food supply to keep pace with an ever-expanding global population. Ehrlich also claimed to foresee an imminent and dramatic decline in U.S. population and life expectancy, and some of these gloomy predictions were echoed in *The Limits to Growth: A Report for the Club of Rome's Project on the Predicament of Mankind* (Meadows et al. 1974).

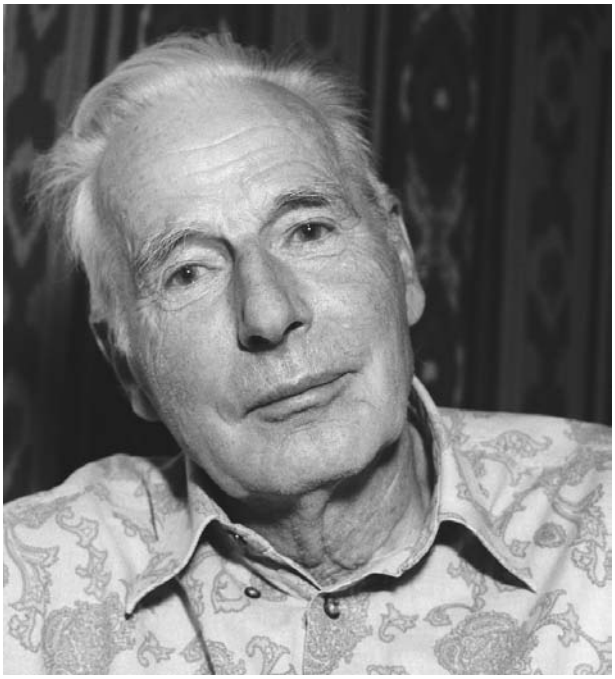
Fears about nuclear war, threats of pollution, and emerging awareness of social injustice coalesced first in popular and folk music and then found less poetic expression in academic work. In a seminal essay that appealed to increasingly disenchanted Marxist and left-leaning thinkers, Murray Bookchin remarked that ecology was a critical science with "explosive implications" because "in the final analysis, it is impossible to achieve a harmonization of man and nature without creating a human community that lives in a lasting balance with its natural environment" (Bookchin 1970 [1965]). When the historian Lynn White Jr. published an essay in 1967 claiming that Judeo-Christian thought was itself a major driver of environmental destruction, the scene was set for full-scale philosophical and ethical soul-searching. Inspired by the work of the American ecologist, forester, and environmentalist Aldo Leopold (1887–1948), thinkers in Australia and the United States produced new defenses of the key ideal of his land ethic: that "land is to be loved and respected is an extension of ethics" (Leopold 1949, Foreword, pp. viii-ix). Richard Routley (who later took the name Richard Sylvan) argued that a narrow focus on humans as the only morally valuable things on earth was a kind of unjustifiable discrimination—"human chauvinism" (Routley 1973, pp. 207ff). Routley proposed the following thought experiment: Consider a case where the last people on earth can choose to eliminate all other living

things after their own demise. If humans are the only morally valuable things on the planet, then the last people seemingly do no moral wrong by eliminating all these other forms of life. Yet, Routley pointed out, there is a strong intuition, shared by many people, that such a destructive final act would be morally abhorrent. One basis for such an intuition would be the presence of some kind of intrinsic or inherent value in nonhuman organisms (Routley 1973, Routley and Routley (1980).

A key ingredient in Leopold's land ethic was the notion that the community of life itself matters, not just its individual members; he wrote that "a thing is right when it tends to preserve the integrity, stability, and beauty of the biotic community. It is wrong when it tends otherwise" (Leopold, 1949, pp. 224–225). Holmes Rolston III explored the implications of this view by looking for ways in which to make sense of the idea that humans have duties not only to individual humans and animals but also to larger wholes—species and ecosystems, for example. Like Routley's last-person argument, Rolston's ideas were illustrated by imagined cases: for example, the butterfly collector who considers eliminating the last members of a rare *Papilio* species to enhance the value of his own specimens (Rolston 1975). This example is meant to prompt the following question: In addition to any duties humans might have to individual butterflies, do they also have duties to preserve the species and processes that sustain life on earth? On Rolston's natural theological view biological processes merit respect because they are intrinsically valuable, embodying the sacred nature of God (Rolston 1989, 1999).

DEEP ECOLOGY AND ANIMAL LIBERATION

The development of Deep Ecology by the Norwegian Arne Naess followed a rather different route (see Witoszek and Brennan 1999 for a historical survey). During a climbing expedition to Nepal, Naess found that Sherpa people would not venture onto sacred mountains. In the wake of this discovery, Naess and two of his Norwegian friends discussed formulating a new philosophy that would extend such reverence for mountains to all of nature, emphasizing the interconnectedness of each thing in larger webs of value. In place of the isolated or atomic individual, Naess postulates people and other things as constituted by their relationships with others—as knots in a larger web of life (Naess 1973). While such a relational conception of the self might be thought to resonate with animist, Confucian, or Buddhist traditions (Naess had no problem with such conflations), Naess himself claimed to draw his philosophical inspiration largely from the seventeenth-century Dutch philosopher Baruch Spinoza (1632–1677). Taking relationships seriously,



Arne Naess. *In 1973, Naess coined the term "deep ecology," intending to highlight the importance of norms and social change in environmental decisionmaking.* **PHOTO COURTESY OF SIJMEN HENDRIKS.**

Naess argues, means that humans should care for the extended, or ecological, self because each person is more than just his or her body. Extended self-concern obliges humans not only to connect with and care about the other people who have made them what they are but also to care for the multifarious systems and beings on which continued human existence depends.

In his early work Naess seemed to regard all living things as having equal value, at least in principle, but by the 1980s he was prepared to support only the weaker claim that the flourishing of all life, both human nonhuman, has value in its own right. In collaboration with George Sessions, Naess also formulated a Deep Ecology platform in 1984, listing the eight points on which deeply committed conservation philosophies could agree while leaving up to individuals how best to interpret such principles in specific cases (Witoszek and Brennan 1999). Whereas Routley and Rolston argued against the human-centered bias of conventional moral theory, Naess's early work in Deep Ecology cast doubt on the individualistic and decontextualized nature of much European and North American philosophical and moral theory.

Through the 1970s and 1980s these themes of atomism, human-centeredness, and the scope of what is intrinsically valuable set much of the agenda for further theorizing. With the introduction of the idea of "'animal liberation" in 1973 (Singer 2003), there was a swell of support for the idea that

the capacity to feel pleasures or pains might be a significant criterion of moral value, or at least of moral considerability. On this view, although things that are morally valuable ought to be protected, things that are "morally considerable" ought to figure directly in human thinking and planning but need not necessarily be protected. In the North American and European ethical tradition, moral considerability has been connected with notions of rationality, self-awareness, consciousness, and other typically human features. Environmental philosophy has explored new criteria of such considerability, including being alive (Goodpaster 1978); being a community or a holistic entity of a certain kind (Callicott 1980, 1987; Rolston 1994); being an entity or organism that has an end (or telos) in itself (Taylor 1981, 1986, Rolston 1994); being a subject of a life (Regan 1983); lacking intrinsic function (Brennan 1984); being a product of natural processes (Rolston 1989, Elliott 1982); or being naturally autonomous (Katz 1997). While no agreement on such a criterion emerged, it was clear that the notions of respect for nature, nature's value, nature's intrinsic worth, and the moral considerability of natural things were not only intelligible but also capable of being hotly debated in considerable depth.

Val Plumwood. *One of the most important feminists to emerge in environmental philosophy, much of Plumwood's work focused on analyzing, critiquing, and providing alternatives to dualisms that she believed lie at the heart of the domination of women, nature, and others.* © NEWSPIX.

A DEVELOPING FIELD

Alongside the growth in publications and research on environmental ethics, metaphysics, and the status of nature, new courses and units sprang up in universities across the world. Baird Callicott taught the first environmental philosophy course in the United States in 1971, at the University of Wisconsin, Stevens Point. A year later William Blackstone organized the first conference on environmental ethics which was held at the University of Georgia, and its proceedings contained many seminal papers (Blackstone 1974); the following year Bookchin's Institute for Social Ecology was established at Goddard College in Vermont. The 1970s saw a remarkable mushrooming of meetings, seminars, classes, and conferences in the English-speaking world. Alongside the new environmental ethics the field of environmental theology also started to develop, stimulated by discussion of whether Christian humanism was incompatible with radical environmentalism and whether the work of thinkers such as Teilhard de Chardin was environmentally relevant (Teilhard de Chardin 1959; Cobb 1972, 1990). The journal *Environmental Ethics* was launched in 1979 under the editorship of Eugene Hargrove. Although Hargrove also contributed to the literature of environmental philosophy, a major part of his influence in directing and consolidating the field has been his editorship of this journal since its inception.

By 1974 an early backlash had occurred in the form of the contention of the Austrialian philosopher John Passmore that the Judeo-Christian ethical tradition already contained resources enough to ensure protection and stewardship of nature (Passmore 1974). The issue of whether there really was need for a new ethic for the environment dominated much of the philosophical discussion for the next decade (Rodman 1977, 1983; Attfield 1983; Callicott 1986; Rolston 1986). Continuing into the 1980s, the debate expanded beyond questions of value and ethics and extended to metaethical issues (the meaning of moral terms and the objectivity of value), metaphysical issues (the nature of the cosmos and the place of humans within it), and wider questions about human consciousness, identification, and awareness. The appearance of a number of systematic single-author books and collections of essays (Bookchin 1980, Elliot and Gare 1983, van de Veer 1986, Attfield 1983, Rolston 1988, Brennan 1988, Callicott 1989, Hargrove 1989, Norton 1991) helped to solidify and clarify the main currents of thought in environmental philosophy.

It soon became possible to classify environmental philosophies in terms of various positions or movements: for example, wise use, Social Ecology, ecofeminist, the land ethic, reverence for life, Deep Ecology, bioregionalism, ethics of place, radical activism, wilderness ethics, and animist or panpsychist metaphysics.

Those who regarded themselves as "deep green" were not only the followers of Naess and Deep Ecology but also those who were "fundamentalist" rather than "realist" in their environmental politics. The terminology of "Fundis" and "Realos" was coined in the context of a long-running dispute in the German Green Party during the 1980s and 1990s, with the Fundis committed to veganism, animal rights, and decentralization, while the more pragmatic Realos cooperated with mainline political actors, such as governments, corporations, and existing community organizations (Dobson 1995). Bioregionalists, often inspired by anarchist and socialist models, maintained that small communities located in or around geographically defined zones (the shores of lakes or the areas served by watersheds) would be best able to build sustainable and efficient settlements; feminists sometimes suggested that human-centeredness was a variant of male-centered thinking. Few writers exemplified just one of these positions, and many key writers span several of them. For example, some feminists supported deep ecology and bioregional understandings (Plumwood 1993).

Although some writers argued for a holistic metaphysics and ethics (Fox 1995, 2007), others—Rolston, for example—proposed a hierarchical ethic attributing value not only to individual things but also to entire species and ecosystems. Callicott's defense of a Leopold-inspired land ethic became increasingly complex and nuanced as he tried to give weight to different scales and degrees of obligation to the various communities in which human beings live (Lo 2001).

By the early 1990s the field of environmental philosophy was well established, as evidenced in the appearance of new societies and journals. An initiative by Holmes Rolston III established the International Society for Environmental Ethics (ISEE), the first newsletter of which appeared in 1990; the International Association for Environmental Philosophy (IAEP) held its inaugural conference in 1998. An important and pioneering interdisciplinary journal, *Organization and Environment,* was launched in the United States in the late 1980s, deepening academic interest in the field; it was soon followed by *Environmental Politics* (1990) and another interdisciplinary journal, *Environmental Values*, which debuted in the United Kingdom in 1992. By then dozens of postgraduate and undergraduate courses in environmental philosophy had been established at several centers in the United Kingdom, the United States, Israel, and Australia, along with several interdisciplinary-studies programs with a philosophy or ethics component. Degree programs had begun to emerge, such as the Lancaster University (U.K.) M.A. in values and the environment, announced in 1990. The launch of the journal *Ethics and the Environment* in 1996 bore further testimony to the growth and liveliness of what had by then become a new subdiscipline of philosophy and a focus of interdisciplinary research. In the following year another new journal—*Worldviews: Environment, Culture, Religion*—broadened the range of publishing opportunities in the field. With a focus on continental and comparative philosophy, the IAEP launched its journal—*Environmental Philosophy*—in 2004.

Holmes Rolston III. *One of the key figures in contemporary environmental ethics, Rolston's 1975 article, "Is There an Ecological Ethic?" sparked interest in the subject within academic philosophy. A long-time professor at Colorado State University, Rolston used imagined cases to prompt individuals to consider their duties toward nature.* **PHOTO BY BILL COTTON. COURTESY OF HOLMES ROLSTON III.**

As feminists and political and literary theorists increasingly turned their attention to environmental issues, more debates and schisms arose from the 1980s onward. Indeed, the ways in which the environment and nature have been construed in philosophical, political, and literary texts has furnished the materials for a new area of literary theory: "ecocriticism" or "ecocritique" (Meeker 1972, Buell 1995, Glotfelty and Fromm 1996, Luke 1997, Morton 2007). Although the preservation of the wilderness was the focus of

many of the writings in the 1970s and 1980s, the following decades saw an increasing concern with issues such as restoration, urban environments, pollution, and resource depletion and their connections with poverty, dispossession, housing, environmental policy, social justice, economics, and sustainability (Wenz 1988, Sagoff 1990, Guha and Martinez-Allier 1997, Light 2001, Norton 2003, Shrader-Frechette 2005). In this way the burgeoning of environmental concerns helped philosophy to reconnect with and develop the concerns and speculations of scientists and other thinkers.

PHILOSOPHICAL CONTROVERSIES

Since the time of the eighteenth-century German philosopher Immanuel Kant (1724–1804), nature has been a preoccupation of aesthetic theory. With the intensification of environmental concern has come a renewed interest in the question of nature's aesthetic value. This issue has spawned debates among several schools of thought: those who think that natural science can reveal aesthetic qualities (Callicott 1994, Rolston 1995), those who believe that immersion or engagement rather than understanding is the key to aesthetic experience (Berleant 2005), and those who follow John Muir in finding positive value in that which is untouched by humans (Hargrove 1989, Carlson 1984).

By the turn of the twenty-first century, contemporary environmental philosophy had ramified into nearly all areas of philosophical, social, cultural and political theory. Meanwhile, the sciences continued to influence and be influenced by it, as shown, for example, in the fourth volume of the journal *Environmental Values,* which devoted an entire issue in 1995 to the emerging field of ecosystem health.

Discussions in environmental philosophy have imparted fresh impetus to the consideration of problems that are central to mainstream philosophy. One example is the debate over moral pluralism, pursued vigorously since the late 1980s in environmental ethics and now reemerging as a key issue in moral philosophy. One of the twentieth century's best-known moral theorists, W. D. Ross, outlined a pluralistic ethic in which various moral duties—such as keeping promises, self-improvement, and acting justly—are not reducible to any single duty or principle (Ross 1930). Ross's original argument for pluralism makes use of an intuition about "what we really think." Even if some systematic moral theory based on a single principle or duty (or a set of such duties) were to yield satisfying answers to moral problems, Ross argues that such a system would not match "what we really think" when we engage in moral reflection. According to him, "what we really think" is that we have many different—and irreducible—sources of moral obligation.

Ever since Ross put forward the case for moral pluralism, theorists have worried that such an account of moral duties leaves us with a disparate set of duties without any internal connection among them. As D. D. Raphael put it, pluralism "does not meet the needs of a philosophical theory, which should try to show connections and should tie things up in a coherent system" (Raphael 1981, p. 55). In response to defenses of pluralism in environmental ethics by Christopher Stone (Stone 1987), Gary Varner (Varner 1991), and Andrew Brennan (Brennan 1992), Baird Callicott has argued, like Raphael, that pluralist ethics fail to provide a consistent systematization of moral decision making and can even lead to relativism and nihilism (Callicott 1990, 1994c). For Callicott an environmental ethic should be monistic—committed to a single system of values. More precisely, it should provide clear principles for action, and, in case of conflict among these, it should also provide guidance on which principle has priority over the others. Hence he argues that when, as members of the multilayered communities to which we belong, we are faced with conflicts among different interests, we should give preference to the interests of those communities (and individuals) to whom we are closely related unless some stronger interest is at stake involving communities (and individuals) at a greater emotional distance. Callicott's own proposal has been critiqued as itself involving a kind of pluralism (Domsky 2001, Lo 2001). Nonetheless, the problem remains: If there are various kinds of values, duties, and moral principles, and if these cannot be reduced to a single foundation, how are coherence and unit possible in ethical reflections?

One solution to this problem has been proposed by those environmental pragmatists who claim that the recognition of diverse and incommensurable values does not commit thinkers to a kind of "metaphysical musical chairs" (Callicott 1990) but encourages instead a "metaphilosophical environmental pragmatism" (Light 1996a, 1996b) in which theorists with different underlying metaphysical and value commitments can still reach agreement on practical policies. This form of pragmatism is not dissimilar to the practical pluralism that is explicit in the Deep Ecology platform of Naess and Sessions (as pointed out in Light 2003). As Anthony Weston and Bryan Norton have pointed out, pragmatism as a philosophical stance gives priority to practice over theory and thereby avoids the advocacy of "top-down" solutions to practical problems (Weston 1985, 1992; Norton 1991, 2005).

The label "environmental pragmatism" does not identify a unified school of thought. Some environmental pragmatists align themselves with the tradition of philosophical pragmatism, especially the work of the American philosopher John Dewey (1859–1952) (see Taylor 1990, Minteer and Manning 1999); all or most think that such

pragmatism necessitates a kind of moral pluralism, although at least one theorist thinks that practical pluralism need not be tied to the tradition of philosophical pragmatism at all (Light 1996a). At the heart of many debates involving pluralism and pragmatism lies the issue of reductionism. Systematic philosophy shares with the natural sciences the goal of reducing complex phenomena to simpler ones and to explain complex situations, behaviors, and experiences in terms of a core set of relatively simple concepts or categories. Whether a reductive, systematic approach is appropriate in moral thinking remains a vexed issue, whether in environmental philosophy in particular or in moral theory in general. As Bernard Williams (1985) pointed out, in a new version of Ross's "what we really think" argument, moral reflection seems to carry with it a sense of a system or structure that underlies reasoning and moral sentiments. Yet people recognize, at the same time, that the values, principles, and duties that they consider in a given situation often fail to form a cohesive whole. In some difficult situations apparently incommensurable values seem to pull people in different directions, yielding no clear basis for preferring one over another. The addition of environmental values to earlier values that were concerned only with human beings and their relationships has led to a broadening of people's moral horizons. Whether such breadth makes theoretical reduction more or less likely is still a contested issue.

OTHER APPROACHES AND FUTURE DIRECTIONS

The various schools of philosophical thought arise from diverse methodologies. The analytic or Anglo-American tradition in philosophy emphasizes conceptual clarity, logical rigor, empirical soundness, and scientific validity of arguments. By contrast, continental philosophy (so named because it arises from the work of philosophers from the European continent, most prominently France and Germany) is more critical of claims of scientific rigor (which it sometimes criticizes as "scientism"), is more open to exploring the historical and cultural context of ideas, and is more inclined to explore larger philosophical themes such as the nature of being, existence, and consciousness. Others have been inspired by the assertion of the twentieth-century French philosopher Jacques Derrida, *Il n'y a pas de hors-texte* ("There is no outside-text"); these thinkers focus primarily on the text. Many thinkers embrace more than one of these different ways of writing philosophy, so these labels are not always mutually exclusive.

It was only in the 1970s that philosophers began to rediscover and mine ideas about nature found in Rousseau, Kant, Hegel, Hölderlin, Nietzsche, Benjamin, and Heidegger; thinkers who regard themselves as belonging to the continental tradition have been at the forefront of this development (Foltz 1995; Foltz and Frodeman 2004). Some have argued for the relevance of phenomenology to environmental consciousness and the understanding of the human condition (Evernden 1985, Seamon and Mugerauer 1985, Abram 1996, Toadvine and Brown 2002). A phenomenological approach takes the subject's own awareness and experiences as the starting point for philosophical, aesthetic, and moral reflection. In many ways these approaches recapitulate themes discussed in the analytic literature. For example, does the notion of *Dasein* in the work of the twentieth-century German philosopher Martin Heidegger (1889–1976) provide the basis for an approach to what is intrinsically or inherently valuable? For Heidegger, human beings never just exist, but rather find themselves somewhere: "*dasein*" literally means "being there." Both human awareness and existence are bound up with being in places and so, it may be argued, what is valuable emerges from the interconnection and interaction of humans in their environment. Some writers have suggested that Heidegger's approach can open the way to an account of intrinsic value in nature (Thomson 2004), and others have explored the idea that there is support for deep ecological insights in his thought (Zimmerman 1994).The recovery, reanimation, and novel application of the work of figures such as Husserl, Merleau-Ponty, and Heidegger might seem to bring a new depth and interest to work in environmental philosophy, but there are also critics of such an approach, which, because of its emphasis on the emotional and spiritual links between humans and nature, was once described as "eco-la-la" (Bookchin 1987). Yet Bookchin's own Social Ecology—a view that combines Kropotkin-style anarchism with an ethic of environmental stewardship—seems to share some common assumptions with the theories of Foucault and Derrida, who, like Bookchin, have warned of the hidden traps of liberal democracy and have deconstructed the notions of power and sovereignty in attempting to account for the difficulties of arresting environmentally destructive behavior. Despite Bookchin's qualms, writers whose works emphasize the spiritual and poetic continue to contribute their distinctive voices to the subject (Smith 2001, Casey 1993, 1997, Malpas 1999).

Environmental philosophies often borrow their overall orientation from the author's implicit philosophical, political, and religious identifications. Interpreters of Islamic traditions, for example, echo the ideas of some followers of Deep Ecology in arguing that environmental destruction is an aspect of a wider cultural and moral corruption associated with materialism and spiritual bankruptcy (Wersal 1995). Whether conservation is a politically conservative position and what scope there is for developing "green" forms of socialism and Marxism have been hotly

debated (Dobson 1995, Barry 1999). The green credentials of many religious and cultural traditions have been scrutinized (Callicott and Ames 1989, Callicott 1994b), and some thinkers have proposed that traditional medicine can provide some support for an ethics of place (Brennan 2002). There is a growing interest in comparative studies of environment, religion, and culture, a trend evidenced on two fronts: in the recent publication of a major reference work (Taylor 2005) containing numerous entries on diverse traditions and their environmental beliefs, and in a series of conferences and publications organized by the Forum on Religion and Ecology (2008). Animist and Daoist perspectives have been influential in works that argue that environmental management, development, and commerce should focus on synergy with what is already in place rather than on the demolition, replacement, and disruption that is characteristic of modernity (Mathews 2004, 2005; Harvey 2005).

The call of the wild was a major focus of the early days of environmental philosophy (see Jamieson 1984 for an exception to the trend), but increasing attention is being placed on the built environment (King 2000, Light and Wellman 2003, Fox 2007). Indeed, the questions of wilderness and its moral and aesthetic status were heavily debated in the 1990s and into the first decade of the twenty-first century (Callicott and Nelson 1998, Nelson and Callicott 2008).

The many parallels between natural and human-made things arise in discussions of fakes, restoration projects, and the value of originals (see Elliot 1997, Lo 1999). Original works of art are often sold for huge sums, reflecting their unique status. However, given modern conservation and copying techniques, it is not clear what it is about the original that makes it so valuable. Puzzles about the value of restored and copied paintings, furniture, and buildings run parallel to puzzles about restored and copied landscapes and ecosystems. As a result, restoration, preservation, and conservation have been a focus not only of conceptual puzzles but also of political disagreement, whether in the case of Angkor Wat or ancient forests (Dryzek 1997). To restore ruined temples at Angkor Wat, archaeologists rebuilt them stone by stone and laid new concrete foundations. Controversy abounds over the authenticity of such reconstructions. Likewise, forest restoration politics can become embroiled in disagreement about whether the original species composition has been recreated and to what extent nature restoration involves a "big lie" (Katz 2003, and compare Lo 1999, Light 2003b). Likewise, although poor people are often frugal with resources and extremely good environmental managers (Martinez-Allier 2004), political divisions have arisen between those who regard poverty itself as a driver of environmental destruction and those who see extreme preservationism as a misanthropic contributor to the further displacement and impoverishment of vulnerable communities (Rolston 1996, Brennan 1998, Guha 1999). Such issues pose major questions about environmental justice: The burdens of landfills, chemical plants, and toxic dumps and the loss of environmental amenities often fall disproportionately on the poor and members of certain racial or ethnic groups. (Shrader-Frechette 2005).

Contemporary environmental problems are not simple; they involve intertwined issues of public health and social justice, attitudes to nature, and deep disagreements about matters of science, policy, rights, and ethical obligations. These complexities apply to many areas of contemporary environmental debate: drought, changing weather patterns, the loss of habitat and species, the burden of caring for environmental refugees, the effects of consumerism, and the health problems associated with various forms of pollution (Jamieson 2001). These problems ramify into clusters of interconnected puzzles that are incapable of determinate solution within the scope of any single discipline or framework and may be described as "wicked problems" (Norton 2005, Brennan 2004). In turn, although many of these issues are based on matters of fact, the interpretation of those facts can be skewed by competing scientific, social, and political theories. The resolution of such conflicts and ambiguities demands increased interdisciplinary cooperation between philosophers, political theorists, legal experts and scientists. Such a cross-departmental approach would be consistent with the contemporary trend toward making philosophy more empirical and with Bookchin's suggestion that ecology is both an integrative and a reconstructive discipline. Persistent concerns about climate change, species loss, and environmental degradation are likely to lead to a further integration of the work of thinkers in many fields, scientific and philosophical. As long as scientific facts about the environment pose ethical and philosophical quandaries for philosophers, citizens, and government officials, it is likely that new interdisciplinary research agendas will emerge.

SEE ALSO *Biocentrism; Bookchin, Murray; Built Environment; Callicott, J. Baird; Deep Ecology; Green Politics in Germany; Leopold, Aldo; Norton, Bryan; Rolston III, Holmes; Singer, Peter.*

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Andrew Brennan

VI. POSTMODERN PHILOSOPHY

Postmodern environmental philosophy (PMEP) is the form of environmental philosophy that draws on postmodern theory (PMT) to challenge assumptions made by many environmentalists about the relation between humanity and nature and to redefine that relation. PMT makes use of the work of a number of thinkers, including Jacques Derrida (1985) and Michel Foucault (1991; Dreyfus and Rabinow 1983), who expanded on ideas developed by Friedrich Nietzsche (1995) and Martin Heidegger (1977), among others.

THE MAJOR CLAIMS OF PMT

PMT makes four major claims:

1. First, humans have no unmediated access to a pregiven, independently existing reality; instead, ''reality'' is a construction resulting from power-inflected truth claims made about various phenomena.
2. Second, there are no ultimate foundations, origins, ends, or essences to which appeal can be made to justify hierarchical ideologies or institutions.
3. Third, the self-grounding, autonomous, patriarchal, anthropocentric subject can be deconstructed—that is, shown to be without stable foundation. Dissolving subjects into the effects of socioeconomic structures and competing language games, PMT simultaneously undermines once-stable objects.
4. Fourth, the deconstruction of foundations undermines master narratives of progress, including those of liberal capitalism and Marxism. Each of these claims has been used by PMEP.

VIEWS OF NATURE IN PMEP

According to PMEP, both humanity and nature are *representations* or *constructions* generated by historically situated linguistic practices, conceptual categories, and sociopolitical interests (Evernden 1992, Cronon 1995, Soper 1995, Morton 2007). Strong versions of the social-construction hypothesis reduce nature to a human product in which everything is a self-reflexive representation generated by power-oriented human discourses and in which virtual reality has equal status with ordinary reality. Steve Vogel, a PMEP theorist and proponent of social construction, has provocatively called for abandoning the very concept of nature, defined as a human-independent reality (Vogel 1996, 2002). Vogel also argues, however, that humankind's capacity to alter the world does not grant a license for people to do whatever they please, but rather imposes a serious moral responsibility: to construct a world in which people would like to see their children live. Would people not want a world that includes habitats for wild and endangered species, as well as clean air, water, and land for all life? According to Vogel, being against nature as essence or foundation does not mean not being in favor of extinction and pollution.

Environmentalists sometimes appeal to science to defend a realist, extrarepresentational dimension of nature, even though elsewhere they accuse science of enabling the exploitation of nature. Many contemporary scientific ecologists, however, influenced by PMT, claim that they study not nature but representations of it, framed by various methods and concepts (Dodson 1997). Whereas scientists formerly represented biospheric nature as balanced, harmonious, and delicate, thereby providing grounds for environmental legislation to protect nature from modern industry, scientists now represent natural systems as both ordered and chaotic, as resilient rather than delicate; otherwise, such systems could not survive recurrent, violent perturbations, which are vital for long-term ecosystem health (Botkin 2002, Worster 1994). Natural perturbations, scientists add, are often less intensive and enduring than are modern anthropogenic disturbances.

Additionally, emerging scientific developments are beginning to challenge other assumptions of modern environmental philosophy. Nanotechnology and synthetic biology represent nature in terms of molecular structures that can be redesigned brick by brick, thus allowing the material construction of new life forms that will overcome the traditional distinction between the artificial and the natural, redefine life in terms of human preferences, and sever connections with the evolutionary lineages that some environmental philosophers maintain are the foundations for the intrinsic value of nonhuman life.

PMEP AND VALUES IN NATURE

The problem of nature's value is central to PMEP's critique of environmental philosophers who, influenced by the nineteenth-century romantic aesthetic of the sublime, ascribe intrinsic value only to wild nature and regard Native Americans as if they, too, were instances of wild nature. Such environmentalists depict virgin land as essentially different from, and far more intrinsically valuable than, land altered by human hands. Lamenting the end of wild or "virgin" nature, such environmentalists have also claimed that efforts to restore human-damaged land cannot make it natural again (McKibben 1989, Katz 1995, Elliot 1997). PMEP criticizes the apparent essentialism at work here, according to which nature influenced by humans is somehow less valuable. In a related manner some environmental philosophers have also claimed that nearly all of North American nature prior to the arrival of European colonists in 1492 was wild because Native Americans lived so lightly on it. In this reprise of the myth of the noble savage, PMEP argues, environmentalists represent Native Americans condescendingly as more akin to buffalo than to historical human agents. Evidence now indicates that Native Americans significantly and intentionally altered the land, though not nearly as much as they would have done had they possessed modern technology (Mann 2006).

According to PMEP, claims about the intrinsic value of either nature or humankind assume foundations where there are none. PEMP maintains that values are contested and constructed, not discovered (but see Rolston 1989). PMEP questions efforts to extend to plants, animals, and even ecosystems moral rights or legal standing as these concepts are understood by modern discourses. For PMEP such a view errs in assuming that there are stable human subjects and stable natural objects. Further, because neither humanity nor nature has or is a foundation, environmentalists cannot appeal to either of them to justify a particular principle. PMEP notes, in addition, that this extension of moral standing to nature is anthropocentric insofar as it identifies a trait in wild animals, plants, or ecosystems sufficiently similar to an intrinsically valuable human trait to justify according moral rights to those nonhumans. PMEP likewise criticizes biocentrism, the idea that life (not humankind) is important, because biocentrism purports to be another ultimate "foundation" for morality. PMEP attempts to conceive of morality without reference to any such ultimate foundations. Finally, according to PMEP, just as modern moral and political theory effaces differences among humans by defining people in terms of the traits of possessed by the typical educated, modern, white European male, so, too, does this extension of moral qualities to nature efface differences between humans and nonhumans.

Deconstructing this white male subject as well as its object—wild nature represented as stable, harmonious, and fragile—PMEP argues that environmentalists made anxious by the experienced deconstruction of their own (modern) subjectivity have projected their anxiety onto a wilderness that they seek to protect both from metaphysical deconstruction and physical damage. For such environmentalists the loss of wilderness is tantamount to death of the subject (Bluehdorn 2000). Ecofeminists and environmental-justice advocates criticize environmentalists who remain identified with the privileged, modern male subject because they overemphasize wilderness protection while overlooking how devastated natural environments afflict women, children, people of color, and the poor (Bullard 2005, Warren 2000, Shiva 2005).

CRITIQUES OF PMEP

Many environmental philosophers have taken issue with major features of PMEP, charging that it undermines the basis for environmental action (Sessions 2006). Viewing nature as a representation, they argue, leaves little room for an independent, extrahuman dimension of nature (Lease and Soulé 1995, Cronon 1996, Peterson 1999, Smith 1999, Kidner 2000, Crist 2004). Critics such as Albert Borgmann (1993) speak of *hypermodernism* when describing strong

constructionist versions of such representationalism. Robert Frodeman (2003) adds that hypermodernism's "anything goes" attitude unwisely abandons the search for ethical limits regarding the treatment of nature and humankind alike.

Some environmental philosophers who were initially attracted to PMEP have concluded that its methods deconstruct *all* truth claims, foundations, and narratives, including those cherished by environmentalists. They argue that deconstructing the subject leaves no basis for ethically grounded political agency, thereby giving free rein to corporations whose leaders retain a strong sense of agency and purpose. Having rejected hierarchy, moreover, PMEP advocates have no basis for claiming that the perspectives of environmental justice, ecofeminism, or third world advocates are somehow either truer or more innocent than other perspectives, whether proenvironmental or antienvironmental. Last, critics point out the problem of endorsing Foucault's idea that a power drive is at work in all organizations. Adhering to this idea means that PMEP advocates must view pronouncements made by Greenpeace as skeptically as they do those made by Conoco.

Despite such concerns about postmodernism, many environmental philosophers have agreed with its oftentotalizing critique of modernity, an outlook shaped in part by the noted German antimodernist philosophers Friedrich Nietzsche (1844–1900) and Martin Heidegger (1889–1976) (Foltz 1995, Parkes 2006). Other environmental philosophers, however, have warned that simply appropriating antimodernist attitudes for environmental purposes is dangerous because such appropriation encourages regressive, misanthropic, and dualistic fantasies of "returning to nature" and even eliminating humankind altogether to save nature (Zimmerman 1994, Acampora 1994, Murphy 2003). Bypassing this trend, *ecophenomenologists* have called on the work of thinkers such as Heidegger and the French philosopher Maurice Merleau-Ponty (1908–1961) (2003) to develop profound, postmodern, nondualistic insights about humanity's place in nature while abstaining from gratuitous criticism of modernity (Abram 1996, Brown and Toadvine 2003). (Phenomenology is a method of investigation that focuses on first-person experience of things. Consider the difference between an objective third-person approach to a thing and a first-person approach. A bridge-builder might represent a particular place as an object that blocks the way for a new span. In contrast, a person raised in that locale might regard the same place as a landmark with great personal and communal significance. Ecophenomenology emphasizes the importance of such first-person experience for understanding the felt "meaning" and value of place, features that cannot be ascertained by natural science or engineering.)

PMEP has contributed to environmental philosophy by deconstructing the purportedly arrogant, self-certain European–North American subject, along with its dubious truth claims, metaphysical foundations, and essences, which had justified modernity's grand narrative of dominating nature for human ends. Although recognizing the importance of such achievements, some PMEP advocates are reconsidering postmodernism's strong versions of social constructivism, its overly enthusiastic deconstruction of subjects and objects, its radical antihierarchalism and related conceptual-moral relativism, and its all-inclusive critique of modernity. Such critical reconsideration has opened the way for a post-PMEP, one version of which is called *integral ecology*. Integral ecology holds that many different perspectives must be included in order to adequately characterize the natural world on which human life depends; that entities have a measure of reality and even autonomy, having roles to play in complex systems; that some perspectives are superior to—because more comprehensive than—others; and that environmentalists must appreciate the productive as well as the destructive side of modernity (Wilber 2001).

SEE ALSO *Ecological Feminism; Ecology: VIII. Integral Ecology; Environmental Justice; Native Americans; Phenomenology.*

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Michael E. Zimmerman

ENVIRONMENTAL PLURALISM

Environmental pluralism provides a constructive framework for making decisions in a complicated and divisive world. As worldviews clash, sciences conflict, politics polarize, and institutions entrench, political decisions become dilemmas without obvious solutions. Yet decision must be made: Should we exterminate a species if doing so improves human health? Should we burn trees and bunnies to restore native species and natural fire regimes? Should dams release water for spawning salmon and forgo opportunities to generate clean hydropower and irrigate inexpensive food? Should we subsidize biofuel industries, which produce jobs, enhance national security, and help moderate the climate but convert vast habitats to corn and tree monocultures?

Decision makers facing these wicked choices operate within a segmented and fractured world created by disciplinary, institutional, locale, linguistic, and normative barriers that define communities of practice. Consider the different issues that would be championed when any one of the above mentioned dilemmas gets framed by just one of following perspectives: public health, animal rights, Christian stewardship, environmental justice. Each of these perspectives has an internally consistent, self-reinforcing logic and language to defend and explain observations and actions. Fortunately, despite their differences, these communities of practice often overlap in the preferred outcomes and rationales that they seek to advance. And in that overlap lays the hope of environmental pluralism.

MORAL ENVIRONMENTAL PLURALISM

Moral environmental pluralism accepts multiple competing, overlapping, self-consistent frameworks for differentiating right from wrong, good from bad. No one framework is always best; no one framework subsumes all the others in a hierarchy. Moral pluralism contrasts with moral monism, which is the as yet unfulfilled promise of a unifying ethical theory that can serve as the keystone species of morality, organizing all moral criteria into a hierarchical system from which logical and consistent decisions flow. Moral monism is the understandable search for a golden rule derived from some fundamental truth that reasonable people accept as a

Clear-Cutting of the Spotted Owl's Habitat, Oregon. *Clear-cutting is a method of logging in which all the trees are taken from a specific area, as opposed to a select cut, in which only certain trees are taken, leaving some habitat remaining. Clear-cutting is one practice that can be used to illustrate environmental pluralism. While different interest groups have different opinions on the practice, the decision making processes of environmental pluralism would take into account multiple opinions on clear-cutting, from the forester's social welfare view, to the conservation biologist's ecological values.* **PHOTO BY STEVE HILLEBRAND/U.S. FISH AND WILDLIFE SERVICE.**

tool to resolve difficult environmental problems and dilemmas. Critics of moral monism argue that a unifying system does not yet exist and probably cannot be created, so a theory and practice of moral pluralism is both prudent and necessary. Moral monism is problematic, critics further argue, because it risks excluding or marginalizing some voices, which has the effect of shrinking the political base and creating adversaries instead of allies.

Environmental pluralism, in contrast, contends that the world is infinitely complex, fluid, and negotiated—a circumstance that frustrates any attempt to impose a master narrative as an overarching organizing framework. Reasonable differences of opinion will exist among reasonable decision makers embedded in different communities of practice. Much of professional forestry, for example, has a utilitarian ethic that seeks to maximize social welfare, an economic language to express welfare trade-offs as benefits and costs, and a scientific ability to describe and predict such economic attributes of forests as tree volume, soil productivity, and threats to profit, such as pests and fire. Conservation biology, in contrast, has more of a Leopoldian ethic that respects the integrity of biotic communities, an ecological language to communicate desired conditions of the biotic community, and a scientific ability to describe and predict the content and processes of ecolgocial systems.

Consider the decision to clear-cut trees. Foresters might evaluate the sustained yield of timber, water, animals for hunting, grass for grazing, space for recreation, and other forest products affecting social welfare. Conservation biologists, in contrast, might evaluate the resilience of the forest system to such a disruption of process and removal of content, as well as the sacrifice of habitat made by flaura and fauna dependent on the removed trees and disturbed soil. Two very different understandings of clear-cutting emerge, even though both are internally consistent in the moral and scientific reasoning that they use to identify and defend their preferred outcomes.

Moral pluralism proposes that the diversity of values and principles relevant to moral judgment cannot be

reduced to a single dimension—be it utilitarian pleasure and pain, Kantian respect for rationality, intrinsic value possessed by all life forms, or economic benefits and costs. Longstanding and divisive debates over which monistic dimension trumps all others has distracted ethicists' attention from the moral insights needed to guide practical and pressing environmental decisions. Particularly debilitating is the longstanding debate over whether nature has value independently of humans or whether the value of nature depends entirely on human instrumentality and logic.

Moral environmental pluralism rests on a philosophy grounded in pragmatism and deduces moral principles not from theoretical principles but from negotiated solutions to real management problems. These deductions provide rules of thumb for resolving environmental dilemmas and a language for articulating solutions. Environmental pluralism assists environmental decision makers by helping to identify the values and trade-offs being negotiated. In contrast, moral monism offers solutions that *should* be followed because they are consistent with philosophical principles.

Perhaps the harshest critique of moral pluralism is that it reduces all ethics to rhetoric by promoting relativism. Right and wrong, good and bad, become matters of personal taste and disciplinary preferences. Moral pluralism, according to this critique, enables articulate, sophisticated scoundrels to manipulate deliberations, using whatever ethical principles prove persuasive. On this view, moral pluralism is a giant step backward toward an ethic of might makes right. Those with power—people with legal and technical expertise, political position, and lobbying opportunities—manipulate the system toward their own ends and cannot be held accountable to the higher ideals toward which civilization fitfully progresses. Environmental pluralism, critics further argue, reduces moral reasoning and responsibility to marketing and political populism, a matter of checking the latest opinion poll.

From the vantage point of the pragmatist, and of managers faced with making decisions, this critique of moral pluralism seems impractical. Decisions affecting the quality and future of our environment are made every day, many times a day: decisions concerning forest-road construction, sewage-water discharge rates, poultry-house locations, fertilizer applications, power-plant designs, genetically-modified-crop releases, critical-habitat restorations, mining and drilling operations, and so on. These decisions must be made quickly and with imperfect knowledge. Full knowledge of values and consequences is not possible.

The decision space facing environmental decision makers resembles mountain tops poking above clouds, each mountain representing the collection of facts, values, conceptual models, and methods that create different communities of practice. Competent decision makers can climb to the top of one or two mountains and confidently propose solutions to the narrow range of problems that occur only on those mountains. But the big, complex, and potentially disastrous problems created by 6 billion humans consuming ecosystem services and finite resources don't exist on those mountains; they lie in the thick fog of uncertainty and in the deep valleys of unknowns. Environmental pluralism functions in this terrain; it compares and contrasts alternative moral frameworks and communities of practice for their relevance to the situation at hand.

PROCEDURAL ENVIRONMENTAL PLURALISM

Environmental pluralism accepts that solutions to problems in an uncertain, pluralist world requires open negotiation by earnest and well-meaning people dedicated to navigating the unknowns and finding higher ground in our search for thriving and sustainable communities. Procedurally, environmental pluralism must facilitate collaboration by moving debate beyond the quest for moral certainty, which motivates no-holds-barred conflict, stalemate, litigation, expense, delay, and paralysis in the pursuit of absolute victory. Adversarial politics fueled by interest groups defending all-or-nothing frameworks leave little room for cooperation and can hide agendas, conceal information, guard power, manipulate procedures, and produce ineffective solutions that waste time, money, and talent. Environmental pluralism, in contrast, inspires collaboration as it searches for commonalities, higher ground, and win-win solutions. It requires negotiators to accept the legitimacy of alternative frameworks and look for outcomes that maximize the preferences of diverse stakeholders, who collectively have the ability and will to affect change.

A classic example of a pluralist strategy is replacing command-and-control regulations of pollution with market-based strategies that trade pollution credits. Such a strategy requires considerable collaboration, sharing of information, and respect for the positions advocated by competing communities of practice. For example, it requires human-health advocates accept certain risks from pollution as unavoidable, environmental-preservation advocates accept pollution as a normal part of business, and free-market industry advocates accept that polluting the commons is no longer free and requires payments, as well as sharing with government inspectors proprietary information about industrial processes.

Civic environmentalism and deliberative democracy are promising trends in efforts to reclaim civil society through decentralization and devolution of decision-making authority from the state to local governments,

nongovernmental organizations, and market institutions. This transition reflects the advance of transactive planning and adaptive management as alternatives to centralized and comprehensive rational planning. The goals of these alternative decision-making procedures are to create room and appreciation for civil discourse, to share the responsibility for the definition and solution of problems, to harness local knowledge and agency, to produce equitable outcomes that check abuses of power, and to constantly test our progress as we incrementally advance toward sustainability. The success of these efforts requires environmental pluralism to promote meaningful collaboration by vested stakeholders and to avoid paralysis and polarization.

CONCLUSION

The challenges we face are enormously complex. It seems essential that we collaborate to seek diverse solutions representing a plurality of values and engage in open and regular testing and correction of our progress towards our goals. Environmental pluralism seeks to build a broad political base, encourage experimentation, and strive for the higher ground, where many, but not all, of the preferred outcomes of multiple stakeholders are to be found. It strives to overcome the polarization and paralysis symptomatic of environmental decision making in the early twenty-first century.

SEE ALSO *Adaptive Management; Conservation Biology; Environmental Conflict Resolution; Environmental Philosophy: V. Contemporary Philosophy; Green Politics in Germany; Intrinsic and Instrumental Value; Nongovernmental Organizations; Pragmatism; Sustainability; Utilitarianism.*

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ENVIRONMENTAL POLICY

The domain of "environmental policy," as with any major area of public policy, is at once institutionally vast, conceptually intricate, and politically complex. Public policy has been defined as a "course of governmental action or inaction in response to social problems" (Kraft and Vig 2006, p. 4). It finds expression in the vision and agendas of political leaders, in statutes and regulations, and in the decisions and practices of bureaucracies and courts (Kraft and Vig 2006). The subset of *environmental policy* also includes the politics and priorities of scientific decision making relating to the environment, the programs of environmental advocacy groups (e.g., the Sierra Club), the work of research/policy analysis organizations such as Resources for the Future, and institutions representing business and development interests (often opposed to environmental regulation altogether), such as the American Enterprise Institute.

THE EVOLUTION OF ENVIRONMENTAL AWARENESS IN THE UNITED STATES

In the United States environmental policy has become so pervasive that it is easy to forget that most major environmental laws and regulations were passed only in the last third of the twentieth century (although more informal, uncodified environmental policies have a far longer history). It was in 1963 that Lynton K. Caldwell published his landmark essay, "Environment—A New Focus for Public Policy," in which he voiced concerns that public decision makers had to grapple with a growing litany of difficult environmental problems "without the help of a general body of environmental policy to which [they] may

turn for authoritative guidance" (Caldwell 1963, p. 134). Caldwell—the dean of U.S. environmental policy scholars—was especially concerned about the inadequacy of the traditional "segmental" approach to environmental problems: uncoordinated nonecological attempts to understand an ill-defined "public interest" in the environment through ad hoc interventions in transportation, land management, and other domains. He called for a more comprehensive political response that would view public policy problems in their environmental context.

Caldwell's wish was soon granted. The previous year had seen the publication of Rachel Carson's landmark book *Silent Spring* (1962), which alerted the world to the environmental and human health consequences of pesticides (especially DDT), thereby helping to launch the American environmental movement in the late 1960s and 1970s. This emerging environmental awareness was heightened by environmental disasters that occurred in the late 1960s, including the burning of the Cuyahoga River and the Santa Barbara oil spill.

The most significant federal measure during this era was the historic signing of the National Environmental Policy Act (NEPA) by President Richard Nixon on January 1, 1970. The statutory cornerstone of U.S. environmental policy, this law directed all federal agencies to consider the expected environmental impacts of their actions—a requirement that had to be implemented in part by the preparation of an environmental impact statement (EIS).

Coming on the heels of NEPA was the first Earth Day (April 22, 1970), which crystallized the emerging national environmental consciousness and ushered in a new era of activism in U.S. environmental politics. The Nixon administration ended this momentous environmental year by creating a new agency charged with overseeing the nation's environmental protective and regulatory efforts: the U.S. Environmental Protection Agency (EPA), created on December 2, 1970. The rest of the decade saw a steady rollout of major environmental-protection legislation, including the Clean Air Extension Act (1970) and Federal Water Pollution Control Act (also known as the Clean Water Act) 1972, the Endangered Species Act (1973), the Toxic Substances Control Act (1976), and more than a dozen other federal statutes that collectively manifested new and expanding public-policy goals for environmental protection and natural-resource conservation. Less than two decades after the publication of Caldwell's paper, an expansive federal environmental-policy complex was in place, answerable to a growing environmental constituency of citizen-activists, legislators, administrators, judges, scientists, economists, and, eventually, philosophers.

ENVIRONMENTAL ETHICS AND ENVIRONMENTAL POLICY

Caldwell's 1963 essay anticipated the need for strong environmental regulation for two key reasons: (1) The emerging insights of ecological science had created the need for consistent and clear guidance—and thus authority—for public decision makers in addressing environmental problems, and (2) there was a need to identify and accommodate divergent public values and ethical standards in environmental decision making (Caldwell 1963). He clearly envisioned an environmental policy regime founded not merely on science but also on social values—from broadly articulated policy goals to founding ethical principles.

Most environmental activism and policy throughout the world seeks to protect human interests, especially health, welfare, safety, property rights, aesthetics, and cultural/historical values. To this extent, most contemporary environmental policy is *anthropocentric*. This viewpoint was evident early on—for example, in Rachel Carson's assertion in *Silent Spring* (1962) of the human right to be free of harmful pollutants like DDT and in her powerful depiction of the systematic connections between human and environmental health. Although it is possible to interpret passages of Carson's work—and some of the ensuing environmental statutes and policies of the 1960s and 1970s—as aspiring to protect nature for its own sake, the dominant ethical discourse of environmental policy since the early 1960s has been one of "enlightened self-interest" (Cohen 2006, p. 15).

ENVIRONMENTAL PHILOSOPHERS AND THE POLICY PROCESS

Environmental philosophers seek to influence policy at three stages: (1) *agenda setting*, identifying environmental issues; (2) *evaluation*, assessing whether implementations conform to the original intent of policies; and (3) *policy change*, amending policy goals and means in light of new information and/or new value and political environments. In addition, many environmental philosophers also seek to provide a *normative justification* of public policies for environmental protection by offering alternative—usually nonanthropocentric—defenses for environmental policy goals, especially those that have traditionally been justified on anthropocentric grounds (Glasser 1999; Callicott 2009).

In their writing, teaching, and public speaking, environmental philosophers attempt to raise public awareness and formulate compelling arguments in favor of effective laws to protect the environment. These activities aim to influence agendas and policy/program evaluation. As participants in public discourse and debate, environmental philosophers act as policy advocates and, potentially,

as "policy entrepreneurs" (Kingdon 2003)—informal members of the environmental policy community who encourage fresh perceptions and novel policy initiatives. Mark Sagoff (1988, 2004) and Bryan Norton (2002, 2005) are prominent examples of environmental philosophers who have attempted to engage the policy process by providing a philosophical/normative counterpoint to the dominant economic methods of environmental policy analysis and evaluation. Specifically, Sagoff and Norton have advanced deliberative and communal theories of environmental value as an alternative to the individualist, preference-based forms of environmental valuation common within economic analysis.

Given the largely anthropocentric justification of much of environmental policy (considered as environmental regulatory policy—i.e., pollution control and prevention), most environmental philosophers have focused their attention on issues relating to *natural-resource* policy rather than *environmental* policy proper. The former, typically referred to as *distributive policy* (because it involves the distribution of public resources—e.g., access to public lands), concerns the protection, conservation, and recovery of environmental goods such as endangered species, wilderness, and forest and park resources. Because most environmental philosophers espouse a nonanthropocentric view of nature as possessing intrinsic, not just instrumental, value, their focus on issues like preservation of wilderness and the protection of threatened and endangered species is not surprising. Notable exceptions to this general trend, however, include work by Sagoff (1988, 2004) and Kristin Shrader-Frechette (1991, 2002). Sagoff and Shrader-Frechette have devoted considerable attention to the philosophical dimensions of environmental risk and regulation. These topics raise more traditionally anthropocentric questions pertaining to human health and safety, as well as issues of equity and procedural justice.

A DEBATE EMERGES

Environmental philosophers have always sought to influence policy deliberations. By defending nonanthropocentrism and the intrinsic value of nature, they hope to advance a persuasive moral justification for a robust environmental policy regime that is independent of instrumental (i.e., human-serving) values and thereby to provide a more solid foundation for initiatives that seek to protect endangered species, wetlands, and wilderness areas. Many environmental philosophers insist that only biocentric or ecocentric arguments can provide a truly principled basis for environmental policies (see, e.g., Westra 1997; Katz 1997; Callicott 2002).

The 1990s saw the rise of an "environmental pragmatism" that challenged this insistence on the supremacy of nonanthropocentric environmental ethics. Influenced by the work of classic American pragmatists such as Charles Sanders Peirce (1839–1914), William James (1842–1910), and John Dewey (1859–1952), this school sought to make environmental ethics more relevant to practical policy issues (Norton 1991, 2002, 2005; Light and Katz 1996; Minteer and Manning 1999). The new environmental pragmatists argue that a wide anthropocentrism—an expansion of the instrumentalist position on environmental value—is a more effective and more policy-relevant approach to environmental ethical theory than nonanthropocentrism (although see Minteer 2001 for an alternative pragmatic view). This argument typically rests on a claim about the inherent anthropocentrism of the public. Environmental pragmatists assert that citizens are more familiar with and supportive of environmental policy proposals justified in human terms than they are arguments promoting nature's intrinsic value. Bryan Norton (1991), a leading thinker in the pragmatist camp, has even suggested that the policy implications of nonanthropocentric and wide (pluralistic, long-sighted) anthropocentric philosophies are largely indistinguishable in practice—an argument known as the "convergence hypothesis."

OPPORTUNITIES AND NEW DIRECTIONS

Efforts to make environmental ethics more pertinent to environmental policy and decision making have gathered momentum through the first decade of the twenty-first century. This trend includes the work of philosophers outside the pragmatist tradition who share the concern that the field is not sufficiently engaged with concrete issues of public policy (Frodeman 2006). Scholars working in this vein have produced concrete normative analyses of actual environmental dilemmas, studies of the intersection of politics and environmental values in public decision making, and philosophical investigations into environmental science policy.

The increasing attention to policy goals by environmental philosophers is an important stage in the field's development into a more interdisciplinary and practically applicable method of inquiry. It reflects as well the growing concern that the field has not had a significant impact on environmental policy, law, and administration (Hargrove 2003, Minteer 2005, Stone 2005). By focusing more intently on the intersection of environmental values and policy outcomes, environmental philosophers can expand the boundaries of the discipline while also contributing to a more informed and nuanced analysis of public policies.

SEE ALSO *Adaptive Management; Convergence Hypothesis; Endangered Species Act; Environmental Philosophy: V. Contemporary Philosophy; Environmental Impact Statement; Environmental Law; Environmental*

Politics; Norton, Bryan; Pragmatism; Precautionary Principle.

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Ben A. Minteer

ENVIRONMENTAL POLITICS

Whereas environmental ethics focuses mainly on values and obligations as they bear on individual choices and actions, environmental politics focuses on processes of collective decision making, including processes leading to basic decisions concerning the arrangement of institutions and matters of law and policy within those institutions.

ETHICS AND POLITICS

Environmental ethicists have traditionally sought to give voice to values in and obligations toward natural entities and systems, often as part of an effort to foster an environmental worldview or ecological consciousness. A persistent question for environmental ethicists is whether and how the values and obligations they articulate can have a widespread impact on how people actually live in the world: Can this new consciousness or these new environmental values and obligations inform collective decisions on matters of law and policy? Can they lead to a transformation of political institutions themselves? If so, how?

Answers to these questions are widely seen as following one of two courses. Mainstream environmentalism seeks to work within existing political and economic institutions, reforming them in more environmentally benign directions and fostering policies to protect this or that environmental value. Many environmental philosophers, however, aim for a more radical transformation of institutions, often as an extension of their radical inquiry into the most basic of contemporary assumptions about matters of ontology and ethics. Arne Naess (1973) explicitly frames his "Deep Ecology" in these terms, eschewing the "shallow ecology" that seeks merely to reform existing institutions piecemeal.

On the radical side, one version of the connection between ethics and politics has it that a change in consciousness or in values leads to changes in behavior, which in turn naturally lead to changes in society and its institutions. This take on environmental politics can be traced back to Aldo Leopold, who wrote in *A Sand County*

Almanac (1949) that "governmental conservation" would always be inadequate: Genuine conservation must begin instead with a change in individual conscience (pp. 213–214). J. Baird Callicott, in his contribution to Marietta and Embree's *Environmental Philosophy and Environmental Activism* (1995) casts academic environmental ethics as nothing less than "the most radical and effective kind" of political activism (p. 19).

Nevertheless, it remains a matter of concern that environmental ethics seems to have little impact on the political arena, even at the level of informing policies and practices within existing institutions. In his occasional editorials in the journal *Environmental Ethics*, Eugene Hargrove (1998) has often lamented the apparent lack of any such impact, though in1998, he noted that the field was having some influence on advocacy groups already committed to conservation.

One response to this apparent ineffectiveness is to propose that environmental philosophy move in a more pragmatic direction. Rather than focusing primarily on academic questions of ontology and moral theory, environmental pragmatists hold that philosophers should use the tools at their disposal to participate in and improve the terms of current debate on matters of practice and policy. The goal of environmental philosophy would then be to foster better, more critical deliberation rather than to foster a particular ecological worldview. Bryan Norton has gone so far as to argue, in *Toward Unity Among Environmentalists* (1994) and subsequent works, that environmentalists with diverse worldviews and different ideas about values and obligations actually do converge on matters of policy. Note that environmental pragmatism can be radical rather than reformist to the extent that it holds that good deliberation may require different kinds of political institutions than those now in place.

Critics of the pragmatist approach object to its open embrace of ethical pluralism, which they see as giving too much ground to the forces of environmental destruction. Callicott (1990) in particular has long insisted on ethical monism, the view that the proper goal of environmental ethics is to articulate the single, correct guiding principle for public policy and to bring it into the political realm by convincing people of its rightness.

POLITICAL LEGITIMACY

A key theoretical question at the intersection of environmental ethics and politics concerns political legitimacy: Who is actually entitled to make decisions about environmental change?

One view holds that decisions ought to be left in the hands of experts and administrators who have the correct ends in view. According to John Dryzek (2005), an extreme form of this view surfaced in the 1970s, when the apparent severity of environmental problems and the pressure of population growth seemed both to justify and to require firm, even authoritarian leadership by an ecologically informed ruling elite as in the case of China's one-child policy. This view raised cries of alarm about "eco-fascism" (which might better be called eco-Stalinism), a charge that has more than once been leveled at some variants of environmental ethics. More prevalent and less radical is the view that most decisions about environmental protection should be carried out by administrative agencies within modern nation-states.

By contrast, pragmatist environmental ethicists seem more often to ally themselves with some form of democratic decision making, whereby the legitimacy of political institutions arises from the consent of the governed. The view that political legitimacy and political change alike come from the bottom up does seem to be much more in keeping with Leopold's suspicion of government-run conservation. Within that broad democratic tendency, however, there is still a great deal of disagreement, in part because there are different models of democracy.

The core idea of liberal democracy, first articulated by John Locke, is that individuals ought to be free to go their own way so long as they do not impinge on the freedom of others to do the same. Liberal political institutions may be described as morally thin, requiring no broad social consensus on substantive ethical matters aside from a basic set of individual rights and liberties. Although there is some disagreement among nation-states on the scope of individual rights and what it means to impinge on them, liberal forms of democracy now dominate the international scene.

Environmental philosophers have raised two main objections to liberal democracy. The first objection is rooted in the strategic concern that liberal political institutions foster divisive interest-group politics in which environmentalists must compete directly with other interest groups for attention and for power. The second objection is that liberal democratic institutions typically have been conjoined with a relatively unrestrained form of capitalism that, in its industrial and postindustrial guise, is often identified as one of the roots of environmental destruction.

Against liberalism, many environmental philosophers have come to advocate participatory or deliberative forms of democracy. Whereas liberalism assumes that people come to the marketplace and the voting booth with a fixed set of interests for which they seek political favor, deliberative democracy seeks to foster critical discourse that can in turn promote a process of social learning. In a deliberative democracy, an ecological turn

in consciousness and values might be more likely to work its way up to the level of policy.

A number of environmental philosophers go a step further, advocating a form of "green" or ecological democracy that is morally thicker than deliberative democracy. This means that some environmental values would be built into political institutions themselves, placing them beyond the reach of the critical deliberation that occurs within those institutions. In *The Green State* (2004), for example, Robyn Eckersley projects the possibility of political institutions in which all those who could be adversely affected by a decision would participate or be represented in the decision-making process—including individuals of other generations and other species.

SOVEREIGNTY

The question of political legitimacy is closely allied with the question of sovereignty. The modern nation-state is usually regarded as sovereign, answerable to no higher authority, but the territory over which it is sovereign is usually a product of historical accident. The result is frequently a scalar mismatch between environmental problems and the institutions that have the power to deal with them. This problem is especially acute in relation to global climate change, about which there is very little that any one sovereign nation can do on its own.

There are a range of options available for correcting this mismatch. Bioregionalism would reconfigure the boundaries of political authority onto the boundaries of natural biomes and watersheds. In the other direction, there is a push for political institutions at the global scale that would have the legitimate authority to address problems like climate change at the expense of the sovereignty of present-day nation states. Not everyone is so eager for such a shift in sovereignty: Eckersley (2004), for one, has argued that the modern nation-state can be both legitimate and effective in protecting environmental values.

PREFERENCES AND PRINCIPLES

Another way of seeing the difference between the dominant liberal approach and its alternatives is to look at the basis on which decisions are supposed to be made. Liberal democratic institutions are seen as aiming at an aggregation of interests, enacting policies that satisfy most of the people most of the time, taking people as they are. This model assumes that each individual is motivated primarily by material self-interest and that his or her interests are firmly fixed. Whether in the political forum or in the marketplace of postindustrial capitalism, this model views people mainly as consumers seeking to maximize their satisfaction by acquiring bundles of goods, including policy outcomes, the value of which is determined by how much people are willing to pay for them.

In matters of environmental policy, the assumptions of market liberalism have promoted a rise in cost-benefit analysis, which prizes those policies that bring the greatest overall benefit at the lowest cost, where costs and benefits are both given in monetary terms. The main practical challenge for cost-benefit analysis is in assigning monetary value to goods and services that are not now included in markets, such as clean air, an unobstructed view of a mountain, or a pristine wilderness.

Environmental philosophers have raised any number of objections to cost-benefit analysis, chiefly that placing a monetary value on natural entities and systems is the most crass form of anthropocentrism and that reducing all human motivation to the pursuit of material self-interest and all value to willingness-to-pay trivializes all of the core principles of human morality, including the dignity of human life.

One extension of these objections against cost-benefit analysis, stated most notably by Mark Sagoff (2004), holds that individuals ought to be regarded primarily as citizens rather than as consumers. As citizens, individuals have within them the possibility of acting on principles about what ought to the case rather than acting only on the preferences or desires they happen to have at the moment.

A number of environmental philosophers reject the aggregation of preferences, whereby the desires of consumers are stacked up on one side or another and policies are tailored to suit the tallest stack. Instead, the argument runs, the values held by citizens are not merely given as facts to be collected and arrayed but are instead chosen on the basis of reasons and so are open to critical reconsideration and revision. Political deliberation then takes the form of offering and considering reasons, reconsidering and revising values, and ultimately integrating values in polices that can protect multiple values and meet multiple obligations.

SEE ALSO *Callicott, J. Baird; Cost-Benefit Analysis; Environmental Activism; Environmental Justice; Environmental Policy; Hargrove, Eugene; Leopold, Aldo; Precautionary Principle.*

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ENVIRONMENTAL PSYCHOLOGY

Environmental psychology is the study of transactions between individuals and their physical settings. In these transactions individuals change the environment, which in turn changes human behavior and experiences. It has been a recognized academic discipline since the 1960s. The first conferences devoted to what was then called *architectural psychology* were held in 1961 and l966. The first Ph.D. program in environmental psychology was established in 1968. One marker of environmental psychology's youth is that the first Ph.D. in the field was earned in l975. In contrast, the first American Ph.D. in psychology was granted in 1861. By the late 1960s the first professional journals devoted to the field had been established; the most prominent of these are the *Journal of Environmental Psychology* and *Environment and Behavior*.

THE SCOPE OF ENVIRONMENTAL PSYCHOLOGY

Environmental psychology encompasses theory, research, and practice aimed at making buildings more humane and improving people's relationship with their surroundings, natural and built. Society invests enormous efforts in the construction and maintenance of key features of the physical environment such as cities, buildings, parks, and streets. Designing these features to maximize the well-being of both humans and nature is a major objective of environmental psychology.

Environmental psychology usually focuses on the behavior and experience of individuals and small groups, such as office workers, pedestrians, pupils, extraverts, shoppers, neighbors, hikers, dormitory residents, burglars, architects, and commuters. The discipline attends less often to large aggregates of people such as societies or governments or humankind. Most work in the field revolves around two related goals: understanding person-environment transactions and using this knowledge to address real-world issues. Some environmental psychologists feel more comfortable formulating theoretical principles, whereas others are more interested in practical applications. The situation is similar to that in medicine, where some physicians conduct laboratory research and others go into clinical practice.

RESEARCH AND PRACTICE

Both research and practice are important. Research sometimes confirms hunches or corrects misconceptions about person-environment transactions. The following are only a few examples of conclusions from research that run counter to conventional beliefs: Crowding is *not* strongly related to the number of other persons in a space; human territoriality is *not* primarily associated with aggression; paper cups are *not* environmentally superior to Styrofoam cups, and full-spectrum lighting is *not* necessarily better for people in that it does not, for example, improve productivity or health. Every person-environment transaction is governed by a multiplicity of influences. No single factor shapes human experience and behavior.

Other environmental psychologists prefer to apply knowledge. Instead of working in an academic setting, where most researchers work, they venture into private practice or work for governments. After appropriate training they operate as consultants or civil servants. The practicing environmental psychologist makes good use of research findings to develop policy proposals or to assist a client to improve, for example, the design of spaces such as offices, residences, streets, or parks. Some are mainly interested in improving the built environment, and others are dedicated to addressing concerns about the sustainability of global ecosystems.

Although environmental psychology investigates the same major processes as mainstream psychology (for example, human development, cognition, learning, social relations, and abnormal behavior), it does so in the everyday physical settings in which these activities typically occur. In the words of one of the field's pioneers, Roger Barker, "The awful truth dawned upon me that, although I was well informed about the behavior of children when confronted with tests and experiments devised by scientific investigators, I knew no more than a lay person about the situations and conditions the towns provided their children and how the children behaved" ("This Week's Citation Classic" 1980, p. 10).

THEORY

Theory is a diverse and evolving aspect of environmental psychology. Here is a list of seven of the most promising theoretical approaches:

1. The adaptation-level approach begins with the assumption that people become accustomed to a given level of environmental stimulation. The

common occurrence of too much or too little stimulation is the focus of theories of arousal, overload, stress, and restricted environmental input.

2. A second type of theory emphasizes the importance of an individual's real, perceived, or desired control over stimulation and gauging degrees of reactance, learned helplessness, and boundary regulation.
3. Ecological psychology asserts the importance of behavior settings—naturally occurring, small-scale social-physical units consisting of regular patterns of person-environment interaction.
4. The human-interdependence paradigm advances the idea that humans make decisions, consciously or not, to use or overuse natural resources, and that these decisions will have profound effects on the environment and ourselves.
5. Integral approaches such as interactionism, transactionalism, and organismic theory attempt to describe the full, complex interrelationship between persons and settings.
6. Operant approaches downplay abstract principles, instead adopting a direct problem-solving approach that employs behavior-modification techniques.
7. Environment-centered theories such as the spiritual-instrumental model, conservation psychology, and ecopsychology raise the issue of the environment's own welfare and its ability to support human well-being.

METHODOLOGY

Environmental psychologists assume that person-environment transactions are influenced by many different factors that have led to multiple paradigms for studying them. They use a wide variety of research methods, some standard in social science and others devised especially for environmental psychology. A method devised especially for environmental psychology, for example, is post-occupancy evaluation (POE). POE is an assessment of how a newly designed building or outdoor space is working for those who use it (Zeisel 2006). The strong preference for performing research in the everyday world means that field studies are common. Sometimes laboratories and simulated settings are necessary, but they are used primarily when a field study is not possible. Researchers in environmental psychology often undertake experiments that seek to isolate causes and effects. Field experiments, although rarely feasible, are the best route to external validity, which is the generalizability (or applicability) of the findings from one study to a different place, population, or set of conditions. Field experiments often seem to have greater external validity because they are conducted in the same or similar conditions that exist in the place or setting to which one wishes to apply a study's findings. Quasi-experimental research designs that use elements of both experiment and field studies are much more common.

Environmental psychology employs three levels of analysis. At the most basic level are studies of fundamental psychological processes like perception, concern, cognition, and personality as they filter and structure our experiences of the physical environment. Next comes the management of social space: interpersonal distancing (or personal space), territoriality, crowding, and privacy. Third, environmental psychologists concentrate on the ways in which physical settings inform of complex modes of everyday behavior such as working, learning, living in a residence and community, and interacting with nature. The most important insights that arise from these kinds of analysis are better designs of the built environment and improvements in the sustainability of the human management of natural resources.

The face of environmental psychology varies with national and regional concerns, but it retains a fundamental commitment to understanding and improving relations between humans and their environments. Environmental psychology is at the forefront of a movement to make psychology more relevant to everyday life, but it is still challenged to find more ways of transforming knowledge into practice, devising methods that are better able to accomplish its goals, reaching a wider consensus about its nature and mission, and developing more comprehensive theories.

SEE ALSO *Built Environment; Space/Place; Sustainable Architecture and Engineering; Sustainable Development.*

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ENVIRONMENTAL RACISM

SEE *Environmental Justice.*

ENVIRONMENTAL SOCIOLOGY

Environmental sociology emerged as a field of study in the 1970s in response to widespread societal awareness of environmental problems and the resulting social mobilization on behalf of environmental protection. Early sociological analyses focused on the rise of environmental degradation as a social problem, including the origins, composition, and activities of the environmental movement; the levels and social bases of public support for environmental protection; and the dynamics of governmental policy making. These efforts involved applying traditional sociological perspectives (e.g., social movements theory) to environmental issues and constituted a ''sociology of environmental issues.''

DEVELOPMENT OF THE FIELD

The energy crisis of 1973–1974 reinforced escalating claims of ''limits to growth'' and stimulated a new dimension in sociological work on environmental topics. The increased salience of resource-based limits to growth, along with rapidly mounting evidence of the seriousness of environmental pollution, led some sociologists to examine the relationships between modern industrial societies and their physical environments. Concern with how modern societies were affecting their environments and with how these societies could in turn be affected by changing environmental conditions (from polluted communities to resource shortages) stimulated analyses of societal-environmental relations and heightened recognition of the need for a true ''environmental sociology.'' Sociological examinations of societal-environmental relations, however, involved a major deviation from disciplinary norms.

Sociology became a distinct discipline about a century ago and subsequently evolved during an era of resource abundance, technological progress, and economic growth. As a result, sociology became grounded in a cultural worldview that assumed that scientific and technological developments had freed industrial societies from ecological limits and that environmental factors were no longer relevant for understanding social change. This assumption was reinforced by negative reactions to earlier excesses of ''environmental determinism,'' such as geographers' efforts to explain cultural differences via climatic variation. Consequently, mainstream sociology came to ignore the physical environment. For sociologists ''the environment'' typically signified the *social context* of the phenomenon being studied.

Sociological interest in the societal impacts of energy shortages and the long-term implications of limits-to-growth thus represented a significant disciplinary development. Work on these topics was quickly supplemented by research on the social impacts of toxic contamination and other forms of pollution, as well as examinations of the societal factors that contribute to environmental degradation and excessive resource use. By the 1980s increasing numbers of sociologists were analyzing the societal causes and effects of environmental problems, and environmental sociology was well established as a distinct area of specialization despite its departure from disciplinary norms.

Because inequality is a core sociological concern, it is not surprising that environmental sociologists emphasize the equity dimensions of environmental problems: the unequal contributions of different sectors of society to environmental degradation and the inequitable impacts of such degradation on different social strata. Evidence that lower socioeconomic strata and minority groups often experience disproportionate exposure to environmental contamination has led to environmental justice becoming a major focus of environmental sociology, encompassing analyses of the ''EJ Movement'' that has arisen in response to these inequities. Increasing attention is being given to the international dimension of environmental inequality, with numerous studies examining the unequal contributions of rich and poor nations to global environmental degradation and the inequitable burden the resulting impacts are likely to have on poor nations.

EVOLUTION OF EARLY EMPHASES

Although empirical research on societal-environmental relations has increased dramatically, often in the form of highly quantitative studies, analyses of the factors influencing societal awareness of environmental problems and actions designed to ameliorate them remain popular among environmental sociologists. Continuing work on public opinion, mobilization of environmental activism, and policy making has been supplemented by studies of the use of scientific information by environmental advocates in framing their claims for media and public consumption. Studies investigating the bases of support, ideologies, and tactics of *antienvironmental* interests are also becoming more common.

Analyses of the social construction of environmental problems were revitalized by the popularity of postmodern approaches in sociology in the 1990s. Efforts to ''deconstruct'' climate change and other problems stimulated a

vigorous debate between proponents of established realist and newer constructivist approaches. Realists argued that deconstructing the concept of nature, an obvious human construction, fails to challenge the reality of human-induced changes in ecosystems that cause problems for human societies. Constructivists responded that they were not denying the "reality" of environmental problems in their efforts to problematize environmental claims and knowledge, whereas realists acknowledged the role of social processes in transforming environmental conditions into "problems." Consequently, the debate has subsided.

There is continuing examination of the processes by which various conditions are constructed as problematic, including analyses of the claims and tactics used by both promoters and deniers of problems such as global climate change. Besides analyzing the competing discourses of the two camps and their relative success in gaining media and public attention, environmental sociologists continue to rely on traditional approaches such as surveys of the public and relevant interest groups in order to understand societal attention to environmental issues. Using both original and secondary survey data, sociologists have tracked trends in public concern about environmental problems and the distribution of such concern across various sectors of society. Along with other behavioral scientists, sociologists have contributed to the conceptualization and measurement of "environmental concern," as well as to theoretical models designed to predict pro-environmental behaviors (including environmental activism) based on a combination of social-structural and social-psychological variables.

While attempts to measure endorsement of an environmental ethic by means of survey research are rare, recent efforts to identify the value bases of environmental concern have examined the relative impact of biospheric, altruistic, and egoistic values. Since there is a loose correspondence between biospheric values and an environmental ethic, this work sheds light on the degree to which such an ethic is emerging among various sectors of society and seeks to understand its impact on relevant attitudes and behaviors.

In contrast to the 1970s, currently there is widespread recognition that environmental problems are "people problems": They are caused by human behavior, are deemed problematic primarily because of their potential harm for humans (and other species), and collective human action is required for solving them. Environmental sociology has made major progress in understanding these crucial issues, and this knowledge is relevant for other disciplines and policy-makers interested in environmental issues.

SEE ALSO *Energy; Environmental Activism; Environmental Justice; Limits to Growth; Social Constructivism.*

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ETHICAL EXTENSIONISM

Ethical extensionism is an approach to environmental and animal ethics in which the scope of ethical theories is extended to cover beings traditionally thought to fall outside the purview of those theories. As traditionally understood, the dominant moral theories in Western philosophy restrict the class of morally considerable beings to currently existing human beings. Extensionists contend that this restriction is arbitrary and antithetical to those theories. They insist that a proper understanding of these ethical theories requires expanding the sphere of morally considerable beings to include beings other than currently existing humans.

Anthropocentric extensionists expand the sphere of moral concern to include future humans. Nonanthropocentric extensionists maintain that the domain of morally considerable beings must be expanded further to include various nonhuman beings. For example, animal liberationists expand the domain to include conscious sentient animals. Biocentrists extend the sphere of moral concern to include all living organisms.

Proponents of ethical extensions insist that expanding the domain of morally considerable beings in these ways is not an ad hoc amendment aimed at addressing a particular moral issue but is rooted in a principled and rigorously consistent application of classical moral theories. Utilitarian and deontological extensions illustrate this point.

UTILITARIAN EXTENSIONISM

Hedonistic utilitarians maintain that pleasure is the only thing intrinsically good and pain is the only thing intrinsically bad and seek to maximize intrinsic goodness and minimize intrinsic badness. Accordingly, they hold that an action A is right for an agent if and only if, out of all the actions available to that agent, action A maximizes pleasure and minimizes pain for all affected. Despite the fact that the founder of utilitarianism, Jeremy Bentham, explicitly argued that animal suffering should be included in the utilitarian calculus, in practice utilitarians traditionally have factored only human pleasures and pains into their calculations.

Peter Singer (1975) contended that restricting the domain of morally considerable beings to human beings is arbitrary and antithetical to the spirit of utilitarianism. He argued that any being capable of suffering has an interest in avoiding suffering and that any being with interests deserves to have those interests taken into account equally with all other similar interests. Because many of the animals people eat and perform biomedical experiments on are capable of feeling pain, there is no legitimate reason not to take those animals' interest in avoiding pain into consideration when carrying out utilitarian calculations. Because pain is pain no matter what being experiences it, Singer argued, there can be no moral justification for not taking animal pain into account. Singer's conclusion is that utilitarianism, consistently applied, requires people to take into account the interests of all sentient beings and to give equal interests equal weight in utilitarian calculations.

DEONTOLOGICAL EXTENSIONISM

Tom Regan's (1983) case for animal rights can be viewed as an extension of Immanuel Kant's deontological ethic. The "respect-for-persons" formulation of Kant's categorical imperative commands people to treat persons "always as an end and never as a means only" (Kant 1959 [1785], p. 47). In Kant's view persons are subjects deserving of respect, not mere objects to be used and discarded. When an agent treats a person as a mere means, that agent acts wrongly, for he or she treats an intrinsically valuable subject as a mere object. Kant equated *persons* with rational beings but incongruously held that all and only human beings are persons. The problem with Kant's account of personhood—if rationality is understood as an empirically testable capacity to solve practical problems in a rudimentary logical way—is threefold: (1) Not all human beings are rational; (2) not all nonhuman animals lack rationality; and (3) there is no good reason to restrict personhood to rational beings.

Regan (1985) argued that Kant's account of personhood is too strong, at least if personhood is required for full moral considerability. As Regan (1983, 1985) sees it, the issue is less about personhood and more about which beings are owed full direct moral consideration. Nevertheless, he can be viewed as offering an alternative, more expansive account of personhood.

Regan recognizes that on a consistent reading of Kant's criterion (provided that Kant means by rationality some empirically verifiable mental capacity), some human beings (e.g., the severely retarded) would not be persons and thus would not deserve respect under the categorical imperative. Regan contended that rational or not, those human beings are persons deserving of respect. What makes them persons, according to Regan, is the fact that they are experiencing subjects of a life (ESLs), that is, conscious creatures that have an individual welfare that is important to them regardless of their usefulness to others. Such beings are inherently valuable subjects (not mere objects) and deserve to be treated in ways that respect their value. A consistent application of the ESL criterion of personhood indicates that many of the animals people eat and experiment on are persons with inherent value and thus have a right to be treated in ways that respect their value. The upshot of Regan's argument is that the respect-for-persons imperative, properly understood, requires that people respect all ESLs, whether they are human or nonhuman, as inherently valuable ends and never treat them as mere means.

Albert Schweitzer took the Kantian respect-for-persons ethic and expanded it into a reverence-for-life ethic. Harkening back to the post-Kantian metaphysics of Arthur Schopenhauer (1966 [1819]), Schweitzer (1923) reported that he had a profoundly moving experience watching four hippopotamuses and their young plod along that led him to see that all life possesses the same will-to-live that every person possesses. Once one notices that all life has the same will-to-live that one finds in oneself, one will see that morality requires that all life be respected, not just human life.

ANTHROPOCENTRIC AND NONANTHROPOCENTRIC EXTENSIONISM

Joel Feinberg (1974) argued that any being with a good of its own has interests and that any being with interests has rights. He used the second thesis, which he called the "interest principle," to defend both nonanthropocentric and anthropocentric extensions. In regard to the first extension, Feinberg noted that many higher animals "have appetites, conative urges, and rudimentary purposes, the integrated satisfaction of which constitutes their welfare or good" (1974, p. 50). Because these animals have a good of their own, they have interests and a correlative right against people to respect their interests. Feinberg's anthropocentric extension requires extending rights to future human beings. Feinberg observed that whoever these future human beings turn out to be, they will have certain interests, including an interest in a habitable environment, that people can affect

for better or worse right now. Because future human beings have an interest in a habitable environment, Feinberg concluded, they have a right against contemporary people to be left such an environment.

Kenneth Goodpaster (1978) pointed out an inconsistency in the way Feinberg applied his account of interests to defend a biocentric ethic. Feinberg restricted the class of interest possessors to human beings and higher animals, but this restriction is inconsistent with his stated account of interests, which holds that any being with a good of its own has interests. Feinberg argued that "mere things" have no unconscious drives, no latent tendencies, no directions of growth, and no natural fulfillments and that, therefore, mere things lack a good of their own. However, as Goodpaster observed, plants and all other living organisms have unconscious drives, latent tendencies, directions of growth, and natural fulfillments. Thus, they are not mere things. In addition, all living organisms are such that some conditions are good for them and other conditions are bad for them. Hence, they appear to have a good of their own. Consequently, a consistent application of Feinberg's account of interests entails that all living organisms have interests. Goodpaster concluded that because all living organisms have interests, all living organisms deserve moral consideration. He was, however, careful to point out that the fact that all living organisms are morally considerable does not imply that all living organisms have comparable moral significance.

Synthesizing Singer's egalitarianism with Schweitzer's reverence for life and the Feinberg/Goodpaster account of moral considerability, Paul Taylor (1986) developed and defended an egalitarian biocentric ethic. Taylor contended that by adopting the ultimate moral attitude of respect for nature, people naturally will be inclined to behave properly and responsibly toward the natural world. He maintained that all living things are "teleological centers of life" and as such have a good of their own and went on to argue that every being with a good of its own possesses equal inherent worth and deserves equal moral consideration. Thus, Taylor concluded, every living organism deserves equal moral consideration. It might be objected that in extending equal moral consideration to every living organism, Taylor has taken biocentric extensionism to an absurd extreme, but he tries to mitigate this objection by formulating a complex system of rules for adjudicating and resolving the conflicts that inevitably will arise between these equally considerable organisms.

CRITICISMS

Critics of ethical extensionism contend that piecemeal extensions of the dominant individualistic approaches to ethics cannot give rise to an adequate environmental ethic because individualistic ethics, which privilege individuals over ecological wholes, fail to address people's actual environmental concerns. Many environmentalists are not concerned about the welfare or well-being of individual shrubs, bugs, and grubs; rather, they are concerned about species preservation, ecological integrity, and air and water pollution. These critics of ethical extensionism contend that an emphasis on individual welfare and individual rights is one source of many current ecological and environmental crises. Thus, they recommend the wholesale rejection of all the dominant individualistic ethics, even in their more inclusive extensionist versions, in favor of more radical holistic ethics such as Aldo Leopold's land ethic and Arne Naess's Deep Ecological approach.

SEE ALSO *Animal Ethics; Biocentrism; Regan, Tom; Schweitzer, Albert; Singer, Peter; Taylor, Paul; Utilitarianism.*

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ETHICS OF CARE

Proponents of an ethic of care consider relationships central to moral life. The disposition to care for particular others and the practice of caring for others are

sources and priorities of morality. Relations give rise to obligations; a caring ethical behavior is one that maintains connection and fosters the well-being of someone to whom a moral agent stands in relationship. Some authors who write about care ethics have limited the moral arena of caring relationships to humans. In environmental ethics attention to human relationality and desire to care has been expanded to include dependent animals (Curtin 1996) and the natural world (Warren 2000), ''in which all such relationships are ultimately nested'' (Mann 2006, p. 356).

EARLY WORKS AND CONNECTION WITH FEMINISM

The two most influential early theorists of care at the turn of the twenty-first century were the psychologist Carol Gilligan (1982) and the philosopher Nel Noddings (1984), both of whom observed that insofar as women are more often caregivers, they are more likely to prioritize care-based considerations than are men. Because women's experiences with care often reflect aspects of traditionally feminine roles, feminist philosophy has been especially attentive to the ethics of care, sometimes supportively and sometimes critically. Ecofeminism, which views the oppression of women and the domination of nature as interrelated, tends to incorporate care-based elements either explicitly or indirectly.

Those elements were articulated in 1982 by Gilligan in *In a Different Voice*. Gilligan did not endorse an ethic of care. Rather, she described a noticeable difference between two patterns of reasoning about moral problems. A ''justice perspective'' reflects traditional Kohlbergian conceptions of human moral development, proceeding through stages beginning with self-interest, through deference to authority, and culminating in universal ethical principles. A ''care perspective'' focuses on context, relationships, and emotional information.

Instead of taking a rule or principle as primarily important and applying it to a situation, a person informed by the care perspective takes the situation and its relationships as primarily important and recommends actions that are based on what the relations require. In Gilligan's study, almost all the males adopted the justice perspective and about half the females were as likely to adopt the care perspective. Gilligan did not rank care over justice but suggested that both voices are complementary and necessary. Her data and methods immediately became the subject of much debate. However, her arguments for seeing care as an alternative moral framework lent themselves to emerging ethical theories of care.

In *Caring: A Feminine Approach to Ethics & Moral Education* (1984) Noddings similarly focused on women's experiences with and interests in caring. She added an argument for the superior value of a care ethic on the grounds that traditional Western philosophical concepts, especially universal prescriptions, rationality as opposed to emotionality, and adversarial rights-based individualism, serve to harm individuals by preventing the very emotional and interpersonal sympathetic connections which promote caring for the well-being of others.

In place of those concepts Noddings developed the key concepts of relationality, affective response, and reciprocity. Relationality denotes the inevitability of the human encounter and relationships, especially unequal relationships, as constitutive of one's identity. Affective response refers to the central capacity to respond emotionally to others; in an ethic of care emotions are valuable sources of information rather than obstacles to rationality, as some Western philosophies have portrayed them. Reciprocity is the most controversial of these concepts, intended to refer to recognizable reception of care rather than to contractual notions of equal repayment. In Noddings's account, for example, even newborn babies reciprocate; she describes the thriving of the cared for as a variety of reciprocity.

Relationality is not limited to human encounters. As early as the 1970s and 1980s environmental ethicists debated varieties of holism, a conception of value that was attached to systems and to relationships within systems as opposed to a tradition of seeing only individuals as having inherent worth. Ecofeminists similarly have argued that relationships are ubiquitous. Some ethicists who argued for holism and ecofeminism therefore extended key concepts of care ethics. Because the care ethic insists on attending to relations between unequals as an integral part of moral life, environmental care ethicists do not have to debate whether humans and nonhumans are equal, as justice-oriented environmentalists often do. Any responsive system or individual being with whom one stands in relation is a candidate for caring.

CRITIQUES AND DEBATES

Most critical debates question the wisdom of valuing feminine care as liberatory or as a solution to the problems of a male-dominated world. The presence of the word *feminine* in the subtitle of Noddings's book has moved some feminist ethicists to suggest that when feminine caring is conducted in a patriarchal context, it leads people to losing themselves in their relationships to others, even to the point of exploitation of the caregiver.

Carolyn Merchant wrote about a related concern: ''An ethic of care, as elaborated by some feminists, falls prey to an essentialist critique that women's nature is to nurture'' (Merchant 1996, p. 8). Merchant offered a fairly comprehensive survey of environmental ethics and incorporated care elements into a ''partnership ethic of earthcare,'' taking pains to assert that women do not possess a special ability to care (Merchant 1996, p. 212).

Environmental ethicists who argue for care also debate the value of reciprocity as a component of caring relationships. Deane Curtin (1996) explicitly rejected the necessity of reciprocity to caring, holding instead that ecological care requires a sensitive and emotional capacity to care for the natural world. Other environmental care ethicists prefer to broaden the definition of reciprocity or offer an alternative, as Bonnie Mann did by prioritizing interdependence, suggesting that "our dependency on the earth" is "the source of the moral call to care" (Mann 2006, p. 143).

Despite these debates regarding how to extend care to the environment, many ethicists and ecofeminists agree that a framework of care offers a preferable method of moral reasoning about the environment. The traditional justice-oriented perspective is used to establish the worth of individuals in nature by identifying some universally shared characteristic that endows rights, often with an eye to debating who wins in rights conflicts. Ethics of care identifies the ways in which natural beings are not isolated but interrelated and not necessarily adversarial, instead possessing natural desires to assure the well-being of others.

SEE ALSO *Ecological Feminism; Environmental Justice; Holism; Queer Theory.*

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Kathryn J. Norlock

EUROPE

This entry contains the following:

I. MEDITERRANEAN

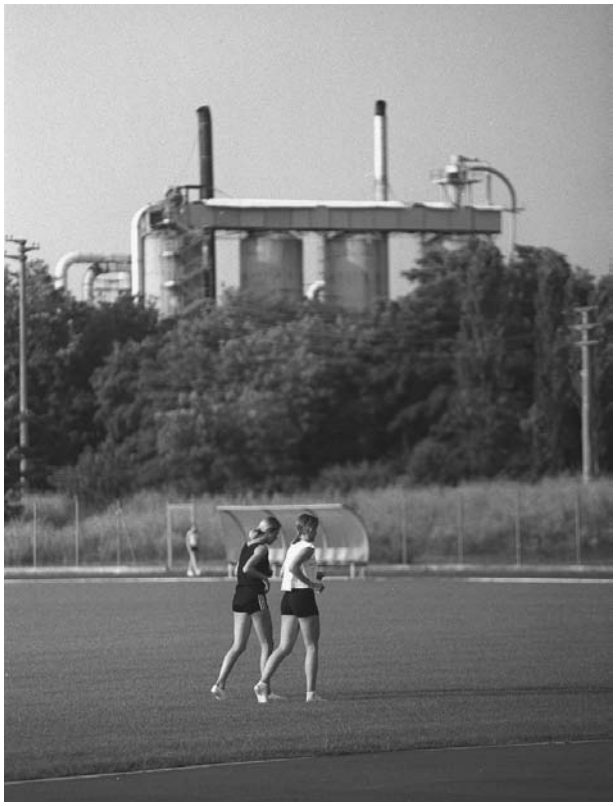
Although Greek and Latin philosophy inform contemporary Western reflections on the relationship between nature and society and between natural and human-made norms, the concept of natural law has been used more as a legitimization of social norms than as a foundation for the protection of nature. This long-standing philosophical tradition has not provided the grounds for a Mediterranean philosophy of the environment. The adjective *Mediterranean* may be used as an interpretive environmental concept that refers to the management of specific environmental issues, such as the sharing of natural resources (coasts, seas, landscapes, species protection, etc.), that require joint policies among the countries facing the Mediterranean Sea. In this context a strategic common vision has led to the adoption of normative and economic measures in agreements of the Council of Europe.

From a cultural point of view the differences between the regions of the Mediterranean area as a whole are more apparent than the similarities. Some Mediterranean countries, such as France, Spain, and Portugal, hardly can be considered Mediterranean because of the major influence exerted by the cultures of their northern areas. Therefore, the term *Mediterranean* is used in this entry primarily to refer to Greece and Italy.

This is the case not only for the environment but also for biotechnology, in which the economic and political presence of the European Union (EU) has led to a harmonized normative framework among member states in both northern and southern Europe. In the context of the common innovation policies endorsed at the European level, the EU has triggered and fueled debate over and the development of different ethical and epistemological positions on the environmentally related topics of risk and safety, intellectual property rights to genetically modified crops and animals, and the role of citizens in the relationship between science and society.

ENVIRONMENTAL ISSUES AND PHILOSOPHIES

The environmental movement in Greece started in the 1970s as it did in many other European countries, but in comparison to those countries it did not become a well-established and deeply rooted green social movement (Koutalakis 2004, Kousis 1999, Roumeliotou 2001). A number of factors have been cited to explain the lack of an environmental consciousness in Greece. The economic situation of that country did not allow the expenditure of funds for environmental protection. The protection of the environment initially was conceived in instrumental/reward terms, namely as an economic



Seveso, Northern Italy. *Joggers run on a sports field built over the Icmesa chemical factory in Seveso. On July 10, 1976, a reactor explosion at the factory released a toxic chemical cloud, causing Italy's worst ecologic disaster to date.* **AP IMAGES.**

necessity potentially increasing opportunities for development, and later in terms of generalized beliefs or values. However, starting in the late 1980s, as a result of the development of democratic forms of civic involvement and the implementation of European environmental policies, environmental thought began to connect science, engineering, policy, and philosophy. Greek contemporary environmental philosophy reflects those heterogeneous beginnings; Michalis Modinos, the founder and publisher of the journal *The New Ecology,* is a geographer, an engineer, a philosopher and an activist.

In Italy environmental concerns emerged after ecological crises in the chemical industry in the 1970s. In 1976 the accidental release of tetrachlorodibenzoparadioxin (TCDD), commonly known as dioxin, in Seveso (Milan) raised citizens' consciousness of the interconnections of the social and natural environments. This led to the enactment by the European Communities of the two so-called Seveso Directives (Directive 82/501/EEC, replaced by Directive 96/82/EC), which were aimed at the prevention and control of major accidents involving dangerous substances and the limitation of their consequences for humans and the environment.

Environmental philosophy and ethics have been imported from North America and Northern Europe. The vehicle for building an environmental perspective and establishing environmental philosophy as an academic field has been the translation of foreign literature, starting with Sergio Bartolommei's translation, in 1987, of Aldo Leopold's *A Sand County Almanac*. This dissemination of literature has allowed the development of writing on the relations between humans, nonhumans, and the environment that have involved or developed the traditions of utilitarianism, theories of rights, and theories of values. These writings generally have supported various forms of weak anthropocentrism, although there also have been discussions of Deep Ecology.

German philosophy, especially Hans Jonas's imperative of responsibility, has been a major influence on authors whose philosophical background is in traditional metaphysics. In these ways of framing environmental issues the concept of nature is a more metaphysical and value-laden notion than is the environment and serves as a link to traditional ontology. Both in Greece and in Italy environmental visions have been framed that are consistent with the idea of human stewardship of nature (Morandini 2007a, 2007b) as well as with ecologically oriented interpretations of God's creation within a Christian theological perspective. In Greek contemporary thought an ecological understanding of Orthodox theology has been proposed as an intrinsic ecological vision of humans and the natural world (Chryssavgis 2003). In Italy there has been an ongoing controversy between Roman Catholic doctrine and most lay philosophies of the life sciences. The Church has supported the natural law tradition as a source for environmental and bioethical values, whereas most secular philosophers oppose its use as a normative concept (Bartolommei 1989, 2003).

Other philosophical works have attempted to go beyond a narrow anthropocentric perspective, often emphasizing perceptual and aesthetic sensibility as an indicator of deeper human dimensions and as a route toward reforming or reframing people's lifestyles. The reappraisal of mental capabilities that seem to resist reductionist explanations was explored by Luigi Lombardi Vallauri (2002) as a potential foundation for a different conception of human beings and their position in the world. The human capacity for wonder about the natural world and animals is seen as a manifestation of an "ontological human noblesse." Human knowledge and self-knowledge generally are conceived of as privileged ontological or biological positions that justify the exploitation of the environment. However, for Lombardi Vallauri these capacities entail more obligations toward the world. In fact, as applications of noblesse oblige, they require greater respect for other species and the environment. According to this perspective, acting ethically is a transformative experience that leads to a fully realized

human condition rather than representing simple compliance with a precept. This is a form of respect that is consonant with the idea of *ahimsa,* or nonviolence. Lombardi Vallauri refers to this condition with the classical Greek word *pleroma,* or plenitude of being.

An approach that is within a more analytical tradition involves a theory of intrinsic value. Laura Mai (2008) proposed that both nonhuman subjects and environmental entities must be approached with a nonnaturalistic form of realism that involves human emotions toward animals and the environment.

ANIMAL RIGHTS AND WELFARE

In the 1980s, the introduction in Italy of philosophies of animal rights and welfare through the work of Silvana Castignone (1985) gave rise to debates and increased consciousness of the treatment of animals in an area that had been insensitive to this issue on both cultural and religious grounds. In its widely differentiated philosophical approaches, ranging from an extension of human rights to welfare theories and practices, this field has been populated by several women scholars and activists. Castignone's work on animal rights encountered resistance in the Italian academic community, where it was perceived more as a personal commitment than as a scholarly contribution. However, cultural and normative developments quickly changed that perspective. Discussions of animal ethics accompanied the implementation in the early 1990s of European conventions and directives that made the philosophy and practice of animal welfare mandatory in animal experimentation, transgenic animals, and animals kept for farming purposes.

Also in the 1990s, in the international philosophical community, work by Paola Cavalieri and Peter Singer (1993) led to the recognition of rights for nonhuman primates. Other approaches include the need to combat suffering in and violence against sentient beings (Battaglia 2002) and the anthropozoological approach of Anna Mannucci (2001), in which the deep anthropological meanings of long-standing relations between humans and nonhumans are analyzed.

ENVIRONMENTAL PHILOSOPHY AND BIOTECHNOLOGY: LAND AS A SOURCE OF TRADITIONS

In Italy environmental disasters caused by the chemical industries initiated debate and led to the enactment of legislation, sometimes on a European scale. With the rise of biotechnology European institutions have worked on regulating biotechnological products and processes in terms of both safety and protection of intellectual property rights (patentability). That legislative effort led to the approval of a directive on the deliberate release of genetically modified organisms (2001/18/EC) and a directive on the legal protection of biotechnological inventions (98/44/EC) (European Communities 1998, 2001).

Those European laws generated resistance and public concern and have become a source for original thought on these issues (Menrad, Agrafiotis, Enzing, Lemkow, and Terragni 1999). The Netherlands, supported by Italy, opposed legislation on "patenting life." The legal controversy ended in 2004, and Italy implemented the directive in 2006. Public discussions about genetically modified organisms (GMOs), especially GM food, have been more complex. In 2004 the Greek government adopted a position against the EU rules, forbidding trade in seeds for several genetically modified corn hybrids. In Italy, after the approval in 2003 of the European regulation on coexistence among GM, conventional, and organic cultivation (Regulation 1829/2003) (European Communities 2003), several regions refused to comply with it. In fall 2007 several nongovernmental organizations, including the Foundation for Genetic Rights, Coldiretti, the World Wildlife Fund, and Slow Food, organized a public campaign to support GM-free agriculture.

The controversial issues of the risks and patentability of GMOs have been the subject of an ample literature on biotechnology and its meaning in terms of the relationship between technoscience and democratic societies. In addition, debate has surrounded the understanding and development of the precautionary principle, a concept established at the European level that is intended to introduce a prudent approach to the unknown potential threats to environmental, human, and animal health triggered by new technologies.

Precaution has provided the ground for conflicts between NGOs and the scientific community that interprets the precautionary principle as a form of antiscientific, irrational and obscurantist thought. It has become a synonym for a debate between those opposed to and those in favor of science.

This reflection on the meaning and implications of scientific uncertainties about the relationship between science and society has led to attempts by some authors (Tallacchini & Terragni 2004) to devise an enlarged perspective on bioethics and environmental philosophy. The precautionary principle thus has become central to the debate about public involvement in science-based decisions as a way to extend and democratize decision-making processes and to the discussion about the benefits provided by GM food in agricultural systems that are based mostly on the quality of local production (Genetic Rights Foundation 2006b).

In Europe the rise of biotechnology in the early 1990s coincided with the attempt, starting with the Maastricht Treaty of 1992, to transform the European

market into a political union as part of the construction of an identity for Europe. Consequently, biotechnology has become associated with the maintenance of different regional identities; it has been perceived of as a threat to the survival of different cultures and values.

In this respect and despite the differences between Greek and Italian environmentalism, there has been a sharing of perspectives involving theorizing about landscape. In both regions there is a vision of the cultural, historical, human-made landscape that is quite different from the American vision of wilderness.

The roles that human-made landscapes in both countries have played historically as structural elements and mirrors of social and cultural identities, along with the increasing loss of these sites, have become major themes for writers such as Michalis Modinos (1996, 1998) in Greece and Eugenio Turri (1979, 2004) and Alberto Magnaghi (2005) in Italy. They and others have called for a geographical philosophy. The tendency of metropolitan and rural postindustrial landscapes to become homogeneous and indistinguishable is associated with a loss of cultural and personal identity and the need for reestablishing an anthropobiocentric dimension of life.

The importance of the landscape as a cultural value also is reflected in the Italian constitution of 1948, which in narrowly anthropocentric wording "safeguards natural beauty and the historical and artistic heritage of the nation" (Article 9). This principle represented the starting point for an attempt to include the environment among constitutionally protected goods. The Greek constitution of 1975 reaffirms the cultural dimension of land in an updated and environmentally aware perspective, stating that "[t]he protection of the natural and cultural environment constitutes a duty of the State" (Article 24).

SEE ALSO *Animal Ethics; Christianity; Environmental Philosophy: V. Contemporary Philosophy; Europe: II. Western Europe; Food Safety; Genetically Modified Organisms and Biotechnology; Land Ethic; Precautionary Principle.*

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Mariachiara Tallacchini

II. WESTERN

This article covers environmental issues and philosophies in Germany, the Netherlands, France, Spain, and Portugal.

GERMANY

The first conscious recognition of the overexploitation of nature can be found in the writings of the German forester Hans Carl von Carlowitz (1645-1714). In 1713, in the middle of a wood supply crisis, he coined the term *sustainable* (*Nachhalt*). He proposed that the amount of wood harvested should not exceed the amount that could be regrown in the same period of time. He invoked the welfare of future generations in arguing for this policy.

The end of the eighteenth century saw radical modifications in the German landscape, such as the draining of wetlands, diking of the Rhine, and the gradual industrialization of agriculture. From the outset, modernization was perceived ambivalently: on the one hand, scientists and engineers as well as many politicians touted the material gain; on the other, intellectuals—especially in the Goethean romantic traditions—mourned such changes as a cultural loss.

In the years before the First World War, a conservation movement became widespread and sorted itself into several non-governmental organizations. It also exerted some influence on legislation. Noteworthy is a speech made by Ludwig Klages (1872-1956) in 1913, in which he accused Western civilisation of destroying the beauty and plenty of nature at a global scale and at a high speed on behalf of progress, utility, wealth, and civilization. Long before Lynn White's "*The Historical Roots of Our Ecologic Crisis,*" (1967), Klages blamed the destruction of nature on the putative Christian doctrine that man should subdue nature. Klages thought that rationality and even ethics could be blamed for supporting this escalating "war against nature."

Because the time between the world-wars was characterized by sharp political conflicts and a deep economic crisis, many conservationists hoped that conserving nature could become a common and unifying concern. A vegetarian diet, long-distance hiking, nudism and communal living in the countryside were part of the so-called *Lebensreform* and *Wandervogel* movements in Germany.

Perceiving U.S. consumerism to be creeping in from the West and Soviet Communism lurking in the east, many were afraid to lose the national identity. For such reasons, leading conservationists (P. Schultze-Naumburg, W. Schoenichen) supported National Socialism. To many conservationists, the naturalistic doctrines and Fascist ideology of the Nazis seemed very close to holistic approaches in ecology. In 1933, most conservationists supported the new order, some with enthusiasm.

Thus the time between 1933 and 1945 constitutes a second stage of nature conservation. This was conceptualized within the overall doctrine of National Socialism and was indicated by the term *Blut und Boden* ("Blood and Soil"). It is perhaps characterized best by the aim to "Germanize" the occupied regions in Eastern Europe and to transform them into "Aryan" landscapes. Some planners constructed so-called military landscapes, which combined laudable environmental objectives with readiness for warfare. However, most Nazi policies with respect to nature were only symbolic; in reality, the use of nature was intensified, as wetlands were drained and forests were overused. At the end of World War II, the traditions of German nature conservation were thus deeply compromised.

A third stage of nature conservation was post-World War II *Umweltschutz* (environmental protection). In contrast to the explicitly value-laden *Blut und Boden,* this third stage took a more scientific approach and was part of an overall concern with environmental protection, especially issues such as air and water pollution. These problems were seen as by products of the economic success of West Germany. The conservation of species and biotic communities was justified with purportedly value-free functional arguments (e.g. the diversity-

stability-hypothesis). Nature conservation was thus perceived as ''applied ecology.''

In the late 1960s, members of the leftist counterculture rejected consumerism, proposed new lifestyles and protested against nuclear power plants and atomic weapons. This movement put environmental policy makers under pressure. Although much environmental legislation was passed in the 1970s, reform-oriented Social Democrats and Liberals who had done a good job putting environmental issues on the political agenda were heavily criticized for ''not doing enough.'' This peculiar combination of reform-oriented political administration, science-based policy counselling, and a civil society which made use of many strategies of political protest made German environmental policy relatively successful, but could not change the underlying pressures on natural landscapes.

In the former German Democratic Republic (GDR, or East Germany) the situation was different. While pollution was bad in some industrial areas, political protests against pollution were suppressed. Agriculture was intensified to supply the working class with highly subsidized bread and meat. Large areas were set aside for the Soviet army and for sport hunting by the political elite, and thus remained in a relatively natural state. Moreover, in comparison to West Germany, large areas of East Germany were less densely populated. It was a paradox of the communist economy that created extreme pollution in some areas, while other areas remained in a more or less pristine condition.

The political reunification of Germany in 1990 opened up new opportunities for nature conservation in the former GDR. The initiative of a small group of highly motivated people (Michael Succow, Hannes Knapp, Leberecht Jeschke) led to the creation of five national parks and several biosphere reserves. With the collapse of the GDR, pollution and carbon dioxide emissions decreased sharply and rehabilitation, revitalization and restoration of many polluted and destroyed sites took place. In 1994 the protection of the environment was added to the German constitution as an objective of the state.

In 1998, a coalition between Social Democrats and Greens established a federal ''red-green'' government. Between 1998 and 2005 this government initiated substantial environmental reforms: climate change policies; facilitation of renewable energy; a program to phase out nuclear power; a shift in agricultural policies to favor organic agriculture and strict regulation of genetically modified crops. A comprehensive sustainability strategy was established in 2000 at the national level that included a strategy to protect biodiversity. In the ''Grand Coalition'' of Christian and Social Democrats, climate change became a focus of German environmental policy. Further environmental modernization of German industries and consumer goods (such as cars, household devices, and chemical products) were prescribed to reduce material input and energy consumption.

Environmental Zone Warning in Berlin, Germany. *Cars drive past a sign indicating the new pollution class for cars in Berlin. Beginning January 1, 2008, Berlin restricted traffic for high emission vehicles in a new "environmental zone." To drive into the inner city, one must display a special pollutant group sticker on his or her car.* **ANDREAS RENTZ/GETTY IMAGES.**

History of German Environmental Ethics In Germany there is a long tradition of ethical reflections on the relationship between humans and nature. In Weimar's ''classical'' period (roughly 1790-1830), philosophers, scientists and poets (Herder, Schiller, von. Humboldt) gathered around Goethe and debated the scientific, aesthetic, and philosophical aspects of nature. The thinkers of the romantic era (roughly 1800-1820) perceived nature as an awe-inspiring world full of miracles, fairy tales, and mysteries.

The ethical philosophy of Arthur Schopenhauer (1788-1860), formulated in the mid-nineteenth century, was based on compassion, including mercy toward sentient animals. In 1923, Albert Schweitzer (1875-1965), building on Schopenhauer, published *Kultur und Ethik,* which advocated an ethics of reverence toward all life: It is wrong to take life and to destroy life, it is right to preserve life and to care for life.

In 1979, Hans Jonas's (1903-1993) *Prinzip Verantwortung* was published, forming a cornerstone in environmental ethics. Jonas argues that life affirms itself in the processes of metabolism and reproduction. This self-affirmation of life, Jonas argued, should be regarded as an ultimate value that exists ''out there'' in the natural world; it cannot be reduced to human preferences.

Jonas's ethics is, to some extent, biocentric, but Jonas distinguishes between the intrinsic value in nature and the dignity of humans.

Klaus-Michael Meyer-Abich grounded a holistic environmental ethics in the medieval philosophy of Nikolaus Cusanus. Meyer-Abich was engaged in three expert commissions of the German parliament, he was part of the government of the city of Hamburg, and he contributed to Working Group III of the Third Assessment Report of Intergovernmental Panel on Climate Change (IPCC) in 2001. In contrast, Gernot Böhme, in his *Phänomenologie der Natur*, proposed a phenomenological approach to environmental ethics based on the philosophy of Edmund Husserl. In the 1990s, Konrad Ott mapped all the contemporary arguments in environmental ethics to give a comprehensive overview to this new universe of discourse (*Ecology and Ethics*, 1994). Dietmar von der Pfordten (*Ecological Ethic,* 1994) gives an even more comprehensive overview than was provided by Ott.

The first German chair in environmental ethics, held by Konrad Ott, was established at the Ernst-Moritz-Arndt-University of Greifswald in 1997, in the "Landscape Ecology and Nature Conservation" program of the Biology Department. Environmental ethics is also offered at the universities of Tübingen Munich, Basel, Münster, and Kassel.

THE NETHERLANDS

In the Netherlands, a highly multicultural, liberal way of life thrives in a densely populated, widely urbanized space. There is intense agriculture and a coastline well suited for human recreation. Nature conservation cannot address unmodified natural landscapes, since there is no wilderness left. Environmental protection, the relation between environmental conditions and health, treatment of animals, food ethics, a critical approach on biotechnology, and restoration ecology are specific dimensions of Dutch environmentalism. There is also a distinctive environmental question concerning the status of "new nature."

The Netherlands face significant environmental challenges. The country has one of the world's highest per capita levels of industrial carbon dioxide emissions, and the country's rivers have suffered from significant amounts of agricultural and industrial pollution. To address these problems, in 1971 the Dutch created the Ministry of Health and Environment. While almost 6 percent of the nation's land is protected, a number of animal species are endangered, including the Atlantic Ridley turtle and the Atlantic sturgeon.

One distinctive aspect of Dutch nature policy concerns the concept of "new nature." Since the eleventh century more than 4.5 million hectares of new land has been created. This land first became dunes, rivers, forest, and farmland. In time, more industrial development became prominent, sometimes accompanied by severe pollution. Since the 1980s some have advocated returning this land to a more "natural" condition—despite the obvious irony that the natural condition of these lands was to be covered by the sea. This has also involved the release of domesticated animals such as Conic horses and Heck oxen in the hope that they will "re-wild." Questions have arisen concerning what if any ethical obligations are owed to protect species that have been domesticated for a very long time.

Finally, climate change presents an especially serious challenge to the Netherlands. With more than a quarter of the country below sea level, climate change is expected to punish the Netherlands by both rising sea level and the increase in the flow of the nation's rivers. While the greatest effects are expected in the second half of the twenty-first century, there have already been discernible signs of climate change.

Prominent Dutch environmental thinkers include Louke von Wensveen who writes mainly on environmental virtue ethics; Michiel Korthals who specializes in food ethics; and Frans Brom who works in the fields of genetic engineering and agricultural ethics. The expatriate (now in the United States) Irene Klaver works on international water issues.

FRANCE

In part because nature protection was so closely associated with Nazi *Blut und Boden* in Germany, environmental ethics was shunned as crypto fascism (or ecofascism) in France until the early 1990s. Nor in France was there much romantic poetry or philosophy to provide a nascent French environmental philosophy with a deep intellectual history. But by the 1990s the environmental crisis, especially in its second wave (as discovered in the 1980s)—massive species extinction, stratospheric ozone depletion and global climate change—could no longer be ignored by the French intelligentsia.

Michel Serres was the first French philosopher to enter the field with *Le contrat naturel*, published in 1990. The title alluded to *Du contrat social* by Jean-Jacques Rousseau, a prominent eighteenth century French philosopher, noted, among other things, for his version of the social-contract theory of the origin and nature of ethics. Contrary to Hobbes's version of that theory, Rousseau believed that in the "state of nature," prior to the formation of society and civilization, humans were naturally benign and were subsequently corrupted by the vices of civilization; thus, he was thought to have

romanticized the pre-civilized peoples of his imagination as "Noble Savages" (a phrase he himself did not coin). Serres is critical of modern technology and the science that informs it, which, in his opinion, has produced an environmental crisis that threatens not only the quality of human life, but human life itself. His deliberate association of his book with Rousseau's and his criticism of modernity led many of his French readers to think of him as a neoRomantic eschewing rationality in favor of some kind of spirituality or primitivism. In retrospect, however, Serres has turned out to be prescient.

Just as John Passmore, with his book *Man's Responsibility for Nature* (1974), tried to squelch the emergence of the new holistic non-anthropocentric environmental ethics broached in Australia by Richard and Val Routley (later Sylvan and Plumwood, respectively), so did Luc Ferry in France—not only that of Michel Serres, but that of many Anglophone environmental ethicists—with his book, *Le nouvel ordre écologique* (1992). Reminding his readers of the repugnant *Blut und Boden* environmentalism of the Nazis, Ferry expressly linked contemporary holistic, non-anthropocentric environmental ethics to the holism of German fascism in the 1930s and '40s. The would-be new tyrannical ecological order, Ferry argued, is a threat to the principles of the existing liberal democratic order. Among the Anglophone thinkers Ferry criticizes extensively for their allegedly fascistic tendencies are Aldo Leopold (who, as a matter of fact, visited Nazi Germany in 1935), Christopher D. Stone, J. Baird Callicott, the American Deep Ecologists (George Sessions and Bill Devall) and ecofeminists (collectively).

While Passmore had little adverse effect on the development of Australian environmental philosophy, Ferry apparently had a great adverse effect on the development of French environmental philosophy. Notable among the few philosophers to advance the field in France is Catherine Larrère. Her 1997 book, *Les philosophies de l'environnment*, summarizes several of the leading issues in Anglophone discussion of environmental philosophy with chapters on the intrinsic value of nature, animals and the environment, wilderness and its deconstruction, and the pluralism-versus-monism debate in theoretical environmental ethics.

Bruno Latour, who has a background in philosophy, anthropology, and sociology, is a founder of the new field of "science studies"—the successor to twentieth-century Anglo-American analytic philosophy of science, which treated not science as it is actually practiced, but as an isolated and abstract ideal divorced from its social context. Latour has also contributed to what might be called "environmental politics"—the French alternative to environmental ethics. In *Politique de la nature*, Latour shares the concern of Ferry that authoritative appeals by "scientists" to the "facts" of a reified "Nature" threaten liberal democratic politics. Nature, he claims, is socially constructed—most authoritatively by the scientific sub-set of society.

France shares with other Western European countries, such as Germany, the legacy of modern commercial and industrial development that has left environmental degradation and ecological destruction in its wake. France has, however, had a less robust environmental movement than other countries. While Germany has moved to reject nuclear power, the French public embraces nuclear energy unreservedly. France has fifty-six nuclear power plants generating 76 percent of its electricity, which gives France, a country with few fossil-fuel resources, a modicum of energy independence. As of 2008 no serious accidents had occurred, but the country had not yet come up with the final solution to the problem of nuclear waste disposal.

SPAIN AND PORTUGAL

Spain's most famous twentieth-century philosopher, José Ortega y Gasset (1883-1955), is something of a cult figure in one corner of contemporary environmental philosophy: the ethics and philosophy of sport hunting. Ortega received his philosophical education in Germany; and thus the main body of his work is in the phenomenological-existential tradition of Continental philosophy. In his *Meditations on Hunting*, translated into English and published in 1972, Ortega characterizes sport hunting as a vacation to the Pleistocene and a retreat from the existentially debilitating mass culture of modernity. It is, in his opinion the only way to experience our authentic humanity, to be ourselves as we are sculpted by natural selection and adapted to hunting-gathering as the formative and original human way of life. In the field, as the hunter's attention is unwaveringly focused on his quarry, his senses become more acute and his awareness more heightened than the senses and awareness of a non-hunter out for a walk in the woods. Ortega insists that the only proper response to an animal obsessed with avoiding capture is to try to catch it; and the highest homage we can pay to such a being is to kill it.

Spain's most notable contemporary environmental philosopher is Nicolás Sosa. His book, *Ética Ecológica* (1990), introduced environmental ethics as it had developed in Anglophone philosophy to a Spanish-speaking audience. Sosa, in ways reminiscent of Lynn White Jr.'s subtext in "The Historical Roots of Our Ecologic Crisis," contrasts proposed technical and political approaches to solving the environmental crisis with philosophical and, more especially, ethical approaches and offers a brief for the latter. Sosa takes an eclectic, pluralistic approach as his

purpose is more practical—to find an effective environmental ethic—than theoretical. Sosa deploys Jürgen Habermas' notion of "communicative competence" as the key to developing both an effective and pluralistic environmental ethics by, in effect, transposing the Leopold land ethic into a Habermasian discourse ethic.

There are striking similarities in the independent development of environmental ethics in France and Spain during the 1990s. Both Serres and Sosa were ahead of their Anglophone colleagues in realizing the central challenge to environmental philosophy of globality, especially global climate change. And Sosa, like both Serres and Latour, suggests that the solution is somehow to give voice, through political representation, to the more-than-human natural world: Sosa with his unrestricted Habermasian community of discourse, Serres with his natural contract, and Latour with his notion that science legitimately speaks for nature if properly integrated into the discourse of politics.

Portugal has not yet developed a robust community of environmental philosophers. However, Ortega spent some years in exile in Portugal; and in 2008, the Fundação Serralves sponsored a series of lectures in Porto on environmental philosophy by J. Baird Callicott, Holmes Rolston III and Catherine Larrère.

The Iberian Peninsula also shares with other Western European countries the legacy of modern commercial and industrial development that has left environmental degradation and ecological destruction in its wake, especially in the form of air and water pollution. Spain is currently facing serious water-shortage problems exacerbated by sprawling coastal development aimed at attracting tourists to its Mediterranean resorts. Like France, Spain has had a less robust environmental movement than Germany, and a less robust environmental politics—until recently. Spain is, however, leading the way, among Western European countries, in environmental policy and legislation, having extended "human rights" to all our fellow great apes (chimpanzees, bonobos, gorillas, orangutans, and gibbons) by an act of the Spanish Parliament in 2008, at the behest of the Great Apes Project, spearheaded by Peter Singer and Paola Cavalieri and its Spanish director, Pedro Pozas.

SEE ALSO *Animal Ethics; Ecology: I. Overview; Ecology: IV. Diversity-Stability Hypothesis; Environmental Philosophy: III. Early Modern Philosophy; Europe: I. Mediterranean; Green Politics in Germany; Ortega y Gasset, José; Russia and Eastern Europe; Scandinavia; Schweitzer, Albert; von Humboldt, Alexander; White, Lynn, Jr.*

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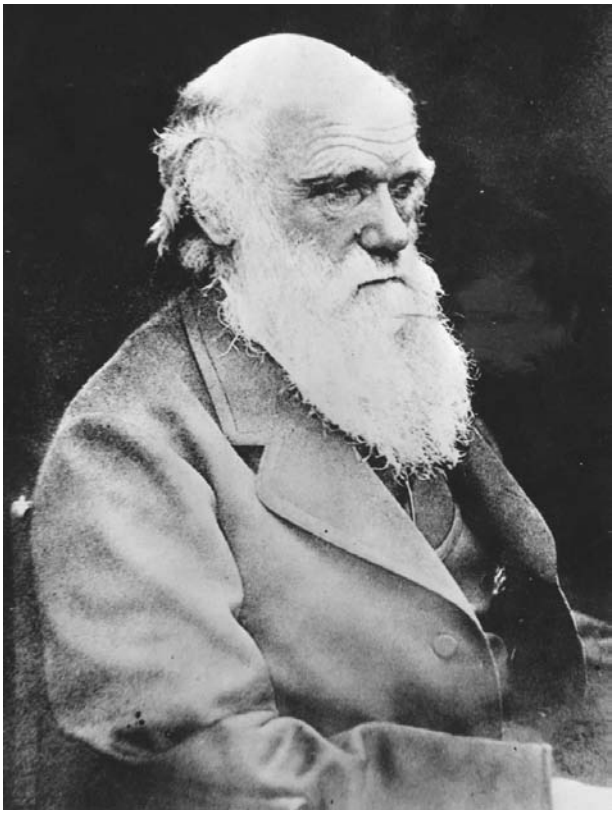
Konrad Ott
Robert Frodeman
J. Baird Callicott

EVOLUTION

Charles Darwin's theory of evolution provides a robust explanation for both the adaptation of organisms to their environments and the diversity of organisms. The implications of evolutionary theory run broad and deep, touching on every aspect of biological understanding and human self-understanding. It has influenced environmental philosophy in at least two ways: by tying ethics to natural roots, and by informing a worldview that emphasizes human kinship with other living things.



Portrait of Charles Darwin, circa 1880. *Charles Darwin (1809–1882) is known as the founder of the theory for the evolution of life. Darwinian evolution has helped to shape modern theories of environmental ethics, such as the idea of biodiversity.* **AP IMAGES.**

BEFORE AND AFTER DARWIN

Prior to the Darwinian revolution, the predominant Western worldview held that the world was changeless and that all of the various forms of living creatures were the immutable products of special creation. The diversity of life, the interactions among living beings, and the adaptation of organisms to their environments were widely taken as evidence that the order of nature must be the product of a designer acting with conscious intention.

By the time Darwin published *On the Origin of Species* in 1859, however, there had already been serious challenges to the predominant worldview. Geologists and other naturalists had come to recognize, for example, that Earth is far older than had generally been believed, and that landforms change by slow and uniform natural processes. A number of biologists, particularly Jean-Baptiste de Monet and Chevalier de Lamarck, had also suggested that species change over time.

What Darwin presented in *On the Origin of Species* was an explanation for how organisms change through uniform natural processes operating over vast stretches of time. Mainly by means of natural selection, he argued, organisms come to be adapted to their environments, and varieties of organisms diverge from one another in characteristics. Offspring are always slightly different from their parents and from their siblings (variation), and the continual struggle for existence ensures that not all offspring will survive (selection). Those individuals that happen to have characteristics that give them some small advantage in the struggle for survival are more likely to pass their traits on to future generations. Over time, all else being equal, those advantageous traits come to dominate a population of organisms; that is to say, the population adapts to its environment. When parts of a population are subjected to different selective pressures, they diverge from one another, eventually becoming distinct species.

Darwin foresaw that applying this same account to human origins could revolutionize human self-understanding. In *The Descent of Man* (1971 [1871]), he cast intellect, morality, and even religion as the products of natural selection. He postulated, for example, that any social animal with sufficient intellect would develop a moral sense, on the grounds that individuals who sympathize with others in their group are more likely to cooperate with them. Membership in a coherent and cooperative group can be advantageous in the struggle for survival. This thread in Darwin's work has been expanded and deepened by research in a field that has come to be called evolutionary psychology, which studies the brain as a physical system and works to explain particular circuits as adaptations to solve particular problems encountered by our ancestors.

One of the main difficulties for Darwin's theory was that he lacked a credible account of the mechanisms of inheritance and variation. It was not until the 1930s that Darwinian evolution merged with Mendelian genetics in what has come to be called the modern or neo-Darwinian synthesis. Since that time, evolutionary theory has secured its position as the unifying core of biology, with implications for medicine, cognitive science, and many other fields.

EVOLUTIONARY ETHICS

In the final section of *A Sand County Almanac* (1949), Aldo Leopold casts ethics as such explicitly in evolutionary terms. He echoes Darwin in his assertion that ethics "has its origins in the tendency of interdependent individuals or groups to evolve modes of cooperation" (p. 202). He then projects the extension of ethics to include the relationship between humans and the land (the land ethic), and he sees this extension as "an evolutionary possibility and an ecological necessity" (p. 203).

J. Baird Callicott has interpreted Leopold's appeal to evolutionary ethics as nothing less than a legitimate way of circumventing the traditional injunction against deriving statements of value and obligation from statements of fact, against deriving *ought* from *is*. In his 1982 essay "Hume's *Is/Ought* Dichotomy and the Relation of Ecology to Leopold's Land Ethic," Callicott traces the lineage of Leopold's argument back through Darwin to David Hume (1711–1776), who maintained that moral claims themselves come down to factual claims about moral sentiments. It is a matter of psychological fact that people are well disposed toward communities of which they are a part. Because of the Darwinian revolution, it is possible to give an evolutionary explanation for this fact. All that is needed to complete a compelling practical argument for the land ethic, Callicott asserts, is to establish that the land is part of a community of which people too are a part.

AN EVOLUTIONARY WORLDVIEW

The ecological worldview that informs Leopold's land ethic can seem static, focused on biotic communities as they are now or as they have recently been. At several points in the *Almanac*, however, a sense of the intertwining of ecology and evolution comes to the fore. "In the beginning," Leopold wrote, "the pyramid of life was low and squat; the food chains short and simple. Evolution has added layer after layer, link after link" (1948, pp. 215–216). Ecology can be said to study the relations among organisms at a particular time, while evolutionary biology studies changes in organisms and the emergence of their mutual relations across time.

For Leopold, evolution provides an important benchmark for evaluating human activities. While evolutionary change is generally slow, humans can now "make changes of unprecedented violence, rapidity, and scope" (1949, p. 217). Also, part of what makes wild nature so compelling is that it is ancient; humans are only recent arrivals. A sense of endless time adds poignancy to the elegiac moments in the *Almanac*: Sandhill cranes, for example, "have their being . . . in the wider reaches of evolutionary time. Their annual return is the ticking of the geological clock" (1949, p. 97).

Leopold also holds that Darwin's theory should foster in humans a sense of kinship and a sense of humility, a sense that we are "only fellow-voyagers with other creatures in the odyssey of evolution" (1949, pp. 109–110). Later environmental thinkers, such as Warwick Fox in his account of transpersonal ecology, place particular emphasis on the kinship of life, rooted in the Darwinian theory of common descent. Whatever the differences between a human being and an oak tree, for example, the two are related through a common ancestor far back in evolutionary time.

Darwinian evolution has also shaped the interests and concerns of the contemporary environmental movement. Biodiversity, for example, is a central issue for many environmentalists, an issue that takes on urgency with the recognition that biodiversity has emerged only slowly over evolutionary time, and that it is unique and somewhat fragile: Once an evolutionary line has ended, it cannot be restored. The sense of deep time and the slow unfolding of natural processes also informs a growing interest among environmentalists in large-scale and long-term problems, such as climate change and the persistence of some human-made materials.

PRE-DARWINIAN EVOLUTION

The term *evolution* frequently enters the literature of environmental philosophy in its older, pre-Darwinian sense. Originally the term denoted a teleological, or goal-directed, process of development, literally the unfolding of an implicit form by stages toward a fixed goal. Embryonic development is a paradigm case of evolution in this sense of the term.

In its mainstream interpretation, by contrast, Darwinian evolution is generally understood to be a mechanistic process tending toward diversity, rather than toward complexity or intelligence. Complexity as such is something like a side effect of the process, and the emergence of any particular complex form, such as the human brain, is wholly contingent.

SEE ALSO *Biodiversity; Bookchin, Murray; Callicott, J. Baird; Darwin, Charles; Environmental Philosophy: V. Contemporary Philosophy; Evolutionary Psychology; Land Ethic; Leopold, Aldo; Thoreau, Henry David.*

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Robert Kirkman

EVOLUTIONARY PSYCHOLOGY

Evolutionary psychology is the human side to sociobiology, which is the area of evolutionary biology that deals with social behavior. Sociobiology focuses not only on animals in their lives and struggle for existence but also on the ways in which they interact with one another, particularly with members of their own breeding group or species. It is a topic that was dealt with, although not by that name, by Charles Darwin in *On the Origin of Species* (1859)—evolutionary psychology, again not by name, appeared in Darwin's *Descent of Man* (1871)—but it was not until the 1960s that sociobiology, including human sociobiology or evolutionary psychology, became a discipline in its own right. This resulted from certain major conceptual moves. The chief Darwinian mechanism is that of natural selection, which holds that there is differential reproduction in the living world and that the organisms that succeed are those which are especially well adapted to their roles in life; they have features that aid them, such as eyes and teeth and hands and leaves and bark and everything else that makes for good functioning.

ORIGINS AND TENETS OF THE THEORY

It was particularly important to see that in terms of adaptive advantage, natural selection rarely if ever works for the good of the group but almost always works for the good of the individual. In the formulation of the evolutionary biologist Richard Dawkins, it is necessary to take a "selfish gene" perspective on animal behavior, including animal social behavior. It then was realized that even though behavior must be directed to the good of the actor, this can involve cooperation with others, for instance, in child rearing and in fighting against predators. Altruism, as this usually is called, can be a good reproductive strategy. Along with these theoretical developments came major studies of organisms in the wild, and it was realized that long-term behaviors often involve much of the selfishness described above: No one helps another out of niceness but because ultimately there is a benefit for the helper. This is not true in every case, but on average such help pays off.

In 1975 an American specialist on ants, the Harvard biologist Edward O. Wilson, tied these concepts together in a major overview: *Sociobiology: The New Synthesis*. What made his work particularly controversial was the way in which, having surveyed the animal kingdom, he then applied his thinking to human beings. Apparently, human beings also are subject to evolutionary forces and show their heritage in the ways in which they interact socially. The fact that men tend to be stronger and more dominant than women is part of biology no less than is the somewhat subservient role played by women. In 1978 Wilson reinforced that kind of thinking with a Pulitzer Prize–winning book exclusively on the human species: *On Human Nature*. His claims were anathema to many—feminists, Marxists, and social scientists, among others—and by the end of that decade human sociobiology was much debated: praised by some and condemned by others. In the years since that time the controversy has died down somewhat, although human sociobiologists have found it politic to do their work under other names, calling themselves biological anthropologists or evolutionary psychologists, among other variants.

The possible implications of human sociobiology (or evolutionary psychology as we can now call it) for thinking about the foundations of morality have been of great interest to philosophers and other scholars. It seems that morality is predicated on the need not to be selfish, to serve others, yet selfish genes appear to be activated only by personal concerns. As was noted above, however, the situation is more complex. An example would be something as basic to ethics as the love commandment—"Love your neighbor as yourself." If a person does help someone else, that person is putting out resources that might be used more immediately for his or her own benefit. An example would be giving someone food that one might eat oneself. However, the love commandment is meant to apply to others as well, and so other people are expected to help when that person is in need.

One might argue that this is hypothetical and that perhaps it is more practical not to help others and assume that one can get by without help. However, as everyone knows, things are not that simple. All people need the help of others when they are young, when they are sick, when they are old, when they are handicapped (perhaps by the burden of having small children), and so forth. In other words, the evolutionary psychologists suggest that a good Darwinian explanation—work for the benefit of oneself—might demand a great deal of cooperation with one's fellows. This probably is best done from conviction rather than from calculation. In other words, biology makes people do what they do because they think it is right rather than because they think it is in their own interest. Selfish genes do not necessarily imply selfish people.

APPLICATION TO ENVIRONMENTAL ETHICS

According to Wilson, environmental issues figure in this equation. Wilson argues that humans have evolved in a symbiotic relationship with the rest of living nature. Simply and literally put, people cannot live without plants and other animals. Beyond the simple utilitarian factors, Wilson argues, people must take into account the human need of biodiversity. That need speaks to deep social and aesthetic needs within everyone—liking landscapes is a part of human biology—and of course pays major dividends in the search for new drugs and the like. In other words, Wilson argues that evolutionary biology shows that people need a new moral imperative: ''Preserve and cherish nature and above all maintain biodiversity.'' This is not something that runs counter to traditional ethics, like the love commandment, although it certainly runs counter to the human urge to look for quick and easy solutions. Wilson argues that with the development of the human brain, people have reached a new level of evolution that requires them to think about the long-term future and eschew the immediate and comfortable for the distant and important. In short, to understand and counter the environmental crisis, people's first duty is to learn some evolutionary biology.

SEE ALSO *Biodiversity; Darwin, Charles; Evolution; Wilson, Edward O.*

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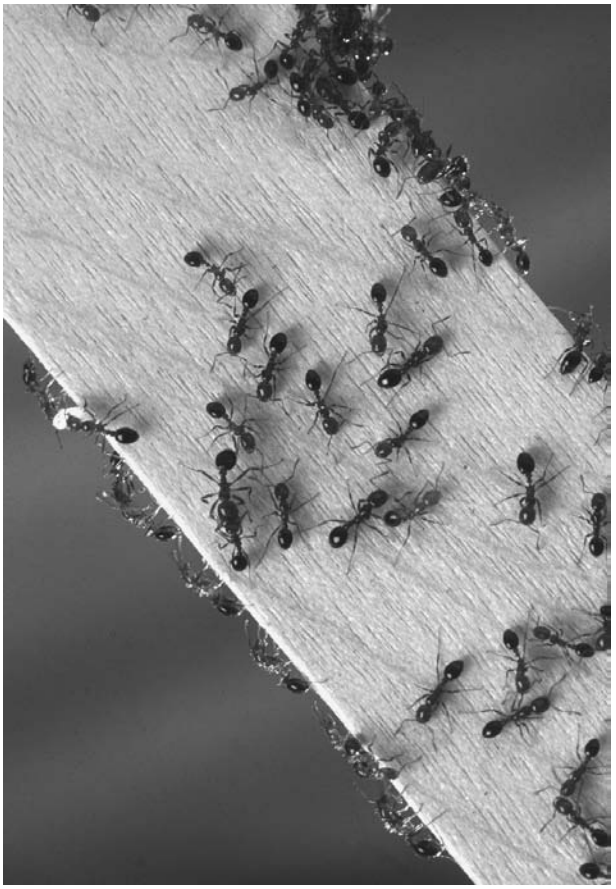
Michael Ruse

EXOTIC SPECIES

The fire ant (*Solenopsis invicta* Buren) in the southern United States, the zebra mussel (*Dreissena polymorpha*) in lakes and waterways of the midwestern United States, and the seaweed *Caulerpa taxifolia* in Mediterranean waters are commonly cited examples of exotic species. What makes them exotic is a shared property: Each species inhabits but is not considered native within the region listed. In the United States, for instance, *Solenopsis* was first discovered in the late 1920s in Mobile, Alabama, likely introduced accidentally in ships transporting agricultural products from South America (Williams et al. 2001); shipping also carried it to Brisbane, Australia, around 2000 (McCubbin and Weiner 2002). Similarly, shipping was responsible for the zebra mussel's arrival in North American Great Lakes around 1986 (Ram and McMahon 1996). *Caulerpa*, a common aquarium plant, was first detected in Mediterranean coastal waters adjacent to the Oceanographic Museum of Monaco near Nice, France (Francour et al. 1995). Although these species were almost certainly introduced by humans to these areas, this circumstance is not what defines their exotic status (cf. Noss and Cooperrider 1994). If nonhuman processes had introduced them, they would be equally exotic. *Solenopsis* is deemed native rather than exotic in Argentina, Brazil, Paraguay, and Uruguay, and



Red Imported Fire Ants. *The red fire ant (*Solenopsis invicta*) is an insect species native to South America, but found on several continents. The ant was accidentally introduced to the southern United States in the 1930s, traveling in soil on a ship that docked at the Mobile, Alabama port. The ants are a nuisance to humans, pets, and livestock, and cause extensive medical and agricultural damage every year.* **PHOTO COURTESY OF SCOTT BAUER, USDA AGRICULTURAL RESEARCH SERVICE, BUGWOOD.ORG.**

neither the zebra mussel nor *Caulerpa* is regarded as exotic in the Black and Caspian seas or Indian Ocean, respectively.

DEFINING *NATIVE* AND *EXOTIC* SPECIES

As the foregoing examples illustrate, a species is appropriately labeled "exotic" only with respect to regions in which it is not considered native. These regions may change, of course, as migration and extinction change the flora and fauna of regions, so a clear criterion for nativeness is needed. Without an explicit criterion, *exotic* and *native* are problematically imprecise concepts and are, consequently, often used inconsistently by ecologists and conservation biologists (Shrader-Frechette 2001; Colautti and MacIsaac 2004). Unfortunately, no such criterion has emerged. It is often unclear, for instance, what temporal reference is being (and should be) considered the standard for nativeness. Cattle, for instance, are arguably a staple of contemporary U.S. biocultural identity and could be judged native on that basis, yet they are exotic as judged against a U.S. precolonial ecological reference state. Similarly, horses were native in North America during the Pleistocene but were presumably exotic when Europeans reintroduced them after they had been locally extinct for more than 10,000 years.

Analogous reference problems confront restoration efforts that seek to determine what past ecological state of a degraded area should be its restoration target (see Callicott 2002). These problems do not, however, show that *native* and *exotic* are entirely useless concepts within conservation biology or that the distinction between them is baseless. It seems undeniable, for example, that the recent introduction of *Caulerpa* and the zebra mussel into areas in which they are classified as exotic justifies the label.

DISTINGUISHING *EXOTIC* AND *INVASIVE* SPECIES

The fire ant, zebra mussel, and *Caulerpa* are labeled *invasive* more often than *exotic*. How this concept should be defined is controversial (see Richardson et al. 2000), but these species are called invasive in regions in which they are considered nonnative because they have had a significant adverse effect on ecosystems, primarily through high fecundity, high density, rapidly expanding distributions, and competitive advantages over native species. Describing these species as exotic does not, however, imply that their impact must be adverse. In fact, some studies suggest less than one-quarter of exotic species negatively affect ecosystems (Williamson and Fitter 1996). *Exotic* and *invasive* are, therefore, distinct concepts and should not be conflated. This does not mean, however, they are unrelated. Being exotic is necessary for a species to be invasive: Native species obviously cannot invade regions they already inhabit.

What makes species invasive is not well understood (Williamson 1996), but high fecundity and absence of predators, parasites, and competitors that negatively affect a species in its native distribution is clearly an important part of the explanation (Sax and Brown 2000). Invasive *Solenopsis* in the United States, for example, normally outcompetes native ants to the point of competitive replacement (Porter et al. 1988). In the presence of even relatively low densities of parasitoid Phorid flies that parasitize them in their native range, however, invasive *Solenopsis* consume less, grow to smaller size, and are less competitive against native ants (Mehdiabadi and Gilbert 2002, Mehdiabadi et al. 2004). Being introduced into new areas frees exotics from these types of ecological pressures. Nevertheless, native species can sometimes escape these pressures as well. For example, white- and black-tailed tail deer in some parts of the United States (especially areas with severe hunting restrictions) share many of the negative attributes of invasive species because humans have eradicated their native predators. Similarly, natural biological changes like mutation can produce selectively favorable physiological or behavioral properties that provide the same advantages, thereby causing a low-density native species to reproduce and spread more effectively, potentially to the detriment of ecosystems containing it. Both natives and exotics can thus be noxious.

ECOLOGICAL IMPLICATIONS AND ETHICAL EVALUATION OF EXOTIC SPECIES

Despite this possibility, the more significant threat comes from exotic rather than rogue native species given that exotics escape negative ecological pressures more completely and with greater frequency than natives. Highly destructive and invasive species, such as the examples discussed above, are usually exotic rather than native. Even though only a small minority of exotics becomes invasive, the threat they pose to native species, agriculture, and industry is growing as humans become better vectors for exotics through increasing travel and trade (Vitousek et al. 1997). At any instant, for example, the zebra mussel is only one of approximately 3,000 to 7,000 species carried globally in ballast (Carlton 1999). As global trade increases, the number of exotics introduced through shipping increases, and one of the few reliable generalizations to emerge within invasion biology is that more exotics will become established and thus potentially invasive as the number of introductions increases (Lonsdale 1999). This significant and escalating threat justifies

an ethical imperative to prevent and reduce introductions of exotics. *Solenopsis* alone has been implicated in the extinction of several native species in the southeastern United States (Forys et al. 2001).

Ethical evaluation of exotics becomes more complicated once they have established self-sustaining populations in new areas and when it is reasonably clear that they will not become invasive. Even if reference state problems with the native-exotic distinction are ultimately resolvable, it is unclear that a simple preference for native over exotic species is ethically defensible (Sagoff 2003). In one of the founding texts of invasion biology, for example, Elton (1958) appealed to people's aesthetic appreciation and intellectual interest in an area's flora and fauna as one reason for excluding and eradicating exotics. But this rationale cuts both ways. The introduced mute swan and many exotic garden ornamentals, for example, are aesthetically pleasing for much of the U.S. populace, as well as interesting intellectual subjects for relevant research communities. Exotics, even invasives, can also benefit ecosystems to which they are introduced. For example, the substantial economic costs imposed by the zebra mussel clogging intake ports of boats, power plants, and infrastructure waterways are responsible for its label as a noxious pest. As a filter feeder, however, the zebra mussel has cleared much of the excess nutrients and algae caused by sewage and industrial pollution in the Great Lakes, to the benefit of many native invertebrates and fish (Strayer et al. 2004). Absent an unequivocal threat to native species or economic interests, the cultural opposition to exotic species may be nothing more than an indefensible prejudice (Chew and Laubichler 2003).

SEE ALSO *Biodiversity; Conservation Biology; Ecological Restoration; Extinction; Invasive Species; Species.*

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James Justus

EXTINCTION

Extinction is a concept that has many nuances and can vary with context. A species is *extinct* when no member of the species remains alive anywhere. If individuals of a species remain alive only in captivity, such as zoos, aquariums, botanical gardens, or other human-controlled environments, the species is said to be *extinct in the wild*. A species is *locally extinct* or *extirpated* when it is no longer found in an area it once inhabited but is still found elsewhere in the wild. Some conservation biologists speak of a species being *ecologically extinct* if it persists in such reduced numbers that its effects on the other species in its community are negligible—for example, when a predator species, such as cheetah, survives at such low densities that it does not significantly affect prey populations. A species is said to be *commercially extinct* if its numbers, once harvested for profit (bluefin tuna, for example) shrink so drastically that they cannot be profitably pursued. A species is considered to be *virtually extinct* when it is reduced to a few individuals that may be incapable of reproduction (e.g., all remaining birds of a species are male, or the last trees of a species are not producing seeds).

GEOLOGIC EXTINCTION EPISODES

Extinction is part of the natural process of species evolution. It is as much a part of the natural life cycle as speciation and has been occurring continually since life first began to diversify from simple organisms. It is not, however, an evenly paced phenomenon: Speciation and extinction may proceed gradually, in tandem, for millennia, but at various times there have been episodes of rapid, mass extinction that far outstrip the pace of species divergence. These past episodes of mass extinction were

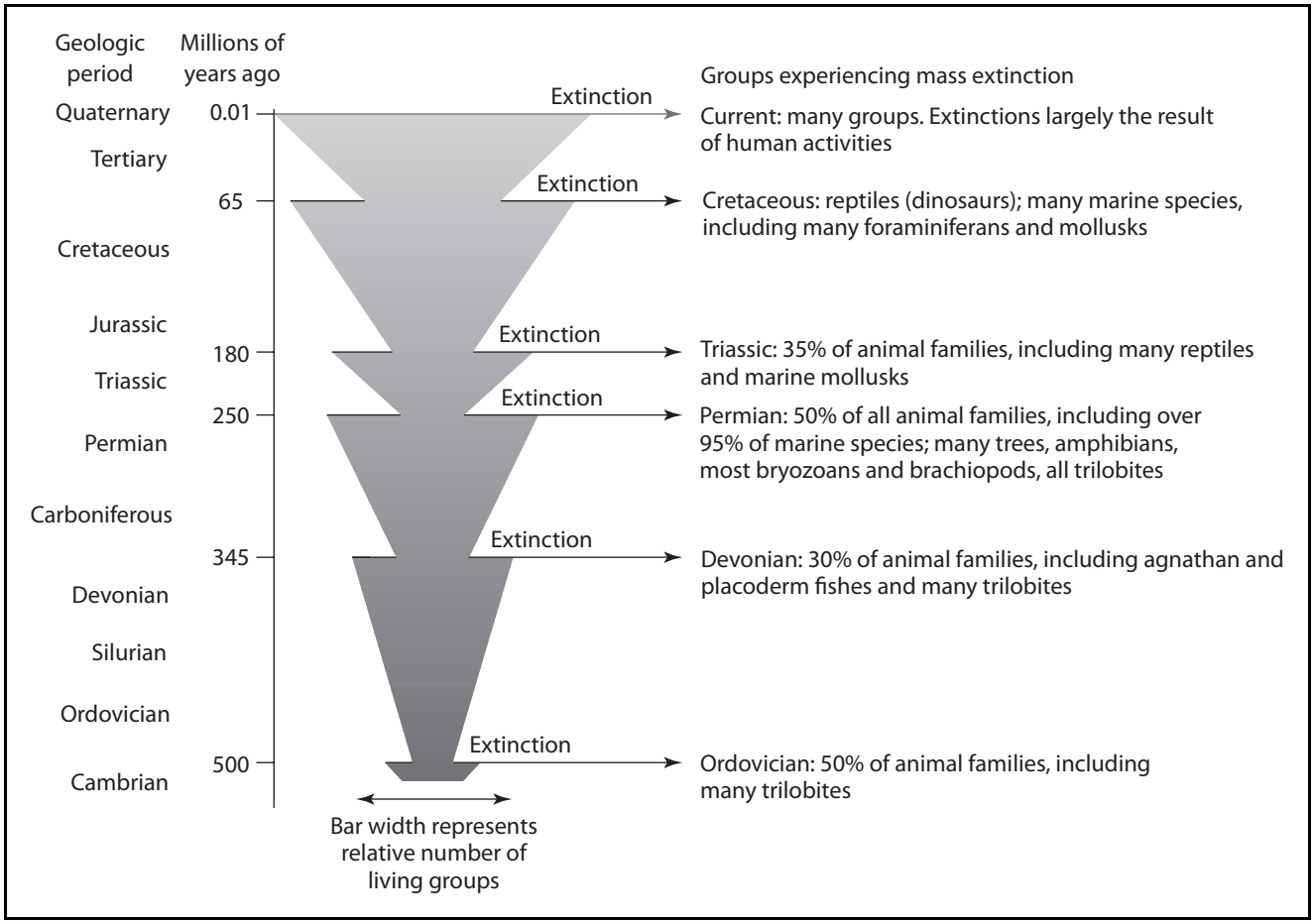

Figure 1. *Although the total number of species groups on Earth has increased over the eons, during each of five episodes of natural mass extinction (named at left), a large percentage of these groups disappeared. The most dramatic period of mass extinction occurred about 250 million years ago, at the end of the Permian period. A sixth extinction event began during the present geological period and will continue for decades to come.* **COURTESY OF SINAUER ASSOCIATES.**

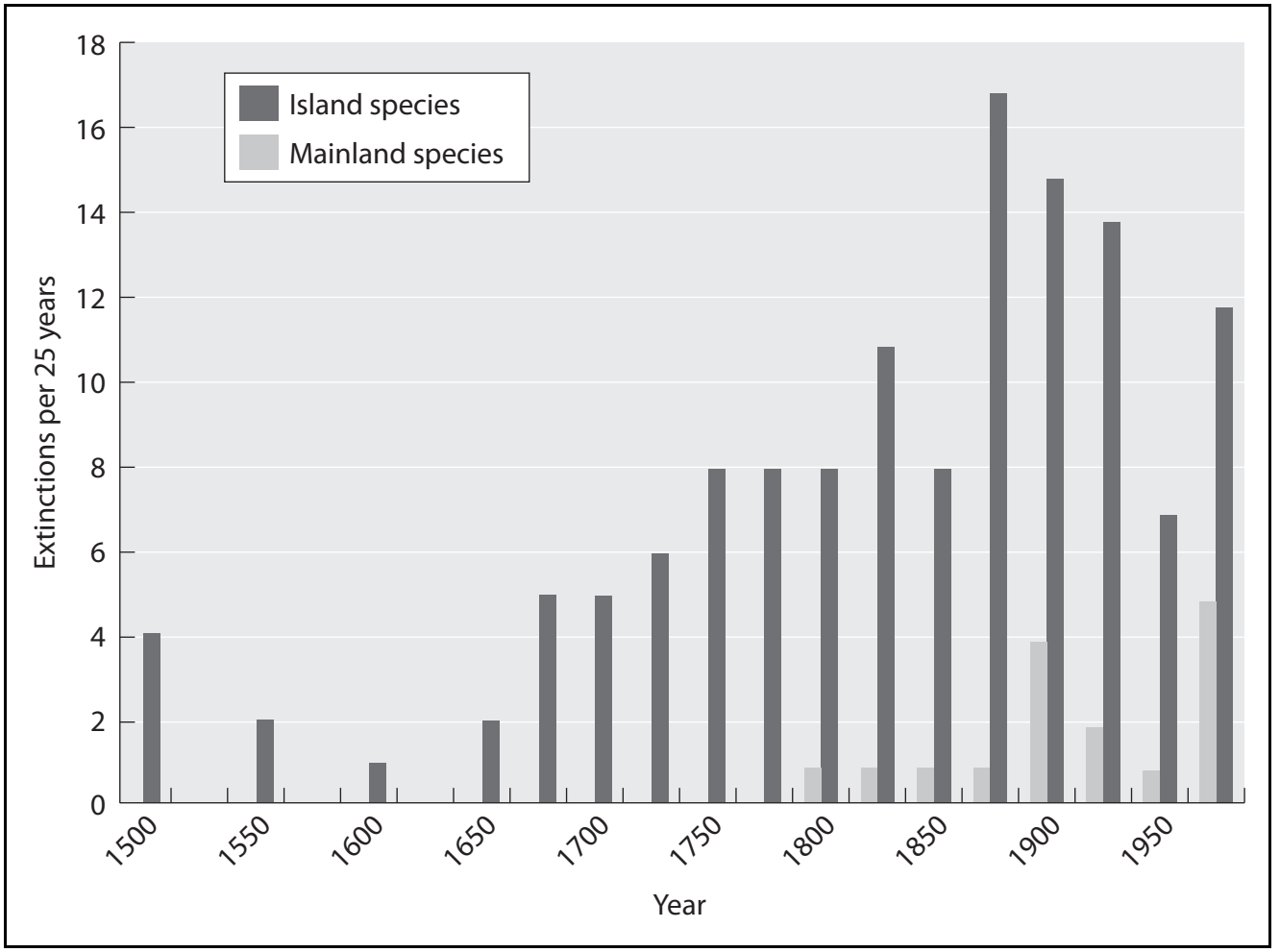

Figure 2. *Extinction rates have been increasing from 1650 to the present. Initial extinctions were on islands, but extinctions of mainland species have been increasing since 1800.* **COURTESY OF SINAUER ASSOCIATES.**

likely caused by asteroid impacts, volcanic eruptions, changes in the atmosphere, or other large-scale events. Most of the time, the pace of speciation exceeds the pace of extinction, leading to net growth in biological diversity. During episodes of large-scale extinction on regional or global levels, however, this growth in diversity does not prevail, and it may take tens of millions of years to recover the level of biological variety lost in a short episode of mass extinction.

Although at least five such extinctions have occurred since life began on earth (see Figure 1), individual extinctions also take place regularly as part of normal competition and evolution. One species may outcompete another or drive it to extinction through predation. A successful species may evolve into another in response to environmental changes or because of random changes in its gene pool. Changes in climate or local habitat may eliminate a key food source, resulting in extinction for a species that depends on that resource. All of these are factors that can and do contribute to the small-scale extinction that is always occurring against the background of evolution.

PREHISTORIC/HISTORIC EXTINCTION EPISODES

Since modern human beings evolved roughly 200,000 years ago, the global diversity of species has progressively declined, particularly during the last 30,000 years and most rapidly in the past 200 years. Human activity is largely responsible for these declines, because humans greatly altered terrestrial and aquatic environments during these time frames. The elimination of large mammals from Australia and the Americas coincided with human colonization of these continents, with 74–86 percent of the megafauna (mammals weighing more than 44 kilograms

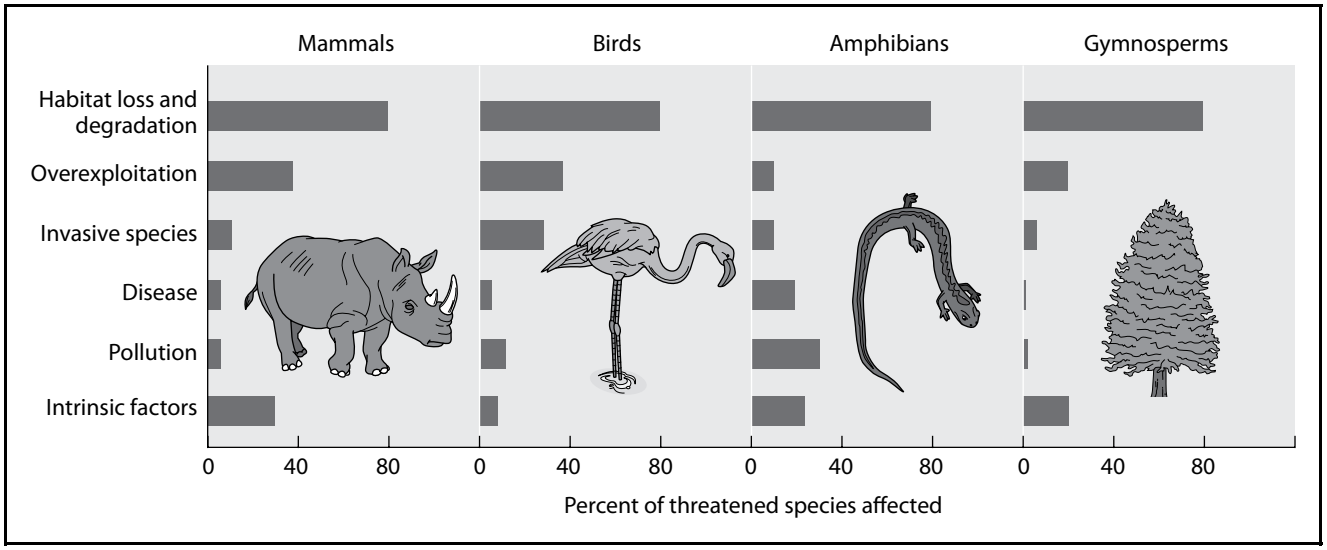

Figure 3. *Habitat loss and degradation is the greatest threat to the world's species, followed by overexploitation. Groups of species face different threats; birds are more threatened by invasive species, whereas amphibians are more affected by disease and pollution. Percentages add up to more than 100 percent because species often face multiple threats.* **COURTESY OF SINAUER ASSOCIATES.**

[100 pounds]) becoming extinct. On all continents paleontologists and archaeologists have found an extensive record of prehistoric human alteration and destruction of habitat that coincides with high rates of species extinctions.

In historic times approximately 206 mammals and birds have become extinct since the year 1600, representing 1.6 percent of known mammal species and 1.3 percent of known birds. It is important to realize that though these numbers seem small, the number of unknown species is vast, and the tally of extinctions among species not known to science is probably significant. More important, the majority of these extinctions took place during a very short period, from 1850 to 1950 (see Figure 2). This increase in the rate of extinction indicates the seriousness of the threat to biological diversity. The apparent decline in extinction rates since 1950 is due to the current practice of not declaring a species extinct until decades after it can no longer be found. Many species not yet listed as extinct—and some that have not yet been documented at all—have been decimated by human activities and persist only in very low numbers. The inability to locate any extant populations of many rare species provides further evidence that extinction rates are accelerating.

CAUSES OF EXTINCTION

There are two causes of extinction: natural and human-caused. The mass extinctions of the geologic past (i.e., those that took place up to about 30,000 years ago) were entirely natural in origin. The source of these extinctions ranged from volcanic activity, asteroid collisions, sea-level changes related to glaciation, chemical alterations of the oceans and atmosphere, and other such global natural phenomena. From approximately 30,000 years ago onward, however, human activities have gradually superseded natural phenomena as the prime movers of extinction. Massive ecological disturbances caused by people have altered, degraded, and destroyed the landscape on a vast scale, driving species and even whole biotic communities to the point of disappearance. Major human-triggered threats to biological diversity are habitat destruction, habitat fragmentation, habitat degradation (including pollution), global climate change, the overexploitation of species for human use, the invasion of exotic species, the increased spread of disease, and combinations of these factors (see Figure 3). These seven threats to biological diversity are all caused by the ever-increasing use of the world's natural resources by an expanding human population.

FUTURE EXTINCTION RATES

Extinction rates will remain high in the twenty-first century because of the large number of threatened species. About 12 percent of the world's remaining bird species are threatened with extinction. Mammal species are in even greater danger, with 22 percent of species under threat; 31 percent of amphibians are at risk. Certain animal groups face gloomier prospects than others, such as three orders that include turtles, manatees, and rhinos. Plant species are also at risk, with gymnosperms (conifers, ginkgos, and cycads) and palms among the especially vulnerable groups. Species on islands are

particularly vulnerable because they often have a limited area, small population sizes, high endemism (that is, they are found in only one location), and a small number of populations. Of all the animal and plant species known to have gone extinct since 1600, almost half were island species. Nevertheless, whereas past extinctions have occurred predominantly on islands, future extinctions will increasingly take place in continental areas as tropical forests and other ecosystems are cleared for human activities.

Predictions of extinction rates based on habitat loss vary considerably. Using the estimate that 1 percent of the world's rain forests are being destroyed each year, scientists have estimated that 0.2–0.3 percent of all species—roughly 10,000–15,000 species, based on a total of 5 million species worldwide—will be lost per year, or thirty-four species per day. The most recent estimates are that species extinctions for the fifty-year period ending with 2050 will be up to 35 percent in tropical Africa, 20 percent in tropical Asia, 15 percent in tropical America, and 8 to 10 percent elsewhere. Extinction rates might in fact be higher because the highest rates of deforestation are occurring in countries with large concentrations of rare species, and large forest areas are increasingly being fragmented by roads and development projects. Regardless of which estimate is the most accurate, all indicate that tens of thousands—perhaps even hundreds of thousands—of species are headed for extinction within the next fifty years. Such a rate of extinction is without precedent since the great mass extinction of the Cretaceous period 65 million years ago.

GLOBAL CLIMATE CHANGE AND EXTINCTION

Global climate change has recently emerged as a new threat with the potential to radically restructure biological communities and change the ranges of many species. The pace of this change could overwhelm the natural dispersal abilities of species and drive them to extinction. There is mounting evidence that species are already responding to warming temperatures, with changes in the distribution of bird, insect, and plant species; reproduction is occurring earlier in the spring. Warming conditions in the ocean are affecting the distribution of species in coastal waters, particularly in coral reefs. The implications of global climate change are far-reaching: Higher temperatures and changing precipitation patterns could lead to crop failures and tree death over large areas, with enormous social, economic, ecological, and political costs. Global climate change will also have an enormous impact on human populations in coastal areas that could be flooded by rising sea levels and in areas that experience large changes in temperature and rainfall. It is likely that, as the climate changes, many existing protected areas will no longer preserve the rare and endangered species that live there, so the extinction rate among these species will likely skyrocket in the absence of countermeasures.

LOCAL EXTINCTIONS

In addition to global extinctions, many species are experiencing a series of local extinctions across their ranges. Formerly widespread species are sometimes restricted to a few small pockets of their former habitats. For example, the American burying beetle (*Nicrophorus americanus*), once found all across central and eastern North America, is now found in only four isolated populations. Biological communities are impoverished by such local extinctions. Similar local extinctions were shown by a survey of one part of the Indonesian island of Sumatra; of twelve populations of Asian elephants known from the 1980s, only three remained there twenty years later. Large numbers of local extinctions are important biological warning signs that something is wrong with the environment. Action is needed to prevent further local and global extinctions. The loss of local populations not only represents a loss of biological diversity, but it also diminishes the value of an area for nature enjoyment, scientific research, and the provision of crucial materials to local people in subsistence economies.

CONCLUSIONS AND STRATEGIES

Conservation biology is the academic field that has developed in the past twenty-five years to deal with this developing extinction crisis. Conservation biologists believe study should be coupled to action. The most important strategy for preventing extinction is to establish protected areas where species can exist without interference from human activity. These protected areas often have to be managed to achieve their goals. Species can also be maintained outside of protected areas if there are compromises that reconcile the needs of human societies with the needs of species. Where such compromises cannot be achieved, species may have to be moved to a different place in the wild where threats to their existence are minimized, or they may have to be preserved in captivity. Most conservation biologists believe that because humans are now responsible for almost all extinctions, humans can and must assume the responsibility for preventing, or at least reducing the rate of, the further disappearance of species.

SEE ALSO *Biodiversity; Conservation Biology; Endangered Species Act; Evolution; Forests; Global Climate Change; Habitat Loss; Species.*

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FACTORY FARMS

Confinement animal agriculture—also known as industrialized agriculture, intensive agriculture, factory farming (an appellation disfavored by the industry), and confined animal-feeding operations—is a creature of the second half of the twentieth century. Before that time, agriculture was extensive and pastoral, with animals housed primarily under open, pastoral conditions. The industrialization of animal agriculture was a major break from the agricultural systems that had existed since the earliest domestication of animals. It is thus fair to state that most animal agriculture changed more during the second half of the twentieth century than it did during the preceding millennia.

The key to the success in traditional agriculture was good husbandry of animals. (The term *husbandry* is supposedly derived from the Old Norse phrase "hus-bond": bonded to one's household.) Husbandry meant placing animals into the environment best meeting their biological and psychological needs and natures, and then augmenting their natural abilities to survive and thrive by providing food during famine, water during drought, help in birthing, medical attention, protection from predation, and so on. Since the producer did well if and only if the animals did well, good husbandry was driven by the most effective human concern: self-interest. Husbandry thus embodied an ancient contract between humans and animals, and both parties fared better by virtue of the contract than they would have done outside of it.

The most powerful articulation of the ethic of husbandry may be found in Psalm 23: "The Lord is my shepherd: I shall not want. He maketh me to lie down in green pastures. He leadeth me beside the still waters. He restoreth my soul." Thus, when the psalmist seeks a metaphor for God's ideal relation to humans, he can do no better than the shepherd's relation to his sheep. As we know from the Bible, a lamb on its own would not long survive predation by hyenas, wild dogs, lions, eagles, and other predators; with the aid of a shepherd it lives well. Animals benefit from the ministrations of the shepherd; humans benefit from the animals' products and sometimes their lives, but while they live, they live well.

In the mid-twentieth century, husbandry's care for animals as the basic value for animal agriculture was replaced by industrial values of efficiency and productivity. This was the result of a confluence of many factors. First, the U.S. public had lived through the Great Depression and the Dust Bowl, and for the first time in American history, the specter of insufficient food, unaffordable food, and starvation loomed as viable possibilities. Second, agriculture had to support larger populations with fewer workers. Many people who had worked in agriculture sought better jobs and security from the vagaries of nature by moving to cities. And the two world wars exposed young soldiers to more exciting venues than rural America. As one song after World War I put it, "How you gonna keep 'em down on the farm now that they've seen Paree?" Moreover, as cities grew, urban encroachment on agricultural land became a factor to be reckoned with. A sharp rise in population meant more mouths to feed. Third, the success of industrialization reinforced the belief that it was a template for success in all areas.

The convergence of all of these mutually reinforcing vectors probably made the industrialization of agriculture inevitable. In a telling, emblematic move, academic departments of animal husbandry changed their names to

departments of animal science, defined as the "application of industrial methods to the production of animals."

Initially, industrialized animal agriculture delivered on its promises. Productivity increased dramatically, and this increase in productivity drove the price of animal foods down to the lowest point in history relative to income. Those areas of animal agriculture that changed most dramatically were poultry, eggs, pork, and dairy. The beef industry changed over to concentrated animal-feeding units, feedlots, as the place where cattle were "finished" with grain. (Cheap and plentiful grain came from a parallel industrialization of crop agriculture.)

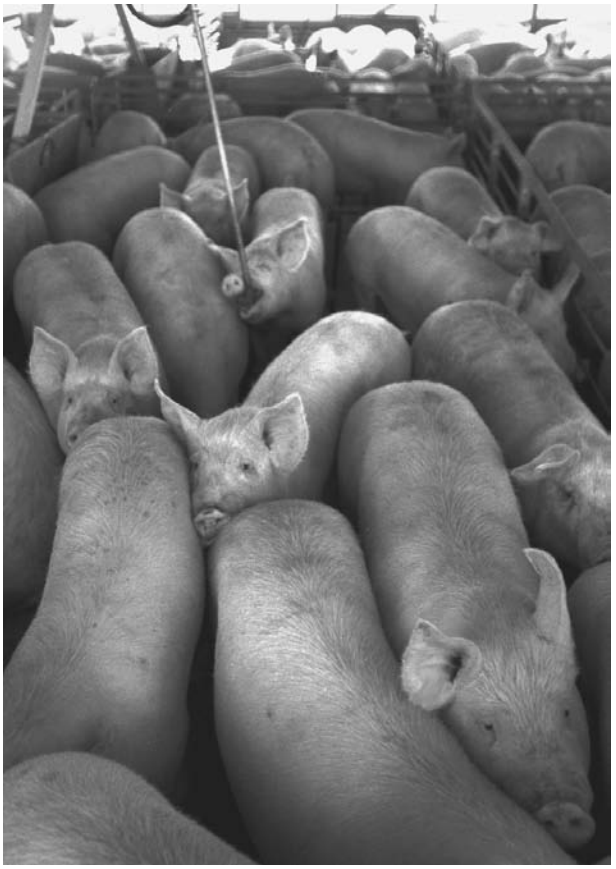
The key to the industrialization of animal agriculture was the concentration of large numbers of animals in small spaces, usually (except for cattle feedlots) indoors. Capital replaced labor, and "animal-smart" people schooled in the husbandry of the type of animal in question were replaced by untrained minimum-wage workers, with "the intelligence being in the system," as one manager put it to this author.

Initial optimism about confinement agriculture then chilled, to the point that the consequences of such an agriculture were viewed as highly problematic in many dimensions, first in Europe and, from the 1990s, in the United States as well. Agriculture became dominated by large vertically integrated multinational corporate entities, and this led to the extinction of small independent producers. This circumstance is dramatically illustrated in the pork industry, in which, in the four decades from the 1960s, the vast majority of small swine producers went out of business (by 2002 there were 87.8 percent fewer swine farms than in 1980), and five companies produced some 90 percent of the pork raised. Small rural communities that thrived when small producers dominated became ghost towns. Since husbandry people were largely unwilling to work in the animal factories, factory farms drew their workers from unskilled, sometimes illegal-immigrant labor paid the minimum wage, and such laborers often experienced a clash of cultures with local people.

Traditional agriculture was sustainable by its own internal logic. Animals consumed pasture, and their wastes nourished the soil. If the farmer exceeded the carrying capacity of the land, the animals would starve, and forage would be destroyed. The result was a balanced ecology, with production limited by available resources and few additional required inputs. In other words, domestic animals became part of the ecosystem in a largely benign manner, as still occurs in properly managed Western U.S. cattle ranching.

In contrast, confinement agriculture requires major inputs of energy, fossil fuel, and water, to increase productivity beyond the inherent carrying capacity of an area. The animals in confinement are fed not on forage, but on grains produced in giant monocultures highly dependent on chemical fertilizers and pesticides, which cause ecosystemic problems of erosion, aquifer contamination, and degradation of soil quality. The manure produced by confined animals (a pig, for example, produces ten times as much waste as a human) leads to problems of waste disposal and eutrophication of waterways by nitrogen leaching into water. The presence of thousands of animals in relatively small confined areas produces air-quality problems as well, which in turn affect the quality of life of persons in the area and the respiratory health of workers and citizens.

The use of technological tools to force animals into environmental conditions they could not survive in without technology, to force square pegs into round holes as it were, creates major problems as well. If farmers had attempted to raise 100,000 chickens in one building 100 years ago, all



Factory Farm outside Milford, Utah. *Hogs at Circle Four Farms in Utah crowd together in indoor pens, ready for slaughter. The industrialization of animal agriculture has led to the existence of factory farms, with the goals of increased efficiency and productivity. However, critics of the practice argue that animal productivity does not equate to animal welfare.*
AP IMAGES.

would have died of disease spread in three weeks. At the beginning of the twenty-first century, these diseases can be controlled with antibiotics and vaccines. Yet it is now clear that such use of antibiotics endangers human health by selecting for antibiotic-resistant pathogens.

Forcing animal square pegs into environmental round holes leads to the most egregious moral problem of confinement agriculture: animal welfare. Because animals are biologically evolved for extensive living conditions, confinement systems create welfare problems. Sows weighing up to 600 pounds, for example, are confined in 2 feet by 3 feet by 7 feet "gestation crates" (and farrowing crates when they give birth) for their entire productive life, unable to move or even turn. Laying hens are kept in tiny cages, with very little space. Dairy cows never see pasture. Broiler chickens are kept in groups of thousands on restricted floor space. In addition, production diseases—diseases that would not be a problem except for the method of production—proliferate, for example, liver abscesses in feedlot cattle fed an unnatural high-calorie, low-roughage diet. Workers are no longer animal-smart. The animal's basic biological and psychological needs and natures are no longer met.

The founders of confinement agriculture made one fatal conceptual error regarding animal welfare. They assumed that animals' welfare was assured if the animals were productive, which was by and large true under the conditions of extensive husbandry. But they illegitimately assumed that productivity under industrial conditions still guaranteed welfare, which is not true, because of the use of the "technological sanders" mentioned earlier (antibiotics, vaccines, air-changing systems). These animals may produce economically, yet they are not well off, as measured by a variety of parameters, including behavioral anomalies and preference tests asking the animals what they prefer.

In Europe, many of the most severe systems have been legally banned. In the United States, a consumer and citizen revolution began in the first decade of the twenty-first century to create a more animal- and environment-friendly animal agriculture. Niche producers raising animals under more natural conditions have proliferated, as have restaurants and grocery stores specializing in such products. Citizen-initiated referenda banning confinement have begun to appear, and public concern was recognized by Smithfield, the world's largest pork producer, when the company announced early in 2007 that it would phase out sow stalls.

For all the reasons detailed above, one can affirm that unrestricted industrial agriculture in its current form represents a failed experiment. While it is unlikely that totally extensive agriculture can be fully restored, it is likely that a new agriculture—blending considerations of sustainability, animal welfare, human and animal health, and social concern for workers and rural communities—will emerge in the future.

SEE ALSO *Agricultural Ethics; Agriculture; Animal Ethics; Farms; Food; Shiva, Vandana.*

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Bernard Rollin

FARMS

During the last ten thousand years, farms have been the primary, most practical, and most intimate site of human engagement with the earth. In most cultures one could expect, even among nonfarmers, a common understanding that life (in the forms of food and fiber) and livelihood (in various forms of work) depended on the health and vitality of an agricultural landscape and economy. Dominant cultural forms in politics, education, art, business, and religion reflected, however indirectly or inadequately, a farm sensibility. Indeed, the term *culture*, in its early Middle English usage, originally referred to a cultivated piece of land (and presumably the skills and values necessary to care for it). It is only in the last hundred years or so, as mass urbanization swept across the globe, that most people have forgotten how fundamental agriculture really is.

The roots of any sustainable culture must finally make their way into a field (*ager*) and into rich, healthy organic soil. This is because the soil is the matrix through which life, death, and regeneration continually circulate. Without soil and the billions of microorganisms in it doing their work of decomposing and recomposing, Earth would be overwhelmed by death and incapable of producing more life. When people destroy or compromise the soil base (through soil erosion or salination or nutrient depletion), as they did long ago in the Fertile Crescent and Meso-America, they precipitate cultural collapse. One cannot have healthy plants, animals, and people while degrading the soil upon which all depend. As Albert Howard, the modern father of organic farming, understood, we must treat the health of soils, plants, animals, and humanity as "one great subject" (1947, p. 11).

Environmental movements, particularly as they have developed in the North American context (where the mountains and forests of Yellowstone, the Adirondacks, and Yosemite were the focal points of America's earliest conservation efforts), tend to reflect an urban-versus-wilderness perspective. For many environmentalists of the early twenty-first century, the preservation of wilderness areas and the protection of plant and animal species is the dominant concern. National parks and wilderness preserves are precisely the regions where farming is not permitted. Not surprisingly, farmers and ranchers who clear and cultivate land or pasture their livestock in environmentally sensitive regions have been viewed with suspicion by urban environmentalists. Farmers and environmentalists are rarely the best of friends.

This antagonism is unfortunate, because a focus on wilderness can become an excuse to ignore our need to preserve and maintain our vast agricultural lands, or to forget that farmers can be vital allies in the conservation and protection of our wetlands, forests, and fields. As Aldo Leopold, one of the earliest and most influential American conservationists, argued in "The Farmer as Conservationist" (1939), conservation cannot be merely a "negative exercise of abstinence or caution," but must instead be a "positive exercise of skill and insight" (1999, p. 164). In this recommendation he had farmers principally in mind, because they are the ones in the best position to acquire and pass on the skills and insights needed to care properly for the land. Moreover, good, healthy farms add to the aesthetic quality of many of our landscapes (not a small consideration when we remember the emotional satisfaction that comes with being in a well-maintained rural setting). Governments and their agencies are simply unable to own and work small pieces of land and make them good and beautiful.

A farm perspective is crucial in conservation efforts, because it is through the farmer's sustained attention and commitment to a farm that we begin to understand what appropriate human settlement looks like. Henry David Thoreau (1817–1862) once described the dominant human pattern of relating to land as robbery. Pioneers came to a place and took (often by force) what they wanted or felt they needed, and then moved on to virgin territory, where the rape and exploitation commenced again. This is not settlement in any commendable sense.

The history of agriculture shows over and over again how easy it is to fail at being a good farmer. In the United States, for instance, nineteenth-century farmers had to move west, because the fields and forests of the eastern seaboard were so thoroughly abused and depleted. Not enough attention was applied to what the land can sustainably provide. A careful farmer asks, What does this particular piece of land—because of its specific contour, soil makeup, native vegetation, and climatic conditions—recommend be grown, and can it be grown without unduly damaging the shared biome? How can farming methods improve rather than degrade the soil base? Will this farm practice entail the wholesale displacement of animal species? Will this farming technique or decision ensure that farmers will be able to work this same land for generations to come? These sorts of questions invariably require us to see the land not as a *resource* that we can extract, but as a *source* of life that we must nurture and protect.

A Vast Cornfield in Nebraska. *Farmers have the unique obligation of making many choices relating to environmental ethics. "Good farming" keeps the health of local lands and waterways intact, and is concerned about the well-being of its livestock.* CHERYL A. MEYER, 2008. USED UNDER LICENSE FROM SHUTTERSTOCK.COM.

Farms are not simply food factories producing sellable commodities. They are places where plants, domestic and wild animals, and people must live together harmoniously. When pressures that encourage the abuse of land predominate, as they invariably do in modern extractive economies that reward volume with profit, Leopold advised that urbanites should pay farmers to leave grain or fencerows or marshes or woodlots for wildlife. When farmers conserve soil by resisting the temptation to mine it for all it is worth, they should be financially compensated. His point is that urbanites and farmers need to find ways to work together to achieve healthy lands and communities.

Good farming, in contrast to ecologically destructive forms of industrial farming and agribusiness, has always kept as its primary concern the health of lands and waterways and the contentment of animal livestock. Farmers understand that we draw our life from the land because of the inescapable fact that to live is to eat. To abuse the land and its animals—as we do when we lace our soils with artificial fertilizers and pesticides, or

pollute and drain our waterways and aquifers, or confine hordes of animals in crates or their own muck—is to abuse human health and invite economic and cultural collapse. It is also to eat bad food, food that is not the most nutritional and tasty. In other words, however we design our food and fiber economies, they must be sympathetically attuned to nature's economy if we are to survive for long. Farms are the ideal place for us to learn this art of attunement.

Industrial cultures have long assumed that they can ignore or override the limits and potential of the land. Caught in the grip of widespread ecological amnesia, people are becoming more and more convinced they can thrive without paying attention to or honoring the biological limits and potentials that exist in every place. Our current industrial food system reflects this tendency in food products that contain more artificial flavors and preservatives than do whole foods, foods that everyone would recognize as having come from the soil. Our survival is necessarily tied to eating off the land, which means that we need to exercise sustained care for all the natural sources and places that literally feed our bodies and communities.

Farming can be a vital source for philosophical and ethical reflection, because it is grounded in an intimate and practical connection between humans and the land. As Wendell Berry, the leading agrarian of our time, put it in *The Unsettling of America* (1977), "No matter how urban our life, our bodies live by farming; we come from the earth and return to it, and so we live in agriculture as we live in flesh" (p. 97). We are not tourists or spectators on this earth, nor are we simply consumers who purchase resources, much like shoppers who pick commodities off a store shelf. As Berry advises, there is no greater myth than the idea that "money brings forth food."

To live at all, we must draw our nourishment from the gifts of the land. To live well, and in a manner that ensures the health and beauty of our shared habitats, requires attention, patience, and the insight and accumulated wisdom of generations of people who have worked with the land. The history of farming and the lessons of farm life simply must play a central role in the preservation and restoration of our diverse landscapes.

The agrarian point is not that all people must be farmers (though urban farming and community gardening are trends that should be encouraged). Growing populations of people, as well as a shrinking aptitude for farm work, make such a prospect untenable and unlikely. The more urgent priority is that all people, no matter how urban or suburban their lives have become, adopt farm priorities that see as their foremost, nonnegotiable concern the health of productive lands. Urban dwellers must make the political, economic, and moral choices that will encourage good farming practices and preserve valuable farmland. If we fail in this task, we invite cultural ruin. More immediately, we deprive ourselves of nutritious, tasty food.

SEE ALSO *Agricultural Ethics; Agriculture; Animal Ethics; Berry, Wendell; Factory Farms; Food; Leopold, Aldo; Shiva, Vandana; Soils; Sustainable Agriculture; Thoreau, Henry David; Urban Environments.*

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Norman Wirzba

FIRE

A natural process that has aided the evolution of all types of ecosystems over the millennia, fire occurs across the world wherever climate allows for the accumulation of herbaceous or woody plant material and at least occasional drying of that material. Fire can open up space for plants to regenerate; return nutrients in dead plant tissue to the ground; and aid germination by triggering seed release, resprouting, and flowering. In some ecosystems, fire is essential to the maintenance of species composition, plant density, structure, and regeneration. Ecosystems that have evolved with fire often have greater animal and plant diversity when they periodically burn.

The most common nonhuman cause of fire is lightning, but other causes include lava and ash from volcanoes, and spontaneous combustion triggered by heat generated from decomposition. Some climates produce

significant amounts of dry lightning (cloud-to-ground lightning without significant rainfall). This is the most common form of lightning to cause fires. Once a fire is kindled in the landscape, the extent and intensity of the fire is related to fuel, topography, wind speed and direction, and relative humidity. These conditions work together to affect the amount of area burned. Before modern fire suppression became possible, it was not uncommon for fires to burn hundreds of thousands of acres before encountering an obstacle or weather conditions that would extinguish them. Because these variables change across the landscape, it is not uncommon to find areas that entirely escape the effects of fire, but that are surrounded by burned areas—a pattern that results in a mosaic of habitat conditions.

Homo erectus has been documented to have used fire as far back as 400,000 years before the present. Evidence suggests that since that time humans and related species have been intentionally or accidentally responsible for increasing the frequency of fires in the ecosystems in which they existed. Native American cultures have been documented to have used landscape-scale fires for at least seventy different reasons, including driving game, attracting game, warfare, insect control, and reducing the severity and risk of unplanned fire.

While humans have caused an increase in fire frequency throughout much of our species' existence, from the twentieth century humans have been directly and indirectly responsible for reducing fire frequency. Increased habitat fragmentation by roads and other development has reduced fire spread and the overall effect of fire on the landscape. After a series of catastrophic wildfires in the United States in 1910, low-intensity prescribed fire for agricultural or silvicultural (forestry) purposes fell out of favor. This was a significant shift for many rural communities where fire had been a part of land management and agricultural practices for centuries.

Fire Prevention Mascot, Smokey the Bear. *Smokey the Bear emerged from Americans' sense of fire as hostile and dangerous after its use in World War II. The U.S. Forest Service's mascot serves as a recognizable face of fire prevention, urging personal responsibility in caring for forests and the animals that inhabit them.* **AP IMAGES.**

SMOKEY THE BEAR

Probably the best-known fire suppression campaign comes from the U.S. Forest Service and its mascot Smokey the Bear. In an effort to reduce accidental human-induced fires in the landscape, this cartoon character urged personal responsibility with the phrase, "Only you can prevent forest fires." These public-service announcements depicted wildfires as destroying forests and the animals that live in them. Stephen Pyne wrote that after Americans witnessed the use of fire as a weapon in World War II, all fire came to be seen as hostile and undesired. Smokey the Bear

> emerged directly out of the wartime emergency; almost on cue, too, Disney Studios releases *Bambi*, in which the same villains who kill Bambi's mother also unleash a terrifying fire that threatens Bambi and his father, a powerful antifire message to young children. Before the war, most Americans, certainly most rural Americans, at least tolerated fire as an instrument of land use; after it, as fire imagery became more horrific and as the rural population drained away to cities and suburbs, Americans distrusted fire. (1995, pp. 198–199)

From 1910 through most of the 1960s, U.S. fire policy called for extinguishing nearly every fire that started as soon as possible. The cost of this policy, both in terms of economic expenditures and the lives of firefighters, grew as fuel loads increased, particularly in areas where fires were historically common. By the 1960s managers and legislators were questioning the goal of full fire suppression, and with the passage of the Wilderness Act in 1964, the National Park Service began to allow lightning-caused or accidental fires to burn through designated wilderness areas of parks. By 1970 the U.S. Park Service specifically changed from a policy of fire

Aftermath of the Yellowstone Fires. *Ten years after the 1988 fires at Yellowstone National Park, the destruction can still be observed. Fortunately, the area is being recolonized quite rapidly by plants and trees, such as these lodgepole pines, near Firehole.* **NPS PHOTO BY JIM PEACO.**

suppression to one of allowing naturally caused fires to burn within the boundaries of national parks. By the mid-1970s the Forest Service had followed suit.

THE YELLOWSTONE FIRES

The most dramatic fires to have hit American television screens and consciousness occurred in 1988 at Yellowstone National Park. From 1865 to 1964 Yellowstone had an extensive program of fire suppression, which resulted in a significant decrease in fires in the park. In 1972 Yellowstone began both to set fires and to allow accidental fires to burn within the park. Through the summer of 1987, this policy resulted in low-intensity burns that affected small portions of the park. In 1988 weather conditions were such that when fires were allowed to burn, they became much larger conflagrations than had previously been experienced since the park had become government property in 1865. Over 36 percent of the park and 245,000 hectares of the greater Yellowstone region burned. At the time of the fires (which continued over three months), there was significant media attention directed to the perceived "destruction" of the Yellowstone ecosystem. Studies since this occurrence, however, have revealed that the ecosystem was able to regenerate from these fires, and in fact some species benefited significantly from them. While immediately following the fire many areas appeared devastated, they were rapidly recolonized, initially by native herbaceous plants and later native trees such as lodgepole pines (*Pinus contorta*, var *latifolia*) and aspen (*Populus tremuloides*). The resurgence of aspen was particularly interesting, as this species, believed to be a holdover from the Pleistocene Epoch, reproduced exclusively from clonal root sprouts. Throughout the park researchers found germination of aspen seeds, beginning immediately after the fire. Native animal species also weathered the fire. While individual animals were undoubtedly killed by the fires, populations of most species had rebounded to prefire levels by 1995.

THE URBAN-WILDLAND INTERFACE

Increasingly, there are many communities and livelihoods centered within or along the urban-wildland interface. In

these areas, homes are often situated within fire-prone ecosystems and are at a significant risk of damage from fires. Much like areas prone to flooding, the often infrequent occurrence of wildfires promotes a feeling of safety and a belief that fires are out of the ordinary, especially when fire frequency goes beyond twenty-year cycles. The location of homes and communities within ecosystems prone to fire has renewed efforts at fire suppression on public land, particularly when it occurs in areas where there is valuable private property at risk.

ETHICAL ISSUES

There are a wide range of ethical issues surrounding wildfires and prescribed fires. For those who feel that human involvement with wilderness areas is unnatural, suppressing lightning-caused fires and setting prescribed fires are seen as attempts to domesticate the wilderness and control wild nature. Increasingly, however, it seems unavoidable that human decisions will affect these areas in some way. The fragmentation of habitats and the suppression of fires throughout much of the United States reduces fire frequency in wilderness areas. Lightning within those relatively small wilderness areas will not be enough to maintain a fire frequency similar to that of historical conditions. Focusing only on lightning-caused fires also ignores the prevalent use of fire as a landscape-shaping tool by cultures around the world over the last 10,000 to 400,000 years, a period during which many systems were shaped by those fires and have come to depend on them. Human-initiated prescribed fires may restore fire frequency, but are often set under conditions when these fires can best be controlled. Such conditions are not likely to be similar to historical conditions when lightning might have begun such fires.

In many ways the ethical concerns surrounding fire come down to the most basic question in environmental ethics: To what extent are human actions natural or justified in the environment? On the one hand, to the extent that humans are perceived as interlopers in nature, there are few fire regimes that can be considered natural. If, on the other hand, humans and their actions, or at least a subset of them, can be considered natural, then the challenge is to identify the level of interaction that will result in desired results stemming from a specific set of philosophical assumptions. In any case, fire is neither good nor bad, but is instead a complex occurrence that must be evaluated on a case-by-case basis.

Anthropocentric value systems will focus on the needs and desires of humans. Under such a value system, fire or fire suppression should be used primarily to protect humans and their property rights, but could also extend to humans' desires to have access to healthy ecosystems for recreation, wildlife habitat, and the production of ecosystem services. Zoocentric and biocentric ethical systems will focus on the effects of fire on individual animals, plants, and their habitats, but can reach conflicting results in cases where, in any one area, both fire and fire suppression will kill some individuals and promote others. Ecocentric ethics will focus on the role of fire in promoting healthy ecosystems and stable biotic communities, but this goal is invested with other challenges. Differences in fire frequency, fire intensity, and fire season can result in changes in community composition and ecosystem functions, and many alternatives can be considered healthy. Selecting the most appropriate way to use or suppress fire in the landscape remains a subjective value judgment that cannot be reduced to objectively verifiable criteria. It is this complexity that makes fire worth studying scientifically, politically, and philosophically.

SEE ALSO *Ecology: III. Ecosystems; Environmental Philosophy: V. Contemporary Philosophy; Environmental Policy; Forests; Habitat Loss; Native Americans; U.S. Forest Service; U.S. National Park Service.*

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FISH FARMING

Aquaculture is the cultivation of aquatic populations of freshwater and saltwater organisms (e.g., fish, shrimp, bivalves) under controlled conditions. Aquaculture accounts for more

than 30 percent of all fish consumed by humans (U.N. Food and Agriculture Organization 2003). During the second half of the twentieth century, the Green Revolution promoted the practice of intensively managed monocultures, or the practice of producing a single species over a wide area in controlled environments. In the 1960s monocultures covering vast areas of land and coastal ecosystems began to prevail also in large-scale forestry and aquaculture. Monocultures usually involve introducing and growing an alien species at the expense of native flora and fauna. Consequently, monocultures have been identified as a major driver of biodiversity losses (Primack et al. 2001).

Defenders of monoculture argue that these intensive farming practices are necessary for providing food for a growing human population, at a time when only a small proportion (approximately 15%) of the remaining land on the planet is available for agriculture and when fishery stocks have declined dramatically (Millennium Ecosystem Assessment 2005). In the early 1980s, aquaculture was presented as the coming Blue Revolution that would alleviate world hunger, provide jobs, and fight poverty (Primavera 2005). Yet ecologists and other scholars began to question the effectiveness of some widespread large-scale monoculture practices that had negative environmental, social, or economic impacts.

The explosive expansion of salmon and shrimp farming since the late 1980s has created an intensive debate on associated issues of environmental and social justice, scientific-technological and indigenous ecological knowledge, ecosystems and human health, and biotechnology and animal rights (Rozzi 2003). Contrasting large-scale industrial aquaculture with small-scale sustainable practices in Asia, the Philippine ecologist Jurgenne Primavera since the 1980s has led tireless efforts to replace unsustainable aquaculture practices with sustainable ones. Primavera (2005) has pointed out that fish farming has boomed during the last three decades, and that although farmed fish are produced mainly in developing countries, most of the production is exported for markets in industrialized nations.

Shrimp and salmon are not only the most controversial aquatic monocultures but also among the most lucrative and widely traded aquaculture products (Naylor et al. 1998, U.N. Food and Agriculture Organization 2003). Shrimp are widely farmed in tropical coastal areas of Asia and Latin America, while salmon are raised in temperate and higher-latitude coastal and inland waters of the Northern and Southern Hemispheres.

THE ECOLOGICAL AND SOCIAL CONSEQUENCES OF SALMON FARMING

It is commonly assumed that aquaculture relieves pressure on wild fisheries and adds to the world's food supply. This assumption is generally valid for herbivorous species, but not for carnivorous fish such as salmon (Beveridge et al. 1997). Farmed salmon spend their first year in freshwater ponds, and then for another one to two years of growth, they are transferred to floating cages anchored in coastal bays, where they are fed nutrient-rich diets containing large amounts of fishmeal and fish oil extracted from caught wild fish. Paradoxically, the required input of wild-fish products is up to four times the volume of salmon-fish output. This imbalance exerts pressure on native fish consumed by humans and on trophic chains in marine ecosystems. Therefore, salmon aquaculture depletes rather than augments fisheries resources (Naylor et al. 1998).

Because salmon depend on a diet that is 45 percent fishmeal and 25 percent fish oil, European salmon farming requires stocks of wild fish imported from South America. Initiated in Norway in the 1960s, salmon farming rapidly expanded toward equivalent high-latitude environments in southern Chile in the 1980s. Chile's southern regions offer ideal water temperatures and salinity conditions in sheltered fjords and in channels of the subantarctic Magellan Archipelagoes, one of the most pristine ecoregions of the world (Bjorndal and Aarland 1999, Robles Gil 2002). The aesthetic of these austral landscapes is transformed by the presence of salmon cages along the coast, and marine biodiversity is affected by voracious feral salmon that escape from the cages. In addition, local fishermen are losing access to use rights of coastal areas because concessions of bays are given to the salmon-farming industry.

Salmon farming uses a dilution approach to water pollution. Salmon cages allow feces and uneaten feed to flow directly into coastal waters, which results in substantial discharges of nutrients. The Nordic salmon-farming industry discharges quantities of nitrogen and phosphorous equivalent to the amounts in untreated sewage from populations of 3.9 million and 1.7 million people, respectively (Folke et al. 1994). High stocking densities of caged salmon have facilitated outbreaks of diseases and parasites, which require the use of antibiotics and pesticides that spread chemicals into coastal waters. High concentrations of salmon in cages also raise questions about animal treatment. The living conditions of farmed fish are even worse than those of industrially raised poultry and mammals (Rozzi 2003). Stress hormones and chemicals can build up in the meat of farmed fish, and these may have health effects on people. For human-health, ecological, and ethical reasons, free-living salmon represent a better option. A healthier alternative is provided by Irish organic salmon produced off-shore, 6 kilometers away from the coast in areas exposed to marine currents, where fish must constantly swim against the current. These conditions not only have a positive influence on muscle development and fat content, in addition, fecal and feed wastes are flushed away.

SHRIMP FARMS IN PLACE OF MANGROVES

The white-gold boom of shrimp production in such Asian and Latin American countries as Thailand, Indonesia, and Ecuador has involved extensive deforestation of mangroves for farming pools during the last three decades. Mangrove deforestation attracted worldwide attention when a tsunami crashed into the coastal regions of Asia in 2004. The lifespan of intensive shrimp pools in Asia rarely exceeds five to ten years, but their ecological and social impacts are long-lasting (Naylor et al. 1998).

A notorious example from Ecuador illustrates the main social and ecological problems associated with shrimp farming (Rozzi 2003). Ecuadorian shrimp is famous in international cuisine. Commercial cultivation of shrimp began in Ecuador in 1968, and this country became the world's principal producer of shrimp in 1983. This boom had such a large environmental impact that in 2008 the extent of shrimp pools surpasses that of mangroves along the Ecuadorian coast. Mangroves act as "ecosystem membranes" between tropical terrestrial and marine ecosystems, recycling nutrients and regulating hydrological flows. Their massive conversion to shrimp pools dramatically increased the levels of sedimentation in coastal waters and losses of soil nutrients. Shrimp industries also discharge contaminated waters and divert the course of streams and rivers. These processes drastically affect population levels of algae, fish, crustaceans, and mollusks that depend on mangroves at some phase of their lifecycles.

In addition, the shrimp industry causes serious social problems by limiting the access of local communities to coastal natural resources. The rights of local communities are ignored or easily violated to favor shrimp industries, which limit or forbid access to traditional users of mangroves by means of government concessions. Furthermore, the conversion of mangroves and the pollution of estuarine ecosystems diminish the quality of life for fisher communities by reducing the populations and diversity of species of shellfish, fish, algae, crabs, and oysters traditionally gathered by women in these ecosystems. Consequently, this export boom in Ecuadorian shrimp leads to hunger in local people inhabiting the coastal region of this country. Local communities have opposed this model of development since the 1970s. As a result of such local opposition, the government established a biological reserve of mangrove ecosystems in the province of Esmeraldas in 1995, and in 1999 it issued a presidential decree that forbids cutting mangroves in Ecuador. This decree created hope in coastal communities of Ecuador, Colombia, and other tropical Latin American countries, as well as in Asian nations also affected by losses of mangroves and displacement of local communities associated with large-scale shrimp farming (Primavera 2005).

The protection of mangroves in Ecuador represented a shift in ecological and social values and national policy at the end of the twentieth century. During the first decade of the twenty-first century, protected mangroves have contributed to the regional economy by providing suitable nursery habitats for shrimp larvae and attractive sites for ecotourist activities.

SEE ALSO *Agricultural Ethics; Hunting and Fishing: IV. Angling; Hunting and Fishing: V. Commercial Fishing; Pesticides.*

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FOOD

Food poses a variety of philosophical issues such as the ethical treatments of animals, the moral and political dimensions of genetically modified food, hunger and obligations to poor, and the role of food in gender and personal identity. Yet food has received scant attention in the philosophical literature compared to subjects like science, technology, and the environment, perhaps because food is perceived to be too physical and transient to deserve serious philosophical reflection or because food production and preparation have traditionally been regarded as women's work and, therefore, unworthy topics for male philosophers. As contemporary philosophy continues to challenge conventional notions of what constitutes "real" and "serious" topics of analysis, and as a feminist "hermeneutic of suspicion" yields important insights previously ignored in mainstream scholarship, philosophers have shown an increasing interest in the moral, political, metaphysical, and aesthetic dimensions of food.

Since World War II changes in the technological and cultural landscape have affected views of food and eating. In the mid-twentieth century the methods and machinery of industrialization were applied to food production, culminating in the so-called Green Revolution, which brought forth great increases in agricultural productivity in both the industrialized and developing worlds. In addition to yielding more food, the Green Revolution also spawned social and environmental changes and raised questions about the appropriate use of land, environmental harms, effects on women, hunger and trade policy, and the ethical treatment of animals.

Further changes in the technological and cultural landscape in the industrialized global north have spurred an increasing awareness of the effects of industrial agriculture, the dubious nutritional value of highly processed foods, the potential health and environmental risks of genetically modified organisms (GMO) and foods, the globalization of food trade and production, and food scarcity and steep price increases in staples brought about by the increasing affluence in China and India and the deepening impact of the biofuels industry on the market for maize.

A Traditional Market in Taipei, 2008. *Food is not a topic that has been traditionally philosophized about, but advancements in technology and culture throughout the world are quickly changing this fact. Rising costs and shortages of food are a major battle being fought by organizations around the world, and other issues, such as nutritional value of processed foods and genetically modified products, have become issues of debate.* **SAM YEH/AFP/GETTY IMAGES.**

NATURAL AND ARTIFICIAL FOOD

Almost everything humans eat has been processed in some way; technologies and techniques transform raw, whole plants or animals into food. Food-processing techniques include cooking, drying, fermenting, slicing, peeling, and butchering. More technologically complex forms of processing includes pasteurizing, canning, freezing, irradiating, and artificially sweetening. Some processed food contains additives, substances designed to help prevent spoilage and contamination or to make food look and taste better. Some processed foods include dietary supplements with nutritional properties, such as vitamins, minerals, proteins, herbs, or enzymes. Among the benefits of food processing are improved preservation, increased distribution potential, fortification, consumer choice, and convenience. Among the harms and risks often associated with processed food are reduced nutritional value, adverse health effects, pollution, and the amount of energy expended in processing.

By contrast, so-called natural foods are purported to be free of artificial ingredients and are often less processed than conventional food. Natural foods—if they are really natural—do not contain artificial food additives, coloring, flavoring, or sweeteners. Nor do they contain refined flour, refined sugar, or hydrogenated oils. "Whole foods" are even less processed or refined. Proponents of a "whole-food diet"

claim it is more healthful than a processed-food diet and results in less harm to the environment.

"Raw foods" are "whole foods" that have undergone little or no processing at all. A "raw-food diet" is one composed of entirely uncooked whole food. Advocates of such a regimen believe that increasing the intake of raw foods produces significant health benefits. They claim that it promotes weight loss, prevents disease, and helps mitigate the effects of chronic illness.

"Organic foods" are supposed to be grown without the use of pesticides, synthetic fertilizers, sewage sludge, genetically modified organisms, or ionizing radiation. Animals that produce organic meat, poultry, eggs, and dairy products are not supposed to be given antibiotics or growth hormones. Organic foods are not necessarily whole foods, nor are whole food necessarily organic. The term *organic* refers to the method of growing food or raising livestock, not to the amount of processing it undergoes.

According to the 1995 U.S. Department of Agriculture National Organic Standards Board, organic agriculture is an ecological production-management system that promotes and enhances biodiversity, biological cycles, and soil biological activity. Organic agriculture is based, in theory, on minimal use of off-farm inputs and on practices and materials that restore, maintain, and enhance ecological harmony and health within the farm and beyond.

Organic agriculture aims to optimize the health and productivity of interdependent communities of soil life, plants, animals, and people. Champions of organic food claim that reducing or eliminating the use of agricultural and industrial chemicals leads to cleaner air, water, and soil, and yields more nutritious, more healthful, and better-tasting food. Critics claim that the health and environmental benefits of organic food are questionable, that it is costly to consumers, and that the slippage in standards for organic production and lack of regulatory oversight leave consumers unsure whether or not their food is as "organic" as advertised.

INDUSTRIAL AGRICULTURE AND ENVIRONMENTAL DEGRADATION

Intensive farming, or the industrialization of agriculture, became the norm in twentieth-century North America, Western Europe, and other developed regions of the world. During the latter half of the twentieth century, this model was exported—some would say imposed on—much of the rest of the world. Industrial agriculture involves highly productive systems based on the use of systematic plant breeding (since the 1990s augmented by genetic engineering); monoculture crops; fossil-fuel energy; farm machinery; artificial chemical fertilizers, pesticides, and herbicides; and mechanized irrigation, processing, and long-distance transportation of both bulk raw foods and packaged processed foods. Intensive agriculture has resulted in higher yields, increased productivity, greater availability, and lower prices, but it has also raised significant health and environmental concerns stemming from the use of chemical fertilizers, pesticides, and herbicides, all of which can pollute the air and soil and contaminate water supplies. These contaminants often enter into the food supply, posing health risks to humans and animals and threatening aquatic habitats and ecosystems. One of most intensive aspects of "intensive farming" is its liberal use of energy, especially the fossil fuels that contribute to increased atmospheric and oceanic carbon dioxide, which in turn cause global climate change, and marine acidification, all with unknown consequences.

Industrial agriculture also exposes the soil to the erosive effects of wind and rain, often leading to a severe loss of topsoil. Erosion has other harmful effects: It washes vast amounts of silt into bodies of water, damaging plant and animal life, and it increases the amount of dust, which is an air pollutant and a carrier of infectious diseases that can cost nations financial and productivity losses.If production is to be sustained, nutrients lost to erosion must be replaced, usually by chemical fertilizers, which compromise water quality and biodiversity and diminish the quality of the soil.

Industrialized agriculture involves the planting of monoculture crops, which are single crops grown over thousands of kilometers of land. Such vast monoculture planting threatens the loss of the genetic diversity represented by "land races," the local varieties of crops once grown on smaller scales on those lands. Monoculture crops create an ecological vacuum that insects and diseases exploit, further reducing the quality of the soil while increasing the possibility of crop failure. These declines in agricultural genetic biodiversity, which in turn reduce natural species biodiversity, have consequences throughout the food chain. Farmers must increasingly rely on chemical fertilizers and pesticides to compensate for the resilience formerly afforded by genetic diversity.

The industrialized production of livestock, poultry, and fish, also known as "factory farming," has many of the same benefits and harms associated with intensive farming. The benefits include efficiency, high yields, widespread availability, low prices, and contributions to local and national economies. Among the harms are the abuse of animals, environmental hazards, health risks to farmworkers, and food-safety problems. Industrial livestock production uses vast amounts of water, fossil fuels, inorganic fertilizers, and field machinery; it involves elaborate technologies such as food manufacturing, packaging, refrigeration, and transportation. The environment surrounding factory farms is often heavily polluted by animal wastes and offal, which foul the air and seep into groundwater and surface waters.

By contrast, "sustainable agriculture" aims to produce food indefinitely without causing environmental degradation. Sustainable agriculture may or may not be the same as "traditional farming," which often has a claim to be sustainable because forms of it have, in fact, been sustained for many hundreds of years; it attempts to combine responsible environmental management, high levels of farm productivity, respect for animals and workers, and support for rural farming communities. Sustainable agriculture might augment or replace traditional methods with postindustrial technologies such as drip irrigation or highly bred perennial polycultures.

In the 1990 "Farm Bill" the U.S. Department of Agriculture defined "sustainable agriculture" as an integrated system of plant and animal production practices having a site-specific applications that will, over the long term, satisfy human food and fiber needs; enhance environmental quality and the natural-resource base upon which the agricultural economy depends; make the most efficient use of nonrenewable resources and on-farm resources and integrate natural biological cycles and controls; sustain the economic viability of farm operations; and enhance the quality of life for farmers and society as a whole.

Farmers who take a sustainable approach substitute knowledge for pesticides and fertilizers. They use crop rotations and other adjustments of the agricultural system to solve problems. Among the benefits of sustainable agriculture are soil enrichment, which produces healthy plants that resist disease; the growth of cover crops (ancillary crops that cover the soil during otherwise fallow seasons), which retard erosion and control weeds; and the use of natural predators to help control pests. Sustainable farming minimizes the use of inputs of pesticides and fertilizers, thereby saving money and protecting the environment.

GLOBAL AND LOCAL FOOD

Trade and the globalization of agriculture are increasingly "delocalizing" the origin of food and the political authority over food policy. Transnational agribusiness and the global political and financial institutions that support them exercise great influence over food production, with growing consequences for food security and safety and the social fabric of communities. One social consequence of intensive agriculture is the consolidation of small farms into large, monocrop operations. As industrialized farming replaces human labor with machinery, each year millions of people are displaced, disrupting societies based on rural farming and swelling the population of urban areas.

The globalized food trade tends not to improve the lot of poor countries; to the contrary, if often aggravates poverty in those nations countries as subsidized foodstuffs from industrialized nations artificially drive crop prices down. Local farmers cannot compete with the factory-farm imports, so poor countries are forced into dependency on wealthier nations for food. A further consequence is that traditional, local diets are being replaced by a globalized, homogenized, animal-sourced diet of supermarket foods infused with high-calorie sweeteners and vegetable oils. These dietary changes and lifestyle changes have led to the globalization of the unhealthy European and North American diet, with attendant rises in rates of obesity, diabetes, and heart disease.

Two food movements have emerged in response to the increasing globalization of food production and commerce. One is the local-food movement. Its proponents maintain that locally and sustainably produced food enhances the economic, environmental, health, and well-being of communities. A locavore is someone who aims to eat only food grown or produced within a short distance from his or her home—preferably within a radius of 100 miles. Local food networks of small farms, community gardens, seed banks, community-supported agriculture, coops, and farmers markets enhance local relationships among farmers and communities while providing alternatives to global food production.

The slow-food movement was started in Italy by Carlos Petrini in the late 1980s as counterforce to the global corporate fast-food juggernaut. This movement champions the consumption of locally grown food that uses land-race seed stocks and traditional methods of production in the particular ecoregions in which they evolved. Its proponents claim that this regional form of agriculture protects the environment; promotes local traditional culinary practices and lifestyles; enhances relationships among farmers, communities, and environments; and yields superior-tasting food.

Critics of the local-food and slow-food movements argue that newly industrialized export-oriented farmers in developing countries are harmed when consumers refuse to support international food production and trade. The moral obligation to alleviate suffering abroad, they argue, takes priority over the obligation to mitigate environmental degradation and to support local "hobby" farmers, who have many economic alternatives that are unavailable in less affluent parts of the world and who are producing expensive fad foods for fashion-conscious, high-end bourgeois consumers in the developed world.

Critics also note that transportation is only part of the total environmental impact of food production and consumption. Thorough environmental assessments of food include analyses of methods of production and amounts of energy used. Often the total energy used in food produced and transported great distances is less than that expended in local production. Proponents and critics alike agree that food and agricultural practices should be

subject to more stringent moral and political scrutiny in order to promote food safety, nutrition, and taste while protecting farmworkers, food producers, animals, and regional biodiversity.

BIOFUELS VS. FOOD

At the turn of the twenty-first century, one of the most hotly contested issues in the ethics of food is the advisability of using foodstuffs such as maize to produce biofuels. Partly as a consequence of this shift in the commodities market, food prices doubled between 2007 and 2008, threatening many poor people throughout the world with chronic hunger, malnutrition, and even starvation. Unlike the controversy over slow and local foods, this debate does not involve individual consumer choice because ethanol, made mostly from maize, is added indiscriminately to gasoline, and ethanol-free gasoline is not offered to consumers as an ethical alternative, even at a higher price. Rather, this is a collective moral issue, to be dealt with at the level of public policy enacted in response to popular outrage over farmers converting food to energy rather than making it available for people to eat.

Critics of the biofuels industry point out that ethanol produced from maize may require more energy to produce—in the form of tractor fuel, petroleum-based fertilizers, the energy involved in distilling it, and other energy-intensive inputs and processes—than is contained in the ethanol derivative. At best, the net energy gain is marginal. Second, other nonfood, less energy-intensive crops such as switchgrass can be used as the raw material for ethanol and other biofuels. The current U.S. policy of encouraging rather than discouraging the growing of maize for ethanol production has been criticized as pork-barrel legislation favoring the economic interests of farm states while masquerading virtuously as a means of achieving U.S. "energy independence."

Another cause of the steep worldwide rise in food prices from 2007 to 2008 is the growing prosperity of the Chinese and Indian populations, which has led to an increased global demand for meat. Producing meat, except on lands incapable of producing crops, involves feeding animals food that might otherwise be available to hungry humans. Only about 10 percent of the "feed" consumed by cows, pigs, chickens, and other animals in factory farming is converted to meat; or, put the other way around, 90 percent of the food value of feed crops consumed by animals for meat production is lost. This indeed can be construed as an individual moral choice. Animal ethicists argue that if the slaughter of sentient beasts cannot penetrate the conscience of the mass of meat eaters, perhaps the prospect of massive human hunger, malnutrition, and starvation will.

A problem remains, however: what economists call the "free-rider" issue. Morally motivated consumers may choose to be vegetarians, but their choice may register such a weak signal in the global marketplace that if many others do not make the same choice, food prices will remain unaffected. In that case government-enforced remedies are the only workable alternative. A luxury tax, for example, might be put on meat to discourage consumption and thus ease price pressure on agricultural commodities, diverting them from animal feedlots and onto the plates of hungry poor people.

SEE ALSO *Agricultural Ethics; Agriculture; Factory Farms; Farms; Genetically Modified Organisms and Biotechnology; Pollen Flow; Seed Banks; Soils; Sustainable Agriculture; U.S. Food and Drug Administration; Vegetarianism.*

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FOOD SAFETY

A safe and secure food system is undeniably a public good, and so protection of foods is a major public-policy concern (Caswell 1998). Safe food may also be a basic human right. In an urbanized society, the complexities of the food system, especially its lack of transparency to most of the public, has long obligated governments to ensure safe food

by overseeing farmers and food processors and distributors (Starbird 2005). Several factors have made carrying out this moral responsibility more serious and difficult in the present era. Government agencies responsible for food safety now face (1) increasingly concentrated corporate control over the food chain from farm to market, (2) the introduction of genetically modified foods into the marketplace, (3) a global market in even basic food staples, and (4) a hostile international political climate, especially the proliferation of terrorist activities.

In the past, most of the problems with food safety were associated with bacterial/viral contamination or spoilage. In many parts of the world, these are still the main sources of food-borne health risks. In modern societies with industrialized agricultural systems, risks from microbial contamination and spoilage still exist, but other contaminants pose greater concern. Among these are agricultural chemicals (such as pesticides, herbicides, fungicides), industrial chemicals (such as mercury and other heavy metals entering the food chain via air and water pollution), and foreign material (such as animal excrement, toxic plant material, and other undesirable biological material) (Henson and Caswell 1999). Ethical and public-policy problems arise in part from the fact that different agencies are responsible for different links in the food-system chain, with different risk factors tied to different links. The Animal and Plant Health Inspection Service and the Food Safety and Inspection Service of the U.S. Department of Agriculture are responsible for insuring that healthy animals and nontoxic plants are used in agricultural production. The Environmental Protection Agency is responsible for industrial and other environmental contaminants. And the Food and Drug Administration is the ultimate arbiter of whether or not processed and new food products are safe for public consumption. The Food and Drug Administration also determines whether certain foods need to be labeled as having certain ingredients, beyond their nutritional composition.

All three agencies have faced an especially difficult situation since the introduction in the 1980s of genetically modified plants (and more recently animals). In the view of at least some people, foods that contain such material as seeds or oils or even proteins derived from genetically modified plants and animals are ethically unacceptable. The U.S. Department of Agriculture supported and encouraged farmers to adopt genetically modified crops as a way of reducing use of pesticides and herbicides, and the Environmental Protection Agency supported this policy. However, the Food and Drug Administration has faced considerable pressure from consumer advocates and citizen groups to prevent genetically modified material from entering the food system, or at least to label foods that contain genetically modified material as such. After deciding that most genetically modified organisms are safe for human consumption—a controversial decision in its own right—the Food and Drug Administration decided that labels are unnecessary (Hoban 1998).

The no-labeling decision of the Food and Drug Administration appears to contradict a basic ethical consideration: People have a moral right to choose what they put in their bodies, especially what they eat. If some people object to genetically modified organisms or biotechnology generally on religious or cultural grounds, or perceive risks in genetically modified organisms, then governments must respect their right not to consume such items. Even if those who object to genetically modified organisms are scientifically incorrect in their assessment of risk, they are nevertheless entitled to have their rights protected. This is an ongoing ethical dilemma that the Food and Drug Administration will face as long as genetically modified foods are allowed on the market and are not labeled as such (Thompson 2007).

Since the September 11, 2001, terrorist attacks on the United States, the notion of food safety has taken on a new meaning, closely associated with what used to be called food security. Because of how vulnerable consumers are to intentional food contamination with anything from toxins to carcinogens, there have been calls for stepped-up efforts to protect agriculture, monitor food processing more closely, and inspect food distribution centers more aggressively, especially entry points for imported foods. However, as the global market intensifies and expands, to the point where the United States imports much of its basic staple commodities from other nations with less-rigorous safety standards than our own, questions have arisen as to whether, or even if, regulatory agencies can act on their ethical responsibilities to secure the public good efficiently and effectively.

SEE ALSO *Food; Genetically Modified Organisms and Biotechnology; Shiva, Vandana; U.S. Department of Agriculture; U.S. Environmental Protection Agency; U.S. Food and Drug Administration.*

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FORESTS

Forests are ecosystems dominated by trees; the technical definition specifies a tree-canopy cover of at least 10 percent. For millennia forests have provided food, medicinal plants, and wood to humans living in and near them; they have proved so valuable that humans have overexploited them. By the Middle Ages thousands of square kilometers of forests had been cut in Europe. At about the same time catastrophic deforestation took place in central Mexico that may have contributed to the collapse of the Maya civilization. In the *Critias*, written in the fourth century B.C.E., the ancient Greek philosopher Plato tells of the fifth-century deforestation of his native Attica and the attendant ecological damage, principally massive soil erosion. Deforestation has increased sharply during the twentieth and twenty-first centuries, threatening the very survival and evolutionary potential of many species, including human beings.

LOCATIONS AND BIODIVERSITY OF THE WORLD'S FORESTS

In 2007 the Food and Agriculture Organization of the United Nations (FAO) estimated worldwide forest cover at 39 million square kilometers, which is 30 percent of the earth's land area, with two-thirds of the forested lands distributed in only ten countries. If only intact forests (those not modified by humans) are counted, the estimated land area covered by forests is about 15 million square kilometers, or 10 percent of Earth's landmass (Greenpeace 2006). The three major forest biomes, described below, are tropical forests, temperate forests, and boreal forests.

Tropical Forests Some 56 percent of the world's forests (21.8 million square kilometers) are tropical and subtropical. Tropical forests are found between the Tropic of Cancer (23.4° north latitude) and the Tropic of Capricorn (23.4° south latitude); subtropical forests are located between the tropics and 30° north or south latitude. There are two major types of tropical and subtropical forests: Deciduous forests grow where the climate is humid but has a pronounced dry season, and rain forests grow in areas with more than 2 meters of rain per year and no dry season. Tropical rain forests are found in Central and South America (especially Brazil), central and western Africa, eastern Madagascar, Southeast Asia, New Guinea, and northeastern Australia. In Central America, Madagascar, and the Philippines forests are located within the paths of tropical cyclones (also called hurricanes or typhoons), which can uproot or break trees. Trees in rain forests located within cyclone paths are shorter, on average, than trees in other rain forests. The Amazon rain forest, covering 5.5 million square kilometers, makes up more than half of Earth's remaining tropical rain forest. It is so large that its trees produce 20 percent of Earth's atmospheric oxygen and remove approximately 62 tons of carbon per square kilometer per year from the atmosphere.

Per unit area, tropical rain forests contain more species of plants, animals, and fungi than any other terrestrial biome. Two-thirds of Earth's plants and animals, including more than 175,000 vascular plant species (flowering plants, gymnosperms, and ferns) and more than 170 primate species (apes, monkeys, and lemurs) are found in tropical rain forests. Tropical rain forests are also home to approximately 50 million indigenous peoples.

Temperate Forests Temperate forests once covered large expanses of western and central Europe, southern China, Japan, and eastern and western North America, approximately between 30° and 55° north latitude. Smaller areas of temperate forests are found in New Zealand, eastern Australia, southern Chile, Argentina, and South Africa. Today only 11 percent of the world's forests (4.3 million square kilometers) are temperate forests. Some 80 percent of the temperate forest biome is in the northern hemisphere, with the largest remaining forests in western North America. Although only 20 percent of temperate forests are in the Southern Hemisphere, they are ten times more species-rich per unit area than those in the Northern Hemisphere.

The world's largest and oldest organisms are found in temperate forests. Chile's west-coast Valdivian forest (the world's largest pristine temperate rain forest) contains 3,500-year-old *Nothofagus* (southern beech) and *Fitzroya* (Patagonian cypress) trees that average 60 meters in height and 5 meters in diameter. In California the coast redwood (*Sequoia*) can reach 110 meters in height and 8 meters in diameter, and the bristlecone pines, some of which are more than 4,800 years old, are the oldest organisms on Earth.

Depending on geography, climate, and soils, temperate forests are dominated by broadleaf deciduous "hardwood" trees (Europe and eastern United States), evergreen needleleaf "softwood" conifers (western North America and New Zealand), or a mixture of both. Other temperate forests (China, southern Chile, South Africa, and eastern Australia) are dominated by broadleaf evergreen tree species. Fire is a major disturbance in temperate forests, especially those dominated by evergreen coniferous trees, with the fire interval (the time between two fires at a given location) ranging

Humboldt Redwoods State Park, California. *Forests throughout the globe are being threatened by fires, acid rain, global warming, and deforestation. The American national park has become the most widespread model of forest conservation in the world.* **RICH REID/NATIONAL GEOGRAPHIC/GETTY IMAGES.**

from a few decades to a century or more. Fires in coniferous forests can be "stand-replacement" disturbances that kill many of the adult trees and trigger the germination of a new cohort of seedlings. Indeed, many conifers (redwood and knobcone pines, for instance) require fire to regenerate, either because their seedlings cannot get started in the thick forest litter or because their cones will not open and release their seeds unless they burn, or both.

Coniferous temperate forests are also prone to large-scale cyclical insect pest infestations that can kill entire stands, especially when trees are already stressed by drought or atmospheric pollution. Fire-suppression policies may also be responsible for pest outbreaks because natural fires keep insect pest populations low and break forest landscapes into mosaics of stands of different ages, keeping pest outbreaks spatially restricted.

Boreal Forest, or Taiga Some 33 percent of the world's forests (12.9 million square kilometers) are boreal forests that grow in a nearly continuous belt of trees between 55° north latitude and the Arctic Circle, through Norway, Sweden, Russia (where the boreal forest is called *taiga*), Alaska, and Canada. This biome includes the coldest human settlements on the planet, with winter temperature falling below minus 65 degrees Celsius in parts of Siberia. The boreal forest is dominated by conifers such as larch, spruce, fir, and pine, but broadleaf trees such as birch, alder, willow, and aspen also abound. Trees have adaptations for survival in harsh winters, including tapered conical shapes that shed heavy snow loads. Wildlife includes large herds of caribou and predators such as wolves and bears. Migratory birds use numerous large lakes and wetlands in the summer. Several aboriginal communities live in the boreal forest, especially in Canada, where aboriginal First Nations make up 14 percent of the population.

HUMAN IMPACTS ON FORESTS

Humans have burned, cut, and otherwise affected forests for thousands of years. Only 4 percent of the world's forests are in Europe today because of a long history of forest removal dating back to the Greek and Roman empires, when the growth of cities and the building of military ships required larger and larger supplies of lumber and firewood. Although natural phenomena such as droughts may have also played a role, the decline of the Sumerian civilization (in what is now Iraq) around 2000 B.C.E. and of the Mayan Empire (in what is now southern Mexico) in the eighth and ninth centuries C.E. were due partly to uncontrolled forest exploitation, soil erosion, and the resulting increase in the salinity of arable lands that triggered large-scale food shortages and famines. Since the Industrial Revolution, however, the variety and scale of human impacts on forests has increased dramatically.

The industrial release of sulfur dioxide and nitrogen oxides from power plants creates acid rain, which has affected large forested areas in industrialized regions, especially eastern North America and Europe. Acid precipitation damages leaves, stressing trees and making them more vulnerable to diseases and fires or killing them outright. A third of Germany's forests, including the famous Black Forest, and more than 10 percent of Switzerland's forests have been affected. In the United States forests in New England and the Appalachian Mountains have been affected by acid rain, and rivers and lakes have also become more acid, killing fish and other aquatic wildlife and plants. Ozone, a pollutant generated by car exhaust in areas with sunny climates, can also damage tree leaves and affect forests.

Fire suppression, mostly in the temperate forests of western North America and Europe, has replaced natural fire regimes (fire frequency, season, and intensity) that played a critical role in fire-adapted forest ecosystems. Fire control has altered the succession of species in these forests, has suppressed the regeneration of fire-adapted tree species, and has allowed the accumulation of flammable litter, increasing the size and severity of fires when they burn out of control in dry and windy weather.

Global climate change has been linked to worldwide forest damage and forest biodiversity loss, and it may become the primary cause of forest loss. From Costa Rica, where "cloud forest" amphibian species are becoming extinct because of the rising altitude of clouds, to western Canada, where unusually large bark beetle outbreaks killed 130,000 square kilometers of pine forests in 2007, global climate change is having increasingly severe impacts on Earth's forests. Dead trees further contribute to global climate change by releasing into the atmosphere carbon previously fixed in wood and soils.

The major human impact on the world's forests, however, comes from deforestation. The FAO estimates that the global rate of deforestation is about 130,000 square kilometers (the size of Louisiana) per year, which means that from 1990 to 2005, the world lost 3 percent of its forests. The main causes of deforestation include tree harvesting for wood or paper pulp, clearing for agriculture or livestock production, urban development, and tree harvesting for firewood. From 2000 to 2005, the yearly deforestation rate in the Amazon forest alone was 22,400 square kilometers (the size of New Jersey); making room for livestock pastures or soybean production accounted for 90 percent of this activity. Tropical deforestation has caused the extinction of many animal species and threatens others, including the mountain gorilla of central and east Africa and the Sumatran tiger.

Temperate and boreal forests are also being cut at an alarming rate. Nearly 9,000 square kilometers of Canada's boreal forest are logged every year for paper and timber, destroying habitats for caribou, grizzly bears, wolverines, and other wildlife, thereby threatening these species with extinction. In the Southern Hemisphere thousands of square kilometers of Chile's forests have been logged to make wood chips for export; these areas have been replaced with plantations of exotic species such as Monterey pine (more than 10,000 square kilometers have been planted) that cannot support the rich animal and plant biodiversity found in the native forests. Half of the coastal Valdivian forests of Chile have been cleared, and in the U.S. Pacific Northwest only 15 percent of the original forests remain.

FOREST CONSERVATION

People on all continents have practiced some form of forest conservation for several millennia. Protection laws regulated the use of forests in ancient Persia as early as 1700 B.C.E., and Celtic tribes in Europe had set aside sacred forests by about 500 B.C.E. Scholars have documented rules against overharvesting of trees among some North American Indian tribes and the designation of sacred forest groves with tree-cutting taboos—some still in force—in and around burial sites in Africa and Madagascar. Around 250 B.C.E. in India the earliest written laws sanctioning the conservation of forests and the regulation of hunting were promulgated under the Maurya dynasty. Throughout the tropics agroforestry (the cultivation of crops and trees together) has been practiced for hundreds of years, preserving many native tree species from extinction.

The tension between the modern European and North American conservation movement and the rights of indigenous people was foreshadowed in the writings of the American naturalist and preservationist John Muir (1838–1914), who, upon encountering a group of Mono Indians on the trail, reflected, "Somehow they seemed to have no right place in the landscape, and I was glad to see them fading out of sight down the pass" (1992, p. 343). The conservation policies of the U.S. government focused on landscapes, and the legislation that created national parks in the nineteenth century did not recognize traditional indigenous hunting-and-gathering rights in those areas.

Many parks protecting forest ecosystems were created in the late 1800s and early 1900s in the United States, Australia, Canada, Sweden, and South Africa, where Kruger National Park was established in 1926. In contrast to the United States and Canada, where national parks were carved out of largely pristine landscapes, national parks in Europe often incorporated human-modified landscapes such as farms, managed forests, and even villages. Nonetheless, the American national park system has become the most widespread model of forest conservation throughout the world. From 1962 to 2003, the number of "protected areas" worldwide increased from about 1,000 to more than 100,000, mostly in terrestrial ecosystems, including nearly 8 million square kilometers of forests, of which more than 4.5 million kilometers are in tropical forests (approximately 20 percent of the tropical-forest biome) and more than 3 million are in temperate forests (approximately 12 percent of the temperate-forest biome).

In developing countries, where populations are mostly rural and depend on land and natural resources for survival, the effectiveness and equity of the national park model, with its emphasis on removal of human land-based subsistence, has been the subject of much research and debate. The intensity of that debate sprang, in part, from the radicalization of a section of the environmental movement in the 1960s. Arguments for valuing forests intrinsically (the ecocentric viewpoint) rather than for their value to humans (the anthropocentric viewpoint) were articulated

by proponents of Deep Ecology, who sometimes advocated the use of monkeywrenching or ecotage, the sabotage of human activities perceived as threatening natural ecosystems. Some monkeywrenching methods used in the 1980s included driving metal spikes into trees of U.S. Pacific Northwest old-growth (pristine) forests to prevent logging. Internationally, the Deep Ecology view that humans should be removed from ecosystems targeted for conservation influenced the methods used to establish parks and forest reserves. In Africa especially, there were expropriations of indigenous peoples from newly created parklands. In Tanzania the establishment in 1960 of Arusha National Park involved the forcible removal of Meru villagers and Maasai herders, and in the Democratic Republic of the Congo the establishment in 1970 of Kahuzi-Biéga National Park resulted in the displacement of more than 13,000 Twa, Shi, Tembo, and Rega inhabitants.

THE HUMAN CONTEXT OF FOREST CONSERVATION

There is widespread agreement about the worthiness of the goal of conserving the world's forests and their plant and animal biodiversity, but there is also widespread disagreement about the best means to this end. Steven Brechin and his coauthors (2003) suggest that too many conservation programs focus on conservation objectives (the "what") and not on the social and political processes that can help realize those objectives (the "how"). In several instances, they argue, expediency has rationalized conservation without due consideration for indigenous rights. Neither the Meru of Tanzania, the Twa of the Democratic Republic of the Congo, nor the Chimane of Bolivia were consulted before being expelled from the forests that had supported their traditional livelihood. In all cases these communities ended up poorer and more marginalized.

Conservation biologists such as Thomas Struhsaker (1998) or John Terborgh et al. (2002) argue that incorporating economic development for, or sustainable resource use by, local communities (a "conservation through development" model) cannot substitute for totally protecting forests and will eventually drive ecosystems in protected areas to extinction. They suggest that even though indigenous people have lived at sustainable levels within their forest environments in the past, there is no guarantee that they will continue to do so, given global pressures for modernization and integration into the modern economy.

Paul Wolvekamp (1999) counters that many indigenous cultures are, in fact, responsible for the pristine condition of many forests. The Kayapó indigenous people of Brazil, for instance, have protected the boundary and integrity of the 110,000 square kilometers of the Kayapó Reserve forest against the encroachments of logging and mining. Wolvekamp argues, therefore, that it is counterproductive for western-based conservation organizations to advocate the removal of indigenous groups from protected areas or to urge the cessation of their traditional use of the forests. He suggests such proposals lack legitimacy because the carbon footprint of large-scale tourism in parks—considering the air travel involved—is more deleterious than the global impact of indigenous communities living inside these parks.

James Fairhead and Melissa Leach (1996) document the damaging consequences of the dogma that indigenous people can only mismanage their forests; they report that this outlook led to a misreading of the forest-savanna transition of Guinea, in western Africa, as the product of human-caused deforestation. Fairhead and Leach show, rather, that farmers had a long tradition of creating and maintaining forests around their villages. Nancy Peluso (1992) found that the many instances of deforestation she studied in Java resulted from inappropriate top-down state control of forests previously managed appropriately by peasants. She and Roderick Neumann (1998) have also challenged the often-assumed correlation between indigenous population growth and increased deforestation, arguing that it is untested and often at odds with local realities.

Janis Alcorn (1993) and Steven Brechin and his coauthors (2003) have suggested that indigenous expropriations, especially when enforced militarily, have undermined the perceived legitimacy—and therefore the effectiveness—of forest conservation programs. Michael Soulé (1991) agrees with Alcorn that many park-style conservation projects have failed and have undermined the ability of indigenous communities to protect forests. Because nature conservation is essentially a mechanism of resource control, Brechin proposes that forest conservation strategies must be both ecologically sound and socially just to gain legitimacy in the eyes of all stakeholders. To succeed in the long term, Alcorn argues, such programs must involve local communities and indigenous people. Brechin sees nature conservation as a complex social enterprise that requires negotiated compromises, not one-sided, state-imposed, short-term solutions; he contends that the social cost of global forest conservation should not be borne solely by the indigenous forest communities.

NEW DIRECTIONS IN FOREST CONSERVATION

Soulé argues that nature conservation should be adapted and tailored to various geographical and political contexts. Accordingly, it is worth reviewing a small sample of forest conservation efforts in which local communities have been an integral part of the solution.

Tropical Forests In Madagascar partnerships among the Department of Water and Forests, the University of Antananarivo, nongovernmental organizations (NGOs) such as the Worldwide Fund for Nature, and local communities have made successful use of the *Dina*—a traditional system of rules and regulations governing rights of usage, timing, quantity, and frequency of harvest—to guide resource use by villagers. Such contracts have been implemented in the Manambolo Valley (a biodiversity corridor linking the Andringitra and Ranomafana National Parks) and in the Tampolo littoral forest, protecting rain forests and their unique plants and animals, including several species of lemurs. In eighteen other tropical countries, the NGO Rainforest Foundation adopted a rights-based, social-justice forestry strategy to halt rain forest loss by helping forest-dwelling communities establish land-tenure rights and greater control over the use of forest resources.

To promote social equity in bioprospecting (the search for medically promising plant compounds for commercial use), the National Biodiversity Institute (INBio) of Costa Rica, an NGO, was established in 1989. INBio helps rural communities become active participants and beneficiaries, based on the assumption that the sustainable use of natural forest compounds can benefit local communities economically and reduce the financial pressures that can drive some forest communities to cut trees for cash. Similarly, "extractive reserves," pioneered by Mary Helena Allegretti and Chico Mendes (murdered in 1988 for his opposition to deforestation of the Brazilian Amazon for cattle ranching), are forest reserves where local residents are allowed to tap trees for rubber, gather fruits and nuts, hunt wildlife, and harvest wood within sustainable limits, providing forest-generated income to local communities and diminishing incentives to deforestation.

As long as soils are not seriously compacted by heavy equipment or damaged by erosion, tropical forests can recover from logging or agriculture. Carl Sauer (1958) suggested that many tropical forests once classified as pristine had in fact been widely manipulated and transformed by South American Indian communities with fire and plantations of useful tree species. Recent findings that large sections of the Amazonian rain forest are in fact secondary forests (forests that grow back following a disturbance) have supported Sauer's hypothesis. Robin Chazdon (1998) therefore suggests that today's tropical forest conservation agenda should be visionary and not focus exclusively on protecting "pristine" forests; disturbed forests and secondary forests that have a good potential for recovery could also be protected, to become the "pristine" forests of tomorrow.

Temperate Forests In 1992, in cooperation with the Environmental Defense Fund, the Wasco, Warm Springs, and Paiute tribes of Oregon developed a management plan for the Warm Springs Reservation, 60 percent of which is forested. The tribes, which earn a large part of their income from timber sales, voluntarily reduced the timber harvest by half and established best-management practices for future timber sales. The plan sets new guidelines for managing protected forests, fisheries, and other nonforest resources.

Boreal Forests The Boreal Forest Conservation Framework (BFCF) is an NGO that acts as a liaison between Canadian conservation organizations, industry groups, First Nations, and local governments in support of research and forest conservation. The BFCF seeks to protect more than half of Canada's boreal forest in a network of large, interconnected forest areas while maintaining long-term economic benefits for communities and respecting the land rights of aboriginal groups. Thousands of miles away, in the taiga of the Russian Far East, the Udege aboriginal group spearheaded the creation of the Russian Far Eastern Association for the Use of Non-Timber Forest Products. The group's main goal is to link village organizations, traders, processing plants, and scientific institutes to develop nontimber-based indigenous economies and reduce logging, thus preserving the forest habitats for endangered species such as the Amur tiger, cranes, and salmon.

CONCLUSION

Conserving the world's forests is an enormous social enterprise with an urgent ecological goal. Losing the world's forests would be an ecological catastrophe. Averting that disaster while preserving the rights and dignity of indigenous peoples remains the unfulfilled challenge to the scholars, activists, NGOs, and governments that know that the health of Earth's ecosphere—indeed, perhaps the very survival of life on the planet—hinges on the health of the world's forests.

SEE ALSO *Civil Disobedience; Ecosabotage; Environmental Activism; Fire; Mendes, Chico; Sustainability.*

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FRANKFURT SCHOOL

Critical theory, which was developed in the Frankfurt Institute for Social Research (hence its later name, the Frankfurt School), is a body of broadly neo-Marxist social theory. The distinctive features of critical theory were its critical analysis of the Enlightenment and the dominant ways of acting and thinking associated with it and its linking of social theory to social criticism of the prevailing "modern" social order both in the liberal-capitalist West and in the authoritarian-communist East. It included thinkers such as Max Horkheimer (1895–1973), Theodor Adorno (1903–1969), Herbert Marcuse (1898–1979), Walter Benjamin (1892–1940), and Jürgen Habermas (born 1929).

Horkheimer and Adorno's *Dialectic of Enlightenment* (1973) was an examination and explication of the "dark" side of modernity: the costs and dangers of advanced technological industrial society and its dominant modes of thought and behaviors. The danger they pointed out is quite stark. For them, the "fully enlightened world radiates disaster triumphant" (p. 3), a sentiment with which many radical greens would agree in regard to the local and global environmental degradation and destruction modern industrial societies have caused.

According to Andrew Biro, "Like both Rousseau and Marx before them, Horkheimer and Adorno question the association of increased mastery over nature … with a betterment of the human condition" (Biro 2005, p. 123). For Horkheimer and Adorno the technological sophiscation, economic organization, and politicial institutionalization associated with that mastery have no necessary connection with universalizing the benefits of that mastery (here they echo the Marxist critique of the necessary inequalities of capitalism) and such mastery is misplaced and dangerous as the basis for structuring the relationship between society and nature. Also, and connecting with the point raised above in relation to Sigmund Freud, Biro points out, "The lesson of *Dialectic of Enlightenment* is that if we think of nature as 'other' to be controlled, the technology we develop will inevitably be turned to control the nature that resides within the self" (p. 148).

As S. Vogel puts it, "the Frankfurt school's critique of contemporary society was offered up in a certain sense 'in nature's name'—both that of the damaged inner nature of humans stuck in the fatal dialectic of enlightenment and an outer nature robbed of all qualities save those that render it amenable to human use" (Vogel 1997, p. 175). As a result of the logic of the Enlightenment, the only value the natural environment can possess is instrumental value; that is, the natural world possesses value only insofar as it is useful for human purposes or ends.

The "disenchantment of nature" (the cultural transformation of nature from a morally significant realm with its own intrinsic value to nature viewed solely as a set of resources for human use and enjoyment, as discussed in the last chapter of Horkheimer and Adorno's *Dialectic*), as one of the main consequences of modernity, was something not just to be regretted (the romantic reaction) but also dangerous for both human society and the nonhuman world. In particular, the critical theory perspective of the Frankfurt School suggested that the increasing rationalization that was central to the successful technical manipulation of external nature had a tendency to spill over into other

spheres of human life in which it was not appropriate and in fact was dangerous.

The basic problem was that the instrumental use of nature led to the development of institutions and modes of thinking and acting that were "transferred" illegitimately to human social and personal relations. The domination and exploitation of the natural environment leads to the domination and exploitation of humans, a point echoed by various green thinkers from deep ecologists to ecoanarchists. Enlightenment-derived institutions as modes of rationality suited to human-nature exchanges contained the possibility of being used in human social relations, in which they were dangerous and harmful. As Horkheimer and Adorno put it, "Men have become so utterly estranged from one another and from nature that all they know is what they need each other for and the harm they do to each other" (Horkheimer and Adorno 1973, p. 253).

Although Adorno in particular is pessimistic about any reconciliation with nature (such a project had to wait for later critical theorists such as Marcuse and Habermas), the importance of the early Frankfurt School in relation to social theory and the environment lies in updating and greatly developing the essentially Marxist notion that the root of the link between society and nature lies both within social relations internal to the organization of society and at the same time within the way society views, uses, and abuses its natural environments (Biro 2005).

SEE ALSO *Deep Ecology; Environmental Philosophy: V. Contemporary Philosophy; Environmental Sociology.*

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FREE MARKET ENVIRONMENTALISM

Free market environmentalism (FME) begins with the belief that market institutions can and do promote environmental quality effectively. Proponents of FME see private property rights as holding individuals and firms accountable for their environmental impacts and rely on markets to provide crucial information about environmental conditions to society. FME stresses principles of individual liberty, voluntary exchange, and common law liability. FME typically stands in contraposition to command-and-control regulatory approaches to environmental policy, arguing against the inefficiencies of bureaucracy, centralization, and regulation.

THEORY

In place of regulation or taxation, proponents of FME recommend altering incentives to conserve environmental resources by extending property rights and markets into domains that have been external to market processes. The FME vision rejects assertions that markets are to blame for environmental problems. Instead, environmental problems are viewed as opportunities to institute property rights, internalize externalities, and let markets improve environmental quality and welfare. Free market environmentalists emphasize the institutional context of decision making and argue that market institutions provide the best incentives and information about ecological conditions and scarcity. Market arrangements tend to reward good decisions and ecological stewardship and penalize waste and degradation.

Central to FME are well-defined, enforced, and sellable or transferable private property rights. Secure private property rights encourage stewardship, as degradation and poor management undermine market value. They also reward ecoentrepreneurs who reduce consumption and waste, find better uses or substitutes, improve productivity, or conserve for times of scarcity. Limitations on property rights such as use-it-or-lose-it rules governing permits for grazing, timber, or water rights and limited liability arrangements are seen as distorting conservation incentives.

This approach draws heavily on the Coase theorem, which holds that an optimal level of pollution is achieved through bargaining regardless of who owns the right to pollute as long as certain conditions are met (Coase 1960). With well-defined property rights and low transaction costs, individuals internalize their environmental costs by bargaining in a market. This amounts to a strict polluter pays policy. In a Coasian system the amount of pollution is not set by regulators or by firms with disregard for victims but through negotiations and a voluntary exchange of rights between interested parties. The rights to pollute are owned and exchanged voluntarily, falling into the hands of polluters, victims, or other parties, depending on who bids the highest. The level of pollution traded in this market may be more or less than what a regulator would allow.

APPLICATIONS

As an alternative to the command-and-control environmental policies that dominated the 1970s and 1980s, market-based approaches exist around the world and many more are emerging. Several nations employ individually transferable quotas that are set by government regulators to enable the trading of commercial fishing rights. Also, the United States has implemented a trading scheme for rights to emit sulfur dioxide. Large-scale successes have inspired ongoing efforts to use market-based approaches in other areas, such as a cap-and-trade policy for dealing with carbon emissions.

It can be argued that these markets for harvesting or emissions are only partial markets because they ultimately rely on technocrats or nonmarket mechanisms to establish the overall cap, or target quantity. A pure FME approach would task the market with setting the cap. Akin to shoemakers being compensated for their efforts by those wanting shoes, the owners of the rights to a clean stream could exchange some of those rights to polluters, in principle leading to a market clearing in which as much pollution is generated as its victims will tolerate. Such markets govern Scottish rivers and streams and are used in the western part of the United States for maintaining instream flows.

Other market institutions, both new and old, have been marshaled to promote environmental quality. Land trusts and organizations such as the Nature Conservancy are considered exemplars of private efforts to protect the environment through the use of private property rights and voluntary exchange. Those interested in protecting natural resources can do so simply by purchasing them or purchasing and not using the development rights—known as conservation easements—and holding them in perpetuity. Conservation trusts that advance environmental goals through the marketplace are proliferating in the United States. These green payments (akin to polluter pays) favored by FME are seen in various forms, such as user fees for recreationists, bottle bills, payments by the Defenders of Wildlife to ranchers who suffer losses from endangered wolf populations, and water markets in the western United States.

Free market environmentalists often criticize central planning and regulatory institutions for mismanaging environmental resources. FME advocates call for green scissors, referring to the cutting of environmentally and economically wasteful subsidies and regulations. They call attention to the poor environmental performance of regulatory agencies and managers of public lands. They see the failure of centralized regulation and public management as arising from institutions with incentives misaligned with conservation.

DEBATES AND CRITICISMS

Pragmatic concerns about FME usually start with transaction costs. The Coasian bargaining central to the efficacy of the market-based approach hinges on minimal costs in reaching and enforcing voluntary agreements in the market. In practice this may be unrealistic, although high costs also may plague the alternatives. Multiple polluters contracting with thousands of private parties may create overwhelming transaction costs. Similarly, the rule of law and functioning markets depend on costly government, especially a highly responsive judiciary. The polluter pays principle of FME requires clear and defensible property rights, low-cost application of tort law principles, and monitoring of environmental trespasses. These conditions often are lacking in environmental contexts.

The practical limitations of applying common law liability may be most serious when the source of environmental harms or the effects of pollution are difficult to identify. FME advocates see the costs and complexities of enforcing property rights regimes as being outweighed by the social and environmental gains arising from voluntary trading, especially compared with the alternative of governments dictating pollution levels without conferring private tradable rights.

Critics have found shortcomings in FME on ethical grounds. Markets for pollution often are seen as immoral or as tacitly endorsing pollution. Moreover, market processes provide only for anthropocentric values. Markets also may be blind to important social inequities such as marginalization of the poor. FME proponents often acknowledge this and favor the use of poverty policy, not environmental policy, to address poverty.

The FME paradigm offers no guarantees that certain outcomes will be achieved. Holding people accountable and fostering voluntary exchange may produce results that some find objectionable. Markets, for instance, provide no special protection against irreversible changes such as extinctions, although regulatory or other institutions also may not provide such guarantees. Critics of FME also contend that placing control of natural resources in private hands creates a reliance on individuals who may not be sufficiently enlightened, knowledgeable, farsighted, patient, or altruistic. FME advocates often counter that regulators and technocrats are often worse in terms of those qualities and that market incentives discipline individuals in ways bureaucracies do not.

Ultimately, markets are easier to establish and property rights are easier to define for some resources and activities than for others. Implementing idealized markets for resources such as global climate and biodiversity presents enormous practical and political challenges. Advocates of FME contend that although markets are not a panacea, they should be used to promote environmental goals when possible.

SEE ALSO *Conservation; Defenders of Wildlife; Economics, Environmental; Environmental Policy; Green Business; Hunting and Fishing: V. Commercial Fishing; Land Ethic; Nature Conservancy; Private Property; Takings.*

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Douglas S. Noonan

FUTURE GENERATIONS

Global climate change, fossil-fuel depletion, overpopulation, loss of biodiversity—these issues trouble thoughtful individuals, not only for their impact upon themselves or even their children and grandchildren, who will escape the worst consequences, but also for the consequences to persons far into the future whose lives will not be concurrent with our own. Because of advances in science and technology, the current generation may bear a greater burden of moral responsibility toward its successors than that of any previous generation. This is because science has provided us with unprecedented knowledge of the consequences of our acts and policies, and technology has provided us with the means to effect or avoid these consequences. *Knowledge* of consequences and *capacity* to affect future outcomes are two essential criteria of moral responsibility (Partridge 1994).

THE STATUS OF FUTURE PERSONS

Our responsibility to future generations is a common topic in political rhetoric and public discourse. When discussed in these contexts, future persons are usually regarded as essentially the same as our contemporaries, fundamentally of a common humanity. Accordingly, it is widely assumed that responsibilities to future persons are not all that different from responsibilities to contemporaries of other cultures.

Most philosophers who have studied the question of the duty to posterity do not share this view. Instead, they recognize that future persons have a moral, epistemological, and even ontological status that is radically different from the status of our contemporaries. First of all, future persons cannot be identified as individuals and thus must be conceived abstractly. Second, because they are not actual—that is, they do not exist at the present time—there is considerable controversy regarding which, if any, rights claims future persons might have on our generation. Third, our relationship with future persons is *nonreciprocal*: While we may act upon them, they do not act upon us. Fourth, we are ignorant of the conditions of their lives, their values, and their culture—the more so as we project further into the future. Finally, the very existence of future persons depends on our present policies of population control.

THE FUTURE-PERSONS PARADOX

All effective policies regarding remotely future generations entail a profound paradox, generally overlooked in nonphilosophical discussions, namely, that such policies will result in different individuals living in the future. This fact follows from the contingent nature of human conception. When conception takes place, one sperm cell among about 200 million wins the lottery, as it were. Should conception take place a day, an hour, or even a fraction of a second earlier or later, a genetically different individual will result.

Suppose, for example, that the United Nations, or even just one or a few industrialized nations, undertakes a concerted effort to mitigate the consequences of climate change. The simple publication of this policy will cause different individuals to be conceived throughout the world, all the more so as the policy is implemented. In time, this effect accelerates exponentially. In a relatively few generations, some say as few as six (Schwartz 1978), the world will be populated by entirely different individuals than would exist had no such policy been adopted "for the benefit of future generations."

According to the person-affecting principle (Temkin 1993), widely accepted by moral philosophers and appealing to common sense, a morally praiseworthy act benefits a person or persons, while a morally blameworthy act harms a person or persons. Thus an act or policy that neither benefits nor harms anyone is of no moral significance, and thus is not morally required or forbidden.

Now the paradox. A policy enacted today with the goal of improving the life prospects of future persons will benefit no one, nor will a failure to enact such a policy harm anyone, for no future individuals will be made better or worse off by a policy decision at the present time. Instead, policy A (e.g., mitigating global climate change) will result in future populations of individuals that are better off, and policy B (business as usual) will result in future populations of entirely different individuals who are worse off.

Some philosophers conclude from this that there are no obligations to future generations (Schwartz 1978). Others find reason in this stark conclusion to reject the person-affecting principle (Parfit 1984, Kavka 1982, Partridge 1998). They argue that because the identity of remotely

future individuals is unknown and unknowable, and because our part in determining the eventual genetic makeup of those individuals is inescapable, the choice before us is whether to bring about future populations of prosperous and happy individuals, or future populations of miserable, albeit entirely different, individuals. The former alternative is the morally required choice, even though no future individuals will personally benefit from such a policy.

THE RIGHTS OF FUTURE PERSONS

Do future persons have rights to clean air, energy resources, and a nonthreatening climate? And do these rights entail claims upon the current generation? Many philosophers have argued that future generations do not have rights, not because future persons are not entitled to these benefits, but more fundamentally, because the concept of rights cannot meaningfully be attributed to future persons. Only actual persons can be said to have rights (De George 1979). Future persons will have rights only at such time in the future as they come into existence.

In rebuttal, one must first point out that the concept of rights is complex. There are many varieties of rights, some of which apply to future generations and others that do not. Most directly, one must distinguish active rights from passive rights. Obviously, future persons cannot act in the present. Therefore, future persons do not now have active rights (to do or not do such and such). But they might have passive rights (to be benefited, or at least not to be harmed). The aforementioned rights to clean air, energy resources, and an agreeable climate, all of which we might or might not provide for the future, constitute valid rights claims of future generations upon our contemporaries (Partridge 1990).

DISCOUNTING AND POLICY ASSESSMENT

How does one assess social benefits and harms? The economist's answer is to assimilate costs and benefits under a single metric: willingness to pay. This procedure, called "cost-benefit analysis," is the dominant method of government-policy assessment. The monetization of policy alternatives has the advantage of commensurating all values under a single measure, quantifying and allowing mathematical analysis of policy, and thus arriving at clear and determinate conclusions (Partridge 2003).

The economic assessment of policy inexorably leads to discounting the future, that is, assuming that the value of future costs and benefits, from the perspective of the present time, diminishes with the passage of time. Future discounting is reflected in interest rates. Assume, for example, an annual interest rate of 5 percent. This means that for $100 today to be equal to an amount in a year, $5 must be added to the $100, in other words, that the value of $100 today decreases to approximately $95 in a year's time.

If a human life is given a dollar value (as it must for insurance policies and in civil suits), then at a 5 percent discount rate, the value of 1 human life today is equal to the value of 2 lives in 14 years, 130 lives in 100 years, more than 1,000 lives in 200 years, and more than 1 billion in 500 years (Parfit 1984, p. 357). By this accounting, small dollar benefits of nuclear power today are greater than the discounted cost of millions of lives due to radioactive poisoning hundreds of generations in the future.

Why should the value of a human life be at all affected by the time at which it is lived? Why, in general, should a time in the sequence of generations be relevant to that value? Derek Parfit argues that it should not be (1984, p. 486). Several factors that accompany the passage of time are sensitive to the passage of time, he writes, among them probability, opportunity costs, excessive sacrifice, uncertain knowledge, but this list does not include time itself.

In addition, critics of the economic assessment of policy point out that numerous values are totally independent of economic analysis. Among them, the value of truth (to a scientist), justice, love, loyalty, nature, and above all, moral value (the worth of individual persons).

JUSTICE BETWEEN GENERATIONS: JOHN RAWLS AND CONTRACT THEORY

John Rawls's landmark book *A Theory of Justice* was one of the few philosophical treatments of the issue of justice between generations when it was published in 1971. Since then philosophical interest in the issue has increased substantially. Rawls's analysis of justice proceeds from this fundamental question: If you were given the choice of a society to live in, not knowing your status in that society, what kind of a society would you choose? The subtlety, complications, and controversy of Rawls's theory follows from elaborations of "what kind of a society," "not knowing your status," and the implied question "By what rules of rational choice and according to what knowledge might one make the best choice?" The answer to this question, devised by Rawls to be the answer of any person, yields principles of justice applicable to all persons. Rawls calls this perspective of rational choice, which includes all relevant general knowledge and excludes all particular personal knowledge, "the original position."

Applying the original position to the sequence of generations yields this question: What would a hypothetical future person, acknowledging that the same rules apply to all generations, require of the present generation? Such rules constitute a hypothetical contract among generations. From this original position, Rawls derives these principles

of justice between generations: "Each generation must . . . preserve the gains of culture and civilization . . ., maintain intact those just institutions that have been established . . ., [and] put aside in each period of time a suitable amount of real capital accumulation" (1971, p. 285). By "capital," Rawls means "not only factories and machines, and so on, but also the knowledge and culture, as well as the techniques and skills, that make possible just institutions and the fair values of liberty" (p. 288). Not included among these principles, but surely equally important, is the responsibility of each generation to bestow to succeeding generations a viable, well-functioning, and sustainable global ecosystem.

A SUSTAINABLE FUTURE: POLICY GUIDELINES

If we reject future discounting and thus treat succeeding generations as being of equal value, our policies regarding the future must entail sustainable resources and populations.

Leaving "Enough and as Good" In his *Two Treatises of Government* (1988 [1689]), John Locke sanctions the acquisition of property, provided one leaves "enough and as good" for others. If this proviso is applied to future generations, the obvious problem is, how can we possibly share with future generations depletable resources available to us today? A fair distribution of petroleum and coal, for example, to all future generations would leave each of us today with a cup of petroleum and a few lumps of coal. The answer to the problem is that we owe future generations, not a share of available oil and coal, but rather what these resources provide us, namely, energy. This implies that we owe the future the means to find and develop new sources of energy, and this in turn implies that we should pass on well-funded educational institutions and robust facilities of research and development. Our obligation also entails a policy of recycling and recovering mineral resources and of using renewable resources.

Do No Harm The further we project into the future, the less we are able to anticipate the goods of future generations: their pleasures, satisfactions, tastes, and aspirations. It is much easier, however, to identify what will harm humans of any generation. Most fundamentally, this would be physical injuries and disease and a deterioration of the physical and biotic environment that sustains humans.

Doing Well by Doing Good Lack of motivation is foremost among the practical impediments to responsible provision for the future. With an abundance of problems facing us here and now, how can we expect the present generation to make sacrifices for persons whom we will never personally know and whose values we might not share? This problem is capably addressed by adopting policies that benefit both the present and the future. This would include generous public support for education, and in particular, for scientific research and technological development. This research and development should address the problems facing us today or in the near future, as well as in the remote future. The most prominent of these problems are renewable energy, climate change, and ecological protection and renewal.

Preserving Natural Capital Nature normally performs essential functions for humankind. Among these functions are climate regulation, air and water purification, groundwater accumulation, carbon sequestration, pest control, pollination, oxygen production, and wetland production of marine nutrients. It has been estimated that the global economic value of these functions is in excess of $33 trillion, approximately twice the annual gross global product of all Earth's economies (Costanza et al. 1997). Undisturbed, nature produces these indispensable services continuously, without depletion. Surely the preservation of this natural capital must be included among our primary responsibilities to future generations.

SEE ALSO *Biodiversity; Cost-Benefit Analysis; Energy; Global Climate Change; Intergenerational Justice; Population; Sustainability.*

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Ernest Partridge

G

GAIA HYPOTHESIS

The Gaia hypothesis is the proposition that all life on Earth functions in essential ways as a single living organism. According to the originator of the hypothesis, British inventor and geoscientist James Lovelock, "The entire range of living matter on Earth, from whales to viruses, and from oaks to algae, could be regarded as constituting a single living entity, capable of manipulating the Earth's atmosphere to suit its overall needs and endowed with faculties and powers far beyond those of its constituent parts" (Lovelock 1979, p. 9).

GAIA HYPOTHESIS AND GAIA THEORY

In his 2006 book *Animate Earth*, ecologist Stephan Harding defines Gaia theory as the view that the "sum of all complex feedbacks between life, atmosphere, rocks, and water give rise to Gaia, the evolving, self-regulating planetary entity that has maintained habitable conditions on the surface of our planet over vast stretches of geological time" (Harding 2006, p. 64). Gaia theory goes beyond the original Gaia hypothesis in several key ways. For one, it includes abiotic elements. Harding adds that "all the rocks on the Earth's surface, the atmosphere and the waters have been altered by life, and vice versa" (p. 64). Some Gaians argue that even the movement of tectonic plates is influenced by life processes (Margulis 2004). In addition, Gaian Theorists can appeal to extensive empirical support accumulated since Lovelock's first formulations (Schneider and Boston 1991; Schneider et al. 2004), but also tend to speak much more circumspectly than Lovelock originally did about Gaia's emergent "faculties and powers."

ORIGINS

In the early 1960s, while working for the National Aeronautics and Space Administration (NASA) to conceptualize experiments to detect life on Mars, Lovelock realized that one of the clearest signs of life on our own planet, as it might be viewed from space, is the chemical disequilibrium of the atmosphere. Without life, Earth's atmosphere would consist almost entirely of carbon dioxide, whereas in fact it consists mostly of nitrogen and oxygen. The radical chemical instability of the entire mix signals processes at work beyond physical chemistry.

Lovelock and his early collaborator, microbiologist Lynn Margulis, quickly began to fit other terrestrial improbabilities into the picture. The current atmospheric composition appears to have been constant almost from the moment aerobic organisms appeared. Global temperatures likewise have been maintained well within the range that suits living organisms, as has the salinity of the oceans. Yet these balances have been sustained in the face of highly variable inputs. Since the emergence of life, the Sun's output has increased by at least 25 percent, and there have been regular perturbations in Earth's orbit, comet impacts, volcanic eruptions, variable mineral runoff into the oceans, and so on.

Lovelock and Margulis argue that life processes produce and sustain these otherwise entirely improbable balances (Lovelock 1991). Atmospheric composition and global temperature may be regulated by differential growth rates in plants that change the albedo (reflectivity or heat-absorption) of the surface. Plants, along with animals, also exchange carbon dioxide for oxygen, or vice versa, and produce methane and other greenhouse gases. Shell formation in the

oceans helps regulate salinity of the seas. Research since 2000 has uncovered increasingly subtle and previously unsuspected feedback loops, such as the influence of dimethyl sulfide emissions from ocean algae—sensitive to temperature variations in the waters—on the formation of temperature-regulating cloud cover (Lovelock 2006). For Gaia theory, then, the Earth System as a whole is homeostatic (it maintains stable and "hospitable" internal conditions despite varied inputs)—a key feature of life. Earth truly begins to appear as a kind of superorganism. The name *Gaia* invokes the Greek Earth goddess of that name—a mythic connection suggested by Lovelock's friend and neighbor in Wiltshire, United Kingdom, the novelist and classicist William Golding.

DEBATES AND DEVELOPMENTS

A widespread early objection to the Gaia hypothesis was that it imagines life deliberately manipulating conditions to suit its needs, and thus is illegitimately teleological. Lovelock's response was that even simple cybernetic systems are capable of finely tuned adaptation without conscious intention. To illustrate the point he developed a model called Daisyworld, demonstrating that a world with merely two colors of daisies can maintain level planetary temperatures over a wide range of solar inputs. If the planet begins to heat up, the light daisies spread, as they are better able to reflect sunlight and avoid overheating. Planetary albedo therefore inches up, cooling the planet. Likewise, spreading dark daisies can keep temperatures from falling too low. Adding many daisy color variants, and even animal grazers and predators, only increases the stability of the temperature-regulation (Harding 2006; Lovelock 2006). Daisyworld has now become so mainstream that multiple versions are available on the Internet as software for ecology courses. The appearance of teleology has been reduced by the use of less poetic, newer names for Gaia theory, such as "Earth systems science" and "geophysiology."

Commentators distinguish a variety of Gaia hypotheses. One version asserts simply that life changes the abiotic environment, rather than just adapting to the conditions it finds. The critic James Kirchner calls this version "Weak Gaia" (Kirchner 1991, p. 38), though Lovelock has declared that it is all he really claimed—and disputes the label "weak," arguing that this recognition represents a profound and fertile paradigm-shift (Lovelock 2004, p. 2f). Somewhat different is the claim that life plays a key role in maintaining the stability of the natural environment (Kirchner calls this "Homeostatic Gaia") or some of its holistic processes. A stronger version holds that life *optimizes* the conditions for itself in this way ("Optimizing Gaia"). What Kirchner calls "Coevolutionary Gaia" asserts a tight relation between Gaian processes and evolution. While some Darwinians argue that evolution could not give rise to a planetary superorganism, others argue that it literally *must* (Volk 1998). These latter claims are naturally hard to evaluate when we have only one example (so far!) of a Gaian system from which to generalize (Boston and Thompson 1991; McKay and Stoker 1991).

GAIA AND CLIMATE CHANGE

Gaia is resilient. Life responds as a whole to defend itself and has done so successfully for hundreds of millions of years, sometimes under much more massive assaults than at present. Thus, though his 1979 work did identify what he called planetary "vital organs"—the wetlands, continental shelves, and rainforests—where caution is necessary, Lovelock's early thinking did not underwrite environmentalism as it usually is understood. Lovelock did not propound a land ethic, for example, or special standing for other-than-human individuals or even many species or ecosystems (Lovelock 1979).

However, Lovelock's *The Revenge of Gaia* (2006) announced a major reversal. Systems thinking implies that a system may remain stable for a long time, even with a variety of inputs and stresses, but then abruptly shift into some other, sharply different state. (Though we have learned to speak of Earth's homeo*static* processes, the technically proper term is homeo*rrhesis*, since the equilibrium points can shift.) Lovelock now believes that human disruption of Gaian processes has reached such a scale and intensity that we have already passed key system "tipping points." Global climate change not only is real but is likely to be amplified, by the same feedback processes that for so long held it stable, into a vastly worse (for humans) set of changes than most climate modeling now predicts. As polar ice melts and the snows retreat, for example, more exposed ocean and soil absorb more sunlight, warming the region still more. Even small amounts of glacial melting in Greenland have already changed the entire structure and flow rates of glaciers, greatly accelerating melting. Many more "positive" (self-accelerating) feedback processes are being discovered.

In the face of large temperature increases and a huge rise in sea level, Lovelock predicts, most of Earth will become barren and people will be able to survive only at the poles. Crash programs might forestall some of the worst and most rapid effects, he argues, but they will have to be radical programs such as replacing fossil fuels with nuclear power (the only way to seriously reduce carbon dioxide emissions, he argues), synthesizing food to reduce overfarming, and launching orbiting sun-shades (Lovelock 2006). Gaia will survive in any case, and some humans may also survive, but the survival of civilization, Lovelock fears, is a poor bet. As of this writing, these bleak predictions have only barely been assimilated by many Gaian thinkers, and a developed critical assessment has not yet emerged.

Receding Exit Glacier, 2004. *The sign marks where Exit Glacier, in the Kenai Fjords National Park in Alaska, used to reach in 1978; its location in 2004 was a half mile back. James Lovelock believes that human disruption of Gaian processes has contributed to the devastating effects of global climate change, which he believes will only become more amplified over time.* **© ASHLEY COOPER/PICIMPACT/CORBIS.**

ETHICAL IMPLICATIONS

Personifying "Gaia" explicitly draws upon the respect for persons built into traditional ethics. If Earth can be viewed as an integrated, organic being, then *she* has a claim on our respect, and acknowledging something like the "personhood" of the entire planet might even bring environmental ethics to the (seeming) endpoint of a long series of recognitions of other- and larger-than-human persons (Roszak 1978). Aldo Leopold expressed just such a sentiment quite beautifully in his relatively unknown essay "Some Fundamentals of Conservation in the Southwest": "Possibly, in our intuitive perceptions … we realize the indivisibility of the earth—its soil, mountains, rivers, forests, climate, plants, and animals, and respect it collectively not only as a useful servant but as a living being, vastly less alive than ourselves in degree, but vastly greater than ourselves in time and space—a being that was old when the morning stars sang together, and, when the last of us has been gathered unto his fathers, will still be young" (Leopold 1991 [1923], p. 95).

Alternatively, it could be argued that environmental ethics really needs to move beyond what might be called *person*-centrism entirely—perhaps a residual form of anthropocentrism itself (Weston 1987). Other and quite different sorts of entities, such as vast and intricate planetary systems, may require moral consideration in very different terms. Insofar as later Gaians construe homeostasis in ways that do not involve any hint of teleology, Gaian thinking has moved away from a personlike model as well.

Some Gaian thinkers propose an exalted role for humans within Gaia. Lovelock wrote that "the evolution of *homo sapiens*, with his technological inventiveness and his increasingly subtle communications network, has vastly increased Gaia's range of perception. She is now through us awake and aware of herself. She has seen the reflection of her fair face through the eyes of the astronauts and the TV cameras of orbiting spacecraft." (Lovelock 1979, p. 148). The evolution of human consciousness might represent a new phase in Gaia's own evolution: the development of planetary self-consciousness and mind. The Internet could be thought of as a Gaian nervous system in the making. Gaia may even reproduce itself through the

human colonization of other planets. A fictional work of Lovelock's, cowritten with the science writer Michael Allaby in 1984, proposes to use global warming to literally "terra-form" Mars into another Earth (Allaby and Lovelock 1984). This idea continues to be seriously debated at NASA and elsewhere (Morton 2002).

Others read the Gaia hypothesis in a much more modest light. Humans are extreme latecomers in the Gaian story, and until the last geological split-second or so, we have made only the most infinitesimal contribution to any of the great cycles that keep Earth in balance. With the coming of industry, (some) humans began to become destabilizers, and though the system has a place for destabilizers, their role is often short-lived. At best, on this view, we are small parts of a much vaster and sublimely indifferent—now perhaps somewhat hostile—system. As Crispen Tickell puts it, "Gaia has no particular tenderness for humans" (Tickell 2004, p. 224).

On either view of the place of humans within Gaia, new ethical responsibilities and a new vision of ourselves are incumbent upon us. On the more exalted view, we now need to articulate and apply our awareness of Gaia as our largest ethical point of reference. Indeed the development of environmental ethics itself has been pictured as an expression of this very planetary self-awareness now awakening through us (Harding 2006). Environmental ethics not only speaks for Earth but in a sense may represent Earth itself speaking.

The more modest view also embraces a new ethic, but *humility* is its key theme. Tickell goes on: "There has . . . been some talk, notably among the religiously inclined, about an alleged human obligation of 'stewardship' of the Earth. If so, the Earth has had to wait a long time for the arrival of the stewards. Certainly the trilobites managed for over 250 million years without them" (Tickell 2004, p. 225). In a similar vein, Lovelock himself has declared that "humans are about as qualified to be stewards of the Earth as goats are to be gardeners" (quoted in Tickell 2004, p. 225, but he does not offer a citation). Rather, our first and urgent task is to get ourselves under control. At best we might aspire to "plain biotic citizenship" (Leopold 1949, p. 204). From this point of view, the new awareness to which we are challenged is chiefly awareness of *ourselves* in a Gaian context, implying a radical and new kind of circumspection and care.

Philosopher-magician David Abram draws from the Gaia hypothesis a vision of intimacy with Earth, a vast webwork of interconnection that is alive and aware in *all* of its parts. He writes that "we must remember and reacquaint ourselves with the very medium within which we move. The air can no longer be confused with mere negative presence or with the absence of solid things: henceforth the air itself is a density . . . a thick and tactile presence. . . . We are immersed in its presence as surely as fish are immersed in the sea" (Abram 1985, p. 96). Human awareness is distinctive, to be sure, but so is every species' mode of awareness, and all of us together constitute Gaia's mind. For Abram, the Gaia hypothesis is an invitation to recover what he calls our "sensuous immersion" in the natural world. This same Gaian interconnection also gives us a direct link to the suffering of Earth. Our own bodies are entirely parts of the vast physiology that is the planet, and just as all the cells of an individual body can be shocked and stressed by damage to another part of that body, so an individual can be shocked and stressed by what is done to Earth as a whole.

The idea of Earth as a superorganism is not new. Historically it has taken many forms, from the original goddess who lends Lovelock's hypothesis her name, through Thales, Plato, Hutton, Leopold, and many others (Scofield 2004; Harding 2006). Giordano Bruno burned at the stake for advocating one version of it. Add to this ancient intuition the power of modern systems thinking, extensive scientific observation and analysis, and the urgency of the moment, and we find ourselves with a vital new philosophical as well as geophysiological paradigm.

SEE ALSO *Animal Ethics; Darwin, Charles; Evolution; Future Generations; Global Climate Change; Land Ethic; Leopold, Aldo; Stewardship.*

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Anthony Weston

GENETICALLY MODIFIED ORGANISMS AND BIOTECHNOLOGY

Genetically modified organisms (GMOs) are plants, animals, and microbes whose genetic code, or DNA, has been altered, using biotechnology. Ethical issues associated with GMOs and biotechnology have been in the public spotlight since the 1980s, and many of these issues are environmentally focused. This entry addresses the nature of biotechnology and the ethics behind scientific and public-policy issues.

The structure of deoxyribonucleic acid (DNA) was discovered by James D. Watson and Francis Crick in the early 1950s. By the late 1970s scientists were developing mechanisms for recombining DNA, that is, moving DNA material, genes, from organism to organism, even across species boundaries. Genetic engineering, or recombinant DNA (rDNA), did not gather much public awareness or public-policy concern until 1980, when the U.S. Supreme Court issued its *Diamond v. Chakrabarty* (447 U.S. 303 [1980]) decision, allowing genetically modified organisms to be patented. Ananda Mohan Chakrabarty, a genetic engineer working for General Electric, had developed a bacterium (derived from the *Pseudomonas* genus) capable of breaking down crude oil, and he proposed to use this bacterium in treating oil spills. Chakrabarty's success in obtaining a patent for this potential environmental silver bullet was watched closely by individuals, research institutions, and corporations involved in the life sciences. In fact, *Diamond v. Chakrabarty* spurred the development of the global biotechnology industry (Busch, Lacy, Burkhardt, and Lacy 1991).

It is fair to say that most current controversies over biotechnology in general, and GMOs in particular, are the result of different assessments of the ethical acceptability of what biotechnology has and might produce. Many of these issues stem from the fact that genetic engineering for food, agriculture, and pharmaceuticals is now a large and powerful global business enterprise.

THE SCIENCE OF GENETIC ENGINEERING

According to the Office of Technology Assessment of the U.S. Congress, "Biotechnology is any technique that uses living organisms or parts of organisms to modify products, to improve plants or animals, or to develop microorganisms for specific uses" (1988, p. 3). Under this definition, several disparate procedures count as biotechnology, including fusing protoplasts, growing whole plants from tissue cuttings (cultures), and harvesting enzymes from the metabolic functions of bacteria. Some people count traditional plant breeding, crossing, as biotechnology. Most scientists and observers note that the major function of biotechnology is genetic engineering, more specifically, transgenetic engineering. Transgenesis is the process of removing genetic material (DNA) from one species (the host) and transferring it to another species (the target) using some biological agent, usually a bacterium (the vector).

In simple terms, the process of genetic engineering begins with scientists identifying an organism, say a crop plant species, which they desire to see exhibit certain traits, either new ones for that species or enhanced traits that the species already possesses. For example, tomato plants are susceptible to tomato mosaic virus, which significantly reduces the productivity of the plant by

reducing the efficiency of its photosynthesis. Scientists then find other species of plants that seem to resist or combat tomato mosaic virus and analyze the DNA of the host plants to determine what sequence(s) of genes are responsible for regulating the chemical/microbiological process that leads to resistance. From there, scientists use enzymes to cut the responsible DNA sequence out of the nucleus of the host, and use a bacterial vector (usually an agrobacterium, whose pathogenic, mutagenic, and/or carcinogenic properties have been neutralized) to transfer the genes from the host to the nucleus of the target. The target plant cells, which now include the gene sequence(s) of the host, are cultured into plants, which are then tested for their resistance or ability to combat tomato mosaic virus. If the initial DNA sequence was properly identified and the process has been properly carried out, the new tomato plant will have increased resistance to tomato mosaic virus.

Important elements in this form of genetic engineering are, then, knowing what properties or traits are desirable for which plant species, and knowing where the DNA is to be found for the transfer successfully to occur. One key element, from both a practical as well as philosophical perspective, is that DNA is the universal building block of all living things, so that in theory, DNA from any living source might be inserted into any other living source, according to what scientists, farmers, or pharmaceutical manufacturers desire. Practically, this means that the possibilities for transgenetic engineering are vast. Philosophically, this means that genetic material from virtually any plant or animal species can be transferred to any other plant or animal species. Jeremy Rifkin (1984), a major critic of biotechnology, coined the term *algeny* to reflect the brave new world of potentially infinite interspecies DNA transfers. Rifkin thus equated the potentially world-transforming nature of biotechnology with alchemy, the attempt to turn one substance to another, particularly lead into gold. The foolish and dangerous nature of alchemy served as the basis of his critique of algeny. We shall return to this point later.

There are other biotechnological procedures worth mentioning. Among them are gene-deletion techniques (designed to remove unwanted traits from organisms) and cloning (the creation of identical twins from the cells/DNA of a host organism). Cloning received much public attention with the creation of Dolly the sheep in 1996 from the mammary cell of an adult sheep. The U.S. Food and Drug Administration approval of cloning food animals is under close scrutiny by both proponents and opponents of biotechnology.

In sum, while biotechnology may encompass many different procedures, in practice, transgenetic engineering is by and large the most useful and most used biotechnology today. Scientists and many potential client groups continue to be excited about the prospects of this new tool in the toolbox. As scientists are prone to note, biotechnology is considered to be just the next advance in genetics and microbiology, and will take science to new levels of useful and potentially profitable outcomes. The process of genetic engineering is becoming so common that it undoubtedly will continue. In the minds of many observers and concerned citizens and policy makers, the direction of this science needs to be carefully monitored, if not controlled. Algeny may be useful, but may also be a Pandora's box.

A SERIES OF ISSUES

Biotechnology in general has come under philosophical and ethical scrutiny in part because of issues that have arisen concerning particular products (including some GMOs), mainly those used in the food-production system. (Pharmaceutical and medical biotechnology has received relatively little attention and ethical critique.) One of the earliest GMOs was Flavr Savr tomatoes, developed by the biotechnology company Calgene (one of the first biotech firms). Flavr Savr tomatoes were engineered to prolong the shelf life of fresh-market tomatoes. Traditional tomatoes must be picked from the vine while still green to maintain their firmness during transport to the supermarket. The tomatoes are then sprayed with ethylene, their natural ripening agent, to turn the tomatoes red. Flavr Savr tomatoes were designed to ripen on the vine longer while maintaining their firmness so that an actually ripe, full-flavored tomato could be delivered to supermarket shelves. As beneficial to consumers as this product appeared to be, immediate concerns arose: Was this tomato dangerous to human health? Should we have concerns about toxins, allergies, or nutrition? What are the dangers to the environment? What about gene transfer across different organisms? Public reaction and the subsequent failure of Flavr Savr tomatoes in the market led to the withdrawal of this product from the market in 1997. The issues that Flavr Savr tomatoes presented set the stage for public attitudes and ethical concerns regarding most other products of food and agricultural biotechnology.

Bovine somatotropin (BST), or bovine growth hormone (BGH), met with more heated reactions. BST is a nonsteriodal hormone, produced in the pituitary glands of cows, that regulates metabolism and, indirectly, the production of milk in dairy cows. Scientists with Monsanto Corporation were able to insert DNA for the active protein in BST into the nonvirulent bacterium *E. coli*, thereby synthesizing a pure form of recombinant BST (rBST) that could be injected into dairy cows. It was found that BST-treated cows could increase milk production by up to 40

percent with only a small increase in feed consumption (around 15%). Again, what appeared to be a benefit for farmers (more milk and greater profits) evoked widespread concern and ethical critique (Comstock 2000). For example, one health-related Web site (Lipschutz-Robinson 2007) cites these problems associated with BST/BGH:

- Cows get sick from rBGH. Monsanto has been forced to admit to about 20 veterinary health risks on its Posilac label, including mastitis and udder inflammation.
- Pus from mastitis induced by rBGH and antibiotics used to treat the mastitis contaminate rBGH milk.
- The genetically engineered hormone can contaminate rBGH milk, since it can be absorbed through the gut and induce immunological effects.
- Chemically and nutritionally, rBGH milk is very different from natural milk.
- In rBGH milk there are high levels of the insulin-like growth factor 1 (IGF-1), excess levels of which have been incriminated as a major cause of breast, colon, and prostate cancers.
- Factory farms producing rBGH milk pose a major threat to the viability of small dairy farms.

As it turned out, the U.S. Food and Drug Administration approved the use of BST, and many dairy farmers adopted the technology. A few states, such as Wisconsin, required that milk from BST-treated cows be labeled as such, but public furor subsided in the late 1980s, and labels differentiating BST from non-BST milk have all but disappeared in the United States, although Europe continues to ban imports of meat, milk, and dairy products from BST-treated cows.

Flavr Savr tomatoes and BST dairy products were examples of biotechnology products that had direct consumer contact, and concerns tended to focus on human-health issues. Another class of agricultural biotechnologies has faced a different set of concerns. One of the first biotechnology products to receive attention because of potential environmental problems was the bacterium ice minus. *Ice minus* was the name given to a nonharmful bacterium found on the leaves of many crop plants, *Pseudomonas syringae*, which forms ice crystals at near-freezing temperatures, damaging the plants. *P. syringae* was genetically modified so that the ice-producing properties were removed from the bacterium, which could then be applied to crop plants to serve as a sort of blanket against cold temperatures. Although ice minus was tested thoroughly and behaved as expected in laboratory and greenhouse conditions, the public expressed outrage when it was discovered that scientists were field-testing this GMO on the roofs of laboratory buildings. Fearing that the altered bacterium might escape and confer frost resistance on weeds and other nonbeneficial organisms, environmental groups sued to stop this practice and to prevent field tests. The U.S. Environmental Protection Agency finally gave approval to field tests for ice minus, but by then concerns about the environmental impacts of GMOs had become a major consideration in public conversation and in regulatory circles.

Environmental concerns about GMOs became even more focused in the case of the most successful agricultural-biotech products to date: Roundup-Ready crops (corn, sorghum, cotton, soy, canola, and alfalfa). Roundup is a patented form of the herbicide glyphosate, originally developed by Monsanto Corporation. In the late 1970s Monsanto scientists were able to isolate the gene for herbicide tolerance and insert that gene into the crop plants listed above. The result is a crop plant that can withstand being sprayed with Roundup. In effect, Roundup kills all weeds (including microflora) while leaving the crop alone. Farmers hailed Roundup-Ready technology as a way to drastically reduce herbicide applications and thereby reduce costs, and the Environmental Protection Agency found Roundup to be far less environmentally hazardous than most of the other herbicides used in the production of crops for which Roundup-Ready technology had been developed. Concerns were raised, however, about human and animal health effects. Most of those objections were scientifically refuted. Of more serious concern were the effects on ecosystems and aquatic life. Since Roundup is a systemic herbicide—it kills plants by inhibiting the production of an amino acid essential in photosynthesis—the risks of exterminating "weedy" plants that are nevertheless essential in plant-insect-bird food chains are real, as is the potential effect on aquatic systems whose microflora are the staple foods of much aquatic life. Debate about these effects continues, even as some Roundup-Ready crops, such as soybeans and canola, constitute over 60 percent of the varieties grown in the United States.

Similar issues were raised in connection with Bt crops, which were genetically engineered to produce the enzyme active in *Bacillus thuringiensis*, a pesticidal bacterium long-used in organic farming and gardening. The Bt enzyme reacts with digestive enzymes in the gut of pest insects to produce toxins that force the insect to stop eating and starve to death. Commonly, a Bt solution was sprayed on crops, which, when their leaves were attacked by certain insect larvae, caused the insects to die. Scientists were able to engineer plants to contain the toxic enzyme from Bt, thereby conferring insect resistance on the plant. In 2007 versions of Bt cotton, Bt corn, and Bt potatoes were grown in the United States, Canada, and several other nations.

Genetically Modified Corn, near Santa Rosa, California. *In order to use fewer chemicals and save money, the owner of this Sonoma County dairy farm began growing genetically modified corn, finding it more resistant to weeds and a cleaner feed for his dairy cows. Genetic engineering of food products has become a controversial ethical issue due to the possible hazards both for human health and the environment.* **AP IMAGES.**

Objections to the Bt enzyme originally were focused on possible health effects, but after it was shown that the digestive enzymes in humans would not produce toxins even if the leaves of Bt plants were consumed by people, attention turned to environmental impacts. The incident that brought Bt crops to the public's attention was a 1999 report that showed monarch butterflies to be severely threatened by Bt technology (U.S. Department of Agriculture, Agricultural Research Service). Monarch butterfly larvae feed on milkweed plants, and milkweed is frequently found near cornfields in the major corn-growing areas of the United States. Pollen from Bt corn drifts onto milkweed plants, and when larvae feed on milkweed leaves, they are poisoned, just like pest insects on corn. Public concern about the threat to the monarch butterfly led to several studies and an eventual recommendation by the Department of Agriculture and the Environmental Protection Agency that cornfields maintain a buffer between crop plants and fencerows, and take other precautions to prevent pollen drift. However, there continues to be concern about the impacts of Bt and other biotechnology products on nontarget plant and animal species. In addition to such concern, there is now widespread awareness and regulatory interest in what has come to be called "genetic pollution"—the movement of genetic material from a deliberately engineered plant to wild relatives of that plant and other plant varieties as well. Even if there are no proven human health effects of a polluted nontarget plant species, concerns remain.

The Starlink controversy is an example of genetic pollution in a different form: What happens when GMOs not approved for human consumption inadvertently make their way into the food supply? Starlink corn, engineered and introduced by Aventis Corporation, is a Bt/glyphosate-tolerant corn hybrid approved by Food and Drug Administration for use in animal feed. As noted above, Bt toxins have not been considered a health risk. However, tests submitted by Aventis to the Environmental Protection Agency suggest that the version of toxin in Starlink may be more stable and digestion-resistant than other members of the Bt toxin family, and hence more likely to cause allergies in humans. For this reason the Environmental Protection Agency did not allow the use of Starlink in human food. In 2000, however, Starlink material was detected in taco shells sold by Taco Bell. There was a great public outcry, and eventually the taco shells (and many other yellow-corn products) were recalled from the market. How Starlink made its way into the food chain is not clear, although it is possible that some Starlink growers sold corn to a Mexican company that milled it for Taco Bell. Regardless, now most corn buyers and processors must routinely test for the presence of Starlink corn. If it is detected, the corn is sold for feed or nonfood industrial uses.

Flavr Savr tomatoes are no longer available, and ice minus and BST are no longer as controversial as they were when first introduced. The Starlink controversy is over. However, Bt crops and Roundup-Ready crops (generically, glyphosate-tolerant crops), all major parts of U.S. agriculture, continue to evoke discussion and critique. Since U.S. agriculture is so highly productive, U.S. farmers and the U.S. government are always looking for ways to market agricultural commodities abroad. Historically, the United States has found ready markets for meat, grains, vegetables, and fruit across the globe. However, in some parts of the world, GMOs and biotechnology in general are looked upon with some suspicion, if not outright disdain.

Indeed, for reasons not always clear to U.S. growers and officials of the U.S. Department of Agriculture, the European Union has been hostile to GMOs and genetically engineered agricultural commodities. The European Union has placed stringent limits on genetically modified crops and other products, in some cases (e.g., BST dairy products and meat) banning them entirely. Although the United States continues to challenge European Union trade prohibitions through the World Trade Organization, so far Europe has managed to keep most U.S.-created genetically modified products out of the continent.

An interesting result of the official European stance toward genetically modified foods occurred in 2002. Southeastern Africa was experiencing a severe drought and sought international relief. The United States offered to send maize through the U.N. World Food Program, but Zambia and Zimbabwe rejected the aid. Both nations expressed concerns about the potential genetic pollution of their indigenous maize crops and the potential loss of European markets for their products. Although most African nations are actively engaged in agricultural-biotechnology research and development (as resources permit), concerns about human health and environmental safety are as strong there as anywhere else. As a result, Africans have adopted a precautionary approach similar to the Europeans', which helps account for their reluctance to accept U.S.-produced genetically modified maize. Eventually both nations agreed to accept U.S.-produced corn meal to help alleviate hunger, but allowed no kernels to be imported (Njoroge 2002).

ETHICAL CONSIDERATIONS IN PUBLIC DEBATE AND PUBLIC POLICY

The public controversies surrounding GMOs show that people's attitudes toward and beliefs about GMOs frequently differ and even contradict each other (Hoban and Kendall 1993). Indeed, behind critiques and defenses of everything from Flavr Savr tomatoes to genetically modified maize are essentially ethical positions and judgments. The main argument in support of agricultural biotechnology has been a consequentialist-utilitarian one: Biotechnology is a means of improving the efficiency and perhaps environmental friendliness of modern food and fiber production, which translates into lower producer costs and lower consumer prices. Since achieving these goals enhances human welfare, biotechnology is prima facie good for society (National Agricultural Biotechnology Council 1995).

In contrast, criticisms of biotechnology and GMOs tend to be based on one of three ethical stances (Thompson 1997). (1) Some criticisms are based on the nature of the technology itself. (2) Some concerns are based on people's rights to be able to choose the products they consume, and the potential difficulty of being able *not* to choose genetically modified foods. (3) Some objections are based on potential environmental and/or social consequences of GMOs.

Jeremy Rifkin's notion of algeny captures part of the idea that there is something inherently wrong with GMOs. The main concern is that biotechnology is playing God, illegitimately interfering in the natural order. In this view, manipulating DNA is doing something only God should do—create life forms. God or evolutionary process produced species, each within special ecological niches. Altering species, especially in transgenesis, threatens to disrupt creation or eons of natural selection and diversification. As such, biotechnology is inherently unethical, immoral, or even sinful.

The second kind of ethical objection to GMOs is based on people's rights and autonomy—their moral entitlement to be able to choose. As biotechnology-based foods have become so prevalent, it is increasingly difficult for people who have ethical objections to GMOs, such as believing them to be unnatural, to avoid consuming those foods. The fact that genetically modified foods are not labeled in the United States means that consumers are effectively forced to consume them—a fact that violates their rights. And violations of rights are unethical.

The third ethical critique of GMOs concerns their potential social, economic, and especially environmental consequences. As discussed above, there were concerns that rBST would place small dairy farms at an economic disadvantage. Also noted was the impact of Bt crops on monarch butterflies. The fact that GMOs are still relatively new indicates that their potential long-term environmental and social consequences have not yet been assessed, nor can they be. GMOs and biotechnology are not necessarily unethical, but they may place people and the environment at risk, which is unethical. Consequently, we should adopt a go-slow policy with regard to permitting the use of biotechnology, prohibiting some GMOs entirely.

Defenders of biotechnology have replies to each of these objections. Regarding the objection of playing God, they note that humans have always interfered in nature, and have genetically altered plants and animals through traditional breeding for millennia. Regarding choice, if there is nothing wrong with biotechnology, why do people need a choice? To demand to be able to avoid genetically modified products is silly or irrational. And concerning consequences, the fact is that biotechnology is precise and controlled, so that scientists and regulators do in fact know in advance what the consequences of a given GMO will be. At the very least, government regulators make sure that products (genetically modified or otherwise) are not allowed on the market until they are

deemed safe, that is, posing minimal or no risks. Again, biotechnology is ethically acceptable because of the overarching benefits it confers on people.

To date, there have been no health or environmental catastrophes associated with genetically modified products. Proponents cite the adequacy of public and private institutional mechanisms for assuring safety and beneficial consequences. Since 1986 the U.S. government has maintained the Coordinated Framework for Regulation of Biotechnology, which is intended to maintain the positive track record for food and agricultural biotechnology (U.S. Department of Agriculture 2007). Depending on the product, the Animal and Plant Health Inspection Service of the U.S. Department of Agriculture, the U.S. Environmental Protection Agency, or the U.S. Food and Drug Administration is responsible for ensuring public health and safety.

Even though there is regulatory oversight, public-interest and activist groups continue to press the federal agencies involved, and continue to publicize ethical debate. In part, this is because biotechnology and GMOs are almost exclusively developed, owned, and marketed by a small group of large multinational corporations: Monsanto, Dow, Aventis, and DuPont, to name a few. Groups such as the Rifkin's Foundation for Economic Trends; the Union of Concerned Scientists; Greenpeace; the Consumers Union; Environmental Defense; and the Environment, Technology, and Concentration Group continue to pressure the government and these corporations to make sure that biotechnology and GMOs are safe and in keeping with the public interest. All these groups issue frequent communiqués, maintain active Web sites, and are vocal in the media as new products emerge from the food- and agricultural-biotechnology enterprise. The point is to make sure that all actors in this system behave ethically.

To summarize, although biotechnology may be a simple tool in the toolbox, allowing food and agricultural scientists to achieve plant and animal improvements that they see as beneficial to the public, several biotechnology products that have made their way into the market have been the subject of serious ethical critique and widespread public debate. Much of the ethical critique has focused on human-health issues, but environmental concerns have been just as important in the continuing discussion of food and agricultural biotechnology. The issue facing us is whether future products of food and agricultural biotechnology will have beneficial consequences, or will continue to be perceived as posing risks to health, environment, or to people's free choices, which exceed said benefits.

SEE ALSO *Animal Cloning; Food Safety; Greenpeace; Microbes; Organic Farming; Patenting Life; Shiva, Vandana; Substantial Equivalence; Transgenic Animals; U.S. Department of Agriculture; U.S. Environmental Protection Agency; U.S. Food and Drug Administration.*

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Jeffrey Burkhardt

GLOBAL CLIMATE CHANGE

The possibility of anthropogenic (human-caused) climate change has been recognized since at least 1896, when the Swedish Nobel Prize–winning physicist Svante Arrhenius speculated that burning fossil fuels such as coal and oil might

increase atmospheric carbon dioxide, affecting both climate and terrestrial biological systems. Arrhenius estimated that a doubling of atmospheric carbon dioxide would increase the mean surface temperature of Earth by about 4 to 6 degrees Celsius, a figure that is very close to those produced by contemporary climate models. In 1963 a Conservation Foundation meeting warned of "potentially dangerous atmospheric increases of carbon dioxide" (Conservation Foundation 1963, pp. 19–20) and a 1979 report from the American National Academy of Sciences stated that a "wait-and-see policy may mean waiting until it is too late" (National Academy of Sciences 1979) to avoid significant climate changes. In 1988 Senator Tim Wirth of Colorado introduced a bill calling for a 20 percent reduction in carbon dioxide emissions by 2000 from 1990 levels. Although the bill failed, it had fifteen cosponsors, both Republicans and Democrats. In 1992 virtually all the countries in the world signed the Framework Convention on Climate Change (FCCC), in which they pledged to "prevent dangerous anthropogenic interference with the climate system."

Drought in Tanzania, 2004. *Children walk past a carcass in the Malambo district of Ngorongoro, one of Africa's most popular tourist destinations. The region is also home to the Maasai, a traditionally pastoral tribe whose livelihood is heavily affected by drought. Some theorists contend that it is the poor countries of the south that suffer the most from global climate change.* **TOM STODDART/GETTY IMAGES.**

THE ISSUE

Climate change is a difficult, complex, and challenging problem for several reasons. One reason is that Earth responds on different time scales than do political systems. Once carbon dioxide is emitted, it remains in the atmosphere for centuries, and other greenhouse gases (GHGs) can remain in the atmosphere for millennia. Because GHGs have such long residency times in the atmosphere, their effects on climate extend far into the future. Even if all GHG emissions ceased immediately, there would be at least another 0.7 degree Celsius of warming in addition to the 0.8 degree Celsius of warming that already has occurred.

Emissions will not cease immediately. Globally, emissions are increasing, as are atmospheric concentrations of carbon dioxide. In the mid-eighteenth century there were 280 parts per million (ppm) of carbon dioxide in the atmosphere, while at the start of the twenty-first century the number was more than 383 ppm. Only the most optimistic people talk about stabilizing the atmospheric concentration of carbon dioxide at 450 ppm. If it were possible to do that, there would be about a 50 percent chance of limiting the warming to about 2 degrees Celsius, the figure that has become the benchmark for "dangerous anthropogenic interference with the climate system." Any rapid warming, including the one that already has been experienced, causes harm to people and nature, but once the threshold of 2 degrees Celsius is crossed, the harms become universal, widespread, and acute, and the risks of catastrophic climate change grow exponentially.

Climate change will affect everyone, but the people who will suffer most are those who have done the least to bring it about. Poor countries will suffer more from climate change than will rich countries, just as they suffer more from climate variability and extreme events. Honduras suffers more from hurricanes than does Costa Rica, Ethiopia suffers more from drought than does the United States, and no country is affected more by floods than Bangladesh. In 1998, 68 percent of the land mass of that country was flooded, affecting about 30 million people, and that was only one of seven major floods that occurred over a twenty-five-year period. A rise in the sea level of 1 meter, which is plausible under many climate-change scenarios, could inundate 11.5 percent of the land in Bangladesh and 12 to 15 percent of the arable land in Egypt. Among the 300 million people who live fewer than 5 meters above sea level, 80 percent are in developing countries. A Ugandan president, Yoweri Museveni, is reported to have called climate change "an act of aggression by the rich against the poor" (Clark 2007).

When seen in this way, it seems clear that climate change is a dramatic challenge to the moral consciousness of humankind. It not only challenges people to act in a morally responsible way but it also challenges the very idea of moral responsibility.

A PARADIGMATIC MORAL PROBLEM

The paradigm of the moral problem discussed in this section is a case in which an individual acting intentionally harms another individual. Both the individuals and

the harm are identifiable, and the individuals and the harm are closely related in time and space.

> Example 1: Jack intentionally steals Jill's bicycle—An individual, acting intentionally, has harmed another individual. The individuals and the harm are clearly identifiable, and they are closely related in time and space. If the case is varied on any of these dimensions, it still may be seen as posing a moral problem, but its claim to be a paradigm moral problem will be weaker. Consider some other examples, each of which varies the paradigm on a single dimension.
>
> Example 2: Jack is part of an unacquainted group of strangers, each of whom, acting independently, takes one part of Jill's bike, resulting in its disappearance.
>
> Example 3: Jack takes one part from each of a large number of bikes, one of which belongs to Jill.
>
> Example 4: Jack and Jill live on different continents, and the loss of Jill's bike is the consequence of a causal chain that begins with Jack ordering a used bike at a shop.
>
> Example 5: Jack lives many centuries before Jill and consumes materials that are essential to bike manufacturing; as a result, it will not be possible for Jill to have a bicycle.

Although it may seem that moral considerations are at stake in each of these cases, that is less clear than is the case in Example 1, the paradigm case. The view that morality is involved is weaker still, perhaps disappearing altogether, if one varies the case on all of these dimensions simultaneously.

> Example 6: Acting independently, Jack and a large number of unacquainted people set in motion a chain of events that prevents a large number of future people who will live in another part of the world from ever having bikes

For some people the perception persists that this case poses a moral problem. This is the case because the core of what constitutes a moral problem remains. Some people have acted in a way that harms other people. However, most of what typically accompanies this core has disappeared. In this case it is difficult to identify the agents, the victims, or the causal nexus between them; thus, it is difficult to deploy the usual moral concepts and assign responsibility and blame.

These thought experiments help explain why many people do not see climate change as an urgent moral problem. Structurally, the moral problem of climate change is similar in many important respects to Example 6. A diffuse group of people are setting in motion forces that will harm a diffuse group of future people. Indeed, if anything, the harms caused by climate change will be much greater than the loss of the opportunity to have a bicycle. Still, people tend not to see this as a moral problem because it is not accompanied by the features that are characteristic of a moral problem. Climate change is not a matter of a clearly identifiable individual acting intentionally in a way that inflicts an identifiable harm on another identifiable individual who is closely related in time and space. If people are to see climate change as confronting them with a clear case of moral responsibility, they will have to revise or reform these concepts.

REAL-WORLD CASE

One response would be to say that climate change is not primarily a matter of individual moral responsibility but a question of political justice among states. Indeed, it might be thought that this is truer to the sentiment that Museveni expressed. Moreover, data can be mobilized that seem to show that this view is correct. When one looks at per capita or even total GHG emissions by country, the rich nations of the North dominate. However, when one looks at the actual and expected damages from climate change, it is the poor nations of the South that do and will suffer the most.

When we look at some countries in particular, the case seems even stronger. A rise in the sea level of 1 meter will flood one-third of the coastline of Bangladesh, creating another 20 million environmental refugees. In addition, saline water will move deeper inland, fouling water supplies and crops and harming livestock. This will occur as cyclones and other natural disasters become more frequent and perhaps more intense. Bangladesh will suffer in all these ways, yet its carbon dioxide emissions per capita are one-twentieth of the global average. A typical American emits 80 times as much GHG as does a typical Bangladeshi. However, although Americans will suffer from climate change, Bangladeshis will suffer vastly more. In light of this it seems natural to say that, although most of the emitting is done by the rich countries of the North, most of the climate-change-related dying is done in the poor countries of the South.

However, when one looks at the data in more detail, complications emerge. First, per capita emissions do not march in lockstep with gross domestic product. The nation of Trinidad and Tobago emits more per capita than the United States, and Malaysia emits more per capita than France. Moreover, the atmosphere does not care where GHGs originate. A molecule of carbon dioxide emitted from the exhaust pipe of a sport-utility vehicle (SUV) in Kenya is indistinguishable from one emitted from the exhaust pipe of an SUV in the United States. A coal-fired electrical

generating plant in South Africa affects climate as much as one in Germany.

From this perspective, climate change, rather than being caused by rich countries, is caused by rich people wherever they live. The richest 500 million people emit half the fossil carbon worldwide, and not all of them live in North America, Europe, Australasia, or Japan. Indeed, there are more high emitters in China than there are in New Zealand and probably more than in Australia. Because the United States has greater economic inequality, more extreme poverty, and fewer government services than do some poor countries (e.g., Cuba), more people will suffer from climate change in the United States than in some developing countries.

Once again it can be seen that climate change poses questions of global justice but strays from the paradigm. Greenhouse gas emissions are not like weapons of mass destruction launched by one country against another. The nation-state perspective is one important way of looking at climate change because nation-states are casually efficacious, but they are not the primary bearer or beneficiary of moral responsibilities. Climate change challenges not only people's sense of justice but their concepts of justice as well.

Climate change divides the future from the past as well as the rich from the poor. Those who will suffer most from climate change are those who will live at the end of the twenty-first century and beyond, and they largely will be the descendants of those who currently are living in poverty on the periphery of the developed world. What is required to "prevent dangerous anthropogenic interference with the climate system" is for people who are rich by global standards to restrict their emissions radically to benefit future generations of poor people.

This creates a problem of motivation. Burning fossil fuels primarily benefits those who burn them, while the damages are suffered largely by those who come afterward. The climate change that contemporary people are experiencing was caused largely by their parents and grandparents. The much greater level of emissions today will affect contemporary people's children and grandchildren. Because restricting emissions primarily benefits those who come later, it can be asked how it is in the interests of contemporary people to do so, especially if it is assumed, as most economists do, that their descendants will be richer than they are. From this perspective, asking people to sacrifice for future people is like asking the poor to sacrifice for the rich.

In addition to the divisions that climate change creates in the human community, it divides humans from nature. The biggest losers from climate change will be the plants and animals that are now barely surviving. At the beginning of the twenty-first century 700 mountain gorillas were clinging to life in two small areas of misty, densely vegetated forest in Uganda and Rwanda. What will happen to them when their reserves dry out and warm up as a result of climate change? Orangutan habitat is being destroyed in Indonesia to plant palm oil for biofuels as part of the attempt to mitigate climate change. Scientists predict that one-quarter of all species face extinction by the middle of the twenty-first century because of climate change. Things could be even worse if people do not act immediately to address the problem.

RESPONSES TO CLIMATE CHANGE

Three types of responses to climate change have been identified: mitigation, adaptation, and geoengineering. Mitigation involves reducing emissions and stabilizing GHG concentrations more than would be implied by a business-as-usual scenario. Adaptation involves positive adjustments in biological or cultural systems in response to actual or expected changes in climate. Geoengineerng involves the intentional large-scale manipulation of the climate system.

The consensus view is that if there is to be a reasonable chance of averting the most extreme risks of climate change, global emissions will have to peak in 2025 and decline by 50 percent by 2050 and the global economy must be virtually decarbonized by the end of the twenty-first century. Thus, cheap energy–high consumption lifestyles cannot be sustained in Europe and North America or replicated by developing countries without causing a climate cataclysm. People will have to find another way to live, and poor countries will have to find another model to guide their development.

Although environmentalists emphasize the low-hanging fruit and science enthusiasts put their faith in technological breakthroughs, the transition to a carbon-free energy system will entail real costs. If China and India cannot burn their vast stores of cheap coal, their development path will be more difficult and costly. If Brazil cannot exploit the Amazon in the way Americans exploited the U.S. West, they will forgo the use of one of their most valuable resources. Even a "Manhattan Project" that produced hydrogen cars and biodegradable products would shift resources from one part of the economy to another, displacing workers who have contributed no more to the problem than those who would benefit from the new economy. Although conservation often is presented as cost-free, it means something different to a poor person in a drafty house who relies on an old polluting car than it does to an investment banker who superinsulates his or her house and installs solar collectors on the roof.

Considerations such as these bring up questions of justice. How should people distribute the ever-shrinking rights to emit greenhouse gases? What principles should

Farmers Planting Seaweed in Bali, Indonesia, 2007. *Indonesia is particularly vulnerable to the impact of climate change, as global warming threatens to raise sea levels and flood coastal farming areas, threatening food security. Moreover, a rise in sea level would put thousands of farmers in the country at risk of losing their livelihood.* **SONNY TUMBELAKA/AFP/GETTY IMAGES.**

govern that distribution? Should the "luxury" emissions of the rich be treated comparably to the "subsistence" emissions of the poor? How should subnational inequality be treated in comparison to international inequality?

Many analysts endorse "contraction and convergence," an approach that calls for contracting emissions immediately and eventually converging on equal per capita emissions for everyone in the world. How could the proposed 50 percent reduction in emissions be achieved by 2050? Former French President Jacques Chirac hinted at the possibility of a global carbon tax, and others have speculated about a global emissions trading scheme that would connect the European Union system with the emerging North American carbon markets. There are a great many technical difficulties with both approaches, and some people object to the idea of buying, selling, or taxing carbon, seeing it as a way for rich people to buy their way out of their moral obligations. How does China, where the use of coal is increasing faster than gross domestic product and is now the world's largest emitter but still relatively low in terms of per capita emissions, get integrated into this type of system?

Whether or not the nations of the world succeed in mitigating their emissions, it is clear that adaptation will play a major role in the greenhouse world. Although it is not noticed by many people, adaptation raises many of the same questions of justice as mitigation. Unless catastrophic climate change occurs, rich countries largely will be able to adapt to climate change. They will build seawalls to protect their coastal areas, compensate farmers and foresters who lose their livelihoods, and invest more in developing and maintaining water resources. However, poor countries do not have the resources to adapt. For example, it has been estimated that Bangladesh needs $4 billion to begin to adapt to climate change by building embankments, cyclone shelters, roads, and other infrastructure. However, in 2007 Bangladesh's total national budget was less than $10 billion.

Will the developed countries and rich people who are the major causes of climate change be willing to finance adaptation for poor people and poor countries? They may have self-interested reasons to do so. Climate change will cause environmental refugees and political instability in a world that is already uncertain, but nations and individuals do not always act on the basis of rational self-interest. In many countries, such as the United States, there has been a systematic backing away from providing public goods such as libraries, parks, and schools. Financing adaptation projects in faraway places would have even less appeal.

Because so little is being done to mitigate or adapt to climate change, geoengineering is gaining prominence. Moreover, the idea that in the end science will save people from themselves is a popular one, at least among Americans. Different approaches to geoengineering have been mooted—reflecting solar radiation with space mirrors, seeding the atmosphere with sulfate aerosols, fertilizing

the oceans with iron, removing carbon from the atmosphere—but in general the science is relatively undeveloped.

The most important moral and political question about geoengineering concerns how the decision to implement a program will be made and by whom. It would seem that any decision to change global climate should be made with the participation of all the people of the world, as expressed through legitimate political institutions. But what are those legitimate political institutions? Do they exist? What decision rules should they follow? By and large, those who think of geoengineering as a promising approach to climate change have ignored these questions.

POLITICAL CHALLENGES

Climate change challenges the political system in addition to the problems that it poses to people's moral consciousness. Are European and North American democracies able to act on the time scale required to address climate change? Would liberal values have to be sacrificed? Would citizens have to change their values?

Reflecting on these questions leads to further questions about what development means and what kinds of lives are worth living. U.S. President George H. W. Bush is reported to have said in the run-up to the Rio Earth Summit of 1992 that "the American way of life is not up for negotiation." That categorical statement begs the question of whether the American way of life should have been up for negotiation. Is the American way of life superior to all other ways of life? Is it the only one worth living, even for Americans? There is little evidence in favor of affirmative answers to these questions. Surveys suggest that Scandinavians are happier than Americans and that, once basic needs are met, economic status is associated only very loosely with happiness.

From Plato to the present time reflection on the nature of the good life has been at the heart of philosophical inquiry. Some, such as John Stuart Mill, have argued that economic growth, the reigning ideal of progress and development, can be antithetical to the quality of life. Such ideas sound strange in a world in which the front page of the newspaper has been taken over by the business section, as if this week's economic indicators were the most important information. Whether up for negotiation or not, the American way of life will change, as will the ways of life of other nations, and it is important to think about what comes next and how to manage the transition.

Climate change is occurring, and serious impacts are being experienced, especially in polar regions and small island nations. Unless emissions are reduced significantly, the impacts will be severe and possibly catastrophic. People will have to adapt, and those already living on the margin have little capacity to do so. Can contemporary political systems respond to this challenge? In the second and third decades of the twenty-first century the answer will begin to emerge as GHG concentrations in the atmosphere continue to increase.

SEE ALSO *Atmosphere; Economic Discounting; Forests; Future Generations; Intergovernmental Panel on Climate Change; Jamieson, Dale; Oceans; Ozone Depletion; Precautionary Principle.*

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Dale Jamieson

GLOBALIZATION

Globalization refers to the increasing unification of the world's economic order through reduction of such barriers to international trade as tariffs, export fees, and import quotas. The goal is to increase material wealth, goods, and services through efficiencies catalyzed by international specialization and competition. According

to the theory of comparative advantage of David Ricardo (1772–1823), specialization promotes efficiency. The theory maintains that even if one country could produce everything more efficiently than its best potential trading partner, trade would increase efficiency if the first country concentrates on producing what it makes most efficiently and trades with the other country for some of its other needs. Competition also promotes efficiency. In free markets, competition requires firms to improve products or lower prices to retain customers. International competition increases the number and types of competitors.

GLOBALIZATION'S DURABILITY

Some thinkers maintain that globalization will inevitably continue, but this confuses globalization with what Ulrich Beck calls *globality*. *Globality* refers to the increasing global interdependence resulting from human population increase together with powerful technologies, swift transportation, and instant communication. Globality decreases people's ability to isolate themselves from political instability, technological change, environmental pollution, health crises, and the like, wherever they occur. So long as our civilization lasts, globality will increase.

An element of globality is globalization, interdependency in the production and consumption of goods and services offered for sale in a supposedly free market. Unlike globality, however, globalization does not steadily increase. It was greater at the beginning, than during the middle, of the twentieth century. Wars, national pride, security fears, and the economic interests of powerful groups can inspire national protectionism, which is a retreat from global economic interdependence.

The World Trade Organization exists to promote globalization. Member nations commit to lowering tariffs and other barriers to free trade, including government subsidies to favored industries. Early in the twenty-first century, expansion of globalization under the aegis of the World Trade Organization stalled as a result of agricultural subsidies in the United States and the European Union. Its future has been challenged also by national security concerns related to terrorism (for example, about a Middle Eastern country owning American ports) and related to energy supplies (for example, about dependence on foreign sources of oil and natural gas).

ENVIRONMENTAL IMPACTS

According to Thomas Friedman (2005), globalization allows any country to get rich, regardless of natural-resource limitations, if property rights are secure, the rule of law prevails, taxes are low, interference with international trade is minimal, and governments balance their budgets. Failure to obey these rules results in the flight of financial capital needed for efficient production and viable competition in global markets. Friedman and the World Trade Organization essentially endorse laissez-faire economics on a global scale. Regional trade agreements, designed to promote international trade within a geographic region, such as the North American Free Trade Agreement (NAFTA), also embody the laissez-faire ethos. They promote national policies designed to attract investors.

This approach replaces governance by states with governance by international institutions to maximize investment income. Governance by states typically includes regulations and taxes designed to discourage negative externalities, such as environmental pollution. Corporations must internalize (pay the cost of) such externalities rather than impose such costs on the public. In contrast, the international institutions that replace states, such as the World Trade Organization, generally oppose such governmental constraints. Governments that force companies to internalize the costs of production tend to impair their companies' global competitiveness, as competitors from other countries can avoid such costs. Environmentally oriented countries thus may suffer failing companies, reduced tax revenues, declining investment, and increased poverty. Under reduced environmental regulations, however, overall efficiency can suffer. The public suffers the cost of avoidable harms, such as increased air and water pollution, which corporations lack incentives to curtail.

A provision of the North American Free Trade Agreement exacerbates this problem. In general, in the United States and other countries, companies do not receive compensation from the government when they are subject to reasonable environmental regulations. Because such regulations are deemed necessary to prevent companies from harming the public, companies must pay for the cost of compliance or suffer losses resulting from reduced opportunities. But the North American Free Trade Agreement contains a provision that requires governments to compensate companies for losses incident to regulations. For example, a U.S. company sued a Mexican municipality that refused to allow development of an area as a toxic waste dump. The company won $15.6 million. It would have had no case against an American municipality with the same regulation, because NAFTA rules apply only internationally. NAFTA's rules and the awards they allow discourage reasonable environmental regulations.

Regimes promoting globalization compromise environmental concerns also because they focus primarily on commerce, whereas national governments promote a variety of values, including some related to the environment, such as retaining species diversity, protecting favored species, preserving natural beauty, and conserving

Container Ships in the Port of Oakland, California. *Advocates of globalization claim that as societies become wealthier through free trade, they can devote more resources to environmental protection. As a rich state, California has among the highest environmental standards in the United States.* **ALFREDO SOSA/THE CHRISTIAN SCIENCE MONITOR/GETTY IMAGES.**

natural resources. The World Trade Organization generally treats government responsiveness to such concerns as unjustified impediments to free trade. It does this in part by distinguishing products from the processes used to create those products. Trade restrictions are acceptable if products offered for trade are dangerous or otherwise harmful. But harms caused by processes used to create products are not considered legitimate reasons for restricting imports. For example, the United States wanted to restrict imports of Mexican tuna that had been caught in nets that killed dolphins. More dolphin-friendly nets were available. But American interest in protecting dolphins was not considered a legitimate basis for import restrictions. Eventually a compromise was reached outside the aegis of the World Trade Organization.

Another example of commercial concerns trumping environmental concerns is rejection by the European Union of American beef grown with the use of hormones made available through genetic engineering. From the perspective of the World Trade Organization, the only legitimate concern about the beef was its safety, which a panel of experts affirmed. For their continued refusal to allow importation of such beef, the European Union was penalized (restrictions on some of their exports). Yet environmentalists may have many concerns about genetic engineering besides the safety of the product. Ecofeminists, for example, may consider genetic engineering an additional form of mastery of nature that tends to harm subordinated groups. Environmentalist Christians may consider genetic engineering as manifesting insufficient appreciation of God's gift of nature to humanity. Followers of Aldo Leopold's land ethic may consider genetic engineering to exemplify a conqueror mentality, which Leopold thinks backfires eventually. And many environmentalists advocate precaution, rejecting such innovations as genetic engineering unless they meet definite needs, because human beings cannot predict long-term consequences. None of these environmental considerations are allowed in deliberations of the World Trade Organization.

Supporters of globalization point out that the free market can be used to promote environmental and other

goals. Bad publicity and the threat of a consumer boycott dissuaded Shell Oil, for example, from dumping a decommissioned oil storage platform in the North Sea. Nike was persuaded to improve the pay and working conditions of its Indonesian workforce. Bad publicity for tuna inclined its producers to adopt more dolphin-friendly methods of capture. In addition, some corporations are proactive, making deals with environmental organizations to capture consumers who favor green corporations. These include McDonald's, International Business Machines (IBM), Hewlett-Packard, Dell, and Starbucks.

There is little doubt that enormous good has come from bad publicity, threatened consumer boycotts, and corporate leadership. However, free-market approaches are insufficient to protect the environment. Corporate commitment to environmentalism is conditioned by consumer attitudes, which are fickle. Consumer boycotts, for example, require the mobilization of public sentiment, and the public cannot concentrate simultaneously on all the different ways that corporations can assail the environment. Governments, by contrast, can simultaneously maintain rules on many different matters, to which affected industries must conform. This system affords more durable and consistent protection. In sum, joint decision making through political processes are the major means of protecting noncommercial values, including those related to the environment, so globalization cannot marginalize politics without harming the environment.

THE GENERATION AND DISTRIBUTION OF WEALTH

Advocates of globalization reply that as societies get wealthier through free trade, they can devote increasing resources to environmental protection. One trend evident in the 1990s was for small states highly integrated in the global market to have the highest environmental standards. These states included the Netherlands, Denmark, Sweden, South Korea, and, among Third World countries, Costa Rica. Within the United States, California, a rich state, has among the highest environmental standards. Environmental protection and wealth generated from global trade seem to go hand in hand. On this reasoning, environmentalists should applaud globalization as a means to more universally available wealth coupled with greater environmental protection.

This raises two questions. First, does globalization really spread wealth around the world? Second, does greater wealth generated by increasing global commerce really benefit the environment? The actual, as opposed to theoretical, economic benefits of globalization are contested. The world's very poorest people, those living on less than $1 per day, has decreased in recent decades, but the number living on less than $2 per day has not. The income gap between the richest one-third of nations and the poorest one-third has declined, but the gap between the richest one-tenth and the poorest one-tenth has increased. Moreover, it is uncertain how much these trends resulted from globalization. Under protectionist policies in the 1960s, Latin American economies grew at about twice the annual rate of the globalization-dominated 1990s. The U.S. economy grew very quickly under its own protectionism in the early twentieth century. Sub-Saharan Africa has generally become poorer during globalization, but it was getting poorer before as well.

China is the biggest economic winner in globalization so far, and to a lesser extent Southeast Asia and India. Exclude China from the figures, and globalization's record for enriching the poor is unimpressive. Increasing inequality is another problem. Ninety-five percent of people now live in countries where inequality is increasing. In poor countries, increasing inequality is particularly dangerous for the environment. Globalization typically denies peasants traditional access to local resources, because commercial interests want to use those resources to make money. Even though these peasants may have increased purchasing power, measured in monetary terms, they may be more destitute than before because they are denied access to resources that were formerly free, such as fields, woods, and pastures traditionally used to grow crops, gather wood, and graze animals. Their only recourse for survival may be to raise crops in unsuitable locations, such as hilly regions and rain forests, eroding topsoil and threatening endangered species. In sum, globalization may not be effective in making the world's poor rich enough to afford environmental protection.

COMBATTING ENVIRONMENTAL DECLINE

From an environmental perspective, however, globalization's success at enriching the world's poor may be worse than its failure to do so, as China illustrates. One problem is pollution. By 2004, 16 of the world's 20 most polluted cities were in China. Another problem is resource depletion. In 2004 there was a net increase of between 800 and 1,000 cars per day on the streets of Beijing. If China's increased use of automotive transportation continues, China in eight years will go from importing 7 million barrels of oil per day to importing 14 million barrels, the increase equaling the daily oil output of Saudi Arabia. China's use of fossil fuels is expected to overtake that of the United States, exacerbating the problem of global climate change. In addition, China uses its relative prosperity to buy palm oil from Indonesia and Malaysia, soybeans from Brazil, and timber from central Africa. The production of these items decimates rain forests and other

important habitats. Finally, China is running out of water. Water tables are generally down in India, Mexico, and the United States, but the problem is more severe and immediate in Northern China. An environmentally controversial water-diversion project is underway to use South China water resources in North China, but the more basic problem is that China has about 20 percent of the world's people, but only 7 percent of the world's available fresh water. And global climate change is diminishing some of that resource, as Himalayan glaciers are melting.

If the goal of globalization is to offer the First World lifestyle to everyone—cars, shopping malls, air conditioning, big houses—the environmental consequences of success could be catastrophic. An environmentally more benign alternative would be for the First World to develop a different sense of human flourishing centered on environmentally benign technologies and lifestyles. This would allow everyone around the world to enjoy the same lifestyle without ruining the environment. People would live in more compact settlements, have smaller homes, walk more, use readily available public transportation, eat more locally grown food, and so forth. Human health, education, and communities could flourish under these conditions.

This, however, is essentially a rejection of globalization in favor of bioregional alternatives where people live within the sustainable limits of their own regions of earth and trade at a distance only when absolutely necessary. People could have materially sufficient and culturally rich lives with smaller economies owing to less need to exchange goods and services. The Deep Ecologist Arne Naess, among others, advocates such a lifestyle, simple in means and rich in ends. But those promoting globalization reject this alternative because in smaller economies, returns on investment are reduced, as are tax revenues. The interests of globalization and government may combine to perpetuate the belief that high consumption is essential to the good life.

People who favor globalization but recognize environmental dangers suggest that politics be reinserted into commerce through new multinational institutions that protect the environment and other values, not just commerce. The economist Joseph E. Stiglitz, for example, suggests that such international institutions mandate product labeling that gives consumers information about the origins of products. Consumers could then choose products that better reward Third World workers or better protect the environment. The idea is to allow consumer choice to move corporations from free trade to fair trade. He also suggests establishing an international court where class-action suits could be brought against violators of new international environmental standards.

Successful international cooperation has some precedent in efforts to reduce ozone depletion and save some species from extinction, such as whales and elephants. But the United States so far has rejected many international initiatives that may weaken state sovereignty, including a treaty to eliminate land mines, the Kyoto Protocol to reduce emission of greenhouse gases, and the International Criminal Court to prosecute crimes against humanity. Without American participation, binding agreements that require trade to be fair and ecologically responsible will likely have little effect. On the other hand, common effects can produce concerted action, especially when elites with the greatest impact on decision making are jeopardized along with everyone else. But it is uncertain whether such elites will feel threatened, as they did regarding ozone depletion, before globalization does enormous and irreparable damage to the environment.

Another possibility is to require globalization to be more free-market-oriented. In spite of advocates' claims that globalization embodies free enterprise, it is highly subsidized by governments, especially in the areas of energy and transportation. For example, the U.S. government offers oil companies a tax break called the oil depletion allowance. It subsidizes the production of the oil substitute ethanol, made primarily from corn. It does not require oil companies, utility companies, manufacturers, or consumers to internalize the cost of illnesses produced by exhaust fumes and stationary sources of air pollution. Nor do they internalize the eventual costs of global warming caused by most current forms of energy production. In addition, the United States maintains a very expensive military presence in oil-rich areas of the world to assure continued oil supplies. And the road taxes paid by large trucks come nowhere near the cost of the damage they do to roads. A fully loaded large truck causes almost 10,000 times more damage per mile than an average passenger car.

If these costs were built into the price of products that travel long distances, the price structure of products would favor consuming more locally produced items. As it is, each item in a typical meal in the United States has traveled an average of 1,500 miles. Bioregionalism (people concentrating their commerce closer to home) may actually be what a really free market would produce. But this alternative requires powerful industries, with influential lobbyists, to relinquish government subsidies. Their self-interest may overcome an ideological commitment to free markets.

Globalization may not last. Security concerns may convince governments to reduce the international flow of goods and services, or powerful lobbies may convince states to protect domestic industries. Unfortunately, the decline of globalization may be unrelated to environmental concerns until such problems become acute.

SEE ALSO *Agricultural Ethics; China; Civil Disobedience; Consumption; Deep Ecology; Economics, Environmental; Ecotourism; Global Climate Change; Hunger; North American Free Trade Agreement; Regionalism; World Trade Organization.*

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GLOBAL WARMING

SEE *Global Climate Change.*

GREEN BUSINESS

Green business (or commerce) involves the commercial provision of goods and services in a manner that minimizes environmental damages or provides environmental benefits beyond the requirements of the law. In some cases companies dedicate themselves to minimal or net-positive impacts on the environment. Their product or service could be nearly anything; what matters are the environmental impacts of production, distribution, use, and disposal. Ecotourism, organic/sustainable foods, and socially responsible investment funds are examples of green-business products and services. A company's environmental practices can be a selling point for consumers and investors who prefer "green" products. The customers' knowledge of the minimal or positive environmental impacts of the company's practices is often crucial to the brand.

Green businesses also provide less-polluting alternatives to existing products. Renewable solar and wind energy technologies can supplant nonrenewable and environmentally unfriendly fossil fuels and potentially disastrous nuclear reactors in many applications. Products made from recycled materials, such as outdoor benches and machine components, can replace items made from original materials. Another category of green business involves helping other companies comply with environmental regulations: Such businesses sell remediation equipment or provide services such as pollution monitoring and environmental consulting.

WHY GREEN BUSINESS?

A green business has several possible advantages: It can

- reduce environmental-damage liability risks and the costs of production (if original materials are more expensive than recycled materials) and regulatory compliance;
- improve brand image;
- forestall additional environmental regulations;
- help recruit and retain valued employees;
- promote creative approaches to new product categories; and
- provide a competitive advantage in pursuit of public-sector contracts.

In this last case businesses with a stellar reputation for environmental performance may have a bidding advantage for large public projects if the decision makers are elected officials and an environmentally concerned public can influence the selection.

From a social and political perspective green businesses cause less environmental damage, allow regulators to focus on other environmental problems, reduce public health costs connected to industrial pollution, and develop technologies and systems that reduce the cost of environmental protection. From a consumer perspective green products may have lower energy costs and be less dangerous to use. They also provide opportunities for recycling and offer the consumer the satisfaction of buying products that are consistent with his or her environmental values.

A BOOMING MARKET FOR GREEN BUSINESS

Green business is a rapidly growing, multibillion-dollar sector of the economy. Nearly $1 billion of venture capital was invested in clean energy technologies in 2005 (Gangemi 2006). By 2006 U.S. organic food sales had reached $16.7 billion and were growing at an annual rate of roughly 20 percent (Organic Trade Association 2007). In 2007, 260 socially responsible investment funds controlled assets of $202 billion; overall socially responsible investment reached $2.7 trillion (Social Investment Forum 2008). The potential for further rapid growth is large; organic foods, for example, make up just 3 percent of all U.S. food sales.

Creditable monitoring is needed to support green business claims. Monitoring typically occurs through industry groups, nongovernmental organizations, and government

agencies. One example is the certification program of the U.S. Green Building Council's Leadership in Energy and Environmental Design (LEED). LEED-certified buildings pass inspections related to energy efficiency, water and materials use, innovative building design, and indoor air quality.

Regulatory agencies have been adopting tougher standards in judging the performance of green business products. One example is the rapid expansion of the renewables portfolio standard (RPS) regulations. This is a mandatory, market-based requirement to increase the quantity of renewable-resource energy used to produce electricity. This regulatory requirement both responds and provides incentives to the green energy sector, driving down the cost of green energy while driving up its consumption. U.S. states first launched RPS programs in approximately 2000; by 2008, numerous European nations and over 20 U.S. states had RPS programs and federal RPS legislation was pending.

Informing the public in a timely and effective manner of the latest innovations in production is another challenge facing green business. Many labeling programs have emerged to inform the public about the broader environmental impacts of the product. Governments require energy-efficiency labeling of household appliances and have developed rebate programs for appliances that meet strict energy-efficiency standards.

ETHICAL ISSUES AND GREEN BUSINESS

The primary ethical question surrounding green business is how much discretion private entities should have in making environmental-protection choices. The self-imposed standards of green businesses supplement those already mandated by government regulations. For nations with a mature capacity to regulate industry, the green-business sector need not aspire to supplant official regulations that protect human health and the environment. But for nations that lack regulatory capacity, the self-imposed regulations of green businesses may furnish a de facto standard of environmental performance.

A second ethical question involves the nature and extent of reporting. Green businesses are, of course, part of the private sector. Protection of brand reputation and trade secrets are first-order concerns of private companies. Self-reporting of environmental performance in the absence of third-party verification raises the possibility of self-serving misrepresentation, sometimes called greenwashing. Official verification of private-sector claims provides benefits both to the public and to the firms that faithfully report their performance. The green business concept has matured to the point that most major green labeling programs, such as the sustainable forestry initiative, have some form of outside verification of claims.

A third ethical question is whether green business standards and expectations are a barrier to smaller firms. Improvements in environmental performance often require carefully coordinated combinations of advanced technologies, integration with existing technologies and practices, and novel financing. Highly capitalized firms with integrated laboratory, production, distribution, and financing arms have a clear advantage. Smaller, less technologically advanced firms, however, may offer benefits to society by providing lower-cost products, employing less-skilled workers, and being located in poorer regions or nations. The success of green businesses in raising environmental-performance standards may entail a trade-off with other beneficial social outcomes expected of markets, including distribution of wealth to poorer regions of the world that cannot, for example, produce state-of-the-art energy-efficiency products.

A fourth question—perhaps the most fundamental—is what kinds of ethical principles should underlie green business practices. In the cases of very old companies or companies with long-term, stable ownership and management, green business practices can be considered an expression of Kantian duty or stewardship: a self-imposed obligation, the moral worth of which is its own reward. The business itself becomes an expression of the overall values—and environmental values—of the owners/managers. An example of a firm with long-term stability in leadership that includes a stewardship ethic is Granite Construction, an integrated mining, processing, and infrastructure building company highly respected for its environmental performance in a resource-intensive industry. In the case of many other businesses, in which commitments to maintaining profitability are paramount, green business choices, or lack thereof, can be viewed in the utilitarian mode of improving society through voluntary, individual market transactions regardless of environmental outcomes. An example of a firm in which ownership transitioned from long-term, stable, sustainability-oriented leadership to a shorter-term, profit-oriented, and more environmentally damaging approach is California-based Pacific Lumber Company. From the 1930s to the 1980s, the company was managed by the Murphy family, which insisted on a 100-year sustainable harvest model. In 1986, Pacific Lumber was purchased by Maxxam, Inc., which altered harvest management practices to maximize short-term profits. Two decades of regulatory battles over clear-cut practices resulted in the company declaring bankruptcy in 2007. The stewardship ethic of the long-term owners was not sustainable once ownership changed hands and a commitment was made to short-run financial profitability.

SEE ALSO *Alternative Technology; Ecotourism; Energy; Environmental Law; Environmental Policy; Pollution; Stewardship; Sustainability.*

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Brent M. Haddad

GREEN CHEMISTRY

Whereas conventional industrial chemistry sometimes has been used to create highly persistent toxic compounds with little regard for their effects on living organisms, green chemists attempt to develop chemicals that are inherently safe—benign by design. Chemical design thus involves the ethical choice of whether to make nontoxicity a fundamental requirement. The term *green chemistry* was introduced by the U.S. Environmental Protection Agency (EPA) in the early 1990s as part of a broader effort at pollution prevention. Some Europeans refer to the endeavor as *sustainable chemistry* to avoid political connections with leftist Green parties. In contrast to the older *brown chemistry*, green chemistry (Anastas and Warner 1998) seeks to:

- Design chemical products that have little or no toxicity and degrade into innocuous substances to prevent accumulation in the environment;
- Make chemicals from renewable sources such as corn and soybeans;
- Synthesize chemicals using manufacturing methods that create no hazardous waste by-products;
- Increase energy efficiency by manufacturing at room temperature and pressure.

ORIGINS AND EXAMPLES

Everyday examples of chemical greening include formaldehyde-free housing insulation, cleaning compounds derived from citrus, and plastics designed to biodegrade instead of piling up in landfills (Stevens 2002). More esoteric changes occur in chemical manufacturing, such as ibuprofen synthesis that does not produce tons of cyanide and formaldehyde as unwanted by-products. Dangerous solvents such as benzene, toluene, and perchloroethylene (for dry cleaning of clothes) gradually are being replaced by safer solvents, including ordinary water (Nelson 2003).

With thirty thousand chemicals in widespread commercial use, and myriad others in specialized applications, no one knows whether zero toxicity will prove feasible. However, green chemists are finding enough new approaches that phasing out all the persistent bioaccumulative toxics is beginning to appear doable (Thornton 2000). Many government environmental agencies worldwide are encouraging chemical greening, including the EPA, which offers annual awards to green chemistry innovators in both business and academia. The Green Chemistry Institute probably has done more than any other organization to promote chemical greening. The Canadian Green Chemistry Network, the Mediterranean Countries Green Chemistry Network, and the Green & Sustainable Chemistry Network in Japan are among several dozen international organizations that stimulate research and encourage voluntary reforms within industry.

THE ROLE OF CHEMICAL PROFESSIONALS AND ORGANIZATIONS

Virtually no professional chemists or engineers have engaged in public speaking and political organizing to shift the environmental movement toward a focus on detoxification. The failure of chemical professionals to help the public, journalists, and elected representatives understand the prospects for chemical redesign could be construed as a violation of the Chemical Professional's Code of Conduct, which asserts, chemists "have a responsibility to minimize pollution and to protect the environment" (American Chemical Society 2007). These tasks cannot be done by lone individuals without supportive regulations, tax codes, and social norms to induce changes in chemical research and development, manufacturing, and use. Professional associations such as the American Institute of Chemical Engineers focus not on public service but on the career advancement of their members, research conferences, and services to business. Chemistry is the science traditionally most closely connected with the corporate world, and chemical professionals working for industry outnumber those working for environmental organizations by roughly ten thousand to one.

Practitioners of brown chemistry do not perceive themselves as behaving unethically, and most would not dump hazardous wastes or falsify paperwork deliberately. However, chemists and engineers play key roles in an

ethically problematic system of invention, manufacture, use, and disposal that diffuses around the planet each year some ten billion pounds of toxic chemicals. If those amounts could be traced back to the four hundred thousand individuals employed worldwide as industrial chemists and engineers, each professional would be responsible for a hundred pounds of toxics per working day. The figure would be higher if one added deliberate releases of pesticides and herbicides, chemicals not tracked by government regulators, and chemicals leaching from consumer products.

The toxic planetary system has been co-constructed by industry executives and their customers and by government officials and voters who have failed to make brown chemicals illegal. Polar bears and humans would not have perfluorinated compounds in their fatty tissues if chemical experts had attempted to invent bioaccumulative chemical methods for cooking microwave popcorn and manufacturing carpets. If more chemists had adopted green methodologies, the endocrine systems of mammals and amphibians would be less disrupted and environmental mutagenesis and cancer would be less prevalent.

PHILOSOPHICAL ISSUES

The ethical advantages of green chemistry should appeal to philosophers concerned about sustainable relationships between humankind and the planetary ecosystem (Cairns 2003). However, philosophers of chemistry have devoted little attention to controversies concerning chemical politics and ethics, focusing instead on subjects many people might consider antiquarian, such as the origins of the periodic table of elements. In reading the philosophy journal *Foundations of Chemistry,* one cannot detect that the domain being studied pertains to global toxification. Even though the journal *Environmental Ethics,* which is devoted to studying the moral relationships of humans to the environment and to nonhuman life-forms, has covered hundreds of topics from endangered species and the intrinsic rights of nature to vegetarianism and ecofeminism, in three decades it has included virtually nothing on chemical ethics.

Environmental philosophers of biocentric and anthropocentric persuasions alike might find their scholarship enlivened by dealing with green chemistry. What obligations do professors have toward students in teaching brown-versus-green chemistry? Do some research trajectories merit higher priority than others? By what democratic processes could public interests be better combined with the academic freedom of chemistry professors? A physician can lose her or his license to practice by failing to provide adequate care to a single patient; what equivalent standards might apply to chemical professionals who can harm thousands of people at a time? Do organizations of professional chemists and engineers have special moral obligations that are proportionate to their greater resources?

Philosophers working outside the liberal tradition might ask: If mass publics are incapable of governing a synthetic planet, are there plausible neotechnocratic alternatives? Does chemical greening require a shift away from market-oriented economies dominated by business corporations? If local majorities want to move expeditiously toward chemical sustainability, do they have a right to nullify hostile state, federal, and international law? Conversely, do chemical greening opportunities suggest that nation-state democracy is outdated, and can global governance legitimately be asserted over the chemically irresponsible?

Overall, green chemistry joins with human cloning, surveillance, nanotechnology, the coming age of androids, and other twenty-first-century risks and opportunities to raise a master question: What social norms, laws, and institutions would constitute an ethically acceptable system for directing innovation wisely and fairly?

SEE ALSO *Alternative Technology; Pollution; U.S. Environmental Protection Agency.*

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GREEN POLITICS IN GERMANY

The term *green politics* describes a set of political issues rather than a coherent ideology. Green politics is concerned mainly with environmental and ecological goals.

It also stresses issues of peace, feminism, civil liberties, social justice, and grassroots participation. The success of green politics represents a fundamental change in postwar politics that cannot be explained in terms of traditional socioeconomic divisions. The emergence of green politics in the 1970s was closely related to the rise of environmental, pacifist, feminist, and grassroots democracy movements. In the wake of those movements green parties were founded in many nations in the early 1980s. The term *green* traces back to the German party *Die Grünen* (the Greens), which was the first successful green party. The German party remains one of the most important and influential green parties worldwide.

BACKGROUND

The success of green politics and the emergence of the Green Party in West Germany were associated with an important change of values in the 1970s. As the student movement of the late 1960s and the APO (Extraparliamentary Opposition) weakened, the so-called new social movements emerged. Strongly supported by left-wing students and youth from the middle classes, those protest movements brought a new political and social awareness along with a new cultural identity to West Germany. During the mid-1970s opposition to the North Atlantic Treaty Organization (NATO) and the civil and military use of nuclear power became important issues, along with environmentalism, pacifism, general criticism of politics, and gender issues.

Those social and protest grassroots movements were the forerunners of the German Green Party. Even before the official founding of the party, so-called green and colorful lists were formed after 1977, mainly including those involved in antinuclear protests. Fast electoral success on the local, *Länder* (state), and European levels was crucial for the formation of the Green Party. As a result of laws on party funding, state financing played an important role. Consequently, the 1979 European Parliament election, in which the Greens won 3.2 percent of the vote, financed the party's early organizational development: In 1980 the Greens received nearly 70 percent of their revenues from the state and less than 16 percent from membership fees and donations. The formal founding of the Green Party took place in January 1980 when a thousand delegates gathered at the first party convention in Karlsruhe. Reflecting its ideological diversity, four pillars of the party were articulated: environmental, social, grassroots democratic, and nonviolent. Important figures in the early years included Heinrich Böll, Petra Kelly, and Joseph Beuys.

THE HISTORY OF THE GERMAN GREEN PARTY

The self-styled antiparty party achieved electoral success very quickly. In the 1983 federal election the Greens won 27 seats (5.6%) in the Bundestag. In Hesse they were part of a government for the first time at the *Länder* level (1985–1987). Joschka Fischer was appointed environment minister in that red-green coalition. He functioned as the informal party leader until 2005, although he never held an important party office.

After German reunification the West German Green Party failed to win 5 percent of the vote in the 1990 federal election and thus, under German law, lost its representation in the Bundestag: While Germans discussed the reunification process, the Greens focused on climate issues in their electoral campaign with the slogan "Everyone is talking about Germany; we're talking about the weather." Because of special election rules, in this first all-German federal election Alliance 90/Greens—Civil Movement, a combination of the East German civil rights movement Bündnis 90 (Alliance 90) and the independent East German Green Party, won eight seats in the Bundestag. In 1993 Alliance 90 and the Green Party merged into Alliance 90/The Greens (Bündnis 90/Die Grünen). The newly formed party won 7.3 percent of the vote nationwide in the 1994 federal election. When the Christian Democratic chancellor Helmut Kohl was voted out after sixteen years in office in 1998, the Greens joined the federal government in coalition with the Social Democratic Party for the first time, a coalition in which they remained until 2005. Fischer was appointed foreign minister and vice chancellor.

Despite that electoral success the party failed to stabilize its membership, especially in eastern Germany, after the mid-1990s. It has remained a mainly West German party in terms of its membership and electorate. As a result of fundamental changes in the German party system, especially the emergence of an all-German postcommunist party (Die Linke), the relevance of the Greens has been decreasing since 2005. In the European Parliament, however, more than one-third of the green members come from Germany and the parliamentary group's copresident is the German-French Daniel Cohn-Bendit. The German greens also played an important role in forming the European Green Party in 2004.

CENTRAL VALUES, MAIN CONFLICTS, AND NEW DEVELOPMENTS

Demographic analysis shows that in the first decade of the twenty-first century members of the German Green Party were mainly middle-aged, highly educated academics with an above-average income and that they shared left-wing and postmaterialistic ideas in many cases. Nevertheless, there has never been a coherent green ideology. The four pillars of the party's political agenda have not been used to form a stable ideological framework. Consequently, green

politics and the history of the German greens are affected strongly by policy conflicts. For a long time the consensus was that "green politics is neither left nor right but out in front." The party program dating from 2002 stated: "We are united by a set of basic principles, not an ideology."

In the early 1980s conservative, more right-wing members left the Green Party and reunited as the Ecological Democratic Party (Ökologisch-Demokratische Partei). That early schism arose largely from cultural conflicts about the forms of protests the Green Party should support, such as civil disobedience. Afterward, especially in the early 1990s, as part of the party merging process, many left-wing greens dropped out. The ideological polarization decreased in the late 1990s. At the same time that process enabled the party to create the nationwide red-green coalition.

From the mid-1980s to the late 1990s, conflicts between left-wing ideologists and office-seeking realists dominated the Green Party. Programmatic shortcomings resulted from that conflict. Only in 2002 was the Green Party able to discuss and finalize its second party program after 1980. Meanwhile, only short statements and electoral manifestos filled that gap. In the 2002 program the Green Party emphasized basic aspects of green politics: "We combine ecology, self-determination, expanded equitability and a vibrant democracy. With the same intensity, we are committed to non-violence and human rights." Grassroots democracy as affirmed in the 1980s is no longer a basic pillar of German greens. The party's interpretation of nonviolence has changed as well, having become less absolute.

Even though it is not disputed among Green Party members that the point of the party is to win elections and govern, joining a standing government is still a matter of conflict. During the red-green coalition there was a shifting mixture of political success and political failure. Participation in NATO actions in Kosovo in 1999 and Afghanistan in 2001 almost split the party, but achieving an intermediate-term shutdown of German nuclear plants was considered a great success. In reaction to a general change in the party system, coalitions with Christian Democrats on the *Länder* level became feasible. Green politics in Germany is no longer a dogmatic left-wing affair; it is a pragmatic approach to politics that is based on a half dozen basic positions.

SEE ALSO *Civil Disobedience; Ecological Feminism; Environmental Politics; Europe: II. Western Europe; Social Ecology.*

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GREENPEACE

Greenpeace is an international nongovernmental organization (NGO) that is committed to protecting the global environment and promoting peace. It originated in Vancouver, Canada, and has established national and regional offices in forty-one countries and a central headquarters in the Netherlands. It has close to three million members worldwide. It is known for its confrontational nonviolent, direct-action, and media-savvy strategies for exposing and promoting solutions to global environmental problems.

ORIGINS AND ORGANIZATION

Greenpeace grew out of the Don't Make a Wave Committee (DMWC), a group of peace activists committed to stopping the United States from testing nuclear weapons under the Aleutian Islands near Alaska. The DMWC feared that the tests would set off massive tidal waves. The group's most dramatic action was to sail two ships toward the test site to disrupt the detonations. The ships never reached the site, nor did they succeed in stopping the tests. However, people mobilized around the action and the voyages received significant media coverage. The action is credited with creating enough public pressure to persuade the United States to cancel planned testing. In 1972 the DMWC expanded its agenda to include a host of environmental concerns and formally dissolved to become Greenpeace, a name coined by Bill Darnell to express the group's dual commitments.

Greenpeace International, the organization's main coordinating body, works with national and regional offices to craft shared campaign strategies, but individual offices work largely independent from one another to devise local strategies and actions. In 2006, Greenpeace had close to 3 million members and an operating budget of approximately $196 million. The largest regional or national office is Greenpeace USA, which, in 2006 had roughly 300,000 members and an operating budget of nearly $15 million. In contrast to many other environmental activist groups, Greenpeace receives most of its funds (90 percent) from voluntary individual donations and does not accept money from governments or corporations.

Greenpeace Activists in Berlin, Germany, 2007. *Members of the nongovernmental environmental organization Greenpeace paint a BMW pink to dress it up as a "climate pig." The protest is aimed against the German car industry, which the activists accuse of producing climate-damaging cars. Greenpeace has established offices in forty-one countries, and numbers close to three million members worldwide.* **AP IMAGES.**

ISSUES AND ACTIONS

Greenpeace organizes its work around six primary issue or campaign areas: (1) climate change; (2) ancient forests; (3) oceans; (4) peace and nuclear disarmament; (5) agriculture; and (6) toxic chemicals. Within each of those campaigns the group works on a host of subissues, including genetically modified organisms (GMOs), persistent organic pollutants (POPs), and ozone depletion. Greenpeace lobbies national governments, attends international forums on global environmental issues, accompanies national negotiating delegations to international conferences, and tries to influence governments to advance environmental protection. Additionally, Greenpeace works throughout civil society to build public support for environmental well-being and pressure corporations to adopt more ecologically sound standards of conduct. It also conducts or supports original research into technological innovations and policy prescriptions that advance environmental sustainability.

One of Greenpeace's most effective actions was its 1979 effort to stop French atmospheric nuclear testing in the South Pacific. David McTaggart sailed a yacht into the exclusion zone at Moruroa atoll in French Polynesia. McTaggart's action, like that of the DMWC earlier, received significant media coverage. It also received strong resistance from the French. The result is that it projected a negative public image of atmospheric testing and nuclear weapons in general. Many credit the Moruroa incident and the Greenpeace organized antinuclear campaign efforts that followed with persuading New Zealand to declare itself a nuclear-free zone. Another notable set of Greenpeace actions involve efforts to stop whalers on the high seas. Using inflatable dinghies, Greenpeace activists have tried to protect individual whales by positioning themselves between whale pods and Soviet, Japanese, and Norwegian ships. They also have tried to board whaling ships in acts of civil disobedience. Additionally, campaigners have unfurled banners from the tops of smokestacks, scaled skyscrapers of corporate enterprises, and plugged up industrial discharge pipes. Such actions represent Greenpeace's commitment to bear witness to environmental abuse and bring widespread public attention to hidden environmental degradation.

The practice of bearing witness originates in the early days of Greenpeace, when many of its members

were influenced by Quaker practices. The idea of bearing witness is that when observing an injustice, one cannot turn away in ignorance but must, if one is unable to stop such action, stand by and attest to it. When Greenpeace bears witness by trying nonviolently to disrupt environmentally unjust behavior or documenting such actions, it broadcasts its actions worldwide through various media. Greenpeace ships, for instance, have satellite hookups that allow video footage to be sent instantaneously to media outlets throughout the world, and almost all its actions take place in the presence of photojournalists.

Since Greenpeace emerged, environmental activists have proliferated. There are tens of thousands of environmental NGOs around the world that work in the service of environmental protection. One can distinguish such groups according to the depth of critique they level against societies' environmental practices and the kinds of strategies they employ.

Many associate Greenpeace with the more radical wing of the environmental movement because of its commitment to direct action and civil disobedience. There is a significant difference, however, between Greenpeace and other confrontational groups such as Earth First! or Earth Liberation Front (ELF). This revolves around the use of violence. Some Earth First! and ELF members condone violent tactics, especially against property, as legitimate tools of political expression. They see violence as a way to dramatically draw attention to issues and as a means for immediately stopped ecologically harmful practices. Greenpeace disagrees. Its direct actions and forms of civil disobedience may, at times, violate existing laws; they are not violent, however, and aim deliberately to avoid harm to people, animals, and property.

Greenpeace's commitment to nonviolence has been tested over the years. In its early days Paul Watson, a member of the board of directors, advocated and at times practiced violent tactics, notably against hunters of baby harp seals. After being voted off the board, Watson went on to found a more radical organization, the Sea Shepherd Conservation Society. Over the years the society quarreled with Greenpeace about how aggressive tactics should be and what counts as violence. This led to their taking different approaches to the same issue. In the 1980s, for example, Greenpeace organized a boycott of fish products from Iceland to protest that nation's whaling policies. In contrast, the Sea Shepherds sank half of the Icelandic whaling fleet.

Although Greenpeace has been committed to nonviolence, violence has been directed against the organization. One incident involved the French government planting explosives on a Greenpeace ship in a New Zealand harbor. The ship was part of Greenpeace's antinuclear campaign against French atomic testing in Polynesia. A Greenpeace photographer was killed, and the French government publicly apologized for its actions and paid NZ$13 million to the government of New Zealand and over 2 million francs to the family of the photographer. The event cast Greenpeace activists as martyrs and helped them gain worldwide publicity and a significant increase in voluntary donations.

There is strong evidence that Greenpeace has played a central role in securing international legal agreements on issues such as whaling and ocean fishing, burning and dumping hazardous substances at sea, international trade in toxic waste, and persistent organic pollutants. Its campaigns and lobbying have been credited with bringing about a moratorium on the planting of genetically engineered crops in Europe, ensuring the support of the Mexican government in controlling pirate fishing of its waters, promoting an international ban on the trade in so-called conflict-timber from West Africa, working to improve the environmental practices of corporate entities such as Apple Computers, spearheading the shutdown of Cargill's soy-processing plant in the Amazon, and encouraging a European phase-out of soft polyvinyl chloride (PVC). More generally, Greenpeace can be credited with educating and inspiring environmentally concerned people around the world.

CRITICISMS

Critics of Greenpeace object to its activist strategies, accuse it of exaggerating scientific information, and contest the group's campaign priorities. For example, observers have criticized Greenpeace for its outspoken opposition to the first Gulf War, misuse of information in insisting that Shell Oil decommission an oil rig on land rather than at sea, and strong stance against GMOs.

Greenpeace has become an international presence on the world environmental scene. It engages in most global environmental issues and partners with many environmental organizations. It has been visionary in establishing offices in countries with little formal, organizational environmental presence and using dramatic direct actions, captured by the media, to highlight environmental assaults on the planet.

SEE ALSO *Civil Disobedience; Earth First!; Environmental Activism; Environmental Law; Genetically Modified Organisms and Biotechnology; Nongovernmental Organizations; Nuclear Power.*

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Paul Wapner

GUHA, RAMACHANDRA
1958–

Ramachandra Guha was born on April 29, 1958, in Dehra Dun, in the Uttar Pradesh, India. A leading environmental historian and sociologist, he has held academic positions in India, Europe, and the United States. Guha writes from a social-ecology perspective and argues that environmental issues must be considered in the context of the social conditions that arise from and cause the society's ecological conditions. India's environmental issues revolve around forests, dams, pollution, and biodiversity, all of which, in Guha's view, entail social conflicts over access to natural resources. He argues that, although material conditions do not exclusively determine social structures, it is impossible to understand social conditions without considering the underlying ecological conditions.

Guha's work presents a consistent ethical and ecological critique of colonialism and neocolonialism. British colonial policy contributed to considerable environmental degradation in India, particularly of India's forests. British demand for commercial wood products and timber led to vast deforestation, and deforestation disproportionately affects those whose livelihood depends on the forest. Although many have written persuasively about negative social effects of colonialism, Guha's work explores the relationship between social and ecological issues.

Although India gained its independence more than fifty years ago, European interests in Indian natural resources, including ecotourism, perpetuate social inequities between the First and Third worlds. Large-scale projects such as dams, animal preserves, and state forests continue to transfer control of and benefits from such resources from peoples who rely on them to biospheric omnivores who consume a large portion of the world's resources.

Guha's first book, *The Unquiet Woods: Ecological Change and Peasant Resistance in the Himalaya* (1989) explores the social dimensions of forestry in Uttaranchal, detailing the nature and form of peasant-based social protests against commercial forestry. He views the forest rebellions as peasant-driven rather than driven by interests of the Congress Party, which controlled the government, an outlook that reflects his association with the Subaltern Studies project. This work blends two previously distinct foci: the sociology of lower-class protest and environmental history—viewing peasant resistance in the context of its ecological setting—and the relationship between the simultaneous processes of social and environmental change in the Indian Himalayas.

This Fissured Land: An Ecological History of India (1992) and *Ecology and Equity: The Use and Abuse of Nature in Contemporary India* (1995), both of which Guha coauthored with the biologist Madhav Gadgil, address the relationship between society and environmental exploitation of India. *This Fissured Land* presents an ecological history of changing human interactions with living resources, exploring the ecological dimensions of social life and the conflicts that arise between the groups who use the resources. *Ecology and Equity* offers a theoretical framework to understand the ecological basis of India's complex social structure. Gadgil and Guha divide India's population into three ecological and sociological categories: omnivores, ecosystem people, and ecological refugees; they argue that social conflict and environmental degradation result from unequal access to natural resources. These categories are based on relative resource use and the ability to transform nature into artifact. They rethink debates regarding Indian development with insights gained from an ecological interpretation of past Indian development schemes.

Guha's 1999 biography of Verrier Elwin—*Savaging the Civilized: Verrier Elwin, His Tribals and India*—depicts the life of the Oxford-trained missionary and amateur anthropologist who defended the rights of India's indigenous populations to practice traditional forms of shifting cultivation. Under the British colonial administration and the newly independent Indian government, controversy raged over the extent to which indigenous peoples should practice sovereignty over their own lands or be assimilated into Indian society. Elwin's advocacy exemplifies "the other side of the Raj," British subjects who resisted the British imperialism, but whose resistance has not typically been included in subaltern treatments.

Guha's book *How Much Should a Person Consume? Environmentalism in India and the United States* (2006) compares the dominant environmental philosophies of the United States ("wilderness-oriented") and India ("agrarian"). This work draws on and expands on material from his *Environmentalism: A Global History* (2000). Guha argues that the U.S. environmental movement does not address the social dimensions of environmental issues and critiques the emphasis on wilderness and recreation usage as isolationist and privileged. Tiger preserves or wilderness preserves, for example, are based on a wilderness aesthetic that idealizes pristine landscapes, and ecotourism replicates colonial use of natural resources. To create such preserves,

indigenous peoples are evicted from their ancestral lands and lose access to traditional means of support.

Guha's critics have noted that his Marxist and economic interpretation of movements such as Chipko ignore religious or eco-feminist dimensions of these movements. Guha's criticism of Arundhati Roy in 2000 regarding the Narmada dam provoked discussion and criticism regarding one's authority to speak on issues of social justice.

SEE ALSO *Chipko Movement; India and South Asia; Social Ecology.*

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H

HABITAT LOSS

Habitat loss is the transformation of marine or terrestrial areas from states suitable for the persistence of biota to those which are not. Habitat loss can be anthropogenic (due to human activity) or not; for instance, it can be due to geological activity over which humans have no control. The accelerating pace of habitat loss since 1960, particularly in the tropics, has been a major factor contributing to the emergence of contemporary biodiversity conservation movements and the forms those movements have taken (Gómez-Pompa, Vázquez-Yanes, and Guevera 1972, Janzen 1986).

DEFINITIONS OF HABITAT LOSS

Habitat loss can be conceptualized along a continuum ranging from transformation to a state unsuitable for the persistence of almost any form of life to one that is unsuitable for the persistence of a particular species. (While there is nothing conceptually incoherent about referring to the habitat of individual organisms [though "home range" is the more usual term], concern over habitat loss is rarely expressed at the individual level.) The habitat of an individual species corresponds to its realized geographical niche: the part of its fundamental ecological niche (as defined by its autoecological requirements) that comes to be contingently occupied by the species (Soberón and Peterson 2005). Typically, in discussions of biodiversity conservation the context indicates the type of habitat loss that is intended, whether it is for a single species or a broad range of species. In different countries policies focus on different types of habitat loss.

In the United States and in other countries in which biodiversity conservation efforts often are directed at individual species (most often endangered, threatened, or endemic species) habitat loss typically refers to the loss of suitable habitat for such species. Designating a "critical" habitat for those species becomes a major conservation concern. In these contexts the normative basis for concern about habitat loss can be concern for individual species or for general biodiversity, that is, all biota. The broader goals of the second category include the individual species of interest. Until the emergence of conservation biology as an organized discipline in the 1970s and 1980s most conservation efforts were concerned with this type of habitat loss.

MAINTENANCE OF HABITAT TYPES

Since the early 1980s much of conservation planning has been directed toward the maintenance of habitat types, as defined by using a wide variety of ecological criteria, such as vegetation and soil type, elevation, temperature, and precipitation (Sarkar 2005). In such contexts habitat loss refers to the transformation of the habitat type that presumably leads to degradation of suitable living conditions for entire suites of species. Such planning protocols are based on the normative assumption that what matters are all components of biodiversity, not just individual species.

Three developments have motivated this important shift. First, there has been a general expansion of normative concern for the persistence of all species and other biota from the traditional concern with the persistence of just charismatic or otherwise useful species, for instance, game species. Second, there was a realization that designating critical habitat precisely for individual species is a labor-intensive process that takes a long time. Thus, in light of the continuing high rate of habitat loss, it was unlikely that

Deforestation in the Anapu Region of the Amazon. *Brazil's Amazonian rainforest, shown here in 2005, is a highly contested environmental ecosystem. The fight is between those who want to see Brazil's economic development include the Amazon region, and those who want to continue to conserve the biggest forest in the world. According to a government report in 2005, Brazil has lost 26.130 square kilometers of rain forest due to deforestation, an area similar to the size of El Salvador.* **ANTONIO SCORZA/ AFP/GETTY IMAGES.**

critical habitats could be identified and protected for large numbers of species before habitat loss put those species under threat of extinction. Third, there was a realization that conservation efforts should include the welfare of species for which no information was available, including species that had not been scientifically identified yet.

Nonanthropogenic habitat loss for individual species and for biota as a whole has always been part of the evolutionary history of the planet. Species have become extinct as their habitats have shrunk and disappeared as a result of geological and other changes. Asteroid impacts have contributed to habitat loss besides influencing extinctions directly. Whether this type of habitat loss raises normative issues is controversial. Human agency is not responsible for the effects of nonanthropogenic habitat loss, and extinction is a standard evolutionary process. However, human agents may incur moral responsibility when they have the power to counteract extinctions that result from such habitat loss.

ETHICAL ISSUES IN HABITAT LOSS CAUSED BY HUMAN ACTIVITIES

Anthropogenic habitat loss can be direct or indirect. It is direct when human activity alters the physical structure of habitats in the temporal and spatial vicinity of that activity. It is indirect when the effects are felt later or at a distance in space. For instance, habitat loss due to climate change is an indirect effect of human energy consumption and other activities. Much of the concern over habitat loss in the first decade of the twenty-first century has been driven by the perceptions that the rate of direct habitat loss increased greatly during the second half of the twentieth century and that contemporary transformations of land- and seascapes are irreversible and often result in environments that are unsuitable for virtually any form of life (Margules and Sarkar 2007). In that sense this habitat loss has no precedent in the evolutionary history of the planet and should be a matter of special concern.

Significant causes of this direct habitat loss have included resource extraction, especially logging and mining, and conversion of land- and seascapes for agriculture and human habitation and recreation. The increased rate of habitat loss is due to expanding resource use caused by overconsumption and overpopulation (Cohen 1995). Technological advances have enabled this rate to continue to increase exponentially for the last several centuries.

In the developed countries of the North, besides energy consumption, the expansion of cities through urban sprawl has been a major cause of habitat loss, particularly in North America. Thus, habitat loss is linked directly linked to the cultural choices humans make about how they want to live. However, in these countries a drastic decrease of consumption levels can be achieved without seriously affecting human well-being. In sharp contrast, in the developing countries of the South reduction of consumption is usually not an option if minimal standards of human well-being are to be maintained (Martínez-Alier 2005). Preventing habitat loss thus must be weighed against other legitimate normative goals for social policy, such as ensuring food, water, shelter, and at least minimal health care and education for all individuals.

Not only are demands for decreases in consumption often lacking in normative justification, in many cases economic growth and the attendant increase in consumption are imperative to alleviate poverty and disease. Expansion of agriculture is a pressing need in areas with hunger or malnutrition. Achieving such growth without permanently depleting environmental resources is the goal of sustainable development (World Commission on Environment and Development 1987). One consequence of these imperatives is that protecting all critical habitats may not be a reasonable normative goal for every species of interest (or every component of biodiversity), a position contested by those who maintain that biodiversity has intrinsic value on a par with and independent of all human interests.

Similarly, the determination of appropriate strategies for preventing habitat loss has been a matter of contention between biodiversity conservationists from the North and social ecologists and other activists from the South, along with some marginalized groups at the fringes of the North, such as the First Nations of North America. The traditional Northern model of habitat protection has been exclusionary, setting up wilderness area and national parks that do not allow permanent human presence (Callicott and Nelson 1998). There are ethical, scientific, and pragmatic arguments against this "wilderness" model (Guha 1989, Sarkar 1999). The ethical arguments include the right of cultures to continue to live on and utilize ancestral lands and the right of individuals to utilize available natural resources for food, shelter, and other basic necessities. These problems are particularly salient in the South because some of the most biologically important habitats are in southern countries (because of the latitudinal diversity gradient) and are often used by marginalized peoples to sustain their meager livelihoods. Mark Dowie (2005) documented how conservation measures carried out by distant governments and big North-based nongovernmental organizations have created a new class of conservation refugees.

Scientific arguments against the wilderness model include the acknowledgment that many areas now perceived to be wildernesses attained their present form because of intensive human management in past eras. Most of the North American landscape is an example of this kind. Additionally, maintaining biodiversity does not necessary require absence of human activity or presence in a habitat: rather, strategies for maintaining viable populations of biota should be based on empirically ascertained ecological needs of species (Sarkar 2005). Finally, pragmatic arguments include the effectiveness of including local residents in all conservation efforts, and the history of political conflicts generated by attempts to exclude traditional residents and users from potential conservation areas.

Ethically responsible policies for reducing habitat loss and achieving habitat restoration where possible thus must navigate carefully between these problems. Habitat protection must be done in a way that achieves sustainability while ensuring that the basic needs of humans continue to be met and without abrogating the rights of individuals living or working in contested habitats. The ideal of distributive justice requires an emphasis on the rights and interests of those individuals who are least privileged, for instance, those living in marginal habitats in Southern countries.

SEE ALSO *Biodiversity; Conservation Biology; Consumption; Population; Wilderness.*

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HARGROVE, EUGENE

1944–

Eugene Hargrove, who was born on October 22, 1944, in Detroit, Michigan, grew up in St. Louis, Missouri. For three decades, as the founder and editor of the journal *Environmental Ethics*, he has been the principal figure in setting the context for the development of environmental philosophy. He is known especially for research into the history of the ideas behind environmental thought, such as aesthetic appreciation of nature in landscape and wildlife art. Hargrove also has been pivotal in graduate education throughout his career, having founded the first doctoral program with a specific focus on environmental ethics.

Hargrove received his bachelor's (1966), master's (1967), and doctoral (1974) degrees in philosophy from the University of Missouri. He did postdoctoral work on the philosopher Ludwig Wittgenstein at the University of Vienna and was a Rockefeller Foundation fellow in environmental affairs in 1976 and 1977. Hargrove founded the journal *Environmental Ethics* at the University of New Mexico, with publication beginning in 1979. This was the first journal wholly dedicated to environmental philosophy, and for three decades it has been considered by many scholars to be the most important. It has provided a forum for the discussion of environmental ethics and fostered the emergence of a new subfield in philosophy. The success of the journal has stimulated the publication of several complementary journals. Hargrove created a nonprofit organization, Environmental Philosophy, Inc., to own and manage the journal, which he moved in 1981 to the University of Georgia, with its Institute of Ecology.

In 1989 Hargrove relocated, with the journal, to the University of North Texas, where he served as chair of the philosophy department. That department also stayed in close association with the programs in ecology at that university. Hargrove created the Center for Environmental Philosophy to promote the field and Environmental Ethics Books, a reprint books series. He has been concerned with applying environmental ethics and introducing it into public primary and secondary schools and into graduate programs that train environmental educators and other professionals.

Hargrove's views are elaborated in *Foundations of Environmental Ethics* (1989) as well as two dozen professional papers. He is the editor of three anthologies: *Beyond Spaceship Earth: Environmental Ethics and the Solar System* (1986a), which is concerned with ethical and environmental issues related to the U.S. space program; *Religion and Environmental Crisis* (1986b), an attempt to go beyond the Lynn White debate whether Christianity with its teaching about human dominion over nature bears major responsibility for causing the environmental crisis; and *The Animal Rights, Environmental Ethics Debate: The Environmental Perspective* (1992a), which discusses environmental ethics in relation to animal liberation and rights. Robin Attfield has provided an important commentary on Hargrove's work (Attfield 1994, chapters 5, 6, 14).

Hargrove's environmental philosophy features what he calls "weak anthropocentric intrinsic value," by which he means that all values encountered in nature are generated by humans in their encounter with nature, which always is seen from a human perspective. In such interactions nature is valued instrumentally, although it can and should be valued intrinsically as well. That intrinsic value is weak in the sense that it depends on the human presence, in contrast to a strong nonanthropocentric intrinsic value, which others suppose they can find inherent in plants, animals, species, and ecosystems with a good of their own in the absence of humans. Hargrove allows that such autonomous intrinsic values may exist but thinks that humans are not in an epistemological position to know such values or their bearing on how people should behave. He urges: "A simple reminder that humans are fully capable of valuing things noninstrumentally and have been doing so for thousands of years is all that is needed" (Hargrove 1992b, p. 199). Hargrove's historical research on the sources of environmental ethics in classical American landscape painters of the frontier provides support for that viewpoint.

Early in his career Hargrove was an active caver and an environmental activist for the National Speleological Society, especially in the period 1971–1974. His interest

in caves has given him a perspective that goes beyond that of the usual aboveground land ethic because caves are anomalous as ecosystems. Cave conservation respects life in caves but is concerned equally with mineral formations. Weak anthropocentric appreciation of nonliving cave formations may be needed to protect a cave—"hollow spaces in layers of sediment" (Hargrove 1992b, p. 192). His ongoing concern with environmental ethics in space (empty space, lifeless planets) provides further evidence of his ability to extend environmental thought. In 2007 Hargrove received funding from the National Science Foundation to hold a workshop on "Space Science, Environmental Ethics, and Policy."

SEE ALSO *Animal Ethics; Caves; Environmental Philosophy: V. Contemporary Philosophy; Land Ethic; Outer Space; White, Lynn, Jr.*

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SEE *Process Philosophy.*

HEGEL, GEORG WILHELM FRIEDRICH

SEE *Environmental Philosophy: IV. Nineteenth-Century Philosophy.*

HETCH HETCHY

In the late nineteenth century two strains of thought about nature prevailed in the United States. The first was that careful management of natural resources was essential to the long-term expansion of the American economy and to the welfare of society. This conservation movement was led by the first chief of the U.S. Forest Service, Gifford Pinchot (1865–1946), who was appointed to that post in 1905 by President Theodore Roosevelt (1858–1919). The approach established by Pinchot and Roosevelt brought increased regulation and management of vast acreages of forest and grazing lands by government scientists and other experts. They believed that the combination of government oversight and large corporate interests could efficiently manage nature to serve national prosperity in perpetuity.

The second impulse was to set certain lands aside entirely from development. Derived from eighteenth-century European Romanticism, preservation had acquired uniquely American qualities. Literary and artistic depictions of nature figured prominently in the early cultivation of America's cultural identity. Middle- and upper-class Americans found picturesque and sublime landscapes a source of both national pride and a refuge from the increasingly harried pace of urban life.

THE FOUNDING OF YELLOWSTONE NATIONAL PARK

The establishment of Yellowstone National Park in 1872 represents the first grand achievement of the preservation

Hetch Hetchy Valley, Yosemite National Park, California. *Hetch Hetchy, described by John Muir as "one of Nature's rarest and most precious mountain temples," has been a controversial topic regarding environmental ethics. Over 80 years ago, the valley was dammed and flooded to supply drinking water and hydropower to the San Francisco Bay area; much of the valley still lies under water today.* **AP IMAGES.**

ideal. Yellowstone's early history, however, reveals a tension between preservation and development that surfaced more dramatically in Yosemite National Park's Hetch Hetchy Valley. Congressmen established Yellowstone Park only after the U.S. Geological Survey assured them that the volcanically geothermal region was without value for either agriculture or mining, leaving tourism as its only economically redeeming function. For the next two decades park defenders were hampered by the inherent limits of that original economic justification for the park. Faced with repeated attempts by mining and railroad interests to overly commercialize the park and then to penetrate or slice off a portion of the reserve, those defending Yellowstone's inviolability ironically resorted to utilitarian arguments to fend off the proponents of utilitarian exploitation of the area.

YOSEMITE AND SAN FRANCISCO'S QUEST FOR WATER

By 1900 the question of whether the boundaries of national parks were sacrosanct had been positively resolved in Yellowstone but still loomed in Yosemite. In contrast to the struggle in Yellowstone, where corporate interests could be branded as rapacious invaders, here the issue was clean water for the city of San Francisco. Since the 1880s city engineers had envisioned the possibility of damming the high-walled Hetch Hetchy Valley, 150 miles to the east, as the best way to solve San Francisco's perennial water-supply problem. Damming the Tuolumne River at the lower end of the valley would create a reservoir to serve a growing population. The problem was that Hetch Hetchy was inside the boundaries of the newly established (1890) Yosemite National Park. For San Franciscans the public good to be gained by damming the valley—for the needs of the many—far outweighed the value of preserving it for the pleasure of a few.

John Muir (1838–1914), who had come to national attention with his earlier writings on the natural glories of the Yosemite region, did not see it that way. In 1903 Secretary of the Interior Ethan Allen Hitchcock (1835–1909), agreeing with Muir and his fledgling Sierra Club, refused to grant the right of way for the dam and reservoir to the city, asserting that he could not violate the original intent of Congress to protect the area.

The devastating 1906 earthquake that struck San Francisco was followed by a citywide fire, and there was not enough city water to control it. The destruction of the city by earthquake and fire and the public health crisis that came in its wake—aggravated by a lack of safe drinking water—changed everything. With the routine occurrence of typhoid outbreaks caused by unsafe urban drinking-water supplies, the argument made by city officials for a reliable source of clean, fresh water received a sympathetic hearing. Furthermore, most conservationists argued that western waters that flowed to the sea represented an inefficient "waste" of a vital resource. Their grand vision, inscribed in the Reclamation Act of 1902, was to "reclaim" vast areas of arid land in the American West through massive dam and irrigation projects.

Hetch Hetchy Reservoir in Yosemite National Park, 1987. *Hetch Hetchy has been the subject of environmental controversy since the late nineteenth century, when a proposal to dam the valley to provide water to San Francisco created an early rift between environmental perservation and human resource interests. More recently in the early 2000s, groups have proposed measures to "restore" the Hetch Hetchy Valley.* **© GALEN ROWELL/CORBIS SYGMA.**

HETCH HETCHY: CONSERVATIONISM VS. PRESERVATIONISM

When San Francisco's plea for the right of way to build the reservoir was made again in 1908, a new secretary of the interior, James R. Garfield—appointed by President Roosevelt—received it favorably. In many ways Roosevelt was the central figure in this struggle. A firm believer in resource conservation, he also created new national parks and established the nation's first wildlife refuges and national monuments. His pronouncements on the value of wilderness and wildlife were often accompanied by declarations of the more practical, material benefits of government management of the nation's natural resources. Forested watersheds were to be protected for the benefits

that would accrue to farmers, commercial navigation, and home building. The support of Roosevelt, the nation's most famous outdoorsman, for the Hetch Hetchy project carried considerable weight. The Hetch Hetchy controversy rendered the chasm between preservation and conservation impassable. Garfield's approval of the city's request prompted Muir and Robert Underwood Johnson, editor of the *Century Magazine*, to launch a five-year-long national campaign to defend the valley and, as they saw it, the very integrity of the national park idea. For preservationists the proposal to flood Hetch Hetchy Valley represented the most egregious sign of an urban civilization slouching toward decadence. In congressional hearings over the Garfield decision, valley defenders held up Hetch Hetchy as a sacred symbol of unspoiled nature, a bulwark against the juggernauts of urbanism and industrialism. Invoking the divine association that such places of grandeur had assumed in American culture, Muir and others condemned the proposal as an ungodly, satanic act that would destroy one of God's own "temples." Others clamored against the private interests that purportedly stood to profit from the dam. Letters and telegrams opposing the dam poured into congressional offices from civic groups, scientists, and travelers. Editorial boards of leading newspapers and magazines inveighed against the project. The popular groundswell killed the legislation in 1909.

But proponents of the dam would not surrender. In 1913 San Francisco's congressman, John E. Raker, introduced the bill that finally delivered victory to the dam's advocates. Raker grounded his argument in economics. He trumpeted the enormous monetary value (in the millions, he said) of an impounded reservoir versus the paltry $300,000 value he ascribed to the valley in its present "swampy" state. Most dam advocates, including Pinchot, acknowledged their support for parks—when not in conflict with other, more pressing human needs. Further, they argued that the dam held aesthetic and recreational value; the valley's "old barren rocks" and "swampy floor" would be greatly enhanced by the reservoir.

The opposition reprised its nationwide campaign of protest against the "sordid commercialism" the dam had long come to symbolize. Impressive though it was, the effort failed. Congress voted decisively in 1913 in favor of granting the city the right of way through Yosemite to construct the dam. President Woodrow Wilson signed the Raker Act, which led to the flooding of Hetch Hetchy, signaling defeat for preservationists.

The campaign to save Hetch Hetchy drove a deep wedge between conservationists and preservationists. The controversy revealed the limits of the "worthless lands" rationale for establishing parks and wilderness areas—an issue with which preservationists continually contended. Hetch Hetchy forced the nation's elected officials to consider the higher value of untouched wilderness and demonstrated the broad support that the ideal had acquired in American culture. Forty years later, when another proposed dam threatened to invade the sanctuary of a national preserve (Dinosaur National Monument), preservationists recalled Hetch Hetchy, rallied national support, and this time prevailed.

SEE ALSO *Conservation; Muir, John; Pinchot, Gifford; Preservation; Roosevelt, Theodore.*

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Chris J. Magoc

HINDUISM

Hinduism is distinctive among the great religions of the world in having no explicit creed, founder, or centralized authority. It is a complex tradition in which local indigenous devotional practices stand alongside, and are sometimes integrated within, sophisticated philosophical systems. Some scholars refer to Hinduism not so much as a singular religion as a confederation of worshipping communities held together by shared literary, philosophical, and ritual traditions. Its antiquity is comparable to the ancient traditions of Egypt or Mesopotamia. Unlike them, however, it is a continuous, living, and dynamic tradition continually responding to new conditions. Hinduism has not made a strong effort to proselytize members of other faiths. Thus, except for devotional movements, such as the International Society for Krishna Consciousness, that have attracted followers in the Europe, United States, and Latin America, the reach of Hinduism as such has been confined to India and to Indian immigrant communities abroad.

Nevertheless, from the time Hinduism came to be known in Europe and North America, scholars have taken a keen interest in the philosophical ideas of Hinduism and its remarkable artistic and cultural achievements. Interest in the significance of nature in the Hindu religious traditions and the importance of Hindu ideas for the environment have been of particular interest to environmental philosophy, particularly the Deep Ecology of the Norwegian philosopher Arne Naess.

CULTURAL SETTING OF HINDUISM

There is no specific time and place in which Hinduism can be said to have begun. Sometimes called Sanatan Dharma, or "the eternal teaching," it is appropriately understood simply as the life and culture that, before the advent of other religious traditions, embodied the values, concerns, hopes, and ideals of the people of the Indian subcontinent. Hindu worship centers on rituals that celebrate the importance of natural phenomena, critical changes in the rhythm of nature, the key moments in the life of the individual in the community, and decisive events in narrative traditions recognized both by local communities and by the larger society. In these traditions aspects of the flora and fauna of India, rivers, trees, plants, mountains, and animals play a significant role.

During the nineteenth century many scholars held that the philosophical and cultural achievements of ancient India were the work of invaders or immigrants who entered the region from the third through the second millennium B.C.E. That view was discredited in the 1920s with the discovery of an advanced civilization that flourished in the Indus Valley, in what today is Pakistan, from 2500 to 1500 B.C.E. Archaeological investigations of the Indus Valley civilization (2500–1500 B.C.E.) have revealed cities with straight streets, a central bath, a sophisticated system of wastewater management, and evidence of a written language not yet deciphered. The absence of elaborate temples or palaces suggests a relatively egalitarian society. Artifacts suggest worship of a mother goddess and a strong regard for fertility as well as spiritual ideas and practices that appear in Hinduism today.

INFLUENCE OF HINDUISM IN EUROPE AND NORTH AMERICA

From the early nineteenth century, when Hindu texts came to be known in Europe and North America, philosophers in those areas took a strong interest in the philosophical ideas of India. With the influence of Hindu writings available to him, Ralph Waldo Emerson (1803–1882) rejected the Western notion of deity as the Supreme Being that stands over nature and embraced the idea of divinity in nature itself. The interest of such thinkers led to an appreciation of the intellectual content of Hinduism, but largely to the neglect of the patterns of worship and devotion that motivated much of Hindu religion.

Interest in the environmental values of Hinduism emerged in the 1960s amid claims by some environmentalists that because the Judeo-Christian tradition held the idea of God as a being outside of nature who created humans as uniquely endowed with a soul, and who placed them in charge of nature to use it as they pleased, this tradition was largely responsible for the present ecological crisis. Because these thinkers saw the traditions of Asia as different from those of the Judeo-Christian tradition, Hinduism came to be explored for the insight it might offer toward the development of a viable environmental ethic.

In this context, writing about Hinduism tended to reflect the influence of the nineteenth-century about India known as *orientialism*. In this discourse two opposing images of India often confronted each other. One was a view of India as an alternative to the exhausted materialism and utilitarianism of European–North American civilization. In this view India was the venue of enchanting landscapes and esoteric teachings. Its doctrines were intuitive, mysterious, profound, and luminous. In the texts of India available to him, Arthur Schopenhauer (1788–1860) found deep, original, and sublime thoughts that stirred his spirit to its depths. But the same discourse also generated the image of India as the "irrational other." Lord Thomas Macaulay (1800–1859), the architect of the British educational system in India, argued that the whole of Sanskrit literature, replete with its grotesque and immoral mythologies, was not to be compared with the intellectual content of a common English schoolbook.

Writing concerning the Hindu view of nature through the 1980s tended to reflect these opposing views. For some, Hinduism presented a view of nature in which every mountain, rock, and tree was to be respected, venerated, and presumably protected. For others Hinduism was hopelessly occupied with liberation from the material world and therefore irrelevant to environmental concerns. Environmental writing since the 1980s has tried less to infer a single disposition of Hinduism toward the environment than to understand such issues as the environmental significance of particular texts and practices, the impact of environmental degradation upon Hindu worship, and the ways in which particular Hindu ideas and practices have supported local environmental initiatives.

HINDU VIEWS OF NATURE

The history of India reveals differing views of nature developed over an enormous span of time. Many Hindu traditions have supported strategies of resource use that have helped sustain India's biological diversity and have supported communities that depend on it. A strong interest

Hindus Celebrating the Ardh Kumb Mela. *Indian Hindu devotees participate in ritual bathing at Sangam (the confluence of the Ganges, Yamuna and mythical Saraswati rivers in Allahabad, January 28, 2007) during the Ardh Kumbh Mela festival (Half Pitcher festival). The Hindu tradition regards all rivers as sacred. With a majority of its population practicing Hinduism, India is seen as a center of the religion. The Hindu regard for nature will likely play a part in environmental debates as India continues to increase its population and development.* **MANAN VATSYAYANA/AFP/GETTY IMAGES.**

in nature is evident from the earliest period of Indian civilization. Among the remains of the Indus Valley civilization, small square or rectangular steatite seals (measuring 3.8 to 7.6 centimeters across) depict trees, water, and goddess figures standing in close relation with one another. Some of them seem to depict Earth as a mother giving birth to a tree and contain scenes composed of animals, trees, and human beings, usually interpreted as revealing the common rhythm in human, animal, and vegetative life. The relationship of trees, water, and the goddess in the remains of the Indus Valley civilization resemble later images of the Ganges River as a goddess pictured beneath a tree.

Hinduism has an impressive literary history, and, although it is not a text-oriented religion, its textual history provides a convenient framework for understanding the significance of nature in the tradition. The earliest literary source of Hinduism, the Rig-Veda (composed c. 1800–800 B.C.E.) contains hymns of praise and adoration to a number of the phenomena of nature depicted as deities. Indra is the seasonal monsoon rain, pictured as a colossal male figure destroying the demon that withholds the waters from the thirsty land. Surya is the sun, the Maruts are the storm spirits, and Apas is the waters. Prithivi the Earth is praised as the mother who sustains the world and all that dwells upon her.

The Rig-Veda and other ancient Vedic (or wisdom) collections lavish praise on such rivers as the Yamuna, the Saraswati, the Indus, and the Ganges. The Hindu tradition regards all rivers as sacred. Along the banks of rivers across India, ancient temples and contemporary religious practices express deep piety toward rivers as Mother, the source of life, the deity who cleanses defilement and sin. Vedic sources also portray the universe as a living organism in which every part is related to the life of the whole. Vedic literature develops the view that all of life is sacred because all living beings reflect the one divine reality from which all of life has come; it therefore prohibits injury to living things.

In the Upanishads, which are philosophical supplements to the Vedic hymns, (composed c. 800–600 B.C.E.), the attitude of adoration toward the natural world is

retained. But the Upanishads are a diverse body of documents. The teachings of the Upanishads range over such topics as the ultimate ground and source of the visible world, the nature of the true self that resides in the depths of the human person and in other living creatures, the condition of the embodied self in the visible world, and the path that leads to the liberation of the self from its bondage to otherwise endless rebirths in the visible world called *samsara*. Here, alongside the attitude of adoration of nature, we find a disposition toward nature less consistent with the Rig-Veda and other Vedic collections.

Despite the variety of insights of the Upanishads, their attitude toward the natural world can be gathered together in terms of two diverging tendencies. On the one hand, the natural world and all that it contains is, or is the manifestation of, *Brahman*, the ultimate reality. Here the phenomena of nature are sometimes presented as analogies that aid in the recognition of the relationship of the visible world to its ultimate ground. Just as birds resort to a tree for a resting place, so everything resorts to that supreme self (Brahman). As herbs arise from the earth, as hairs arise from the body, so from The Imperishable does everything here arise. Like sparks from a blazing fire, manifold beings are produced from the Imperishable. Other passages emphasize that, although the supreme self is the essence all things, it is also other than anything that can be seen or conceived of. In some of the Upanishads, this reality is to be sought by means of penetration into the depths of the inner self. Although the Upanishads do not all agree upon a single method for the pursuit of this ultimate reality, many recommend renunciation of the material world, which is seen as a provisional and transitory reality. For this reason, some of the Upanishads tend to minimize the importance of the material world and the physical body in which the embodied soul is condemned to repeated lives.

By the second century C.E., the Hindu tradition had begun to mediate between these opposing tendencies by articulating not one but four ends or purposes to human existence (*catush purushartha*):

1. *kama*, sensuous and aesthetic pleasures;
2. *dharma*, the duties and values of temporal moral existence;
3. *artha*, prosperity;
4. *moksha*, release from the cycle of rebirth.

Around the same period the tradition came to understand earthly life as laid out in terms of four stages:

1. the *brahmacarya,* or student, beginning around the age of twelve;
2. the *grihastha,* or householder, beginning with marriage;
3. the *vanaprastha,* or the forest dweller, an optional stage that normally begins when a person has fulfilled the duty to establish and raise a family;
4. the *sannyasin*, the final optional stage, in which the person has renounced the world in pursuit of *moksha*.

Because the four ends of life are relevant to the different stages of life, the tradition emphasizes both the importance of the material world, including the dharmas—which are relevant to the maintenance of the natural, social, and political order—and the final goal of liberation.

The tendency to renounce the material world in pursuit of moksha found expression in philosophical ideas that eventually influenced some European and North American intellectuals. Shankara, who lived a mere thirty-two years in the eight or ninth centuries C.E. and took sannyasin vows at an early age, was the exponent of a school of Indian philosophy known as Advaita Vedanta, or unqualified nondualism—what European and North American scholars have sometimes called *monism.* Shankara held that there is only one reality, Brahman, that the world of everyday experience is a mere appearance of that reality under the conditions of the ignorance (*Avidya*), which is a common characteristic of temporal existence. Committed to the goal of moksha, he encouraged his followers to cultivate an attitude of indifference—even disgust—toward the material world. Some scholars have attributed the deplorable condition of India's environment to the influence to such thinking. Shankara's thought, however, is not completely incompatible with concern for nature. Although Shankara spoke disparagingly of the material world, neither he nor the Hindu tradition recommended world renunciation as the norm for society as a whole. Moreover, among his followers, his rhetoric was intended to discourage attachment to the material world. Thus those who would follow him in world renunciation were bound to radically reduce their environmental impact. The earthly life of the sannyasin is one of self-control, nonviolence, simplicity, and frugality.

The articulation of the four ends and the four stages of life reflect the influence of the *Ramayana* and the *Mahabharata* (composed c. 500–100 B.C.E.), the two most extensive works in Indian literary history. These epics tell stories of the response of idealized characters to challenges that illustrate and provide a context for reflection upon fundamental dharmas, or values, concerning both the temporal world and the aim of human life. Both epics tell of an extended exile in the forest in which much of the action is set. Although the forest evokes fear, it is also admired for its fecundity and beauty. In the forest the characters rise to challenges and encounter the divine. Critical events in these narratives occur in forest locations that are still sites of

religious pilgrimage. Thus, in the grand narratives of the tradition, the landscape of India has an integral significance.

In a critical episode in the *Mahabharata* called the *Bhagavad-Gita* (Song of the Blessed One), Krishna appears as the Supreme Lord of the universe and instructs Arjuna, one of the five central characters of the story, about the critical moral and religious teachings of the tradition: the importance of engagement with the world in an attitude of renunciation and the importance of devotion to God in any of his manifold forms. In this important work, Lord Krishna supports the religious significance of the natural world, proclaiming himself to be the taste in the waters, the light of the sun and moon, the pure fragrance in earth, brightness in fire, and the life in all beings (*Bhagavad-Gita* 7: 8–9).

The importance of the natural world is further reflected in the Puranas (Ancient Stories, composed c. 300–900 C.E.). The *Bhagavata-Purana* (also called the *Shrimad Bhagavata*) tells the story of the birth of Lord Krishna and his childhood in the forests of Vrindavan on the banks of the Yamuna River, now grotesquely polluted with sewage from the city of Delhi 130 kilometers upstream. His teachings are set in these forests, for which he expresses admiration and love. This Purana tells of a colossal venomous serpent that encroached upon the Yamuna and poisoned its waters. The alarmed Krishna dived into the poisoned waters and, after an enormous struggle, prevailed against the serpent and danced on its many heads. For those engaged in the ecological restoration of the waters and land of Vrindavan, Krishna is an inspiration and symbol of hope.

In the *Matsya-Purana*, the goddess Parvati plants an Ashoka tree and cares for it. As it prospers, other deities and the sages question her attention to this tree. Parvati replies that a person who digs a well in a place where water is scarce lives in heaven for as many years as there are drops of water in the well. She states that a large reservoir is worth ten wells, that a son is the equal of ten reservoirs, and that a single tree is the equal of ten sons.

In many of the Puranas, animals are the *vahanas,* or vehicles, and therefore the symbols of the gods. They are featured in narratives both in the Puranas and the epics: the bull is the *vahana* of Lord Shiva, the cow is the *vahana* of Lord Krishna, the elephant of Indra, the lion of Parvati. Often a particular animal has religious meaning because of its role in the religious narrative. The monkey is the living representation of Hanuman, the monkey God who, in the *Ramayana,* assisted Lord Rama when the demon Ravana abducted his wife, the goddess Sita. These animals appear prominently in contemporary religious life.

It is perhaps in the Shastras, or writings concerning dharma (duty) and artha (prosperity) that the most explicit injunctions toward the protection of nature can be found. In the *Arthashastra* (c. 300 B.C.E.), fines are recommended for offenses such as disposing of dust on roads; urinating or defecating near a well, pond, or temple; and for inappropriately disposing of a dead animal. Its concern for forest resources is expressed in its sanctions against the destruction of trees, groves, and forests. For the cutting of the tender sprouts of fruit trees, flowering trees, or shade trees in parks near a city, it recommends a fine of 6 *panas*. For the minor branches of such trees, the fine is 12, and for the large branches of such trees it is 24. For the cutting of the trunk of such trees the fine is 48–96, and for the felling of such trees the fine is 200–500 *panas*. For trees that mark boundaries or are worshipped, the sanctions are doubled.

Although it is impossible to know the ancient value of the *pana*, it is significant that damage to forest resources were taken seriously enough that a fine should have been imposed. The fact that the fines increase geometrically with the size of the damaged branches suggest that trees were objects of value. The imposition of especially severe penalties for damaging a tree that has religious significance indicates not only that trees were objects of worship but also that the provisions of law supported the worship of trees. Widely considered the most authoritative of the ancient *Dharmashastras*, the Laws of Manu (c. 100 B.C.E.) states that anything that contains blood or poison—or impure objects such as urine, feces, spit—is never to be disposed of in water.

ENVIRONMENTAL CHALLENGES SINCE THE NINETEENTH CENTURY

After the colonization of India by the British, a philosophy that viewed nature largely in terms of its economic value for industry tended to marginalize the views of communities that expressed their dependence upon the environment in religious terms and that supported its protection. From the middle of the nineteenth century, British interests exploited India's forests for a burgeoning shipbuilding industry at home and an expanding railway network in India. Timber was in demand for railway ties and as fuel for the locomotives. In many parts of India, forest movements opposed increasing government controls that restricted community access to forests for local needs. Beginning in the 1920s, Mohandas K. Gandhi argued that India should be a republic of economically independent and self-governing villages. He promoted *sarvodaya,* or universal uplift, through the recovery of local and cottage industries and the ideals of life expressed in the ancient writings of the tradition.

With India's achievement of national independence in 1947, state forest departments became the largest landholders in the nation. Under pressure toward economic development, established forest industries supported continued exploitation of forest resources to the

detriment of local communities. Unregulated industrial development contributed to further degradation of forests, waterways, and land. Environmental awareness began to emerge as conflicts over natural-resource use were played out against a background of increasing ecological degradation.

After Gandhi's assassination in 1948, his European disciples Mira Behn (Madeleine Slade) and Sarala Behn (Catherine Heilemann) settled in the western Himalayas, where they established ashrams intended to realize the kind of independent and self-reliant communities that Gandhi had envisioned. Sarala Behn's efforts toward the empowerment of rural women and Mira Behn's writing concerning the ecology of the hills contributed to the emergence of movements (especially the Chipko movement) for the rights of local people and the preservation of the forests upon which they depend. They also contributed to a rising environmental consciousness that inspired environmental activism in other parts of India.

In some places degradation of landscapes of religious significance has also raised environmental concern. Deforestation around temples of national importance has provoked ambitious tree-planting programs. Pollution of India's rivers, traditionally seen collectively as the goddess who supports and purifies all who depend upon her, presents a major problem to the worshipers of these rivers. In the region of Vrindavan, the birthplace of Krishna, the Yamuna is unfit for ritual bathing. Although some religious authorities claim that the pollution of the river cannot detract from its spiritual significance, others have argued that the toxins are harmful to the goddess herself and call for radical action. Some environmentalists believe that the Hindu regard for nature can help to spur an adequate response to the many environmental problems of India's increasingly urban and industrial economy. India's need to balance the imperatives of rapid economic expansion with its traditional regard for nature constitutes a striking challenge to the living and dynamic tradition of Hinduism.

SEE ALSO *Buddhism; Chipko Movement; Emerson, Ralph Waldo; India and South Asia; Jainism.*

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George Alfred James

HOLISM

Although the centrality of holism in both ecology and environmental ethics is indisputable, the meaning of the concept within each field is difficult to define with precision.

HOLISM AND REDUCTIONISM

Holism might be understood best in contrast to reductionism. Reductionism is arguably the central approach to Western science, traceable back to the ancient Greek Milesian school of thought (c. sixth century B.C.E.), which attempted to discern the fundamental stuff out of which all else emanates. Reductionistic science assumes that the experienced world is understandable only through an examination of its component parts, and that through such an examination we discern the reality of the whole. For an environmental reductionist, for example, a species is nothing but a placeholder for a collection of specimens.

The popular expression of reductionism is that the whole is merely the sum of its component parts.

In *Nature's Economy* (1994) the environmental historian Donald Worster portrays holism as a reaction to the influence of reductionism, from Gilbert White's "Cult of Selborne" reacting against the perceived evils of Linneaen fragmentation to John Ray and Henry More rejecting the reductionism of a Newtonian-Baconian mechanistic view of nature. He observes that "the idea of holism ... has ebbed and flowed with extraordinary persistence throughout the modern period" (Worster 1994, p. 21).

In contrast to reductionism, holism asserts that the whole is greater than the sum of the parts: Holists believe that certain properties or qualities that emerge at the level of the collective do not exist in the parts and also are not predictable from a knowledge of the properties or qualities of the parts before their integration into wholes. For example, a holist might point to the quality of life as a property of a living organism that does not exist in the atoms or in the molecules of which living organisms are composed.

Although it sometimes is assumed that both the science of ecology and environmental ethics are inherently holistic, both contain theories that range from the manifestly holistic to the strictly reductionistic. Among classic examples in ecology, Frederic E. Clements's "superorganismic" conception of the biota (the idea that what now are called ecosystems are themselves living organisms) is manifestly holistic, whereas Henry A. Gleason's "individualistic concept" of the biota (the idea that certain plants and animals often are found together because they are adapted individually to similar environmental conditions) is strictly reductive. Among classic examples in environmental ethics, Aldo Leopold's land ethic (which makes the "integrity, stability and beauty" of "the biotic community" the measure of right and wrong) is clearly holistic, whereas Paul W. Taylor's biocentrism (which provides equal intrinsic value for all living beings individually) is strictly reductive. It is therefore a mistake to assume that holism is a defining characteristic of ecology or that all environmental ethics are holistic.

ETHICAL HOLISM

Ethical holism stands in opposition to ethical reductionism: The belief that only individuals as more or less traditionally conceived (e.g., human individuals, other individual animals, and individual plants) matter morally. The focus of most popular environmental concern is on wholes: on species, such as the black-footed ferret, not on individual ferrets; on forests, such as the plains of the Yellow Dog River in Michigan's Upper Peninsula, not on individual trees; on whole ecosystems, such as the Florida Everglades; and even on titanic features of the environment such as the atmosphere, the ocean, and climate. Ethical holists assign moral significance to wholes over and above the individuals they encompass.

Ethical holists assert that environmental wholes are direct objects of moral concern, often claiming that they have intrinsic value. As was noted above, however, not all environmental ethicists are holists. An ethical reductionist might argue, for example, that the good of a species can be accounted for by considering the good of the individual specimens that make it up. As to objects of popular environmental concern such as the atmosphere, the oceans, and the biosphere as a whole, a reductionist might argue that protecting them from damage is necessary to ensure the well-being of individual humans or, in the case of reductionistic animal ethicists, the welfare of individual animals. By contrast, an ethical holist would argue that a species, an ecosystem, a biotic community, or even nature as a whole deserves ethical consideration. Ethical holisms appear to be premised on corresponding ontological holisms.

ONTOLOGICAL HOLISM

Ontological holism is the claim that the reality of the whole transcends the reality of its constituent parts. The principal support for ontological holism is the alleged existence of emergent properties belonging to wholes that neither exist among the parts nor are predictable from knowledge of the properties of the parts and the way the parts relate to one another. Ontological reductionism, in contrast, is the claim that the properties of wholes are always reducible to—that is, are found in or predictable from—the properties of their component parts. Only the parts are real; the whole is not. A social reductionist, for example, would argue that individual human beings are real but human societies are not; societies are simply aggregates or collections of interacting individual human beings. An ecological reductionist would argue that individual plant and animal species populations are real but biotic communities are not; a biotic community is, as Gleason put it, a "coincidence" of species populations that are adapted to the same environmental conditions, such as temperature and rainfall.

To counter reductionism, holists invoke the emergent properties of wholes. A social holist might point out that societies exhibit properties, such as political institutions, that are not found in individual human beings. A biological holist might point out that a species has a minimum viable population (the smallest number of specimens necessary to assure the perpetuation of the species for the foreseeable future), a property not found in any of the specimens. An ecological holist might point out that ecosystems modulate local climates—areas of standing forests, for example, have

lower summer temperatures than areas in the same climate region that have had their forest cover removed—but that the individual trees do not modulate their local climate. Because reductionists cannot deny the existence of whole-level properties, dispute centers on the predictability of those properties from the interaction of the properties of the parts.

Holists also contend that wholes exert downward causation on their parts. A social example would be the way political institutions shape the physical and mental properties of individual people. Would a contemporary Swede be the same individual if his parents had thrown in with the Communist revolution in China when he was born in the 1940s and he had experienced the physical hardships and relentless political indoctrination of the Cultural Revolution in the 1960s? Thus, the properties of the society that individuals find themselves in exert downward causation on the individual humans who compose those societies. An evolutionary example would be the way a species supposedly adapts to an ecological niche in a biotic community. If the niche is what the species is adapted to and is conceivable only as an emergent property of the community, the community is real because it exerts downward causation on its parts: the individual species that compose a biotic community, whether or not the niche property is predictable from knowledge of the community's parts and their mutual relationships.

As the last example suggests, ontological holists implicitly assert the existence of a hierarchy of wholes. Individual species populations are the parts of a biotic community, whereas specimens are the parts of a species population. That invites holists to reduce ontological reductionism to absurdity. What are the parts of specimens? Their individual living cells is one plausible answer. In that case, are only cells real whereas specimens are not? And what are the parts of cells? Their individual molecules. And the parts of molecules? Their individual atoms. This regression is not infinite, but it terminates in something so remote from the ordinary experience and conception of reality—subatomic particles, quarks, or superstrings—that only the most obdurate reductionist would endorse such an ontology. Thus, social reductionists appear to be merely arbitrary, drawing the line at individual human beings, not the individual cells of which humans are composed, but refusing to acknowledge the reality of social wholes composed of individual humans. Ecological reductionists such as Gleason appear to be equally arbitrary, drawing the line at individual species populations, not the individual specimens of which they are composed, but refusing to acknowledge the reality of biotic communities composed of individual species populations.

RADICAL (METAPHYSICAL) HOLISM

Radical holism is the assumption that the embeddedness of organisms in their ecological matrix serves essentially to erase the individual. That is, ecological interconnectedness eliminates the individual, which is subsumed by the reality of the whole. Popular expressions of this might include the slogan "all is one" or metaphorical expressions such as the "web of life," a web lacking nodes that one might recognize as individuals, or, as Worster characterizes holism, a view "in which all nature is approached as a *single indivisible unity*" (Worster 1994, p. 21; emphasis added).

One also can glimpse flirtations with this more untempered form of holism in certain variations of the environmental ethic of Deep Ecology. Arne Naess, the founder of this school of thought, was influenced, through his study of the philosophy of Mohandas Gandhi, by ancient Indian metaphysics, according to which there is one being, *Brahman,* and all plurality is *maya:* illusory appearance. In his essay "Deep Ecology: A New Philosophy of Our Time?" (1984) the Deep Ecologist Warwick Fox provides an example of a holism that borders on the radical or metaphysical variety when he comments on what fellow Deep Ecologists Bill Devall and George Sessions endorse in their book *Deep Ecology* (1985) as "the central intuition" of the theory:

> It is the idea that we can make no firm ontological divide in the field of existence. In other words, the world simply is not divided up into independently existing subjects and objects, nor is there any bifurcation in reality between the human and the nonhuman realms. . . . To the extent that we perceive boundaries, we fall short of deep ecological consciousness. (Fox 1984, p. 66)

Some ecofeminist philosophers have strenuously objected to the radical holism of Deep Ecology because it not only obliterates distinctions between humans and nature but also obliterates distinctions among humans. They point in particular to important gender and class distinctions and the different ways in which men and women relate to nature (Salleh 1984).

Holistic theories of environmental ethics have been subject to the charge of environmental fascism. In *The Case for Animal Rights* (1983) the animal-welfare ethicist Tom Regan levels this charge against holistic theories in general and specifically against the holistic Leopold land ethic:

> [It is difficult to reconcile] the *individualistic* nature of moral rights with the more *holistic* view of nature emphasized by many of the leading environmental thinkers. . . . It is difficult to see how the notion of the rights of the individual could find a home within a view that, emotive connotations to one side, might be fairly dubbed "environmental fascism." (Regan 1983, pp. 361–362).

Some proponents of holism in environmental ethics have acknowledged that certain holistic theories of environmental ethics may be ecofascist, especially radical holism, but that the Leopold land ethic is not (Nelson 1996; Callicott 1999). Leopold regarded the land ethic as an addition to, not a substitute for, the human-centered ethics that has been inherited from the past. Thus, concern for the "integrity, stability, and beauty of the biotic community" (the principal measure of right and wrong in the land ethic) (Leopold 1949, pp. 224–225) does not necessarily trump concern for human welfare and human rights. Although Leopold did not work out a system for adjudicating conflicts between the indications of a holistic environmental ethic and the indications of an individualistic human-oriented ethic, J. Baird Callicott (1999) tried to do that on his behalf and thus rescue the land ethic from any hint of ecofascism. However, according to Michael Nelson (1996), that may take the teeth out of the land ethic (that is, make it less robust) and render it "a paper tiger."

SEE ALSO *Animal Ethics; Biocentrism; Callicott, J. Baird; Deep Ecology; Ecosystem Health; Land Ethic; Leopold, Aldo; Naess, Arne; Species; Taylor, Paul.*

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Michael P. Nelson

HUDSON RIVER SCHOOL

The Hudson River school was a name used to refer to a large group of landscape painters in the United States whose work was popular from 1820 to 1875. It was not an actual school, institution, or organization. The name originally was intended as an insult, indicating that the members of the group did not travel far from New York. Initially artists chose the Hudson River Valley, the Catskills, and the Adirondacks as their primary subjects, but many later ventured into the western United States. The central figure in the movement, considered the founder, was Thomas Cole. After his death, Asher Durand became the leader of the group, primarily because of a series of essays on landscape painting he published in the art magazine the *Crayon* (Durand 1855).

FROM LUMINISM TO IMPRESSIONISM

Hudson River paintings are characterized by the presence of intense light that serves two functions: highlighting the materiality of the physical world and adding a spiritual element. Because of their emphasis on intense light, all the painters in the Hudson River school were classified as luminists by John I. H. Baur in 1954. When luminism gave way to impressionism, artists began painting the light itself rather than the objects.

The Hudson River painters originally were influenced by three European landscape artists: Titian, Salvator Rosa, and Claude Lorrain. Most notably, Rosa became the model for the sublime, and Lorrain the model for picturesque beauty.

Two contemporary European artists were also influential: J. M. W. Turner and John Constable. American painters were inspired by Turner's romanticism and treatment of light and admired Constable's photographic realism and approach to natural beauty. A remark by Constable was quoted frequently by American painters: "No, madam, there is nothing ugly; I never saw an ugly thing in my life." That remark was taken to mean that everything in nature was beautiful if viewed from the proper perspective, a view that has come to be called positive aesthetics (Carlson 1984).

There was a close relationship between landscape painting and literature, especially the writings of William Cullen Bryant, Henry David Thoreau, and Ralph Waldo Emerson. That relationship is commemorated in Durand's painting *Kindred Spirits* (1849), in which Cole and Bryant are depicted standing together on a rock outcrop in the Catskill Mountains.

The Oxbow, *1836.* *Thomas Cole is considered the founder of the Hudson River school of art, and is famous for the realism in his landscape paintings. Paintings such as* The Oxbow *provided the most influence on other artists within the school.* **© FRANCIS G. MAYER/ CORBIS.**

REALISM AND IDEALISM

There was considerable tension between idealism and realism in the early days of the Hudson River school. In landscape painting idealism translates into composed painting, in which the elements of a painting do not represent an actual place. Realism involves the depiction of actual places that are easily recognizable to the viewer. Cole believed that composed paintings involved creativity in terms of the selection and placement of objects, whereas realism was simply imitation, involving no creativity. However, his paintings depicting real places, such as *The Oxbow* (*the Connecticut River near Northampton*) (1836), are among those for which he was most famous and provided the basis for his strongest influence on other artists. Cole, disgruntled about the preference for those pictures, lamented that because of the low tastes of the American people he was not able to become the great painter he should have become. The public wanted things (representations of real places), not thoughts (creatively inspired imaginary places). Ultimately, realistic representation triumphed within the group as a result of the views of Durand (1855).

The focus on representation also contributed to an emphasis on scientific illustration. Frederick Edwin Church, the only pupil of Cole, led the way. Inspired by Alexander Humboldt's *The Cosmos* (1845–1847), in which that scientist lamented that he had not taken a landscape painter with him on his expedition to Latin America, Church went to South America, retraced Humboldt's steps, and painted much of what Humboldt had written about. Many of those works were in fact composed paintings, but Church considered them to be scientific summaries of the landscape. Encouraged by Church, Martin Heade traveled to South America, also with scientific intent, with a special interest in studying hummingbirds. Heade's work displays the influence of scientific illustration from earlier in the century, for example, works by scientists involved in the American Philosophical Society, the forerunner of the Smithsonian Institution.

When Yosemite was discovered, members of the Hudson River school, most famously Albert Bierstadt, traveled there to paint the valley and the sequoias of Mariposa Grove. There the artists interacted with photographers for the first time, enhancing the photographic quality of their representations. For example, Bierstadt's *The Great Tree, Mariposa Grove* (1875) was based in part on C. E. Watkins's photograph *The Grizzly Giant, Mariposa Grove* (1864). When the geological surveys in the next decade were organized, landscape painters such as Thomas Moran and William H. Holmes traveled with the scientists to Yellowstone, the Grand Tetons, and the Grand Canyon. Interaction between artists and photographers also occurred on those surveys, for example, between Moran and William H. Jackson.

EFFECTS ON NATURE PRESERVATION

The impact of those paintings and photographs on nature preservation in the United States becomes clear when one reflects that most of the places painted or photographed during that period became national parks and national monuments, beginning with Yosemite and Yellowstone. The Adirondacks, heavily painted by artists of the Hudson River school, eventually was protected by an amendment to the state constitution. Concern by artists, particularly Church, led to the protection of Niagara Falls by an international treaty with Canada.

The shift from luminism to impressionism and eventually abstract expressionism was a shift away from nature to a focus on the self, a change not followed by the general public. As a result, the ability of representations of natural places and objects to generate national concern for nature preservation remains a powerful political legacy of the Hudson River school's influence on people's ways of perceiving and relating to nature.

SEE ALSO *Environmental Aesthetics; Landscape Painters and Environmental Photography; Mountains; Preservation.*

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Eugene C. Hargrove

HUNGER

Hunger is a global problem, in the forms of both undernourishment and long-term malnutrition, besides that of famine, which happens when a social or economic crisis involving malnutrition causes deaths from starvation or related diseases. Malnutrition involves insufficient consumption of nutrients to maintain healthy bodily functions, generates a range of debilitating afflictions, and is characteristically associated with poverty. It affected around 854 million people in the world in the period 2001–2003, some 14 percent of the total population. While the highest percentages of malnutrition are found in sub-Saharan Africa, the greatest numbers of malnourished people live in India, China, and Bangladesh (Food and Agriculture Organization of the United Nations 2006). Moral obligations to prevent this evil impact upon, and are sometimes held to compete with, those of environmental ethics. Simultaneously, hunger deprives humanity of the energies of people who could otherwise participate in sustainable practices, and can spur desperate people to acts of environmental despoliation. Diverse causal theories of undernourishment and of famine support different understandings of our obligations, their relation to human population growth comprising a central issue; such theories will shortly be discussed. In addition, proposals for solving problems of hunger through increased use of genetically modified food will also be considered, since this could on some views alleviate and on others contribute to global problems.

Philosophers in the 1970s (such as Peter Singer) focused on obligations to relieve famine, but this approach risks neglecting underlying factors such as long-term malnutrition and underdevelopment and their causes, genuine as such obligations may be (Crocker 1996). Philosophers have more recently debated priorities between saving nature and feeding people (Rolston 1996), but such debates too risk neglecting systemic factors and political solutions (Carter 2004). Just as global climate change cannot be resolved by lifestyle changes at the individual level, so too problems of hunger cannot be resolved by charity or acts of self-sacrifice alone, or by regulating admission to nature reserves either, but through solutions that go to the roots of the matter.

CAUSAL THEORIES

Hunger is sometimes attributed to population growth and to particular countries (or to the planet as a whole) having exceeded their "carrying capacity," predicted in different terms by Thomas Robert Malthus in his "Essay on the Principle of Population" (1798). This view in recent times has often been associated with Garrett Hardin's "The Tragedy of the Commons" (1968), with population playing the role of an unregulated commons that it pays everyone to exploit and supplement, leading ultimately to human numbers outstripping food supply. Aid to countries where this is happening is considered to make matters worse, and withholding assistance actually to do more good (Hardin 1996).

But the concept of carrying capacity, viable as it may be in biology, has been argued to be inapplicable to human populations and the territories they inhabit, since the number of humans capable of being sustained can be changed by practices such as aid and trade, while the number sustainable by the planet is in part a function of agriculture and technology (Aiken 1996; Cohen 1995). Besides, sufficient food is produced to feed the world population of over six billion (Drèze and Sen 1989), although if the global population were in the future to grow to ten billion or more, this would become more problematic. Meanwhile, increases in land security and food surpluses turn out not to increase birthrates but to reduce them, once it is apparent that large families are no longer required for labor or for security in later life (Ryberg 1997). Hence aid that promotes development can contribute to population being stabilized, where population growth would otherwise continue unabated (Carter 2004).

Much more plausibly, hunger is due to poverty and underdevelopment, and undernourishment not to absence of food but to lack of access to it. Even famines are known to have often occurred in regions where food is available for sale but unaffordable by the poor, regions that are actually exporting food to places where it will fetch a better price. Indeed, Amartya Sen has argued, hunger is widely related to inequalities (often extreme ones) within a society; another factor is environmental degradation, which in the forms of deforestation and desertification widely threatens rural people's livelihood (Drèze and Sen 1989). Jean Drèze and Sen further argue that a lack of democracy is a cause of famines; no twentieth-century famines have taken place under democracies, at least in peacetime, perhaps because democracies cannot conceal dangers of famine and are able to take steps to prevent actual famines beginning.

The role of the international economic system and international institutions such as the World Bank and the International Monetary Fund with regard to the occurrence of hunger is much debated. Granted that the characteristic cause of hunger is poverty, Thomas Pogge has argued that the support of developed countries and their citizens for this system and these institutions amounts to causing poverty and starvation, in breach not only of a possible positive duty to assist but also of a much clearer negative duty not to generate avoidable misery (Pogge 2007). To this causal and ethical view, Gerald Gaus has responded that the global economy is in fact benefiting the poor. Thus life-expectancy in the developing world increased from forty-one years in 1950 to sixty-one in 1998, and the number of people starving has decreased from 45 percent in 1951 to its current much lower average. He admits that the actual number of those starving has increased, but attributes this to an increasing world population rather than to the global economy. The prospects are of continuing improvement, particularly if population can be stabilized, and this underlying improvement is due to globalization, the global economy, and the increased wealth they bring (Gaus 2003). But even if Gaus's analysis is accepted, Pogge's case would not be entirely undermined: if the current system harms those who, rather than benefiting, are still starving, particularly if modifications of the system could alleviate their starvation, and if the presumed benefits of unalleviated globalization would take several decades to emerge, during which millions more would avoidably starve.

One of the United Nations Millennium Development Goals is to reduce by half the proportion of people who suffer from hunger by 2015. Without new effort and international agreements and investment, perhaps of the kind suggested by Pogge, not even this goal will be achieved.

Yet not all hunger is ascribable to the global economy or capitalism. There was hunger in subsistence economies before the rise of capitalism, and hunger can also be found under other systems. Famine in Tibet in the years following 1959 was partly due to the Chinese government's neglect of sophisticated traditional ecological knowledge and insistence that, contrary to what was climatically possible, wheat be grown in place of barley (Government of Tibet in Exile; Bradshaw 2007) In this case, the poor had access to land, but were prohibited on the strength of authoritarian theory from farming it intelligently. Nor is Tibet the only place in the world where respect for traditional ecological knowledge is vital if people of the future are to be able to feed themselves.

THEORIES OF OBLIGATION

While Pogge grounds obligations not to generate avoidable misery in human rights (2002), other ethicists who adopt similar conclusions appeal to utilitarianism (Ryberg 1997), or to Kantianism (O'Neill 1986). Obligations to remedy hunger can also be justified on the basis of the social contract theory of ethics and society, but John Rawls, the leading contract theorist of recent times, avoided such conclusions

in *The Law of Peoples* (1999): He implausibly attributes malnutrition and underdevelopment to local factors and features. However, both Brian Barry (1973) and Charles Beitz (1979) have demonstrated that such obligations can be derived from global versions of Rawls's original position. Jesper Ryberg's well-argued appeal to utilitarianism (and thus to consequentialism) as the ground of these obligations demonstrates that consequentialism need give no support to Malthusian conclusions. The problem with Hardin's attempts to elucidate how agents in developed countries can make the greatest favorable difference lies not in his consequentialism but in his Malthusian causal theories and prognostications.

There are environmental philosophers committed to all these varieties of ethical theory. Tom Regan is a rights theorist, stressing the rights of nonhuman animals as well as humans, but neglects the difference that current agents can make among possible beings (both human and nonhuman) of future centuries and to their prospects for freedom from hunger. The inspiration behind Paul Taylor's biocentrism is Kantian (1986), but this basis generates problems for consistently deriving defensible priorities for interspecies relations, let alone for interhuman relations relevant to hunger and obligations to avert it.

Mark Rowlands (1998) represents contractarianism in its application to interspecies issues, but one could question the coherence of Rowlands's original position, in which the choosers are ignorant not only of their prospects for poverty or prosperity but also of which species they will belong to. Holmes Rolston (1996) adopts a much broader deontological value-theory, but his specific conclusions about priorities between feeding people and saving nature have been criticized for lacking a clear enough account of value priorities. These conclusions also fall into the trap of crediting Hardin's causal theories and lifeboat ethics, or at least the misguided view that refraining from feeding people may sometimes be necessary to save wild species—despite the evidence associating starvation with stress on ecosystems (Carter 2001, 2004, 2005).

Singer's sentientist utilitarianism takes more seriously the far-flung impacts of human action (2004). Meanwhile, Robin Attfield's broader biocentric consequentialism—which takes into account and seeks to prioritize the interests of current generations, future generations, and nonhuman species (in addition to the obligations recognized by Onora O'Neill, Pogge, Barry, and Ryberg)—includes in its purview obligations to prevent, where possible, anthropogenic hunger among nonhumans by seeking to avert the destruction of their habitats through deforestation, pollution, or global climate change, as well as to prevent human hunger (Attfield 1991, 1995, 1999, 2003b). This approach is consistent with the capabilities approach (Nussbaum and Sen 1993, Crocker 1996), modified so as to recognize nonhuman interests, an approach that regards hunger as lack of access or entitlement to food, and proposes related remedies.

SOLUTIONS

Is genetic engineering part of the solution? While the possibility cannot be denied, such approaches can, like aspects of the Green Revolution, make matters worse, as well as sometimes helping boost production and overall prosperity. It is true that we need to produce more food without using up more land, and that genetically modified (GM) foods seem to offer a way forward. But there are questions over their stability, whether their yields are sustainably greater, and whether they require increases rather than decreases of pesticides (Granger 2002). Besides, increasing food production is not our only problem. What the poor need is access to food through growing it themselves, whether in the countryside or in urban allotments, and to this GM foods are not obviously relevant. Arguably, what is needed is access to land (where necessary through land reform), followed by the application of individual or communal effort (including support for new farmers), and the tender loving care widely found among small farmers in the Third World enjoying land security (Stamp 1997; Attfield et al. 2004).

More obviously, the solution to hunger and malnutrition lies in development (Crocker 1996). To some environmentalists, development is the source of all evils. But when development is understood as the process of moving away from poverty, malnutrition, illiteracy, and high mortality and morbidity, and toward participation in overcoming these evils, its desirability is hard to challenge, at least when it is blended with sustainability—not only of an economic but also of social and environmental kinds. Concern for nonhuman nature should not distract environmental ethicists from concern to blend environmental concern with concern for interhuman justice and for flourishing human as well as nonhuman lives across the foreseeable future. That is why comprehensive ethical theories such as biocentric consequentialism are needed. Ethicists who cannot stomach consequentialism need to develop comprehensive nonconsequentialist theories, along the lines, for example, of those of James Sterba (1998). Alan Carter has suggested that no such theories are viable (2001, 2005), but Carter's multidimensional value-pluralism turns out to embody problems of its own (Attfield 2003a, 2005).

While development provides a deeper and longer-term solution than famine relief and food aid, more comprehensive solutions depend on the issue of debates such as that about globalization and global institutions. If theorists such as Pogge are even partially vindicated, then international institutions and the prevailing international

system of trade and finance contribute to the incidence of hunger, and agents in developed countries—including many readers of this entry—have obligations to work towards and campaign for the reform of these international institutions and this system. Unlike Carter, Pogge is not suggesting that the overthrow of state sovereignty, or of capitalism, is required before significant problems can be solved: An internationally agreed tax on certain resources, while it would not rectify all our problems, could, as he shows, suffice to eliminate global poverty, and therewith human hunger, and could do so in a much shorter time period than the forces of globalization possibly could, even on the most optimistic of scenarios (Pogge 2002).

Pogge's Global Resources Dividend comprises part of a sufficient condition for ending of global hunger. If Sen is right, the introduction in all states of a vigorous democracy would form another component of such a sufficient condition. Hence, on most theories of obligation, most of us have a duty to work toward one or the other. Fortunately this obligation is unlikely to clash with duties to mitigate and alleviate global climate change or to preserve nonhuman species (Carter 2004), and is itself part and parcel of promoting sustainable development.

SEE ALSO *Agriculture; Environmental Justice; Food; Future Generations; Genetically Modified Organisms and Biotechnology; Intergenerational Justice; Population; Rolston III, Holmes; Shiva, Vandana; Singer, Peter; Sustainable Agriculture; Tragedy of the Commons.*

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Robin Attfield

HUNTING AND FISHING

This entry contains the following:

I. OVERVIEW

Hunting and fishing raise central concerns for environmental philosophy. Many argue that they are quintessential activities that allow people to participate in and be part of nonhuman nature. Many others argue that these activities constitute undue human interference with the natural world. However nature is valued, embracing or rejecting hunting and fishing will help express one's environmental ethic. Whatever else nature is—species populations, communities, and ecosystems—it consists of individual animals and fish that should or should not be caught, killed, dismembered, and/or eaten. Critical evaluations of hunting and fishing have helped define and shape the field of environmental ethics.

HISTORICAL AND CULTURAL BACKGROUND

There were 299 million U.S. citizens in 2006. Approximately 30 million fished and 12.5 million hunted. These numbers were eclipsed by the 71 million who engaged in wildlife watching, an activity that does not necessitate capturing and/or killing animals and fish (U.S. Fish and Wildlife Service 2006). Although these three categories are not mutually exclusive, far more Americans interact with wildlife as passive observers. Hunting has been on the decline in the United States. It peaked in the early 1950s, when approximately one-quarter of American men hunted, and has been declining sharply since at least 1980 (the sharpest drop occurred between 1980 and 1990—from 19.5 to 16.4 percent of American males) (Dizard 2003). The declining popularity of hunting is the latest chapter in a broader cultural story.

Total Wildlife-Related Recreation in the United States, 2006

Participants	87.5 million
Expenditures	$122.3 billion
Sportspersons	
Total participants*	33.9 million
Anglers	30.0 million
Hunters	12.5 million
Total days	737 million
Fishing	517 million
Hunting	220 million
Total expenditures	$76.6 billion
Fishing	42.2 billion
Hunting	22.9 billion
Unspecified	11.6 billion
Wildlife Watchers	
Total participants**	71.1 million
Around the home	67.8 million
Away from home	23.0 million
Total expenditures	$45.7 billion

* 8.5 million both fished and hunted.
** 19.7 million both wildlife watched around the home and away from home.

SOURCE: U.S. Department of the Interior, Fish and Wildlife Service, and U.S. Department of Commerce, U.S. Census Bureau. 2006 National Survey of Fishing, Hunting, and Wildlife-Associated Recreation.

Table 1. CENGAGE LEARNING, GALE.

Although the arrival date of people in North America is debatable, there is considerable evidence that nearly one-quarter of the continental genera of terrestrial mammals weighing at least one hundred pounds (for example, the American mastodon, mammoth, American cheetah, and Florida cave bear) were hunted to extinction by Clovis people in a relatively short period approximately 13,000 to 11,000 years ago. This might have been the first instance of human hunting pressures that changed North American landscapes. The Clovis extinctions opened ecological niches that were soon filled by Eurasian species more commonly known to Europeans and later Euro-Americans. Contemporary species of bison, grizzly bear, gray wolf, and elk arrived in North America 13,000 to 11,000 years ago, replacing now-extinct species of those mammals. European colonists in the seventeenth

and eighteenth centuries encountered overabundant populations of animals and fish. The standard interpretation is that that overabundance was a result of what might be called Native American Indian conservation practices. This should be tempered with the contemporary understanding that what Europeans and later Euro-Americans identified as wilderness lands teeming with wildlife were more akin to "widowed lands" with rebounded animal populations after nearly 90 percent of the native peoples had died off by the middle of the eighteenth century, leaving landscapes widowed by people.

The majority of European colonists in North America did not hunt. Those colonists came from European countries where hunting was controlled and practiced largely by elite aristocracies. The relative unpopularity of hunting in North America can be attributed to the fact that firearms were not readily available until after the American Civil War and the ideological dictum that the proper life of a European colonist consisted of farming, which anchored European civilization to newly established agricultural fields. The lifestyle of the wandering hunter became a homespun romanticized ideal in the nineteenth century, spurred by real-life figures such as Daniel Boone, Kit Carson, and Davy Crockett as well as fictional characters such as James Fenimore Cooper's Natty Bumppo. Market hunters and fishers, however, were dominant in the nineteenth century. Blamed for decimating animal populations such as bison and Brant goose as well as fish populations such as brook trout, commercial hunting and fishing fell into disfavor by the end of the nineteenth century. By the early twentieth century a sport ideal was championed in which one hunted and fished to celebrate the frontier legacy, retreat from the city into nature, and cultivate outdoor virtues embodied in manly men such as President Theodore Roosevelt.

This sport hunting and fishing ideal has persisted into the twenty-first century. The declining popularity of hunting in countries such as the United States and Canada is a cause of alarm for hunting enthusiasts who fear that Bambi-inspired animal concern will supplant an important tradition. The vast majority of hunters in the United States are white Euro-American men, but the 1.5 percent of American women who hunted in 1990 increased to 2.7 percent in 2000 (Dizard 2003).

FORMS OF HUNTING AND FISHING

Classifying forms of hunting and fishing brings into focus some of the different reasons used to justify these activities. Such classification is fraught with difficulties. What exactly is hunting? Many hunters respond that hunting is more than the mere killing of animals. In *Meditations on Hunting,* José Ortega y Gasset said that death is essential but is not the purpose of hunting, as "one does not hunt in order to kill" but instead "one kills in order to have hunted" (Ortega y Gasset 1972, pp. 110–111).

Subsistence hunters claim to hunt to provide nutrition that cannot be grown. For many people this is the least problematic form of hunting. In contrast, one of the most criticized forms is trophy hunting to acquire prestigious evidence of a killed animal. Commercial or market hunters hunt to sell complete or dismembered animal carcasses for economic gain. Sport or recreational hunters usually eat what they kill, and their primary motivation seems to be pleasure or a primitive, primeval, or atavistic connection with nonhuman nature. So-called pest or varmint hunting, such as prairie dog hunts in the western sections of the United States, is practiced to control or eliminate unwanted animal populations, usually for indirect economic gain. Ecological or therapeutic hunters kill animals such as white-tailed deer to regulate populations that are perceived to have exceeded the carrying capacity of a specific area. Canned hunting occurs when a game animal is enclosed (canned) within a regulated space, such as a private hunting ranch, and typically is taken under a contract between a client and a game owner.

These are not sharply defined categories. Is a sport hunter who mounts the uneaten head of an elk also a trophy hunter? Is a subsistence hunter who sells animal carcasses to make ends meet also a commercial hunter? Is the killing of geese that make one's backyard unsightly a form of varmint hunting? Characterizing the way indigenous peoples hunt and fish also may defy categorization and lead some who oppose hunting and fishing to grant exemptions for indigenous hunting and fishing. Substitution terms for hunting raise problems. Ecological or therapeutic hunting sometimes is called culling, suggesting that unwanted animals are simply removed as opposed to violently killed. Many sport hunters claim to harvest animals, suggesting that killing animals is no different from growing agricultural crops.

The harvesting of fish—fish farming or aquaculture—may make some forms of fishing more like growing plant foodstuffs. As with hunting, people fish for subsistence, financial (market) gain, sport, and trophies. These forms also are not mutually exclusive. For example, many sport fishers (anglers) attempt to catch the biggest fish possible, thus securing a trophy fish. There is no hunting equivalent of catch and release fishing, although camera hunting has most of the elements of a hunt except the kill. However, similar to wounded animals that escape from hunters and die in the wild, many caught and released fish die from angling wounds.

ETHICAL CONTROVERSIES

Hunting and fishing are similar activities. With the possible exception of catch and release fishing and camera

hunting, both activities result in the death of wild fauna. However, far more people disapprove of hunting than fishing. Although some people consider fishing a form of underwater hunting, individual fish seem to have less value than individual animals for many people. This may be related to questions about the sentience of fish.

Most people who hunt animals in North America call themselves sport or recreational hunters. Brian Luke (1997) argued that sport hunters face a paradox: To hunt ethically, one must adopt a sport-hunting ethic that implies that hunting is immoral. Sport hunters must admit the paradoxical nature of hunting, renounce an ethical hunting code, or renounce hunting. A. Dionys de Leeuw (1996) argued that sport fishing also is ethically problematic and that the proper response to the "angler's challenge" should lead fishers to give up fishing.

These challenges to hunting and fishing stem from philosophical positions on the intrinsic or inherent value of individual animals and fish. The environmental ethicist J. Baird Callicott (1980) argued that animal ethicists concerned about individual animals fail to see that the protection of holistic environmental entities such as species and ecosystems necessitates the death of individual animals. The animal ethicist Tom Regan (1983) labeled Callicott's view "environmental fascism," in which individual animals are sacrificed for the greater good of the ecosystem, and claimed that animal rights and environmental ethics are like unmixable oil and water. This debate plays out at the practical level of hunting. Many animal advocates argue that hunting is immoral and that people should leave wildlife alone. Many environmentalists argue that subsistence and sport hunting are morally acceptable and that ecological hunting sometimes is required to protect nature.

Some animal ethics positions may permit forms of therapeutic hunting to relieve animal suffering. However, many animal advocates argue that the proper human response to wildlife is noninterference. Many hunters and fishers counter with the claim that some forms of hunting and fishing allow people to participate in wild nature. Further, if *Homo sapiens* is a naturally evolved species, these kinds of activities may be morally similar to natural nonhuman predation. Critics sometimes respond by denying that moral similarity (Moriarty and Woods 1997).

SEE ALSO *Animal Ethics; Callicott, J. Baird; Food; Leopold, Aldo; Oceans; Ortega y Gasset, José; Regan, Tom.*

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Mark Woods

II. RECREATIONAL HUNTING

Recreational hunting is a popular outdoor activity in many countries. It is controversial because it involves the killing of animals and sometimes causes animals to suffer; its supporters argue that it is a legitimate activity that contributes to conservation. It is a paradigm case of the conflict between animal liberation and holistic ethics as identified by the environmental philosophers J. Baird Callicott (1980) and Mark Sagoff (1984).

Recreational hunting is thought to have begun 3,500 years ago (Anderson 1987) and until comparatively recently was restricted largely to the royal and aristocratic classes. In Assyria and other areas of western Asia, India, Africa (especially during the period of European imperialism), and parts of Europe it sometimes was conducted on a vast scale and often was referred to as "the Hunt" (MacKenzie 1988).

Recreational hunting may be defined as the pursuit for sport of wild animals; a successful hunt typically is defined as one that ends with the killing of one or more animals, though many recreational hunters are satisfied by stalking the game, experiencing the outdoors, and sharing comradeship with fellow hunters. It is concentrated in North America, Europe, northern Asia, southern and eastern Africa, Australia, and New Zealand. In 2006, 12.5 million American adults hunted (U.S. Fish and Wildlife Service 2006). That represented a slight drop from 13 million in 2001. Most people hunt on foot, using modern rifles; others prefer primitive "black powder" weapons, handguns, or bows. Sometimes dogs are used to locate or corner animals for the hunter to kill, trail wounded animals, or retrieve shot animals, especially birds in wetlands. In British fox

Recreational Hunters Aiming at Waterfowl. *Three hunters raise their guns at a flock of waterfowl near a pond. Most recreational hunters follow some code of ethics designed to give the animal a "fair chance."* **U.S. FISH AND WILDLIFE SERVICE.**

hunting, which has been illegal since 2004 but still is practiced, the dogs are the hunters, locating, chasing, cornering, and often killing the fox.

HUNTING ETHICS

Most recreational hunters observe legal requirements designed to maintain both ecological balance and stocks of game. They also follow hunting ethics, known as fair chase or walk and stalk designed to even the odds, to give the animal a fair chance. Fair chase requires the hunter to forgo pursuing game in a vehicle or on horseback, shooting over a bait (such as a tethered goat or carcass) or at waterholes, using spotlights to dazzle nocturnal animals, and the like. Only unconfined animals may be hunted; canned hunting, in which the game is confined to an enclosure or small park, is considered unethical by many people. Many hunters believe that telescopic sights and night vision aids are also unethical.

Green hunting involves fair chase but with a nonlethal climax such as a paintball shot or a dart gun that injects a tranquilizer so that the hunter can pose for a photograph with the animal. This is often part of a research program, allowing the animal to be studied, fitted with a microchip, or translocated.

The founder of Orion the Hunter's Institute, Jim Posewitz, wrote: "Fundamental to ethical hunting is the idea of fair chase. This concept addresses the balance between the hunter and the hunted. It is a balance that allows hunters to occasionally succeed while animals generally avoid being taken" (Posewitz 1995, p. 57).

According to the historian John MacKenzie,

> In [subsistence] hunting the end is all-important, the death and utilisation of the animal. The subsistence hunter is concerned with the ease with which his purpose can be achieved. The sportsman indulging in the Hunt is concerned with the difficulty. . . . In the Hunt the animal is most to be valued, and by extension the hunter who slays it, according to the fight it puts up. In securing its death he follows strict rules of procedure and endangers himself in the process. (MacKenzie 1988, pp. 10–11)

However, this sharp distinction between subsistence and recreational hunting is questionable. First, the

herbivores that are the main target of recreational hunters are not merely edible but regarded as gourmet treats. Many hunters regard it as an obligation to ensure that the animals they kill are utilized, not wasted. Second, often these herbivores must be controlled either because their natural predators have become locally extinct, as in most parts of the United States, or because they were introduced to areas where they never had predators, such as New Zealand. Thus, hunters are often de facto pest controllers. Third, even in traditional societies that depended for subsistence and safety on killing animals, there were often elaborate rules circumscribing hunting, for instance, rules related to religious requirements and rites of passage. Moreover, in those societies hunts often are viewed as fair contests between equals.

KILLING

Killing, not merely successful stalking, is seen by most writers as central to hunting; those writers would not count green hunting as hunting. For proponents of hunting such as the Spanish philosopher José Ortega y Gasset and the U.S. ecologist Paul Shepard (1973) the central meaning of hunting is killing, and killing is essential to "participation in the life cycle of nature" (King 1991, p. 80). The philosopher Ann Causey wrote, "The one element that stands out as truly essential to the authentic hunting experience is the kill" (Causey 1989, p. 332). Some ecofeminists see hunting as a prime example of patriarchal oppression of nature: a "necrophiliac" culture (Daly 1978).

Ortega y Gasset's position is complicated. In *Meditations on Hunting* he stated that "killing is not the exclusive purpose of hunting" (1985, p. 45). Nonetheless, it is essential to hunting:

> To the sportsman the death of the game is not what interests him; that is not his purpose. What interests him is everything that he had to do to achieve that death—that is, the hunt. . . . Death is essential because without it there is no authentic hunting: the killing of the animal is the natural end of the hunt and that goal of hunting itself, not of the hunter. . . . To sum up, one does not hunt in order to kill; on the contrary, one kills in order to have hunted. (1985, pp. 96–97)

Opponents of hunting often claim that it violates animals' right to life. The usual response by defenders of hunting is to deny that animals have that right. The hunting literature uses terms such as *respect* but not *rights,* though in one classic hunting memoir the novice hunter is admonished by his mentor: "And don't forget that an animal has a right to live, the same as you" (Waldeck 1940, p. 45). Of course, a rights-based objection to hunting also implies an objection to killing animals for food, in research, and so on.

SUFFERING

Inevitably, some hunted animals suffer. Even skilled hunters who make a high proportion of clean kills sometimes only wound, and the skills of recreational hunters vary. Hunters acknowledge animal suffering: The environmental philosopher and hunting defender Robert Loftin regarded it as "the most serious argument that can be advanced against sport hunting" (Loftin 1984, p. 146). Hunting codes thus require hunters to acquire and practice the skills necessary for a quick and painless kill and always to follow wounded animals. Those who oppose hunting on the grounds that it causes suffering also must oppose the suffering caused in meat production and research.

HUNTING AND CONSERVATION

There is considerable evidence that subsistence and commercial hunting have contributed to loss of biodiversity, including the extinction of some species. However, in the history of environmental ethics there have been advocates of respect for the natural order who were recreational hunters. Aldo Leopold wrote, "[T]he man who does not like to see, hunt, photograph, or otherwise outwit birds or animals is hardly normal. He is supercivilized, and I for one do not know how to deal with him. . . . There is value in any experience that reminds us of our dependency on the soil-plant-animal-man food chain, and of the fundamental organization of the biota" (Leopold 1949, p. 227).

Others, such as Ortega y Gasset, saw hunting as a way for humans to reconnect with nature and participate in the land community. The ecologist Erik K. Fritzell wrote, "When I hunt I am immersed mentally, physically and even spiritually in an age-old predatory relationship among animals. I am participating in a common ecological process" (Fritzell 2004). Causey stated: "[T]he drive in sport hunting is to be a link in the chain of nature, connected as predator to prey"; the hunter "regards his prey with admiration, reverence and respect" (Causey 1989, pp. 332–333).

HUNTING AND CHARACTER

Traditionally, hunting has been seen as promoting virtue. The Greek mercenary and historian Xenophon (c. 431–c. 355 B.C.E.) wrote of "the health which will thereby accrue to the physical frame, the quickening of the eye and ear, the defiance of old age, and last, but not least, the warlike training which it ensures" (Xenophon, *Cynegeticus*).

However, hunting sometimes is seen as sadistic and cruel and is associated with serious crime against humans. According to the Fund for Animals, "Children raised in a hunting culture, sometimes wearing hunting garb and employing hunting tactics, like [the Jonesboro massacre murderers] Mitchell Johnson and Andrew Golden, have been killing other children with hunting weapons at a

stunning rate. . . . Now the question must be asked: Is the hunting industry's program for recruiting children into hunting also contributing to our national epidemic of children killing children?'' (Fund for Animals 2000).

In contrast, the German social psychologist and psychoanalyst Erich Fromm stated: ''The idea that hunting produces pleasure in torture is an unsubstantiated and most implausible statement. Hunters as a rule do not enjoy the suffering of the animal, and in fact a sadist who enjoys torture would make a poor hunter'' (Fromm 1973, p. 131).

SEE ALSO *Animal Ethics; Callicott, J. Baird; Leopold, Aldo; Ortega y Gasset, José.*

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Alastair S. Gunn

III. ECOLOGICAL HUNTING (CULLING)

Ecological hunting, or culling, is the use of lethal means to remove animals or birds from a population to improve the quality of that population or prevent environmental degradation. Culling has been used for hundreds of years in the belief that it can improve future harvests of game animals by maintaining the carrying capacity of the animals' range, allowing larger numbers of animals to be harvested sustainably, or by improving the quality of trophy animals.

Those goals can require very different culling strategies. To maximize the number of animals that can be harvested sustainably, game managers need to maximize the number of offspring that survive each year. At the highest population densities, average individual welfare is reduced and fewer offspring survive, so to maximize annual harvests the population must be maintained at a lower level, where its rate of growth is highest. That requires an emphasis on culling younger males to maximize the number of breeding females on the range. Management for quality trophy animals, by contrast, usually requires a culling strategy designed to maximize the number of larger, older males on the range. This requires an emphasis on culling both females and young males because mature males are generally heavier and consume more resources.

PURPOSE AND RESULTS

Contemporary environmentalists tend to emphasize the importance of culling to protect the health or integrity of ecosystems and preserve endangered species. Species introduced by human beings sometimes threaten native plant species. Goats introduced to San Clemente Island off the California coast in 1875 thrived in the absence of predators, but by the 1970s they had degraded the island's vegetation dramatically. Indigenous species also can transform their ecosystems significantly, however, especially when their natural predators have become extinct or their prehistoric ranges have been altered significantly by human settlement patterns. In the American Southwest, for instance, deer populations are believed to have soared after wolves and mountain lions were removed by humans interested in increasing deer harvests, and in parts of Africa numerous plant and bird species became threatened with extinction as the elephant habitat was splintered into small, isolated game parks.

REACTIONS AND CRITICISMS

Proponents of holistic environmental ethics generally support culling to defend endangered ecosystems and species whether the threatened species' members are sentient or not. Insofar as an ecocentric ethic would give

ecosystem integrity or health top priority and a holistic ethic would give this and/or species' continued existence top priority, consideration of the conscious experiences of members of culled species must take a back seat to preserving the threatened species and/or ecosystem.

Proponents of individualist sentience-oriented views such as utilitarianism and animal rights find culling more problematic because individualist views claim that only the lives or experiences of sentient individuals have intrinsic value. Therefore, if the culling is aimed at preserving species whose members are not sentient or at preserving ecosystems (which are not sentient even if some of the organisms they support are), an individualist would give top priority to the lives of the sentient animals targeted for culling. Accordingly, culling of goats on San Clemente Island and culling of elephants in African national parks have encountered strong resistance from animal rights groups.

A utilitarian perspective, which attributes intrinsic value to the experiences of all individuals capable of conscious suffering or enjoyment, could endorse culling insofar as it maintains the carrying capacity of a herd's range and thus maximizes the aggregate happiness of animals in future generations. That is, if allowing overpopulation causes suffering through starvation, disease, and conflict over scarce resources, reducing carrying capacity and limiting the number of animals that can live on the range in future generations, the suffering caused by culling (especially if it is done humanely) could be more than outweighed by the reduction of suffering from the stresses of overpopulation and the number of additional satisfactory future lives that are made possible by the culling.

A rights view, in contrast, could rule out culling altogether because rights often are characterized as trump cards against such aggregative, utilitarian arguments. To justify culling various individuals because the culling will reduce the suffering of others and maximize happiness across future generations, rights theorists argue, fails to respect them as individuals with rights.

A further complication within individualist views is introduced by the fact that various animals with similar population dynamics may have very different cognitive capacities. If one considers that these different cognitive capacities qualify the individuals for varying degrees of ethical respect, culling may be more difficult to justify in species such as elephants than it is in deer. Both are ungulates, and ungulates protected from predation have a general tendency to overpopulate and degrade the carrying capacity of their ranges. However, elephants are celebrated for cognitive capacities that deer are not thought to have, such as elaborate memory for events from many years before, sophisticated problem-solving abilities, and perhaps an auditory communication system that rivals that of humans in complexity. Individualists who hold that those cognitive capacities qualify their possessors for special kinds of respectful treatment, as individualists commonly claim in the case of normal human beings, may find it more difficult to justify culling elephants than to justify culling deer.

Birth control technologies and trapping with transfer to understocked ranges are nonlethal alternatives to culling, but both are far more expensive and can have untoward side effects. For example, as few as 15 percent of translocated deer survive for one year; reversible birth control techniques usually require repeated administration to a large percentage of the female population, which can disrupt their lives; and Kruger National Park in South Africa terminated experimental treatment of female elephants with estrogen after they exhibited false estrus, which led bulls to harass the cows so much that several of their calves died.

SEE ALSO *Africa, Sub-Saharan; Animal Ethics; Land Ethic; Leopold, Aldo; Sustainability; Utilitarianism.*

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Gary Varner

IV. ANGLING

Angling is fishing using a hook and line. The more general term *fishing* refers to any form of hunting in which the prey is fish rather than land animals. The hook was developed from the more primitive gorge, a pointed object that is embedded in bait and sticks in a fish's gullet when the bait is swallowed. The hook can be baited with live animals (worms, minnows, even rats), bait produced by humans (bread, dough), or materials such as wool, feathers, and hair to produce an artificial lure. Snagging fish with a hook generally is not considered a form of angling, and when it occurs in angling, it is called *foul*

hooking and considered an unfortunate accident. The term *angling* has been used to distinguish more sporting forms of fishing such as fly fishing from bait fishing.

Angling can be pursued with the primary goal of securing fish as food. When the food is an essential part of the diet, it is referred to as subsistence angling, and there are also forms of commercial angling. Angling can be pursued for its own sake, in which case one can speak of sport angling, though the catch may be eaten. Perhaps the earliest depiction of sport angling dates back to 1400 B.C.E. in Egypt, and angling as a pastime is found in cultures around the world, both ancient and modern.

THE LITERATURE OF ANGLING

Beginning with the *Treatyse of Fyshinge with an Angle* (1496) and achieving an early high point with Izaak Walton's *The Compleat Angler* (1653), a major literature has developed around the sport of angling. That literature is dedicated to techniques and evocative accounts of angling, often including reflections on the meaning of angling for its devotees. A theme running through much of the literature is a concern to justify and recommend the sport as contributing to the health of both body and soul. Walton wrote, "God never did make a more calm, quiet, innocent recreation than angling" (Walton 1653, Part I, Ch. 5), and it did not occur to him to defend the angler against the charge of cruelty. As Arnold Gingrich noted in *The Fishing in Print* (1974), as early as 1577 a list of virtues of the angler was codified, including faith, hope, love, patience, humility, fortitude, knowledge, liberality, and prayer. However, by the eighteenth century the charge of barbarism and cruelty was being raised against anglers.

ETHICAL ISSUES

Angling raises ethical questions. From perspectives such as animal rights theory and some forms of biocentric egalitarianism, any angling that does not provide necessary nourishment is immoral and all sport angling inflicts pain and represents a failure to respect the inherent value of fish. In contrast to those lines of thought, in some approaches to environmental ethics human involvement in the ecological processes of life and death is valued. From this perspective responsible angling may be contrasted favorably with less interactive and more touristic ways of experiencing the natural world.

Even if angling is considered morally permissible, ethical issues arise within the practice. Fish that are to be eaten must be killed, and quick and humane killing of fish is part of some angling traditions, especially in Great Britain, where salmon anglers carry a short weighted club called a priest for administering "the last rites." Similarly, anglers often are admonished to avoid tackle that is too light and thus prolongs the fight unnecessarily.

Some angling practices can be harmful to the environment: Angling can damage fish populations, the use of lead as a weight has polluted the environment and has been outlawed in some places, discarded fishing line can be lethal to wildlife, and hatchery fish stocked for anglers can have a harmful effect on wild and native fish. Anglers have introduced exotic species of game fish, sometimes with devastating results to ecosystem integrity, but anglers are also the most ardent defenders of endangered populations of wild and native fish and of water quality. Like hunters, anglers have played an important role in the development of conservation and wilderness protection.

The practice of catch and release angling is a twentieth-century, originally American strategy for protecting endangered populations of wild and native fish. Contrasting the value of fish as food with their value for sport, in 1939 Lee Wulff wrote, "Gamefish are too valuable to be caught only once" (Wulff 1939, p. xv), signaling a revolution in angling ethics. Releasing much or all of one's catch is a form of resource conservation. Some anglers consider catch and release angling to be morally superior even when keeping some fish to eat would not damage the fishery. In opposition to that development, the Irish philosopher A. A. Luce argued that although catching fish for food is defensible, "To hook trout and put them back into the water . . . is to inflict pain, however small the amount, unnecessarily, and it therefore comes under the definition of cruelty" (Luce 1993, p. 179). Many writers have responded to this argument by insisting that fish do not feel pain the way humans do, do not suffer, or are neurophysiologically incapable of feeling pain at all. Scientific study of the issue is inconclusive (compare the publications of James D. Rose with those of Michael K. Stoskopf).

As the practice of catch and release has spread, it has generated internal ethical problems. Where angling pressure is great, guides report that fish are weakened from being caught repeatedly and their mouths become disfigured from being hooked repeatedly. When the fish are harmed, the practice becomes questionable, and anglers have begun to ask whether it is time to restrict angling to catching a few fish to eat.

SEE ALSO *Animal Ethics; Food; Salmon Restoration.*

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J. Claude Evans

V. COMMERCIAL FISHING

Commercial fishing is an ancient profession. In 1883 the biologist Thomas Huxley suggested that the great sea fisheries are inexhaustible. For decades Huxley appeared to be right. Between the 1950s and the 1990s the global fish harvest increased 400 percent, but in the first decade of the twenty-first century the picture changed.

THREATS TO THE FISH POPULATION

Naturally fluctuating populations and the inherent difficulty of gathering data from the oceans make it hard to get an accurate worldwide assessment of fish. In the Eastern Indian Ocean and the Western Central Pacific harvests of some species still are increasing. In the North Eastern Atlantic, Southwestern Atlantic, and Eastern Central Pacific marine harvests are generally in decline. The overall trend in wild fish harvests is cause for concern. Total global harvest of both inland and marine capture fish peaked at around 95 million metric tons per year in the late 1990s (Food and Agriculture Organization of the United Nations 2006). By some estimates larger predatory fish declined by 90 percent in the second half of the twentieth century. The percentage of generally longer-lived and more slowly reproducing bottom fish is going down. Spawning stock of Western North Atlantic cod, a fish once so plentiful that mariners claimed one could scoop them out of the ocean in buckets, dropped from 1.6 million metric tons in 1962 to 22,000 metric tons at the closure of the fishery in 1992. Cascading ecological effects threaten all marine species. Marine mammals such as whales and sea lions found at the top of the food chain are particularly at risk.

Threats to the health of marine ecosystems include overfishing, land and marine-based pollution (including oil, aquaculture waste, and nutrification), and competition from species not previously found in the area. Global climate change poses further threats, such as ocean acidification, changes in the range of particular species, and habitat destruction from increasing temperatures and more violent storms.

FISHING METHODS

The impact of commercial fishing on a specific ecosystem varies not only with the amount of fish harvested but also with the fishing technique used. Fishing methods range from the most environmentally sensitive, such as dive-caught and hand-gathered, to the most destructive, such as poisoning, explosives, and bottom trawling (Monterey Bay Aquarium 2007).

Trawling involves dragging a cone-shaped net through the water at selected depths. In bottom trawling the heavy, reinforced trawl net, sometimes with a rake on its lower lip to disturb the sediments, is dragged across the ocean floor. Purse seining involves surrounding fish schools with a long net. Once the fish are surrounded, the bottom of the net is drawn tight and the purse is winched slowly back onto the ship. Drift (or gill) netting involves hanging a net vertically in the water column to entangle moving fish. A set net is a type of gill net anchored to the shore and managed by one or two fishers from a small skiff. Long-lining involves putting lines of baited hooks in the ocean to soak before returning later to bring up the catch. Longlines can be suspended vertically in the water column, suspended horizontally at any depth, or placed on the ocean floor. Trolling involves dragging baited hooks through the water to catch fish feeding in the water column. Crabbers and lobster catchers put baited pots on the sea floor that they later winch onto their ships.

BYCATCH

One of the most ethically problematic aspects of most commercial fishing is bycatch, or the catching of nontarget species. Overall, fisheries bycatch is estimated to account for approximately 25 percent of the total harvest. However, because most boats in the worldwide fishing fleet do not have an observer from a regulatory agency on board, bycatch rates are hard to gauge accurately.

Bycatch mortality varies significantly by fishing method. In bottom trawling almost all the captured fish (both target and nontarget) suffocate in the net or when emptied onto the boat's deck. Trolling and rod and reel fishing generally give bycatch a better chance of survival. Lines typically are winched in as soon as a fish takes a hook, and nontarget species often can be released. Bycatch from purse seining depends on the target species. Seining for tuna can result in dolphin mortality because dolphins often swim near tuna. Seining for salmon typically involves little

Fish Seized from Two Chinese Ships, 2007. *The fish, seen at the port of Abidjan, in the Ivory Coast, were taken from two ships intercepted using "bottom trawling," a commercial fishing technique which is against national fishing laws and known to be severely environmentally destructive. Ivorian fishing groups spoke about the threat Chinese fishing fleets presented to aquatic flora and fauna from "exploitation and abusive practices."* **KAMBOU SIA/AFP/GETTY IMAGES.**

bycatch. In addition to nontarget fish, seabirds, turtles, octopuses, whales, and sea lions regularly fall victim to fishers. Some regulatory authorities, such as the Alaska Department of Fish and Game, permit a certain amount of bycatch to be retained for sale, with the remainder returned to the sea with minimum injury. Whatever method is used, fish brought up from great depths usually die when their stomachs are expelled through their mouths as a result of the change in pressure.

A number of devices and techniques have been developed by fishers to reduce bycatch. Turtle excluder devices (TEDs) can be attached to shrimp trawling nets to prevent sea turtles from drowning. Longline hooks can be deployed at night when birds are less active or between streamer lines so that circling birds avoid the baited hooks as they disappear under the water. Acoustic pingers can help scare off marine mammals such as whales and seals from potentially hazardous encounters with fishing gear (U.S. National Oceanic and Atmospheric Administration 2008).

ECONOMIC EFFECTS AND REGULATORY SYSTEMS

Different fishing methods sustain local economies to different degrees. Trolling is often a small-scale operation performed by fishers from local towns and villages. Bottom trawling involves much heavier and more expensive equipment. In the Bering Sea and Gulf of Alaska trawlers tend to be multimillion-dollar vehicles owned by large corporations. Some of those boats process fish in the local communities, providing a boost to their economies. Others are large enough to process and freeze the fish on board. These big boats often do not dock for many weeks.

Regulatory systems for fisheries run from the global to the local (OceanLaw 2008). In 1994 the United Nations Convention on the Law of the Seas came into effect, establishing Exclusive Economic Zones (EEZs) stretching two hundred miles from a nation's shore. In these zones a nation has sovereign rights to explore and exploit marine resources subject to the requirement that sustainable catch limits be determined and enforced by national law. The principle of maximum utilization mandated by the convention also requires that a state that is unable to harvest the entire allowable catch permit other countries to fish within its EEZ. Outside these zones the oceans are declared the "high seas," and nations under any flag can fish those waters subject to the principle of maximum sustained yield. States with adjacent EEZs and states targeting fish on the high seas that migrate into EEZs are instructed by the convention to "seek, either directly or through appropriate sub regional or regional organizations, to agree upon the measures necessary for the conservation of these stocks in the adjacent areas." Transnational organizations such as the European Community have established their own regulations for

FISH FARMING

Fish farming sometimes is presented as a way to compensate for declining wild fish harvests. Nearly one-third of the seafood eaten worldwide is farmed, and the proportion is rising. Ocean-farmed fish live in net pens close to shore. They are fed a carefully managed diet by aquaculture technicians. Tides and ocean currents continually flush the pens. At harvest time the fish do not need to be caught but are lifted out of the water and taken for processing. Because the timing of the harvest can be regulated carefully, it is easier to bring farmed fish to market in an efficient way and without the skin blemishes sometimes caused by wild capture fishing methods.

Opponents of maritime fish farming cite a number of environmental problems. The close proximity of the fish to one another results in a much higher incidence of disease. Antibiotics fed to farmed fish create new strains of bacteria that are harmful to wild native populations. The fish feces that fall beneath the net pens cause local nutrification problems. Fish escaping from damaged pens compete for food and habitat space with native fish. Sometimes native and farmed fish hybridize, altering the purity of the native genetic stock. If the farmed fish is a predatory species, wild fish have to be caught and converted into feed for the penned fish, raising questions about whether the farming saves the wild resource. In the case of tropical shrimp farming many miles of mangrove forests have been cleared to create space for the pens. Farmed fish and shrimp also tend to be less healthy to eat than their wild-caught cousins.

Fish that are farmed inland are less environmentally destructive. Tilapia, trout, and catfish can be raised in freshwater ponds that pose little or no threat to native fish populations. In some areas fish are ranched. Those fish are hatched in captivity and then, after a certain period of growth, allowed to swim free in the ocean for later capture. Unlike fish farming, fish ranching preserves the jobs of fishers.

member states. There are numerous bilateral and multilateral agreements as well as individual national laws to protect fish populations.

UTILIZATION AND CONSERVATION

Arriving at the right balance between optimum utilization and conservation presents significant management challenges. Fish species live most of their lives out of sight of resource managers. Some species are migratory. Proposed multilateral agreements often clash with traditional use patterns. Enforcement is difficult. The principle of maximum sustained yield that generally governs the use of marine resources at the international level may not coincide with the maintenance of biodiversity.

When agreements have been reached to conserve fish stocks, national governments have adopted a range of measures to reduce harvests. Some fisheries have become limited-entry, requiring boat owners to possess one of a fixed number of permits in order to fish. Banning of certain fishing gear, such as drift nets over 2.5 kilometers in the European Community, has reduced catch and bycatch. Seasonal restrictions, size limits, sex restrictions, and quotas are in use. Some governments have offered buy-back programs in which fishers receive a settlement in exchange for retiring their boats or permits. The establishment of a number of marine reserves or sanctuaries in which all fishing is banned has proved to be an effective method for protecting fish populations. Current marine reserves cover far less than 1 percent of the oceans, compared with about 4 percent of the terrestrial surface of the earth that is protected currently. Conventions against pollution, ocean dumping, and offshore drilling are also beneficial to fish populations.

In some cases conservation measures put in place in the last two decades have been effective in starting to restore populations. Increasing trends in catches are occurring in the highly regulated Northwest Atlantic and Northeast Pacific. Striped bass and North Atlantic swordfish are making a small comeback. Kelp beds off Los Angeles began rebounding after discharges into the ocean were reduced. Canada reopened its Atlantic cod fishery to limited catch. Increased management and enforcement regimes will be essential if these positive signs are to be replicated throughout world fisheries.

SEE ALSO *Animal Ethics; Food; Global Climate Change; Oceans; Salmon Restoration; Species.*

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Christopher Preston

HURRICANE KATRINA

Hurricane Katrina was one of the deadliest and most costly storms in U.S. history. The destruction caused by Hurricane Katrina carries valuable lessons about the relationship between humans and nature.

Katrina formed over the Bahamas on August 23, 2005, over the remains of Tropical Depression 10. The system was upgraded to tropical-storm status on the morning of August 24 and became a hurricane only two hours before its first landfall between Hallandale Beach and North Miami Beach, Florida, on the morning of August 25.

The storm weakened as it passed over land, but it rapidly intensified after entering the Gulf of Mexico, growing from a Category 3 to a Category 5 storm in just nine hours. This rapid growth was due to the storm's movement over the "unusually warm" waters of the Loop Current, which increased wind speeds. Katrina attained Category 5 status (the most intense class of hurricanes) on the morning of August 28 and reached its peak strength at 1:00 p.m. U.S. CDT that day, with maximum sustained winds of 175 mph (280 km/h) and a minimum central pressure of 902 mbar. The pressure measurement made Katrina the fourth most intense Atlantic hurricane on record at the time, a record surpassed later that season by hurricanes Rita and Wilma.

Katrina made its second landfall at 6:10 a.m. CDT on August 29 as a Category 3 hurricane with sustained winds of 125 mph (205 km/h) near Buras-Triumph, Louisiana. At landfall hurricane-force winds extended outward 120 miles (190 km) from the center, and the storm's central pressure was 920 mbar. After moving over southeastern Louisiana and Breton Sound, it made its third landfall near the Louisiana-Mississippi border with 120-mph (195-km/h) sustained winds, still at Category 3 intensity. Katrina maintained this potency well into Mississippi, finally losing hurricane strength more than 150 miles (240 km) inland near Meridian, Mississippi.

The storm surge caused severe damage along the Gulf Coast. In Louisiana nearly every levee in the New Orleans area was breached as Hurricane Katrina passed to the east, subsequently flooding 80 percent of the city and many areas of neighboring parishes for weeks. In the aftermath of the storm, communication failures, poor federal response, and extensive levee failures combined to become one of the most devastating and costly disasters in the nation's history. Media coverage highlighted the vulnerability of the poor and predominantly black population of New Orleans, leading some commentators to characterize the aftermath of Katrina as an instance of racially aggravated environmental injustice.

Many analysts have interpreted Katrina and its aftermath as less a natural than an artificial disaster. New Orleans has always had an uneasy relationship with nature. Situated precariously between the Mississippi River, Lake Pontchartrain, and the Gulf of Mexico, the topography of New Orleans resembles a bowl. More than 80 percent of the city lies below sea level; the areas nearest the river (including the high-rent French Quarter and Garden District) are the highest in elevation, but the geographical center of the city is about five feet below sea level. Levee construction along the Mississippi River for the purpose of flood control has been going on since the French settled the region during the first years of the eighteenth century. Today levee construction and maintenance is federally mandated and charged to the Army Corps of Engineers. Efforts to contain the river have disrupted the wetlands ecosystem in its lower reaches and have aggravated New Orleans's elevation problem: The region's soil compacts in a process called subsidence, and without new soil from periodic river floods, the city's elevation decreases, making it even more vulnerable and increasing the risk of lost property and life during heavy rainfalls or storm surges or both—as happened in the case of Katrina.

Further, wetlands in the Gulf of Mexico provide a barrier to incoming storms and hurricanes, blunting their impact and their destructive potential. They function like a sponge, absorbing rain and wind. But containing the river sends further into the Gulf the millions of tons of sediment that would normally be deposited as floodplain silt, thus creating the potential for another environmental debacle—a Gulf of Mexico (hypoxic) Dead Zone.

The environmental risks in the area are compounded by oil and gas industry construction: Canals dug for offshore pipelines lead to saltwater intrusion, killing the soil-holding freshwater marsh grasses. The Mississippi River Delta region has lost more than 1 million acres of marshland since 1900. Each year the region continues to lose an area of about 24 square miles, an area about the size of Manhattan. Restoration of these wetlands could dramatically increase natural resilience and protect against future destruction of life and property.

SEE ALSO *African-American Environmental Ethics; Biosecurity; Environmental Justice; Oceans; Wetlands.*

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Erin Moore

I

INDIA AND SOUTH ASIA

India is the world's seventh-largest country and the second most populous, with more than 1.13 billion people. As a result of its size and population density, environmental ethics in India often focuses on reconciling social and environmental justice. India has diverse, long-standing traditions for accommodating people with place. However, these traditions were disrupted by five hundred years of colonial rule, and are currently being challenged by globalization. There are also indigenous sources of environmental degradation, resulting in issues such as deforestation and groundwater pollution.

More than 80 percent of India's people are Hindu. It is also the fourth most populous Muslim nation (13.4%), and includes smaller populations of Christians (2.3%), Sikhs (1.9%), Buddhists (0.8%), and Jains (0.4%). Tribal groups (called Adivasis) constitute 8.1 percent of the population. India recognizes fifteen official languages.

Geologically, India rests on the Indian Plate, which collided with the Eurasian Plate roughly fifty million years ago to form the Himalaya Mountains and the high Tibetan Plateau. Several of the world's great rivers originate in the Himalayas, including the Ganges, Brahmaputra, Yamuna, and Narmada rivers. They have been extensively dammed to retain water from the summer monsoon. Although these projects provide electricity and irrigation for industrial agriculture, they have been controversial among environmentalists (see Roy's "The Greater Common Good," 1999).

Sri Lanka, an island lying to the south of the Indian landmass, possesses a high level of flora and fauna diversity. Because 80 percent of Sri Lankans are Buddhist, environmental awareness is often expressed in terms of Buddhist spirituality.

RELIGIOUS AND CULTURAL INFLUENCES ON ENVIRONMENTAL ATTITUDES

The many diverse religious traditions of South Asia include strong elements of environmental awareness. Hinduism includes a vast range of religious practices that cannot be summarized briefly. The term *Hindu* is Persian in origin, and referred to Vedic peoples who lived beyond the Indus River. Shiva, Brahma, and Vishnu are held to be manifestations of one god, who is unnamable. Major religious texts include the *Vedas* and *Upanishads*. Most Hindus believe that the individual souls of all beings are identical to the universal soul, *ātman*. Because of its doctrine of reincarnation, some argue that Hinduism celebrates the interconnections between humans and nonhuman animals. Scholar O. P. Dwivedi has pointed out (in "Dharmic Ecology"), "Among the various incarnations of God are a fish, a tortoise, a boar, and a dwarf. His fifth incarnation was as a man-lion. As Rāma, God was closely associated with monkeys, and as Krsna, he was surrounded by cattle" (2000, pp. 6–7). Scientist and environmental activist Anil Agarwal, however, has expressed doubt (2000) about the environmental friendliness of Hinduism, arguing that Hinduism is highly individualistic in its concern for the welfare of one's soul.

One Hindu sect that is celebrated for its environmental awareness is the Bishnois, founded by Guru Maharaj Jambaji (born 1451) in the arid region of Rajasthan after a severe drought. He laid down twenty-nine

Hindu Devotees Offer Prayers During the Gangasagar Mela, 2006. *Thousands in India gather on Sagar Island, at the confluence of the River Ganges and the Bay of Bengal, to celebrate the main bathing day of Gangasagar Mela. The water has a deep religious significance for the gathered Hindus. India, with the second-largest population in the world, is over 80 percent Hindu. The religion has a profound impact on the environmental ethics of the country.* **GETTY IMAGES.**

principles (*Bishnoi* means "twenty-nine"). Central among these are bans on cutting green trees and killing any animal or bird. Three hundred years later, the Maharaja of Jodhpur ordered his men to fell green trees in Bishnoi villages to burn lime for the construction of his new palace. A Bishnoi woman, Amrita Devi, confronted the Maharaja's agents, arguing that the trees were sacred. She famously said that even one tree is worth the price of one's head. The Maharaja's agents severed Amrita Devi's head with their axes. More killing followed, until 363 people had died. Horrified at hearing the news of these deaths, the Maharaja decreed that no further tree cutting would be allowed on Bishnoi land. Amrita Devi remains a heroine of environmentalists in India to this day.

Another aspect of Hindu environmental awareness has recently been explored by the distinguished ecologist Madhav Gadgil. In "The Ecological Significance of Caste," Gadgil and his colleague K. C. Malhotra "document that castes more directly dependent on natural resources had so organized their mode of subsistence as to avoid excessive overlap with other castes in their demands for various resources" (1994, p. 27). That is, some subcastes fish, some graze, some are hunter-gatherers, in order to segment access to different parts of the ecosystem and reduce conflict. The authors observe, "One may then view the Indian society as being analogous to a biological community made up of a number of 'cultural species' or endogamous caste groups" (p. 30). British colonialism put far greater pressure on resources, privatizing the biological commons, causing "considerable impoverishment, and often complete collapse of the natural resource base" (p. 37).

Another dimension of Gadgil's research has revealed important elements of environmental practice among India's diverse indigenous peoples, the Adivasis. Despite colonialism, "Present-day India still abounds in many forms of nature worship," especially in the form of sacred groves. These groves of mixed vegetation, sometimes as large as twenty hectares, are often associated with tribal (Adivasi) groups. "All forms of vegetation in such a sacred grove, including shrubs and climbers are under protection of the reigning deity of that grove . . ." ("The Sacred Uses of Nature," p. 82). Sacred groves preserve entire intact ecosystems, as opposed to the also common practice of preserving individual trees, such as the medicinally important neem tree.

Jainism, whose most prominent spiritual leader was Vardhamāna Mahāẁira (c. 599–527 BCE), espouses the most thoroughgoing commitment to *ahimsā* (nonviolence)

toward all life forms. All Jains, clergy and laity alike, practice a vegetarian diet. Sidewalks are swept in front of Jain priests to avoid accidentally stepping on insects. Jains often support animal and bird hospitals. (See Chapple 2002.)

Buddhist environmental awareness is also indigenous to India. The Buddha (c. 563–483 BCE) was born in a sacred grove of sal trees dedicated to the goddess Lumbini in what is today Southern Nepal. His teachings included the idea of dependent origination: there is no enduring substance; every individual being is dependent on other beings. At a popular level, the *Jataka Stories* are a collection of early Buddhist tales depicting the Buddha's relationships in previous lives to non-human animals.

Asoka the Great (r. 273–232 BCE), military leader of the great Mauryan Empire, converted to Buddhism out of remorse for the carnage caused by his military exploits. Known for encouraging compassionate treatment of animals and the environment, he abolished animal sacrifice, built hospitals for animals, cultivated medicinal plants, and encouraged forest preservation. Asoka's influence might be said to live on today in Sri Lanka, in the Buddhist-Gandhian development organization Sarvodaya, founded in 1958 by A. T. Ariyaratne. Its programs provide "sustainable empowerment of people through self-help and collective support, to non-violence and peace" (http://www.sarvodaya.org).

THE ENVIRONMENTAL LEGACY OF COLONIALISM

The colonization of India by Portugal and Great Britain began with the arrival of Vasco da Gama in 1498. In 1600 Queen Elizabeth I established the East India Company, first for the purpose of trade with India, but later as the instrument of colonial rule. It was abolished in 1858 when Great Britain established direct rule over its colony. The British Utilitarians James Mill and his son John Stuart Mill administered India for the Company from 1830 until 1858 and established the foundations for resource control. (See Majeed, *Ungoverned Imaginings,* and Curtin, *Chinnagounder's Challenge.*) For an excellent, detailed account of the ways the British gained control over Indian forest resources, see Ramachandra Guha's book *The Unquiet Woods*.

No survey of the background for Indian environmental ethics, however brief, would be complete without mention of Mohandas "Mahatma" Gandhi (1869–1948). Gandhi's campaign for *swaraj* (freedom) against British colonialism was guided by the principle of thoroughgoing ahimsa (nonviolence) of body and mind, even in regard to "noxious insects."

Ramachandra Guha has argued in "Mahatma Gandhi and the Environmental Movement" that Gandhi's principal focus was on justice for human beings rather than the environment. Nevertheless, his teachings established an ideal for simple, sustainable living, which, as Vinay Lal has argued (in "Too Deep for Deep Ecology"), included an "ecological vision of life" (p. 183). In turn, he and his disciples, Mira Behn and Sarala Behn, have influenced the Chipko Movement through Vimla and Sunderlal Bahaguna, as well as the protests against the damming of the Narmada River by Medha Patkar and the Narmada Bachao Andolan.

Contemporary attitudes toward the environment are affected by India's worst tragedy of the industrial age, the Bhopal disaster. On December 3, 1984, forty tons of methyl isocyanate was released from a Union Carbide fertilizer plant in the city Bhopal. Although figures are disputed, it is likely that more than 20,000 people have died from exposure to the gas, and perhaps more than 500,000 have been affected by the disaster. Many still suffer from respiratory problems, cancer, blindness, and birth defects. Union Carbide has been widely criticized for its failure to properly compensate victims. Given the legacies of colonialism and industrial exploitation of the poor, it is not surprising that contemporary corporate globalization has been met with widespread skepticism and protest in India.

ENVIRONMENTAL ETHICS

Environmental ethics in India, then, must be understood in the context of centuries-old traditions of non-harm toward nature. Yet, during this period of four and a half centuries, India also suffered from colonial oppression, which was focused on extracting natural capital. Not surprisingly, writers on environmental ethics in India stress the deep connections between social and environmental justice. As Gandhi said, "There are people in the world so hungry, that God cannot appear to them except in the form of bread."

In *Varieties of Environmentalism*, Ramachandra Guha and Juan Martinez-Alier distinguish *ecosystem people,* people who depend heavily on local resources, from *omnivores,* or those who have the power to access resources globally. The environmentalism of the poor is based on the resistance of ecosystem people to attempts by omnivores to access their resources. These nature-based resistance movements have a distinctive vocabulary of protest, including the action designed to disrupt economic life and the *dharna.* or sit-down strike, designed to stop work on large dams. Another form of protest is the *bhook hartal*, or hunger strike, carried out in public by charismatic leaders such as Chipko's Sunderlal Bahuguna and Medha Patkar of the Narmada Bachao Andolan.

Chipko began in 1973 in the northern Indian state of Uttarakhand. Heavy monsoon rains in 1970 had

alerted villages to flooding caused by deforestation. Government logging contracts to private companies caused protest. Chandi Prasad Bhatt suggested the term *Chipko,* meaning "to hug," recalling the efforts of the Bishnois to protect trees in the fifteenth century. Although many of the best-known Chipko leaders have been men, authors such as Vandana Shiva (see *Staying Alive,* 1988) have argued that the core of the protest was women who were left at home to deal with flooding after men had left in pursuit of work. As is commonly the case in the wake of widespread ecological disruption, Chipko women bore the brunt of reduced access to fuel-wood and fodder. It is mainly in this sense that Chipko is a woman's and, to some extent, feminist movement. In the following years, Chipko spread across India and became a broadly based movement campaigning for ecologically responsible village development.

Another celebrated environmental movement, the Narmada Bachao Andolan (Save the Narmada Movement), began in protest against the plans of the government and the World Bank to build 30 large, 135 medium, and 3,000 small dams on the Narmada River. (Gandhi's protégé and India's first prime minister, Jawaharal Nehru, strongly advocated construction of large dams to support rapid industrialization after independence in 1947.) The Narmada was the last of India's major rivers to be dammed. Opponents have stressed the ecological and human cost of displacing 300,000 poor and tribal people. The river valley is also studded with religious monuments. Protest leader Patkar engaged in a twenty-one-day fast in 1991 that brought her close to death. For her efforts she and Baba Amte won the Right Livelihood Award later that year.

Chipko and the Narmada Bachao Andolan have also inspired many recent environmental movements. India was one of the original test sites for the Green Revolution, which brought industrial agriculture, heavy use of pesticides and herbicides, as well as plant monoculture focused on cash crops. Today, there are widespread concerns over the Gene Revolution, which uses genetically modified seeds. Important questions have arisen over questions of who owns intellectual property, as seed and pharmaceutical companies patent product lines that began with investigation of indigenous knowledge of nature. (See Shiva 1991; Curtin 1999.)

The critical roles of women (see the work of Bina Agarwal, Vandana Shiva, and Deane Curtin) in environmental protection are also demonstrated in the Self Employed Women's Association (SEWA), a trade union founded in 1972 by Elaben Bhatt (http://www.sewa.org). Ninety-four percent of female laborers in India are in the informal work force, whose labor is rarely visible to economic measurement. SEWA embraces Gandhian principles of "satya (truth), ahimsa (non-violence), sarvadharma (integrating all faiths, all people) and khadi (propagation of local employment and self reliance)." Its work emphasizes the difficulty of separating women's interests from environmental welfare, but its more explicitly environmental campaigns include campaigns for forest workers, for safe water access, and for safe food.

On other fronts, large plantations of quick-growing and water-hungry eucalyptus trees, used for paper pulp, have been criticized for their reckless use of water at the expense of the poor. Environmental activists have recently targeted the Coca-Cola Company for lowering water tables due to extensive well digging.

For up-to-date information on environmental issues in India, one might consult the Centre for Science and the Environment, founded in 1980 by Anil Agarwal (http://www.cseindia.org). It publishes a magazine and online journal *Down to Earth,* edited by the renowned environmentalist Sunita Narain (http://www.downtoearth.org.in).

SEE ALSO *Animal Ethics; Bhopal; Buddhism; Chipko Movement; Environmental Justice; Forests; Genetically Modified Organisms and Biotechnology; Guha, Ramachandra; Hinduism; Jainism; Postcolonial Environmental Ethics; Rivers; Shiva, Vandana; Utilitarianism; Vegetarianism.*

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Deane Curtin

INDIGENOUS ECOLOGICAL KNOWLEDGE

SEE *Traditional Ecological Knowledge.*

INDUSTRIAL AGRICULTURE

SEE *Factory Farms.*

INDUSTRIAL ECOLOGY

Industrial ecology (IE) can be generally defined as the multidisciplinary study of industrial and economic systems and their linkages with fundamental natural systems. More expansive definitions identify IE as a major mechanism by which humanity can rationally understand and approach sustainability. Among the critical elements of the IE framework are an emphasis on systems; on enhancing energy and material efficiency; on accepting continuing economic, technological, and cultural evolution; and on transdisciplinary frameworks integrating engineering, physical sciences, and social sciences. Robert Socolow in his 1994 article summarizes IE themes as including a focus on long term and systemic phenomenon rather than ad hoc issues; a focus on the intersection of human and natural systems rather than just one or the other; a concern about the resiliency of human and natural systems rather than single outcomes; and a reliance on technocratic tools and methodologies such as life cycle assessment and mass flow analyses.

Industrial ecology was introduced in a seminal 1989 article by Robert Frosch and Nicholas Gallopoulos, which suggested that industrial systems could be more efficient if modeled after natural ecosystems. This was followed in 1995 by the first IE engineering textbook by Thomas Graedel and Brad Allenby. The years since the publication of that book have marked the continuing institutionalization of the field, including a significant expansion of the literature, and the establishment of a journal of record (*Journal of Industrial Ecology*), and a society (the International Society for Industrial Ecology).

Unlike traditional environmentalism, IE was developed primarily by the industrial and technological communities. Conceptually, the growing gap between the complex, systems-based nature of regional and global environmental perturbations, and the inability of reductionist and incremental regulatory approaches to address them adequately, demanded new approaches. Increasing regulatory costs and responsibilities also encouraged industry to explore new, more systemic ways of managing these issues. Accordingly, certain sectors, particularly the electronics industry in the United States, began to develop a set of practices based on IE principles. Contrary to the common approaches at the time, these practices focused not on end-of-pipe management of wastes, but on product design and lifecycle techniques intended to reduce environmental impacts across technology systems. These were generally derived from, and compatible with, existing technocratic practices and tools, especially design methodologies.

Reflecting these origins, much of the early industrial ecology literature tended toward a technocratic, data-driven, engineering approach to environmental implications of manufacturing processes and manufactured products, particularly those aspects that can be addressed by superior design (such as life cycle energy consumption, reduced use of toxics, and enhanced recyclability). In this, IE differs from a number of other similar areas of interest, such as "natural capitalism" and "sustainability," in that it has focused less on normative postures and activism, and more on understanding the physical, built, and economic systems that interact with natural systems to produce environmental perturbations. In keeping with its engineering background, it is also more problem focused, and less broadly philosophic. Whether this should continue to be the case is a subject of ongoing debate within the IE community.

ETHICAL CONSIDERATIONS

IE raises a number of interesting ethical questions. To begin with, because it is a young field, and rests at an intersection of economic, environmental, and technological discourses, even its appropriate definition is contested from different ontological perspectives. The careful reader will have noted that the first definition of IE provided above is a relatively objective formulation, while alternative definitions refer, sometimes directly, to normative constructs such as "sustainability" (indeed, following Graedel and Allenby [1995], IE is sometimes called "the science of sustainability"). Thus, whether IE is, should be, or can be a relatively objective "science," or whether it should be intentionally structured to support environmental activism, is an active dialog within the IE community. The continuing exploration of this question of ontological value makes IE not only more challenging as a field of practice, but also a fertile case study for those interested in environmental politics, ideological conflicts in the scientific discourse, and the philosophy of science generally.

The complexity of the integrated economic/environmental systems that are the subject matter of IE raises additional questions. To begin with, the role of the researcher in defining appropriate topics for study, and therefore highlighting selected issues for technocratic and public audiences, is more important where systems are so complex, allowing for enhanced subjectivity in highly conflictual contexts. Within the IE framework, complexity is also problematic: Not only are characteristics such as discontinuities, temporal and spatial scale effects, and emergent behavior common in many IE analyses, but because IE deals with systems that integrate human and natural components, complexity may be cultural or ideological, not just physical. This makes determining the appropriate boundaries of IE studies, as well as that of the field itself, difficult, especially with regard to the role, and degree of inclusion, of social sciences (or indeed, of the humanities). The latent dichotomy between the social sciences and the physical sciences/engineering is reinforced because of the environmental origins of the IE field, which are difficult to outgrow. IE efforts to address sustainability thus tend to emphasize environmental, and downplay social and cultural, issues. Concomitantly, IE also tends to be less sophisticated in its handling of social and cultural questions than technological and environmental issues. All of this unavoidably complicates IE methodologies; the need for transdisciplinary methods and skills arises from the nature of the systems at issue, but maintaining high levels of intellectual rigor in each discipline while performing integrated analyses remains challenging.

A final question is whether *industrial ecology* should be taken as analogy, as mandate, or simply as suggestive. While most practitioners accept that biological systems, characterized by complex flows and transformations of energy and materials, offer an interesting source of learning and potential models, some go beyond this and treat biology not as metaphor, but as design mandate. Whether this reification of ecology as zeitgeist, replacing the "universe as mechanism" metaphor of the Enlightenment, can remain valid in an age of synthetic biology and technological convergence, and the implications for IE if it cannot, remain open questions.

SEE ALSO *Nanotechnology; Sustainability.*

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Brad Allenby

INTELLIGENT DESIGN

SEE *Creationism and Intelligent Design.*

INTENSIVE AGRICULTURE

SEE *Factory Farms.*

INTERGENERATIONAL JUSTICE

Intergenerational justice—or justice between generations—refers to the set of obligations the members of one generation may owe to people of other generations, past or future. By contrast, *intragenerational justice* involves obligations that members of one generation owe to one another. Although some have argued that there can be obligations to past generations, most accounts of intergenerational justice focus on present obligations to future generations. For example, if people who are alive now have an obligation to preserve the living ecosystems of the earth and to

Rows Upon Rows of Taxis at Beijing's New Airport Terminal, 2008. *Just prior to the 2008 summer Olympics, Beijing opened a new airport terminal to help meet the demand of increasing numbers of tourists. 2007 saw an increase to 185 million passenger trips across China, and the projected number for 2008 was 210 million passenger trips. By the end of 2020, China expects to add nearly 100 new airports across the country. Some would consider this increase in carbon omissions a severe violation of intergenerational justice.* **LIU JIN/AFP/GETTY IMAGES.**

conserve resources for the benefit of people who will live in the future, then such a conception of future-directed intergenerational justice will be a crucial part of environmental ethics and politics.

THEORIES OF JUSTICE

A theory of justice is an incomplete theory of morality, since not all moral obligations are obligations of justice. The obligations of justice are a special group of moral obligations that are connected to the rights and interests of others. For this reason, it is usually considered appropriate to enforce obligations of justice using law or social policy—the coercive powers of the state. On this common view, it is inappropriate to use force or law to compel people to be kind or generous, or to promote other high moral values. But obligations of justice are obligations to others, and when they are violated these others become victims of injustice. Because people have both a general right and an obligation to protect others from injustice, it is permissible to use the coercive powers of the state to insure that people will not behave unjustly. In this sense, the requirements of justice are a relatively small, high-priority subset of the broader requirements of morality.

Political philosophers sometimes distinguish between two broad categories of justice: retributive and distributive. *Retributive justice* seeks to understand and formulate appropriate and just forms of punishment—or retribution—for crimes. This kind of justice pertains chiefly to the criminal-law system and is often applied in the prosecution of people or corporations that violate environmental laws. By contrast, theories of *distributive justice* extend beyond the criminal-justice system to encompass all aspects of the social order; they seek to establish standards for the fair and equitable distribution of goods, services, and rights in society as a whole, to understand what obligations and duties members of a society can fairly and reasonably expect of one another. Theories of intergenerational justice discuss the degree to which future generations have rights and interests that can justly and fairly govern and/or limit the actions of the present generation—or, seen from another perspective, whether canons of fairness and justice imply duties and obligations that the present generation has toward future generations. When accounts of intergenerational justice consider the fairness of resource distribution

between generations, they are centrally concerned with distributive, not retributive justice.

Environmental ethicists often wish to argue for environmental policies and laws. But if the only obligations that can be enforced by law are obligations of justice, then such arguments must be based on a theory of justice. One plausible way to support such policies is to show that they are requirements of intergenerational justice, based on our present obligations to conserve resources and protect the environment for the benefit of future generations.

ENVIRONMENTAL JUSTICE AND JUSTICE BETWEEN GENERATIONS

Many questions of environmental ethics and environmental policy pose fundamental questions of intergenerational justice. For example, it might be more convenient for people living in the present to enjoy the unfettered use of automobiles and jet planes for their convenience and pleasure in getting from place to place. But the carbon emissions from these conveyances are partly responsible for climate changes that could drastically reduce the quality of life—or even the very possibility of life—for people living fifty or a hundred years from now. Does the present generation have an obligation to curb the consumption of carbon-based fuels in order to protect the interests of future generations, even though the interests and convenience of the present generation might be better served by unrestricted use of fossil fuels? If environmental laws can govern or restrict the behavior of individuals within the present society for the benefit of all (intragenerational justice)—say, by mandating recycling of waste or limiting toxic emissions from factories—can such laws also enforce sacrifices on the part of the present generation to protect the interests of future generations? These are the types of questions theorists of intergenerational justice attempt to address.

FOUR CONCEPTIONS OF ENVIRONMENTAL JUSTICE

Because many theorists hold that obligations of justice are the only moral obligations that can justifiably be enforced by law, considerations of justice are crucially important for environmental ethics, and more broadly for environmental philosophy. If the only obligations that can be enforced by law are obligations of justice, then environmental policy arguments must have their foundation in a theory of justice. There are at least four different ways to approach this task:

1. First, one might argue that environmental offenders violate the rights of ecosystems or species, and that these ecosystems or species are the victims who must be protected by appropriate environmental policies. But ecosystems and species lack conscious interests. While the possession of conscious interests is not usually regarded as necessary for the possession of value, or of moral significance, many philosophers (for example Feinberg 1974) have urged that the possession of conscious interests is necessary for the possession of rights. Those who accept Feinberg's view are likely to find this first strategy unworkable.
2. A second approach presupposes that our obligations to protect the environment are obligations to animals—to nonhuman individual right-bearers within the biotic community. Since animals—at least so called "higher" animals do possess conscious interests, it is plausible to attribute rights to them. Many philosophers who are skeptical about the rights of species and ecosystems have argued that animals do possess some rights, including at least basic rights to humane treatment and to a life-sustaining environment (see Nussbaum 2006, and Feinberg 1974).
3. A third approach involves arguing that obligations to preserve and protect the environment are obligations to other existing human beings. Present-day people are the most obvious bearers of rights, and many environmental obligations can indeed be understood as requirements of intragenerational environmental justice (Shrader-Frechette 2007).
4. The fourth approach is to make the claim that the duty to protect the environment is, at least in part, an obligation of justice based on the rights and interests not only of people alive now but also of generations to come. This is the intergenerational standard of environmental justice.

Thus one might see a theory of intergenerational justice as one component of a broader theory of environmental justice, and as a crucial component of a broader theory of environmental values and policy.

RIGHTS, IDENTITY, AND SKEPTICISM ABOUT INTERGENERATIONAL JUSTICE

Skepticism and the Social Contract Some theorists have argued that there can be no obligations to future generations, and that the concept of justice can only apply between people who presently exist. That is, they have urged *skepticism* about intergenerational justice. For example, simple social-contract conceptions of justice such as those advocated by Thomas Hobbes (1588–1679) in his work *Leviathan* (1668/1994) and more recently by David Gauthier (1986) hold that justice is founded on principles that people who live together in the same community would agree to accept as binding, as long as they could be assured that others would abide by the same principles. In the absence of such restraining principles, it might be

advantageous for individuals to coerce others or to seize their possessions. But in such circumstances people would be insecure, at constant risk of the depredation of others. So individuals voluntarily agree to a social contract that places some limits on the freedom of action of individuals to ensure the security of all. According to the simple contractarian view, only those principles individual contractors would voluntarily accept as mutually advantageous can be enforced by the state, and such principles are thus the only requirements of justice.

Although contemporaries might gather together to negotiate a contract for mutual advantage, such negotiation is impossible between people who live at different times. Those living now might take actions that will advance or undermine the interests of future generations, but those living in the future cannot either reward us if we help them or punish us if our actions harm them. This limitation has sometimes been advanced as grounds for skepticism about intergenerational justice: Because distant generations cannot negotiate a contract with their forebears for mutual advantage, they cannot be bound by principles of justice in regard to us, nor can we in regard to them. Future persons could, however, be the objects of contemporary promises and contracts; present-day persons might make promises or contracts among themselves in which they accept obligations to future people. In that case contemporaries would have obligations to one another with respect to the interests of future generations. But promises must be made to someone, and contracts are reciprocal agreements. Because future persons do not now exist, they cannot be contractual partners, nor can we incur obligations to them. Accordingly, Wilfred Beckerman and Joanna Pasek (2001) and David Gauthier (1986) have argued that there can be no direct obligations of intergenerational justice.

Critics of this view argue that its adherents have adopted the wrong conception of justice. The choices we make now will influence the lives of people in later generations in a variety of ways, beneficial or detrimental: For example, we might deplete resources that will be desperately needed decades hence, thus harming future generations and making them the victims of present wastefulness. In such a case it would be reasonable to argue that the resulting intergenerational distribution is not fair to those who are deprived and thus has violated their rights. Simple contractarian theories of justice would seem to be seriously inadequate if they cannot account for such actions as violations of obligations of justice. For this and other reasons, recent contractarian theorists like John Rawls (1971) have urged that the principles of justice must include representation for the interests of future generations.

Justice and Rights Some scholars, including Beckerman and Pasek (2001), have argued against the idea of intergenerational justice on the grounds that future persons cannot have rights. This view is supported with two arguments that must be addressed by any account of intergenerational justice. The first such argument is metaphysical: Future persons are merely possible persons who do not yet exist—hence they cannot have anything at all, including rights. On this view, therefore, present obligations to them cannot be based on their rights.

This argument may be regarded as questionable because it conflates different senses in which future persons might be regarded as "possible persons." Future persons are not like fictional characters who have never existed and never will, or like the inhabitants of alternate possible worlds. While our present actions cannot advance or set back the interests of fictional characters, they will certainly influence the lives of people who will exist after we have died. In addition, critics can argue that Beckerman and Pasek's argument conflates possession of a right with possession of a property or a physical object. Rights are not properties but moral relationships—they bind people through moral and/or legal obligations. Such relationships can hold between present and future individuals even when there is no single time at which both exist. The status of people who will (or may) exist but do not now exist is quite different from the status of fictional characters who never have existed and never will exist and whose interests cannot be advanced or set back by our present actions; the former are potential bearers of rights, whereas the latter are not.

Another closely related skeptical argument is usually called the "nonidentity problem" and is associated with the work of Derek Parfit (1984). According to Parfit present actions do not simply influence future events, but they also determine which future persons will come into existence. Because even minor events will have ever broader implications over time, present actions and policies will result in the existence of a global population that is entirely different from the one that would have existed if the policy had been different. On this view obligations of justice and rights must be associated with specific claimants with determinate identities. But if the very existence of future people will vary with present actions, those yet-unborn individuals cannot be determinate claimants; present choices and actions cannot violate their rights or harm them or be unjust to them. How can one be harmed by an action without which one would not have existed at all?

A possible counterargument would point out that the features that make people eligible for rights are general and often do not refer to the specific identity of the rights bearer. The obligation not to roll boulders down a mountain, for example, is based on the rights of *anyone* who might be down below. The obligation not to shoot

arrows into a dark forest where children might be playing is based on the right of anyone who might be there to be protected from the harm such a reckless action might cause. Even if it turns out that there is no one on the path below, or no one playing in the dark forest, it does not follow that there is no obligation to avoid these reckless actions, as long as there might be some such potential victim.

If contemporaries have rights-based obligations to future generations, they would be obligations to anyone who might suffer the ill consequences of our present choices. These need not be obligations to specific individual right-bearers whose identities could be known in advance. If it turned out that there were no future persons at all, then there would be no one whose rights would have been violated by reckless choices made by those who lived earlier. But it would in no way follow that it is permissible to act in a way that is heedless of the interests of possible future persons who might be harmed by them; if such people were indeed to come into existence in the future, and if they were to suffer such harms, it would make perfect sense to say that their rights had been violated by the wrongful earlier actions (Reimann 2007).

ALTERNATIVE CONCEPTIONS OF INTERGENERATIONAL JUSTICE

One way to develop a conception of intergenerational justice would be to consider how the core concepts of the major theories of justice apply to this issue. For example, we might ask whether present policies are likely to result in a *fair* intergenerational distribution of burdens and benefits. A requirement of intergenerational fairness might at least rule out an unnecessary and rapacious consumption of resources that would deprive later generations of the ability to meet basic needs. Accordingly, one might also ask whether present actions constitute *harms* to future generations. In a similar vein actions can be deemed intragenerationally unjust if they result in excessive benefits for a powerful minority at the expense of a weak majority. Unless such actions are required by other provisions of justice (for example, respect for property rights) they would be judged unjustified and unjust.

Various conceptions of justice have different implications for the standing of future generations. The most common theories of justice fall into three broad categories: libertarian, liberal, and communitarian.

Libertarianism Libertarian theories distinguish between negative and positive rights. Negative rights are claims against the interference of others, whereas positive rights include claims to goods or services, or to the positive actions of others. The right not to be assaulted, for example, is a negative right, whereas the right to education or the right not to suffer deprivation of basic needs is a positive right. If future generations have rights (for example, the right that we not destroy resources they will need or a right to a life-sustaining environment), then these would be positive rights. Libertarian theories (Nozick 1974, Beckerman and Pasek 2001) hold that only negative rights imply requirements of justice. But the obligation to protect the environment seems to be based on positive, not negative rights. Most libertarian theorists accept this view and argue that justice does not justify restricting the liberties of those now alive for the sake of future generations, nor does it justify intragenerational measures designed to protect the environment. Some, however, believe that free market forces and the present protection of negative rights will adequately protect the environment and the interests of future persons (Gauthier 1986).

Liberalism In popular discourse the term *liberal* is usually counterposed to *conservative,* but among political theorists and philosophers the term has a different and quite specific meaning. Like libertarians, liberal political theorists also hold that justice requires the protection of negative rights. But liberal theorists of justice also include some positive rights that they consider basic to equity and well-being.

John Rawls's *Theory of Justice* (1971) is widely regarded as the touchstone for contemporary liberal accounts of justice. Like Gauther (1986) and Hobbes (1698/1994), Rawls develops an account of justice as a social contract. But unlike these other theorists, Rawls urges that a fair social contract must reflect the interests of future generations as well as present contracting parties, and he insists on special restrictions to insure that the social contract will embody principles of fairness, not the arbitrary influence of power or special interests. Rawls argues that the circumstances in which a fair social contract is chosen must exclude inappropriate influences. Just as an ordinary contract is invalid when it is imposed by force, so, according to Rawls, a social contract is invalid if it fails to incorporate the reasonable expectations and interests of all the parties. Hence, Rawls argues, the circumstances of the contract must exclude any information that would allow the contracting parties to skew the principles of justice to privilege their own particular interests or those of their group.

Rawls contends that justice should be based on the principles that rational individuals would choose from what he calls the original position (OP). The OP is designed to ensure that principles will be fair and will protect the rights and interests of everyone to whom they apply. As a thought experiment Rawls asks us to consider a hypothetical convention in which people are required to select principles of justice that will govern social cooperation from one generation to the next, over the life of a

society. In order to ensure that the principles chosen will be fair, Rawls suggests that participants must choose principles under the constraint of a veil of ignorance that deprives participants of any special knowledge about themselves that would enable them to distinguish their interests from those of other people in society. Thus parties to the original position do not know whether they are black or white or male of female or Christian or Jewish or Muslim or agnostic. They are thus prohibited from selecting principles of justice that would arbitrarily (and unfairly) help some people to gain an advantage over others.

Rawls also specifies that parties to the original position do not know to which generation they belong. They must, however, decide on the intergenerational rate of saving—how much each generation should save for subsequent generations. He argues that each generation should save at the rate at which they would like the previous generation to have saved. This will be, he implies, the same rate the children of the present generation would want their parents to adopt. Rawls argues that, although the members of the present generation have no obligation to impoverish themselves in order to make their descendants rich, there is a fundamental obligation to ensure that later generations will inherit just institutions and adequate economic and environmental resources.

Thus, on a Rawlsian view, many important environmental policies can be understood as necessary requirements of intergenerational justice. Rawls argues that intergenerational saving is necessary only when a society is relatively poor and is not yet in a position to guarantee that rights will be respected and basic needs met. Once just institutions are in place and basic needs are secure, there is no further obligation to save for later generations. Thus, on Rawls's view, the problem of intergenerational justice is temporary, and intergenerational saving is no longer necessary after the problem has been solved.

Although Rawls's account is among the best-developed liberal theories of intergenerational justice, it has drawn a wide array of criticisms. Rawls seems to assume that later generations will be better off than earlier generations even though problems of environmental destruction and resource depletion cast serious doubt on this assumption. Furthermore, Rawls does not adequately address the problem of population growth: If the population is increasing, then earlier generations cannot simply maintain an existing stock of capital resources because the subsequent, more populous generations would then suffer from a reduced per capita standard of living. Population growth brings with it increasing strain on resources and the environmental dangers of urban sprawl. The omission of this crucial factor compromises the usefulness of Rawls's work as a practicable theory of intergenerational justice. Nevertheless, some liberal theorists believe that some variant of Rawls's can address these issues (Wolf 2008). To accomplish this, one would need to generalize the Rawlsian view to accommodate changes in population size and corresponding changes in the resource and capital base needed to address people's needs and to secure justice.

Communitarianism Communitarianism developed as a critique of liberal theories of justice. The term *communitarian* is difficult to define because many different theories have been associated with the term (Sandel 1982, Walzer 1983, de-Shalit 1995). Most communitarian critics of liberalism have argued that liberal and libertarian theories place too much emphasis on individual rights and overlook the significance of nonindividual, nonrights-based sources of social value. Whereas liberal and libertarian theories often hold that public institutions should be neutral with respect to the diverse social and cultural values of individuals or communities, communitarians argue that institutions should promote such community values. These theorists emphasize the degree to which communities bind individuals together through a commitment to common values and ideals. Liberal and libertarian theories, on this view, underestimate or even ignore the value of the moral and social cohesiveness that can arise only in a community of like-minded fellow citizens (Buchanan 1989).

Communitarians believe that many of the most important obligations arise out of the roles people play in communities or in families. Instead of viewing political association as merely an instrumental good, communitarians hold that community membership is valuable in its own right and that political participation is good for its own sake, not merely as a means of rendering institutions more responsive to particular interests. Communitarians argue that obligations to future generations arise as an inherent part of the sense of human connectedness that is fostered by participation in a social or political community. Avner de-Shalit (1995) holds that the commitment to future generations is based on our understanding that we and they are members of a transgenerational community. Recognition of our role in this community requires the acceptance of obligations that extend to the next generation of community members.

But, as de-Shalit recognizes, we may not regard the members of *distant* future generations as members of our community. Thus, he argues, our obligations to remote future generations cannot derive from a communitarian view. He holds, rather, that such obligations are an aspect of "humanity," not of justice, because, as he writes, "justice is concerned with principles of ownership or the control of resources, while humanity is concerned with people's well-being." (de-Shalit 1995, p. 63) On this view

intergenerational justice has a sharply limited scope, extending only as far as the boundary of one's community, and does not necessarily take into account any negative effects present actions and policies may have on those who live in other communities or those who will live in the distant future.

Critics regard this limitation as an objection to de-Shalit's communitarian view, and perhaps to communitarian theories in general. If our obligations of justice extend only to members of our community, and distant peoples are not members of our community, this would imply that we do not violate the obligations of justice if our institutions or actions victimize others who are very distant in time or space. When institutions provide disproportionate benefits to some people at the expense of others—even those in the distant future or in far-flung parts of the world—it seems sensible to ask whether these institutions are fair. This question seems to invite a more comprehensive theory of justice than the one de-Shalit has developed, one that can span distant generations and local communities. But such a theory could still be called communitarian only if one's view of ''community'' encompasses humanity as a whole.

COSMOPOLITAN INTERGENERATIONAL JUSTICE AND ENVIRONMENTAL PROTECTION

Although most accounts of intergenerational justice apply to the policies of nation-states, many important environmental problems are global. For example, among contemporary environmental concerns, global climate change is the result of the environmentally damaging behavior of many individuals and corporations around the world. Environmental regulation of the open sea or the global planet's atmosphere requires international cooperation and regulations that fairly distribute the burdens and benefits of cooperation and protect the rights of all nations.

Recent philosophical work on international justice has focused attention on the concept of human rights and on the requirements (and limits) of international distributive justice. Notably, Rawls (1999) and Nussbaum (2006) develop contemporary theories that aim to provide the foundation for an account of internationally enforceable human rights, and Pogge (2002) argues for principles of international distributive justice. However, only a small portion of this work has addressed the intergenerational environmental implications of international agreements and the ways in which requirements of intergenerational justice might inform deliberations about just international policies.

Many of the norms and principles that have been employed to evaluate international institutions and agreements are applicable across generations. For example, in international negotiations aimed at achieving global regulation of greenhouse gas emissions, great weight has been given to considerations of fairness in the distribution of burdens and benefits. In these negotiations the representatives of many third world governments have argued that, because the developed nations of the global north have benefited disproportionately from industrialization during the twentieth century and generate most of the problematic emissions, they should bear more of the costs of addressing the problem.

Global climate change is among the central environmental problems of the twenty-first century, and contemporary theorists have sought to address the problem of climate within the framework of environmental ethics and intergenerational justice. Since the problem of climate is essentially global and intergenerational, and because the policy alternatives are necessarily international, contributions to this problem necessarily involve principles of cosmopolitan intergenerational justice. The Kyoto Protocol, an international climate agreement ratified by many states in 2001, is the most comprehensive climate treaty in effect. The Kyoto agreement sets greenhouse gas emission targets for participating nations, and created a market whereby nations could purchase emission credits from other nations, or could gain credits by exporting so called ''clean technologies'' to developing nations. Critics have argued that the treaty accomplishes too little (Gardiner 2004a, 2004b) and that the environmental problems involved in climate and global environmental change will require a more comprehensive arrangement, which will be difficult to achieve given the constraints of international negotiation. Others theorists have urged that the achievement of a global policy governing greenhouse gas emissions is a high priority requirement, and that failure to achieve such an agreement will violate requirements of both international and intergenerational justice (Shue 1993, 1999; Jamieson 2002).

IS INTERGENERATIONAL JUSTICE ANTHROPOCENTRIC?

Some environmental ethicists have criticized the notion that protecting the environment is chiefly a matter of looking out for human interests. Against this anthropocentric notion these critics oppose the nonanthropocentric argument that the ethics of environmentalism should be based on the intrinsic value of the protected resources or organisms, not merely on their instrumental value to humans—in other words, they view nature as an end itself, not merely as a means to human ends. But perhaps anthropocentric and nonanthropocentric ethical precepts do not conflict but dovetail insofar as they point to

similar kinds of obligations toward the natural world. To the extent that proposed environmental regulations can be shown to benefit both people and nature viewed as an end in itself, then such laws clearly protect the interests of both future generations of people and future ecosystems. Bryan Norton calls this "the convergence hypothesis" because it argues that anthropocentric and nonanthropocentric reasons converge to justify the same actions and policies (Norton 2005). If important environmental obligations are viewed as requirements of intergenerational justice, there is no inherent disparagement or denial of other, nonanthropocentric, justifications for the same obligations. If concern for the environment is founded mainly on nonanthropocentric values, then intergenerational arguments for environmental protections might be viewed as incomplete but not necessarily mistaken.

In practical political contexts there are good strategic reasons for framing environmental obligations in anthropocentric terms, even if such arguments seem to slight the intrinsic value of nature. In public-policy debates it is often prudent to tailor rhetoric to the broadest possible political base, minimizing any potentially controversial justifications. In this sense the anthropocentric justifications of intergenerational justice can help to achieve the ends sought by nonanthropocentrists even in eschewing the latter's principles for practical political reasons; environmental laws that are never passed or implemented do not benefit advocates on either side of that philosophical divide.

SEE ALSO *Communitarianism; Environmental Philosophy: V. Contemporary Philosophy; Environmental Justice; Environmental Policy; Future Generations; Global Climate Change; Limits to Growth; Norton, Bryan; Population; Sustainability; Tragedy of the Commons.*

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INTERGOVERNMENTAL PANEL ON CLIMATE CHANGE

The United Nations Environment Programme (UNEP) and the World Meteorological Organization (WMO) convened the Intergovernmental Panel on Climate Change (IPCC) in 1988 to comprehensively review the scientific and technical peer-reviewed literature on global climate change (GCC). The IPCC does not conduct original scientific research. Any country that is a member

of the UNEP and the WMO can be a member of IPCC. Scientists participating in the IPCC are chosen by their respective governments; there are about a thousand who participate. Because the IPCC represents the world's foremost collection of experts on climate change, nations' governments rely on IPCC reports to guide their GCC policy decisions, including those pertaining to the most important international agreements: the United Nations Framework Convention on Climate Change (UNFCCC) and the Kyoto Protocol. Every five years or so the IPCC issues detailed reports on, for example, ''The Scientific and Physical Basis for Climate Change,'' ''Impacts, Adaptation, and Vulnerability of Climate Change,'' and ''Mitigation of Climate Change.'' In addition, a shorter synthesis report also is published by IPCC that is intended for policy makers; the 2007 ''Fourth Assessment Report'' (AR4) is an example. All of the reports include analyses of possible future development paths relating to social, economic, technological, and energy growth and projections of future greenhouse gas emissions.

Although the IPCC's mission is to synthesize existing scientific and socioeconomic literature in as unbiased a manner as possible, its methods of reviewing and synthesizing the literature raises many ethical issues that often are ignored or underestimated. The examination of the ethical issues posed by IPCC's procedures and reports is important because it prompts a consideration of such matters in subsequent reports; if the issues are not identified, then the IPCC has no mandate to conduct ethical analyses of its work (Brown 2006, 2008).

SCIENTIFIC SYNTHESIS

Even though the IPCC's assessment reports persuasively document the realities of global climate change and attribute a significant amount of change to human activities, it is possible that the impacts of global climate change could be even more dire than the reports indicate. For instance, in the AR4 the IPCC decided to limit its projections of temperature changes to those that fell within a 90 percent confidence level and, therefore, discounted a small but potentially significant risk of greater temperature increases than those projected. These potentially greater increases would disproportionately affect regions in high latitudes and aggravate climate change problems for future generations. In addition, the IPCC decided not to report that there is a possibility—albeit of a lower order of probability—of an even more rapid dynamic melting of the Greenland and Antarctic ice sheets, thereby downplaying the serious and irreversible damages that would ensue in that case, most notably a sea-level rise of approximately thirteen to twenty feet. Finally, the IPCC decided to exclude nonlinear events that might result in higher or more rapid increases in temperature or sea level rise.

SOCIOECONOMIC SYNTHESIS

The various economic models used by the IPCC contain hidden ethical assumptions: for example—that public policy should maximize overall global welfare even if achieving this imposes serious harm on some people, that benefits accruing to future generations from actions to mitigate GCC should be discounted relative to the costs imposed on present generations, and that discount rates for future benefits should be based on how people value benefits to them and not on how costs or benefits are distributed to those most vulnerable to GCC impacts. All of these assumptions are ethically contestable because they discount or undermine principles of distributive justice by relying on cost-benefit analyses as the preferred rational basis for prescriptive guidance for GCC policies and decision-making; and they are not made explicit by the IPCC in its methodology or reports. Further, normative principles stated in the UNFCCC create a preference for energy efficiency and conservation, equity for developing and vulnerable countries, and the right to sustainable development. Although IPCC considers energy efficiency and conservation as options that can be employed to address GCC, it has not fully assessed their potential to provide equity for developing and vulnerable nations and to promote sustainable development.

PROCEDURAL JUSTICE

Procedural justice seeks to ensure that people who will be affected by policies are represented in policy-making deliberations. The IPCC reports rely almost exclusively on peer-reviewed and technical papers published by highly educated and often narrowly trained specialists, disproportionately from northern, developed nations. Typically, the governments who use the reports accept this form of ''expert'' opinion as the only legitimate form of knowledge that can be justified in the reports. Many people living in areas at high risk from GCC, such as indigenous peoples, children, and the disenfranchised poor often are not included in IPCC data-gathering procedures or policy or decision-making processes; nor is their consent sought for such decisions. For instance, when assessing GCC impacts on forestry the IPCC typically consults land managers and professional foresters, with little input from nonstate, nonexpert, nontechnical yet highly knowledgeable victims.

FUTURE WORK

There is no question that IPCC is the most highly respected and authoritative body on scientific and technological

aspects of GCC. At the same time, the way it handles scientific uncertainty, uses hidden assumptions in its socio-economic analyses, and limits full participation of groups most affected by GCC, creates ethical difficulties. Future work should better analyze the ethical issues embedded in dealing with each of these areas.

SEE ALSO *Future Generations; Global Climate Change; Intergenerational Justice; United Nations Environment Programme.*

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INTERMEDIATE TECHNOLOGY

SEE *Alternative Technology.*

INTERNATIONAL SOCIETY FOR ENVIRONMENTAL ETHICS

The International Society for Environmental Ethics (ISEE) was founded in Boston in December 1990, at the Eastern Division meeting of the American Philosophical Association. The founding officers were President Holmes Rolston III (Colorado State University), Vice President Eric Katz (New Jersey Institute of Technology), Secretary Laura Westra (University of Windsor), and Treasurer Peter Miller (University of Winnipeg). In 2007, the ISEE had approximately 350 members, of which 76 were from twenty-six foreign countries. The ISEE has regional representatives from Africa, Australia and New Zealand, China, Taiwan, Eastern Europe, Western Europe, Mexico and Central America, South America, Canada, Pakistan and South Asia, and the United Kingdom, in addition to the United States.

The constitution, as revised in 2007, specifies the following activities of the ISEE:

- sponsor and support philosophical, educational, and scientific conferences, seminars, and workshops, solely or in cooperation with local, national, or international professional associations, meetings, and academic institutions;
- coordinate its activities with similar activities of Environmental Philosophy, Incorporated, the publisher of the journal *Environmental Ethics* (in continuous publication since 1979);
- publicize and where appropriate make available materials and media suitable for the teaching of environmental ethics and environmental philosophy;
- publish an *International Society for Environmental Ethics Newsletter* which shall communicate to the members events of interest and significance in the field of environmental ethics and environmental philosophy;
- make particular effort to relate environmental philosophy and ethics to a variety of other disciplines in ways promoting the objectives stated above;
- endeavor to publicize courses and classes in environmental ethics, environmental philosophy, and related courses, including those in biological conservation, and to facilitate exchange of information among those who teach them;

- promote undergraduate and graduate education in environmental ethics and environmental philosophy;
- run an electronic list and a web site in order to facilitate the transmission of information in the field of environmental ethics and philosophy;
- make particular effort to be global in scope of concern and membership.

The ISEE newsletter has been published quarterly since 1990. It features general announcements, news, and discussions about issues in environmental ethics and policy. In addition, the newsletter lists conferences and calls for papers, and it lists web sites, articles, and books dealing with environmental issues.

The articles and books listed in all volumes of the newsletter were collected into a comprehensive bibliography, which also lists publications in the journal *Environmental Ethics* and five additional environmental ethics journals. With over 12,000 entries, this collection is the largest bibliography of environmental ethics publications in the world. The bibliography, which receives about 15,000 hits a month, can be accessed at the ISEE web site.

ISEE regularly sponsors meetings at the Pacific, Central, and Eastern Division meetings of the American Philosophical Association. In addition, it co-sponsors an annual conference with the International Association for Environmental Philosophy each June. The ISEE also sponsors occasional sessions at meetings of American Association for the Advancement of Science, the Society for Conservation Biology, the American Institute of Biological Science, and the Society of American Foresters, among other professional and scholarly organizations. It has participated abroad at conferences of the Mind Association and Aristotelian Society in the United Kingdom, the Canadian Association of Learned Societies, and the Australasian Association for Philosophy, and it has been represented at the World Congresses of Philosophy in Moscow (1993) and Boston (1998).

ISEE was an official observer non-governmental organization at the United Nations Conference on Environment and Development in Rio de Janeiro in June 1992.

Over the years, several hundred papers representing research in environmental ethics and philosophy have been presented at these conferences, many of which have subsequently been published.

ISEE maintains an active listserv, whereby any member can contact other members on the ISEE-L list immediately by e-mail. The ISEE web site contains a wealth of information for scholars, teachers, students, and others interested in environmental ethics. In addition to the archive of newsletters, the listserv and the bibliography, the web site assists teachers of environmental ethics with its collection of course syllabi and with lists of leading textbooks and articles in the field. The ISEE web site also lists graduate programs in environmental ethics, related scholarly and public associations and publications, and funding opportunities, and it summarizes theses and dissertations completed in the field.

The ISEE web site is the best source of information about the International Society for Environmental Ethics, and the best avenue of approach for those who might be interested in joining the society. Questions to and comments for the members of the society are best circulated through the listserv.

SEE ALSO *Environmental Education; Environmental Philosophy: V. Contemporary Philosophy; Rolston III, Holmes.*

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International Society for Environmental Ethics. Available from http://www.cep.unt.edu/ISEE.html

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Ernest Partridge

INTRINSIC AND INSTRUMENTAL VALUE

The distinction between intrinsic and instrumental value has been central to environmental ethics since its inception as a distinct area of study in philosophy, to the point that some authors believe that the search for intrinsic value in nature is the most fundamental quest of environmental ethics. In fact, this dichotomy is so fundamental that it is possible to create a taxonomy of rival schools of environmental ethics by reference to it, including those that consider the distinction and its various permutations to be less important than most others do. Although some environmental philosophers prefer the terms *inherent* to *intrinsic* and *worth* to *value*, the term *intrinsic value* has now become standard in the field.

THE ORIGIN AND SIGNIFICANCE OF THE DICHOTOMY

The opposition between intrinsic and instrumental value is not an invention of environmental ethics; such a distinction has surfaced in various guises throughout the history of philosophy. Traditionally the opposition between instrumental value and intrinsic value has been posed in this form: How can means, or a sequence of means, relate to an end, to something that is not itself the means to

another end (cf. Plato's *Republic*, Book 2. and Aristotle's *Nicomachean Ethics*, Book 1, for early discussions of the distinction)? If there are instrumental values that are means to ends, then there must be ends that have, by contrast, intrinsic value—ends that are not means to other ends but are ends in themselves. If an infinite regress of means is irrational, then sequence of means must stop at some point—at the end in itself. This is the familiar, classic argument that Richard Routley and Val Routley (1980) employed in some of the earliest papers in the field.

In environmental ethics, however, attributing intrinsic value to the entities of the natural world (or the discovery that these entities have such value) is a first step toward endowing them with moral status. This ethical regeneration of nature arose in the wake of the fierce denunciation of the anthropocentric nature of European and North American culture in a seminal article by Lynn White Jr. in 1967, published in *Science.* White attributed the contemporary environmental crisis to an anthropocentrism that, he argued, lies at the root of Christianity. In his view the triumph of Christianity over paganism was "the greatest psychic revolution in the history of our culture" (White 1967, p. 1204).

Two worlds were in conflict: On the one hand, there was the fundamentally animist world of Greco-Roman antiquity, in which people believed that all natural entities are guided by a tutelary deity or spirit, so that someone intending to intervene in the course of nature would need to gain the favor and win the graces of the presiding spirits; on the other hand, there was the monotheist world of Christianity, in which a de-deified nature could be exploited in indifference to the feelings of the now exorcised natural spirits and demigods. This disenchanted world, reduced to a state of passive inertia, could be subjected to technoscientific manipulation in the service of humanity's interests. In the Christian cosmogony nature lost its intrinsic value and was reduced to pure instrumental value—a mere tool in the hands of human masters. From the perspective of modern neoclassical economics, nature is a pool of interchangeable raw materials for human use and consumption; if humans exhaust one natural resource, such as great whales, other resources can be substituted with no loss of value.

In contrast, a nonanthropocentric environmental ethic—the cornerstone of which is the theory of the intrinsic value of nature—is a radical departure from this representation of a human-nature relationship in which humans are first and everything else a bad last. Environmental philosophers initially seized on Aldo Leopold's *A Sand County Almanac* as a possible point of departure; in Leopold's words, "men are only fellow-voyagers with other creatures in the odyssey of evolution," an implication he drew from the Darwinian worldview (1949, p. 109). A suitably modified theory of descent and the phylogenetic-tree image might undermine the prevailing anthropocentrism and foster greater receptivity to the possibility that some nonhuman natural entities and/or nature as a whole might have intrinsic value.

If humans are seen as members of a biotic community, coevolved with other members, the boundaries of the ethical community might extend to encompass the entire biotic community. Indeed, some philosophers think that environmental ethics owes its uniqueness to its openness to the possibility that nonhuman beings and the abiotic components of the natural world have moral status. One clear route to conceiving of such entities as objects of moral consideration is either to reveal that they have previously unnoticed intrinsic value or to confer intrinsic value on them as we might confer the right to vote on previously disenfranchised citizens. Encouraging environmental conservation and preservation as means to human prosperity and well-being would make environmental ethics a mere complication of human-to-human ethics. If environmental ethics is a distinct form of ethics, it demands taking the nonhuman environment into direct consideration because of an intrinsic value that, once acknowledged, places it beyond the realm of a mere natural resource for human exploitation. By analogy one might oppose slavery because it is economically backward; the prosperity and well-being of slave owners might be served by emancipation, but that is an argument based on criteria of efficiency or self-interest, not ethics. An ethical antislavery argument would require a recognition of the intrinsic human value of the slaves, not merely their instrumental value—or lack of it—to the slave masters.

THE BASIS FOR MORAL OBLIGATION

An environmental ethic must first determine a defensible criterion for intrinsic value and then apply it in judging which natural beings possess intrinsic value and to what degree. A second task is the anchoring of moral obligations and human responsibility to the environment in a recognition of intrinsic value in nature. Since the late 1970s three major approaches to these tasks have emerged in the work of Paul W. Taylor, Holmes Rolston III, and J. Baird Callicott.

According to Paul W. Taylor, all living individual (wild) organisms—whether they are animal, vegetable, or unicellular organisms—have intrinsic value because they are teleological centers of life (1981). In the effort to realize their shared goals of living, flourishing, and reproducing, they have developed complex adaptive strategies that are the means in the service of their ends. Therefore a multitude of self-valuing, goal-seeking individuals exists in nature, independently of any human valuation of them. According to Taylor, the affirmation of an

"inherent worth" in the nonhuman world is sufficient to generate prescriptive or prohibitive norms that do not center on human beings; among the first is the rule of noninterference, which prohibits the hindrance of the development and the prosperity of these life forms.

Holmes Rolston III (1994) agrees with Taylor's criterion for intrinsic value but harbors doubts that such a "biocentric ethic" is suitable for developing measures to protect not just individual living organisms but also species and entire ecosystems, which include abiotic elements. As for species, they are the ends that individual organisms strive to attain. An organism's developmental trajectory ends in a fully developed specimen of its species, and what it reproduces are more specimens of that species. Ecosystems are the theater of the evolutionary play and thus are productive of all the diverse forms of life, each of which has intrinsic value. Rolston describes with an abundance of detail the evolution of life on earth as it was made intelligible by Darwin while drawing attention to the formidable creativity of the evolutionary process so that it commands our respect and admiration. It is for this purpose that Rolston invites his readers to consider more carefully the scope and diversity of the living world and to ponder its wonders of organization, self-regulation, and functional integration. Seen from this angle, asserting that a natural being possesses no value independently of human consciousness appears parochial and narcissistic because many such beings have long had their own genetically embedded agendas that they strive to realize.

But a natural being is itself only part of a whole; it is a member of a species that is adapted, through the evolutionary process, to the ecological niche that it inhabits. And the ecosystem that it inhabits is itself closely connected to a network of ecosystems hierarchically structured in successive levels of integration. That being so, although natural beings individually construct their intrinsic value, this value is transferable, passing successively from individual natural beings to the species, and from there to all the interrelated and hierarchically structured ecosystems in which the species function.

J. Baird Callicott (1986) follows another course. He attempts to construct an environmental ethic that is just as inclusive, but in the framework of a subjectivist theory of value that carefully distinguishes between the site that has a value and the source of all values. An ethic of anthropogenic values that views any valuation as the result of human conscience is not necessarily anthropocentric because it does not reduce all values—except the value of human beings—to the status of instrumental values. This theory joins forces with the Leopold land ethic. Callicott argues that *value* is first and foremost a verb, and a noun only derivatively, and that *instrumental* and *intrinsic* are, therefore, adverbs, not adjectives. Something has value, in other words, only if it is valued by a conscious being capable of intentionality. There are two basic ways in which intentionally conscious beings value: instrumentally and intrinsically.

All conscious beings value aspects of their worlds instrumentally—as bats, for instance, value caves for the shelter they provide. But, as Rolston effectively points out, all conscious beings value themselves intrinsically. By a kind of metaphorical extension, Rolston argues that even nonconscious organisms like plants value themselves intrinsically, to the extent that they vigorously compete with other plants for sunlight, water, and nutrients. Therefore, Callicott argues, despite his protestations to the contrary, Rolston's outlook is also a subjectivist theory of intrinsic value. Organisms have intrinsic value because they value themselves. Human beings and perhaps some other robustly conscious animals are capable of ascribing intrinsic value not only to themselves but also to other entities. Although it is logically possible to value anything intrinsically, people normally do so only for good reasons. In addition to providing a cogent analysis of intrinsic value, part of the work of environmental philosophers, according to Callicott, is to provide people with good reasons to value the natural environment intrinsically. Leopold's *A Sand County Almanac* is perhaps the most effective effort so far to provide such reasons. More recent works, such as E. O. Wilson's *The Diversity of Life* also do that kind of work well.

CRITIQUES AND CONTROVERSIES

There is reason to wonder, however, whether the foregoing discussion is based on a misunderstanding. There are two possibilities: (1) Environmental ethicists genuinely aim to guide policies by subjecting them to rational standards, in which case their failure to achieve this objective so far should encourage them to consider what it is in their way of expressing and dealing with problems that has prevented them from succeeding and how they can adapt their discursive strategy to the realities of politics; (2) or the theorists of environmental ethics choose to indulge their metaphysical wrangles over the intrinsic value of natural entities in oblivion to the practical implications of their work.

This criticism was first formulated by Bryan G. Norton (2005) and was the starting point of what has become a dominant school of thought in environmental ethics: environmental pragmatism. Norton observes that the debate between anthropocentrists and nonanthropocentrists is futile insofar as the major concept of "human interests" (or human utility), on which the whole discussion turns, is left undefined. In fact, Norton argues, satisfying human interests does not necessarily involve the irreversible

destruction of the object of desire; he makes a distinction between a utility that is satisfied by the immediate consumption of natural goods and a utility that implies the conservation of the useful object, conservation being a prerequisite for the continued satisfaction of human interests. Norton insists that programs for the protection of the environment are perfectly justifiable on the basis of a sufficiently broad and long-range interpretation of anthropocentric instrumental values—broad enough to transcend the traditional division of human values into only two categories: instrumental and intrinsic. That dichotomy, in his view, fails to express the whole range of values that human beings actually attribute to nature. Rather than force all the diverse values into the straitjacket of a binary theory of value, Norton proposes a plurality of human values situated on a continuum ranging from the consumptive and self-oriented to nonconsumptive concerns such as aesthetics and spirituality. He also explores a new type of value, "transformative value": a nonconsumptive valuing of nature that can transform unself-critical preferences into expresssions of higher ideals.

Some scholars dispute Norton's assumption that the idea of intrinsic value is politically ineffective. To the contrary, intrinsic value has become the war cry of many advocates of the protection of nature, including members of Greenpeace, the Wilderness Society, and Earth First! Judging from the example of the preamble to the International Convention on Biological Diversity, the belief in the existence of intrinsic values in nature is playing an increasingly important role in the development of environmental attitudes and policies worldwide.

SEE ALSO *Animal Ethics; Anthropomorphism; Biocentrism; Callicott, J. Baird; Deep Ecology; Ecological Feminism; Leopold, Aldo; Norton, Bryan; Rolston III, Holmes; Taylor, Paul; Vegetarianism.*

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Hicham-Stéphane Afeissa

INVASIVE SPECIES

The global distribution of plants and animals has evolved over many millions of years, having been influenced by oceanic and mountain barriers (Elton 1958). Although such geographic isolation led to major speciation, species still dispersed where geographical barriers permitted, either to avoid deteriorating home ranges or to take advantage of potentially new resources (Stenseth and Lidicker 1992). However, since early humans started to migrate, natural barriers to plant and animal dispersal have been broken down and species have been translocated ("introduced") deliberately or accidentally to new ecosystems. The rate at which these introductions occur has increased significantly over recent decades as a result of increased globalization of travel and trade.

When released from their native predators, competitors, and diseases, some species become well established and abundant and have a significant impact on natural environments, agriculture, and human health and infrastructure. Often these invasive species or invasive alien species (IAS) have to be managed (i.e., killed), but in dealing with a sentient species conflict can arise between those wanting to protect the indigenous species and ecosystems threatened by the IAS and those wanting to protect individuals of the IAS.

Those conflicts have led to debate between proponents of individual-based ethics and proponents of ecocentric ethics.

CONSEQUENCES OF INVASIVE ALIEN SPECIES

Internationally, biological invasions pose the second biggest threat to biodiversity loss after habitat destruction; in the United States, with more than 50,000 IAS, damage and losses to agriculture, forestry, fisheries, and other human enterprises are estimated to cost $120 billion per year (Pimentel, Zuniga, and Morrison 2005). Internationally, about 80 percent of endangered species are threatened through competition or predation by IAS; island biotas are especially vulnerable.

With continuing globalization and the resultant increase in travel and trade, national borders are being increasingly challenged by new biological invaders. Although the most effective way to prevent potential IAS from establishing themselves is to prevent their introduction, that outcome often is not achieved because of commercial imperatives. Both international and national legislation and policy are established to facilitate trade, with most policy (e.g., World Trade Organization) including a presumption of safety and requiring proof that the introduction of a species poses a significant risk (Simberloff 2005). However, there is often insufficient evidence of harm to defend a case against such a nonprecautionary policy. As an exception, New Zealand's Biosecurity Act of 1993 was the first national law that did not presuppose innocence. Conflicts can arise when precautionary trade tariffs or restrictions are seen as disguised protectionism. Policy makers appear to fail to recognize that the benefits of an introduction often accrue to only a few whereas the wider society has to bear the substantial cost if an introduced species becomes invasive.

ETHICAL ISSUES

Because some IAS threaten indigenous species, communities, and ecosystems or cause significant economic losses, action to mitigate their impacts results in a reduction in their abundance or their eradication. However, especially when IAS are sentient, there is never universal agreement on whether control is necessary or, when it is, how it should be implemented. The extent to which an introduced species is characterized as good or bad is a value judgment, and such judgments often lead to conflicts. Philosophers such as Mark Sagoff (2005) suggest that an invasive species policy based on aesthetic, ethical, or spiritual values might be legitimate, but when based on nebulous concepts of biodiversity, harm, and impact, that policy can be challenged.

Mitigating the impacts of IAS often requires the use of lethal trapping, shooting, or poisoning, but when used against sentient species, such actions often are considered unethical. There are two major philosophical positions:

An Invasive Species in New Zealand. *The Common Brushtail Possum (*Trichosurus vulpecula*) was introduced into New Zealand from Australia in the 1800s to establish a fur trade. It is now New Zealand's most invasive mammal species, modifying native forest ecosystems and spreading Bovine Tuberculosis to livestock.* **© TOBIAS BERNHARD/OXFORD SCIENTIFIC IMAGES/ PHOTOLIBRARY.**

one focusing on individuals (animal rights and animal liberation) and the other on communities and ecosystems (holistic eco- or biocentric ethics). Those holding a strict animal rights position (Regan 1983) argue that sentient animals have a "right to life," and so individuals of an endangered species are no more or less worthy of moral concern than are nonendangered species such as an IAS. Animal liberationists argue that the interests of sentient animals should be given equal moral consideration and their capacity to suffer must be considered. Anything less would be speciesist.

These conflicting positions do little to support effective management, especially when many thousands of sentient IAS have to be culled to protect nonsentient species (e.g., goats culled to protect vegetation) or only a few sentient individuals (e.g., thousands of rats killed to protect a few individuals of a threatened bird species). Because these individual-based ethics often do not provide clear guidance on what is morally acceptable, especially when ecosystems clearly are being degraded, those concerned about communities and ecosystems argue for an ecocentric ethic that recognizes ecosystems and communities as moral subjects that have intrinsic value (Callicott 1980). However, proponents of ecocentric ethics fail to support effective environmental management because they do not deal adequately with the multiple

values that pervade environmental issues. Bryan G. Norton (1995) suggested an alternative pragmatic, pluralistic, and policy-based approach that recognizes that humans value things in different ways, that those values may be context- or site-dependent, and that differing values often are in conflict. Although not providing a unified ethic, this approach provides a process for dealing with the reality of managing natural environments in the face of uncertainty and in the presence of multiple values.

Often the ethical debate confuses the why (justifying control) with the how (what methods can be used to cull animals). In relation to the how, most people accept the idea that minimizing harm is good, and utilitarian theory provides an effective framework for doing this. However, in most cases the benefits cannot be quantified easily, and so this approach is essentially a harm minimization approach. Thus, control methods that cause the least harm should be used whenever possible. As Peter Singer (1997) suggested, because humans have created a bad situation and must deal with that reality, the way forward is to seek the least bad way out.

The most invasive species on earth is *Homo sapiens,* but even though humans threaten more native species, communities, and ecosystems than do any other IAS, they do not act to minimize this harm as they would for other IAS. Thus, the question arises: Are people therefore speciesist?

SEE ALSO *Animal Ethics; Biodiversity; Endangered Species Act; Environmental Policy; Globalization; Habitat Loss; Life: Respect/Reverence; Singer, Peter; Speciesism.*

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Bruce Warburton

ISLAM

Islam is an Arabic term, literally meaning "submission"—that is, to the will of Allah. A monotheistic religion having arisen in the Arabian Peninsula during the early seventh century, in the twenty-first century Islam counts some 1.3 billion individuals worldwide who identify with the tradition on some level. The largest concentration of Muslims today is found in the South Asian countries of Pakistan, India, and Bangladesh (about 350 million, or a third of the world total), and the country with the largest Muslim population is Indonesia (about 200 million). By contrast, about 25 percent of Muslims live in the Middle East, and Arabs today constitute only about 15 percent of the world's Muslim population.

FOUNDATIONS

According to Islamic tradition, a pious merchant from the west Arabian town of Mecca, Muhammad son of Abdallah, began in the year 610 to receive divine revelations during the course of a mountain retreat. These revelations, transmitted from God to Muhammad via the angel Gabriel, continued over the course of the next twenty-three years until Muhammad's death in 632. Collectively, this body of divine revelation is known as the Qur'an ("recitation").

The Quranic text is divided into two periods of revelation, each thematically somewhat distinct. The first period corresponds to Muhammad's early prophetic career in his hometown of Mecca, where his message attracted a growing number of followers, especially from the more marginalized segments of society, while increasingly alienating most of Mecca's elites. This led the latter to begin persecuting Muhammad and his followers, who eventually accepted an invitation from the inhabitants of Yathrib, a town to the north, to settle there. Yathrib, which became known as Madinat al-nabi (The city of the prophet), or Medina for short, served thereafter as a power base from which Muhammad and his followers the Muslims (literally, "the submitters") could launch raids against the caravans of their Meccan enemies. Generally speaking, the earlier, Meccan revelations emphasize such themes as the oneness of God (contradicting the largely polytheistic culture of Arab religion at the time), and the accountability of humans before God's justice. The later, Medinan revelations are often more concerned with how human societies should be ordered.

ISLAMIC VIEWS OF HUMANS AND NATURE

The Qur'an states that Allah is the all-powerful creator of the universe and all it contains, and that the proper role of humans is that of *khalifa* (2:30, 6:165), a term generally understood in this context as meaning a steward or vice-regent. Creation is said to be good, and all aspects of it are miraculous signs (*ayat*) proving the existence of God. All of creation, moreover, is said to praise God, though humans may not perceive it (17:44). Nonhuman species are said to constitute "communities" similar to those of humans (6:38). In fact, humans are distinct only in that they possess a conscious will (*taqwa*), making them morally answerable to God for their actions. Islam is described as the religion of *fitra*, "the very nature of things," and all created beings are said to be originally "muslim," in that their nature is to submit to God's will, but many humans err by choosing not to do this. Accordingly, it may be said that of all created beings, humans alone have a potentially problematic relationship with Allah.

While the Qur'an explicitly states that the Earth was created for all beings and not just for humans (55:10), it is also stated that certain species (particularly domestic animals) were created to serve humans (16:5–8). Given that Islam accords the special status of *khalifa* to humans, it could be said to be an anthropocentric religion, though Muslims often prefer to call their faith "theocentric." Because creation belongs to God, humans are not to engage in activities that cause it harm (2:205, 7:85). Wastefulness and excess consumption are likewise condemned (7:31).

According to the hadiths (Muslim oral traditions), which, being far more voluminous than the Qur'an, actually serve as a more frequent basis for Islamic norms, the Prophet possessed what might be termed a kind of "environmental consciousness" that was perhaps characteristic of the Arabs in general as they had to survive in a marginal environment providing limited natural resources. The Prophet instructed Muslims to respect plants and animals, to conserve water, and to set aside certain

"No Hunting Area," Kfar, Lebanon. *A young cowherd manages his cows in the "no hunting area" in the village of Kfar Zabad. A pre-Islamic system of environmental protection, born over 1500 years ago in the Arabian desert, is being revived with great success. The community based system, called hima, means that a local population, rather than distant Beirut authorities, decides how to manage its ecosystem, and reap the benefits.* **HASSAN AMMAR/AFP/GETTY IMAGES.**

lands as preserves (*hima* and *harim*). Among Muhammad's best-known sayings cited by contemporary Muslim environmentalists are "The entire earth is a mosque" and "Live in this world as if you will live in it forever, and live for the next world as if you will die tomorrow."

It is often argued by Muslim environmentalists today that the sharia (body of religious laws), if applied to the letter, contains adequate restrictions to ensure a use of natural resources that is both sustainable and just. Resources such as water, air, and wildlife are deemed to be common property, and the utilization of resources is supposed to be determined by the following principles, among others: 1) nonvital needs are subordinated to vital needs; 2) the needs of the poor take precedence over the needs of the rich; and 3) one may not cause harm in order to obtain a benefit. As in any human society, however, these principles remain ideals and often have not been followed in practice.

Classical Islamic philosophy, which thrived from the ninth through the eleventh centuries, was derived to a large extent from Greek philosophy and incorporated much of the Greeks' views of nature. Islamic philosophers coined the Arabic term *tabi'a* to represent the Latin and Greek equivalents *natura* and *physis*, and equated the divine will with Aristotle's first cause. The Islamic philosophers largely followed the Greek model of the cosmos, which they understood to be spherical in shape and bounded by the stellar field. The planets, the sun, and the moon occupy the middle layers, with the Earth constituting the center. The heavenly world (*al-'alam al-a'la*), though made up of ether in contrast to the lower world (*al-'alam al-asfal*) which is comprised of the four elements, shares with it the qualities of heat, cold, moistness, and dryness and acts upon the lower world accordingly. The Earth's geography was most often understood in terms of the pre-Islamic Iranian divisions of seven concentric climes (*keshvar*s), although the fourfold division of the Greeks and the ninefold version of the Indians were also known.

The Islamic philosophers affirm the position of humans near the top within the hierarchy of created beings, below angels but above other animals, plants, and minerals. Humans are the mediators between the heavenly and earthly realms and a major channel for divine grace. The human body, furthermore, is perceived as a microcosm of the universe, with specific parts of the body being identified with parts of the zodiac and thus subject to their influences.

Muslim mystics, known as Sufis, have tended to interpret Quranic references to the oneness of God (*tawhid*) as indicating an underlying unity to all reality. The Andalusian mystic Muhyi al-din ibn 'Arabi (1165–1240) described creation in terms of "unity of being" (*wahdat al-wujud*), an idea that won wide popularity among Sufis, especially in South Asia where his work remains highly influential. Many mainstream Muslims have found this belief to verge dangerously close to pantheism, however; the eighteenth-century Indian Sufi teacher Shah Waliullah (1703–1762) preferred the term "unity of witness" (*wahdat al-shuhud*) as more clearly maintaining the distinction between creator and creation.

The Sufi notion of the "complete man" (*insan al-kamil*), also elaborated by Ibn 'Arabi, expands the conception of the human being as microcosm of the universe. For Sufis, cultivation of the individual is analogous to cultivation of the cosmos as a whole; thus, one's personal spiritual development can affect the entire world.

To Sufis such as Jalal al-din Rumi (1207–1273), not just animals and plants but the entire universe of creation is alive. "Earth and water and fire are his slaves," he writes in the *Masnavi-yi ma'navi*; "With you and me they are dead, but with God they are alive" (1.838). Nature also speaks, though only the mystics realize this: "The speech of water, the speech of the earth, and the speech of mud are apprehended by the sense of them that have hearts" (1.3279). The conversations of nature are indicative of affective relationships: "You yourself know what words the sun, in the sign of Aries, speaks to the plants and the date palms / You yourself, too, know what the limpid water is saying to the sweet herbs and the sapling" (6.1068–69). Moreover, the Sufis often employ the symbolism of love (*'ishq*) to describe the relationship of mutual attraction between the creator and his creation. Yunus Emre, a thirteenth-century Turkish poet, composed the famous line, "We love all creation for the sake of its creator."

Many Sufi tales, such as those found in the works of Rumi, Farid al-Din Attar (c. 1142–1220), and others, include animal characters, though these are almost always stand-ins for human characteristics associated with particular species. Nonhuman animals are seen as occupying a level below humans and the "animal soul" of the philosophers is equated by the Sufis with the "lower self" (*nafs*), or one's own baser instincts that, along the path of spiritual development, one strives to overcome.

CONTEMPORARY ISLAMIC ENVIRONMENTAL THOUGHT

While the preceding observations could indicate a basis for environmental ethics in the Islamic tradition, to project present-day environmental understanding onto any pre-modern society would be inappropriate. Among Muslims, as is the case with all human societies, environmentalist discourse today is in many respects distinctly contemporary and is emerging in response to particularly modern problems and ways of thinking. Despite the presence of some apparent attention to environmental protection in the classical Islamic texts, in general it

would seem that Muslim societies historically caused no more or less damage to the environment than others. These same societies today share the problems common to all developing countries, including severe and in most cases worsening environmental degradation.

Islamic environmentalist thinking as such emerged only toward the end of the twentieth century. Moreover, it has come largely as a defensive or apologetic response to Western environmentalist critiques, and remains unknown to the majority of Muslims who are far more preoccupied with issues such as international and domestic politics, social justice, and gender roles. On the other hand, because environmental problems in countries where Muslims live have become so severe, a certain awareness of these problems is on the rise.

The Muslim probably having the best claim to be the first contemporary Islamic environmental ethicist is the Iranian-American philosopher Seyyed Hossein Nasr, who attributes his environmental awakening to walks in Walden Woods during the 1950s. His identification of human mistreatment of the environment as arising from a crisis in values slightly predates Lynn White Jr.'s famous 1967 essay "The Historical Roots of Our Ecologic Crisis." Contrasting the Islamic tradition to White's portrayal of the Christian West, Nasr argued in a number of works that Islamic science never lost its reverence for the sacredness of nature, and his attribution of Muslims' loss of environmental consciousness to pernicious Western influence has been taken up by many if not most subsequent Muslim environmentalist writers. It may be noted that Nasr, like most Islamic environmentalists, lives in the West and writes in English, largely for a non-Muslim audience, though some Islamic environmentalist works have begun to appear in Muslim countries and languages, including translations of earlier works published in the West.

Perhaps the first explicit attempt to articulate an Islamic position on environmental protection was a short tract commissioned by the World Conservation Union (IUCN) in 1983 and written by a group of Islamic legal scholars then based in Jeddah, Saudi Arabia. The resulting text was published in English, French, and Arabic, but very poorly circulated. One of the authors, the Iraqi-born Mawil Izzi Dien, went on to write a number of articles on Islam and the environment as well as the first full-length book on the subject, which he published in 2000. Izzi Dien has been engaged in attempting to establish a Centre for Islam and Ecology at the University of Lampeter, Wales.

A major watershed in the emergence of Islamic environmentalist discourse was the conference on Islam and ecology organized by Mary Evelyn Tucker and John Grim at Harvard University in 1998. Some forty Muslim scholars, politicians, and activists from around the world participated, and the resulting volume of papers, published as *Islam and Ecology: A Bestowed Trust* in 2003, is the largest single collection of writings on Islam and the environment as of 2007. Similar conferences have since been held in Muslim countries, including Saudi Arabia and Iran, and a growing number of scholarly and popular articles on Islam and the environment are appearing worldwide.

CONTEMPORARY MUSLIM ENVIRONMENTALIST MOVEMENTS

It should be noted that while increasing numbers of Muslims worldwide are engaging in environmental activism, their activism is more often motivated first by environmental concern than by religious belief. Thus much of this activism seems more "Western" than "Islamic," and many Muslim activists are only marginally religious or not at all. In the case of activists who are also believers, in most cases it would appear that the individuals involved first become committed to the environmental cause, then subsequently seek to understand and justify it in terms of their Islamic faith.

Similarly, while most governments of Muslim countries now have departments devoted to environmental protection, they are typically staffed by Western-trained scientists and policy-makers who often do not share many of the values of the broader society. The environmental programs initiated by such government organizations, which often focus more on the interests of tourism or local elites than on genuine environmental needs of the population (such as clean water, garbage collection, and so on), are frequently seen as ineffective or even illegitimate.

Moreover, in all Muslim countries, as elsewhere in the world, environmental concerns are almost invariably subordinated to the demands of development. Economic constraints limit the implementation of environmental protection programs and up-to-date technologies, and corruption and cronyism often privilege industrial and commercial interests at the expense of the environment. Finally, policies imposed by external organizations such as the International Monetary Fund (IMF) and the World Bank often lead to an increase in environmentally destructive activities and unsustainable projects which disproportionately hurt the poor.

Nevertheless, a small number of Muslim environmentalist organizations have proven effective, some of them promoting explicitly Islamic values. The most significant such organization is the Islamic Foundation for Ecology and Environmental Sciences (IFEES), established in Birmingham, England, by Fazlun Khalid. Since the early 1990s IFEES has conducted environmental education campaigns based on Islamic principles throughout the Muslim world. Among its successes are persuading the Muslim fisherman of Zanzibar to cease fishing with dynamite, and

getting religious schools in Indonesian villages to add environmental issues to their curriculum.

One Muslim country where suspicion of environmentalism as an alien Western ideology is largely absent is the Islamic Republic of Iran, where environmentalists have sought government approval by articulating their message and justifying their activities by using Islamic language. The Iranian government, for its part, has adopted strongly environmentalist rhetoric, though its environmental policies are often not put into action. One area in which Iranian government policies have been effective has been human population control. Beginning in the late 1980s an official policy of family planning was adopted, providing for women's health clinics and free contraceptives across the country, with the result that by the year 2000 Iran's fertility rate had dropped to only 1.8 births per woman, lower than that of many Western nations. This success story stands in contrast to most of the rest of the Muslim world, where population control is largely seen as Western propaganda and incompatible with traditional preference for large families. Recently, however, Indonesia has seen some success in implementing family planning programs as well.

While environmental awareness and familiarity with Islamic principles concerning proper attitudes toward nature remain extremely marginal throughout the Muslim world, this is slowly changing as Muslims increasingly suffer from the effects of severe environmental degradation and seek appropriate responses from within their own religious and cultural traditions.

SEE ALSO *Christianity; Environmental Activism; Environmental Education; Environmental Philosophy: V. Contemporary Philosophy; India and South Asia; Judaism; Population; Stewardship.*

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Richard Foltz

ISRAEL AND THE MIDDLE EAST

Respect for individual human life and the protection and promotion of health for all are among the core ethical values of Judaism, Christianity, and Islam. These core values imply the prevention of the environmental destruction, depletion, and contamination that jeopardize life, fertility, and reproduction for future generations. (World Congress of Imams and Rabbis for Peace 2008; Hessel 1998, Izzi Dien 1990). In all three a concern for equity in particular requires protection of the weak—a concept that merges with the environmental principle that protection of all from toxic exposures comes from protecting the most vulnerable from the effects of these exposures (Abumoghli 2006).

A HERITAGE OF REGIONAL CONFLICT

Can respect for life and health and a sense for conservation of environment overcome the region's endemic fanaticism and chronic incitement to terror and hate—which have led it to squander life and much of its capital, resources, and energy? Nearly one million people are estimated to have died in battle during the Iran-Iraq war (1980–1988); according to the Human Rights Watch Web site (1993), the genocidal campaigns of chemical warfare against the Kurds in Iraq under Saddam Hussein's rule are estimated to have claimed more than 150,000 lives, and 151,000 deaths are estimated to have followed the U.S. invasion of Iraq in 2003 (Brownstein and Brownstein 2008).

In the Darfur region of Sudan, desertification triggered a conflict between herders and farmers that served as the pretext for genocide (estimated 400,000 deaths) and ecocide (Richter et al. 2007). Its perpetrators were protected and supported by an outside enabler—China, coveting Darfur's oil reserves. On a much smaller scale, Israel and the Palestinian Authority, locked together in a tiny landmass, face choices between win-win strategies or

zero-sum strategies for protecting the land's carrying capacity and the health of its ecosystems. According to Israeli-Palestinian ProCon Web site (2007), some 4,400 Palestinians—nearly all young males—and more than 1,000 Israelis—from all ages and groups and both sexes—have been killed since September 2000, when the terror attacks of the second Intifada were initiated.

History tells us what happens in the region when there is war, conquest, exploitation, and depletion of environmental resources. In first-century Roman Judea (with a population of less than one million), Jewish farmers were able to feed their families and sell surplus yields of barley, grapes, figs, olives, and pomegranates. But Roman overtaxation of homestead farmers in the Judean hills—and throughout the Mediterranean area—triggered a slow but inexorable chain reaction of overcultivation, followed by loss of soil fertility, abandonment of terraced farmsteads, breakdown of hillside terracing, erosion, further loss of fertility, mass flight to the cities, cutting down of hillside forests to supply wood for building in the cities, and then urban poverty, unrest, riots, and hunger. The Judean hills west of Jerusalem have never fully recovered their fertility, although the rich silt that washed down to coastal areas from the depleted hills became the basis for agriculture in later centuries (Sperber 1974, 1991).

This three-to-four-century scenario of depletion and hardship occurred in a traditionally poor agrarian and mostly autarchic society forced to extract too much from its environment. In Jesus' time, most of the population of Roman Palestine was desperately poor, living on the edge of subsistence. The land's carrying capacity was determined by what it could grow. Today 7 million Israelis and 3 million Palestinians live west of the Jordan River; the once-agricultural coastal areas are now covered by cities, suburbs, highways, factories, military bases, and airports. Less than 3 percent of the Israeli economy is now based on agriculture. The economies of the Gaza Strip and the West Bank are still mainly agricultural. Nevertheless, the carrying capacity of Israel and the Palestine Authority's societies is determined only partly by agricultural yields and far more by their participation in the global economy, which requires access to energy, capital, the information economy, markets, trade, and the capacity for governance, civil society, stability, and social cohesion (Richter 2006). Political instability, war, emigration, and brain drains can disrupt, destroy, and deplete a society's human and natural capital. During the summer of 2006, missile, artillery, and air attacks from terror groups in Gaza and Lebanon—and the ensuing counterattacks—produced loss of life and limb, oil and sewage spills, forest fires and smoke, asbestos contamination, and an array of public health emergencies associated with the breakdown of everyday community-support services. Stepped-up terror attacks and bigger wars, with or without nuclear weapons, will bring much worse.

Israel, the Palestinian Authority, and Jordan, although separated politically, belong to a common ecosystem sharing the same water, air, arable land, and, to a considerable degree, pollutants and exposures to toxic substances (Abumoghli 2006, Richter 2007).

The dispersion of air pollutants and the flow of toxins in streams, subterranean aquifers, and sewers obey the physical laws of energy, gravity, and hydrodynamics, not politics. Global climate change, with its risks of coastal flooding and spread of desertification, along with the progression northward of vector-borne diseases by mosquitoes from tropical areas, pose an emerging region-wide risk.

Israel's population is much wealthier and healthier than those of its nearest Arab neighbors—and its tiny size obscures the fact that its ecological footprint per capita, along with Saudia Arabia, is greater than that of its neighbors, though smaller than that of major Western countries (see Table 1).

These differences pose the question: Can wealth and health be generated and sustained across the Middle East without producing enduring damage to the region's carrying capacity? So far, most of the time, governments of all the countries in the region have been too preoccupied with military threats and, by and large, have, until recently, regarded environmental concerns as an impediment to development or a distraction—except when pressured by advocacy groups—or by what appear to be sudden shortfalls, such as the current water crisis.

WATER RESOURCES AND WATER QUALITY

There always has been a water crisis in the Middle East. Population growth has always expanded to the limits of the scarcest available resource, which has usually been water. The Egyptians and Sumerians built elaborate irrigation systems based on the waters of the Nile and the Tigris-Euphrates. Later, the Nabateans who inhabited Israel's desert—the Negev—and Jordan, built gigantic networks of cisterns and irrigation canals to catch rainfall and runoff from flash floods in the Negev desert. Aqueducts built during the reign of Herod (ruled 37–4 BCE) brought water to the Second Temple—but Jerusalem's inhabitants collected rainwater in cisterns (Isseroff 2001).

Today Israel obtains nearly half its water from the National Water Carrier connected to a rapidly sinking Sea of Galilee and the rest from wells that tap into aquifers in the coastal area. These wells, many of which are now contaminated, are recharged by waters coming off the mountain watershed of upstream sources in the Sea of Galilee and back into Syria, Lebanon, and Jordan.

Ecological Footprint (Global hectares per person, in 2003 gha)

Country	Total population (millions)	Ecological footprint	Cropland	Grazing land	Forest: timber, pulp and paper	Forest: fuel wood	Fishing ground	Co2 Fossil fuels	Nuclear	Built-up land	Water withdrawals per person (1000m^3/year)2
Iran	68.9	2.4	0.52	0.13	0.04	0.00	0.08	1.52	0.00	0.09	1071
Iraq	25.2	0.9	0.10	0.02	0.00	0.00	0.00	0.75	0.00	0.00	1742
Israel	6.4	4.6	0.88	0.12	0.29	0.00	0.37	2.88	0.00	0.07	325
Jordan	5.5	1.8	0.49	0.07	0.08	0.01	0.20	0.82	0.00	0.09	190
Lebanon	3.7	2.9	0.68	0.07	0.18	0.00	0.08	1.85	0.00	0.05	384
Saudi Arabia	24.2	4.6	0.56	0.18	0.11	0.00	0.15	3.43	0.00	0.20	736
Syria	17.8	1.7	0.54	0.14	0.05	0.00	0.03	0.90	0.00	0.07	1148
Turkey	71.3	2.1	0.70	0.13	0.15	0.01	0.06	0.93	0.00	0.08	534

SOURCE: From Richter, Elihu. (2006). "Toxic Exposure in a Shared Ecosystem." *Bridges Magazine* 2 (6). Available from http://www.bridgesmagazine.org/nindex.php?page=issues.12.4.

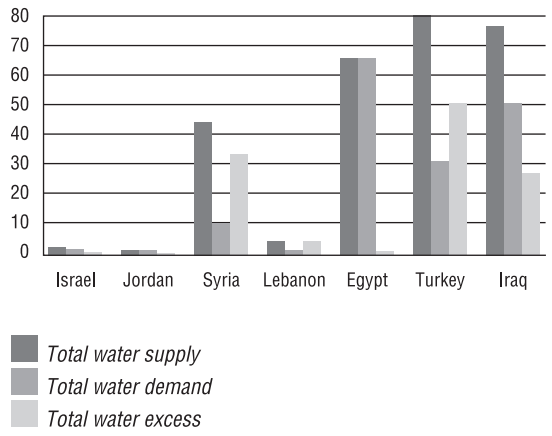
Table 1. *The ecological footprint measures the estimated impact of human activities on the environment in terms of the surface area required to produce everything that an individual or population consumes (transport, accommodation, food, etc.) and to absorb the resulting waste. It is expressed in hectares (ha) per person per year.* **CENGAGE LEARNING, GALE.**

Most Israelis—but not Palestinians or Jordanians—currently have enough water to drink, wash, cook, and dispose their sewage, and the disparities represent major asymmetries in power, economic development, governance, management, and maintenance as well as exploiting of latest technology, for example, desalination.

Contrary to widespread belief, problems with regional availability of adequate and safe water are a consequence rather than cause of the conflict. The water shortages have resulted from regional mismanagement, waste, poor conservation policies, conflict, and zero-sum policies rather than region-wide resource deficiency, as can be seen in the bar graph on water supply and consumption for the countries (see Figure 1).

Ever-expanding demand clearly requires desalination, more conservation, recycling, recovery, reuse of waste effluent, and domestic harvesting of water, the latter as in Roman times—and tradeoffs between water-rich and water-poor countries. Contamination of large aquifers with small amounts of toxins spoils their waters for drinking, washing, and domestic cooking; there is a clear need for zero-permissible emission standards for toxins from industrial and agricultural sources (Marei 2006, Isseroff 2001).

Supply and Demand of Water in the Middle East, 2000



SOURCE: From Issar, Arie S. (2000). "Water in the Middle East Conflict." Available from http://www.mideastweb. org/water.htm.

Figure 1. **CENGAGE LEARNING, GALE.**

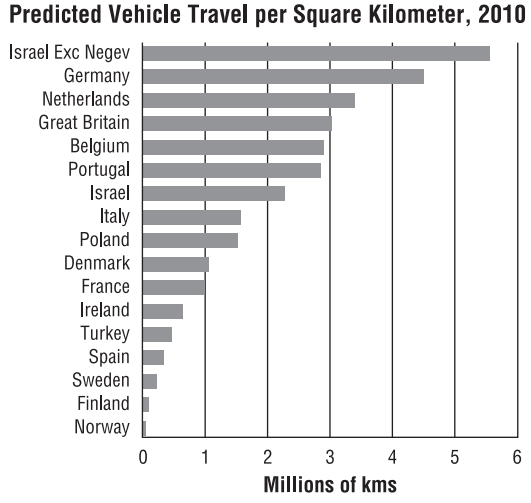
AGRICULTURE AND PESTICIDES

Agriculture is still the major source of livelihood for about half of the population in Jordan and the areas governed by the Palestinian Authority. Only a small percentage of Israelis work in agriculture. Israel is heavily dependent on irrigation, herbicides, insecticides, and fungicides, although figs, spices, and olives thrive in arid areas. The health, developmental, and ecotoxic risks

arising from overuse of organochlorines (endocrine disrupters that bioconcentrate in the food chain) and organophosphates (the major effect of which is neurotoxicity) are well known, as are intergenerational effects through in-utero exposures. Yet there is hard evidence to support strategies for increasing crop yield with less pesticide use from both Egypt and Israel. But an ethical commitment to life and its protection often requires use of pesticides to suppress epidemics of parasitic diseases transmitted by mosquito vectors which currently depend on pesticides (Richter et al. 1997).

TRANSPORT AND URBAN SPRAWL

The heaviest contributor to the region's ecological footprint comes from the enormous growth in roads, motor-vehicle transport, and urban sprawl. The scenario of "predict and provide"—which has led to more roads, more vehicles, more congestion, and, in turn, more road building, urban sprawl, and air pollution—is not only destructive to biblical sites but also has regionwide environmental and public health impacts, including increasing risks for respiratory disease and cancer in infants, schoolchildren, and older adults. Pollutants go from the tailpipes of well-off suburbanites to the windpipes of urban poor. Despite its relatively low rate of car ownership per capita compared to European countries, Israel is heavily congested with motor vehicles (see Figure 2).



SOURCE: Figure 1 from Fletcher, Elaine (2003). "Transport in the Middle East." *The Earthscan Reader on World Transport Policy and Practice*.

Figure 2. CENGAGE LEARNING, GALE.

Bus, truck, and taxi diesel emissions of particulates, polycyclic aromatic hydrocarbons, and other volatile organic compounds (VOCs) contribute disproportionately to health-related air pollution risks in Israel, although regional vehicle traffic and industrial emissions produce only a miniscule contribution to worldwide $C0_2$ emissions.

The recent growth of rail travel—as well as bicycle use—although an extremely important trend, still accounts for well under 10 percent of all intercity travel in Israel. Runoff of sludge, contamination of aquifers, loss of surface earth for filtration, loss of green spaces, and leakage from gasoline storage tanks into groundwater are the results of massive road construction from 1993 to 2008. Sludge from oil refineries is the major solid waste component of toxic waste.

INDUSTRIAL POLLUTION AND WORKER HEALTH

Protecting the most exploited, exposed, and vulnerable—especially workers in industry and agriculture, including women of childbearing age—is a key ethical priority. In the Haifa Bay area—Israel's industrial powerhouse—worker exposures and industrial point-source stack emissions of metals, gases, and solvents probably account for the region's excessive incidence of morbidity and mortality from cancer and cardiorespiratory disease. Since the 1980s there have been epidemics involving workers, adjacent community populations, and others. The causes are diverse: exposures to asbestos; mercury releases into the work environment and seawater from a mercury cell chlor-alkali plant; massive contamination of fields and aquifers with nickel and cadmium from a battery factory; multiple exposures and releases from armament factories; release of bromines; exposures to solvents, pesticides, and volatile gases in pesticide-manufacturing plants; massive contamination of ground, air, and water in the vicinity of the national toxic-waste dump; and ionizing radiation from a nuclear reactor. Toxic effluent from "clean" factories that manufacture silicon chips and other components for high-tech products present new risks.

INCITEMENT: THE MOST TOXIC ENVIRONMENTAL EXPOSURE?

There is a need to recognize that the significance and importance of all the foregoing "traditional" exposures is dwarfed by state-sponsored incitement and hate language, which leads directly to terror, violence, and war and their ecotoxic effects, and diverts energy, capital, and resources away from sustainable development and environmental protection. Such incitement and hate language is the software that leads to the use of the hardware—the guns, rockets and missiles, and weapons of mass destruction, which kill, maim, and destroy. As with other toxic

exposures, it is the children who are the most vulnerable and in whom the effects are most long lasting. Children exposed to incitement and hate language become programmed to act on its messages as they grow up, thereby ensuring the intergenerational perpetuation of violence through the generations. Therefore, people have to apply public health models of surveillance to identify and ban the use of hate language and incitement to prevent its toxic effects to this and coming generations.

ETHICS AND THE WILL TO ACT

The precepts of environmental ethics presuppose the will to act. They are based on the principle that the quality of life (and life itself) requires clean air, water, food, and policies for sustainable development. In the region there are existential pressures to promote live-and-let-live policies in keeping with core principles promoting life, equity, and cooperation through the preservation and protection of health and environmental and social capital. There have been examples of translating this principle into cooperative action. But there is no assurance that win-win scenarios to protect life and the environment will prevail over the cults of hatred, violence, and death. So far, regional and outside powerbrokers have not firmly and unequivocally supported a commitment to ethical values of life and respect for life, and environment, but sometimes seem to prefer the panacea of injecting of huge amounts of financial and military aid. In choosing respect for all life over death, the region's leaders need to develop strong national and regional frameworks based on regional cooperation and effective, coherent, and sustainable environmental policies.

Israel and its Arab neighbors lag behind Europe and North America in environmental philosophy, legislation, and regulation, which remain skeletal and inadequate for the scale and complexity of modern environmental problems. Cost-benefit analysis (rather than cost-effectiveness) and short-term gain rather than long-term impacts remain the guiding motifs. The most notable shortcoming is the failure to develop and enforce substitution strategies and emission standards at the source. The potential for change rests on meshing the protection of the environment and the promotion of public health with the geostrategic advantages to be gained from reduced dependence on fossil fuels and cooperation in protection of vulnerable populations. Several key strategic interventions would advance sustainability, carrying capacity, and public health:

1. Implement zero-emission strategies for controlling industrial and mobile emissions to air, land, and water at the source through substitution strategies, substitute technologies, recovery of emissions, and incineration-recovery technologies (''waste to energy'').
2. Arrest and reverse ''predict-and-provide'' policies by freezing all new road construction.
3. Stop urban sprawl and suburbanization to protect green spaces.
4. Promote energy-efficient rail and integrated transport systems to reduce dependence on private automobiles.
5. Protect vulnerable neglected populations, notably those in work environments, from toxic exposures.
6. Promote ''green building codes'' with proper insulation, proper siting of buildings, and proper roofing, with a possibility of rainwater harvesting.
7. Maximize use of the region's most important renewable-energy source—solar power—and reduce dependence on oil.
8. Promote research and development on increasing crop yield with less pesticide use.
9. Bury power lines and use more fiber-optic technology to reduce exposures to electromagnetic fields.

SEE ALSO *Deserts and Desertification; Pesticides; Sustainable Development; Water.*

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Elihu Richter

Encyclopedia of Environmental Ethics and Philosophy

VOLUME 2

JACKSON TO WRIGHT
APPENDICES, INDEX

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JACKSON, WES
1936–

Wesley Jackson, agricultural scientist, founder of the Land Institute, and proponent of perennial polyculture, was born on June 15, 1936, and grew up just outside Topeka, Kansas. Jackson pursued a variety of options for environmental activism during his career, developing one of the first environmental-studies texts, founding an alternative school, and developing an agricultural-research institution. His most significant contribution to environmental thought was the plant-breeding research at his institute, where he attempted to apply the idea of biomimicry (or nature as model) to science and agriculture.

Jackson earned his Ph.D. in plant genetics at North Carolina State University in 1967 and then moved to Kansas Wesleyan University to teach. While there, he transformed an introductory biology course into one titled Man and the Environment, and in 1971 he edited a textbook based on that course. Though he was raising student awareness of environmental issues, he was not satisfied with his impact.

In 1974 he took a sabbatical and, as part of the back-to-the-land movement, moved to a plot of land in Salina, Kansas. Eventually he and his then-wife Dana founded the Land Institute to create an ideal learning environment and to explore appropriate technology. He also explored environmental ethics. In 1976 he presented a paper called "Toward an Ecological Ethic," in which he lightheartedly suggested that Aldo Leopold would be the most important thinker in an ecological Bible. Yet in the end it was not in philosophy, but in the practical application of ideas, where Jackson's work proved most significant.

The foundations of his later work were presented in the 1978 article "Soil Loss and the Search for a Permanent Agriculture," published in *The Land Report*, the journal of the Land Institute. Soil erosion provided an immediate spur for Jackson to consider how the split between humanity and nature might be addressed. In this he followed in a line of agricultural conservationists who see preservation of soil and the wise use of it as important for human health. He suggested that a more sustainable agriculture would rely on the imitation of key aspects of natural systems. In nature, multiple plant species grow in a field, and the soil is not disrupted each year for planting. Hence, a more sustainable agriculture might also follow those traits.

He further developed his ideas about perennial polyculture and science in his books *New Roots for Agriculture* (1985 [1980]) and *Altars of Unhewn Stone: Science and the Earth* (1987). The Land Institute slowly transformed from a school into a research institute. In his work Jackson sought to develop an agriculture suited to his region, and so he studied the prairie ecosystems of the Great Plains as models. In his emphasis on using nature as a model, he was a pioneer in the field of biomimicry.

Jackson assigned practical and philosophical value to functions at the ecosystem level. Early on, a sense of holism motivated his proposal, but eventually he drew on the work of J. Stan Rowe and Arnold Schultz to argue more specifically that emergent properties on higher levels of organization require identification and respect. Jackson was less interested in valuing the ecosystem in itself than he was in preserving properties of the ecosystem. He believed that plants can be grown more efficiently when humans make use of the properties of the ecosystem.

Jackson looked at two key ecosystem-level properties, one being polyculture and the other being perennialism, which his research staff focused more on as years passed. Agriculture that uses perennials can protect a host of soil microorganisms and the interactions between them, which annual plowing disrupts. The Land Institute saw roots and what occurs in the soil as important, as shown by its logo. Their research assumed that what evolved did so because it developed a useful function in an ecosystem, and thus all aspects of an ecosystem can be worthy of study and preservation. In *The Land Report* through articles by himself and others, and perhaps more so through the photographs of Terry Evans, Jackson promoted an ethic of respect for the prairie (which had few champions when he began his work).

Mainstream agricultural research since World War II promoted reductionism in what it studied and valued, focusing on plants in relative isolation and on chemicals that could be applied to those plants. Little value was assigned to interactions between plants and soil, or to interactions among plants. Little value was assigned to farmers or to the knowledge that farmers developed. The knowledge developed by scientists was privileged, as was the goal of increasing production per acre, and the realization of this goal continually put more and more farmers out of work.

Jackson's work developed in response to these trends. He valued systems, not just parts in isolation. So when he used nature as a model, it was originally on the ecosystem level. Even when he focused more exclusively on perennialism, he did so in part to preserve soil interactions. He sought to respect farmers by having the Land Institute develop a presence in Matfield Green (a small town near Salina), and he made the case for protecting rural communities in his book *Becoming Native to this Place* (1994). Though farmers rarely contributed to his research, he hoped that farmers' knowledge could eventually play a role in a future sustainable agriculture, with farmers breeding species appropriate to their particular places.

Along with focusing on the practicalities of agriculture, Jackson also sculpted an epistemology different from that of most research. He did not believe that laboratory experiments were an effective means of gaining knowledge about nature, since results in the field were so different from results in experiments. For Jackson, reductionist experimental knowledge was of questionable utility and validity. Along with his frequent collaborator Wendell Berry, Jackson promoted a worldview cognizant of human ignorance, arguing that what humans do not know is much greater and more significant than what humans do know. He hoped that humans could find ways to benefit from natural processes, even if they did not understand how those processes functioned. He sought an agriculture that, as he phrased it, relied more on nature's wisdom and design, and less on human cleverness.

SEE ALSO *Agriculture; Berry, Wendell; Environmental Activism; Environmental Education; Environmental Philosophy: V. Contemporary Philosophy; Land Ethic; Regionalism; Shiva, Vandana; Sustainable Agriculture.*

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Jeffrey M. Filipiak

JAINISM

Jainism, which originated prior to 500 BCE in northeastern India, supports key ideas and practices that accord well with environmental ethics. Its cosmology states that soul (*jiva*) is found even in plants and the elements, and its rules of behavior advocate avoiding harm to all beings. Its monastic and lay leaders have advocated personal and societal life patterns that protect life in its myriad forms.

The oldest extant Jain text, the *Acaranga Sutra* (ca. 300 BCE), proclaims that "a wise person should not act sinfully towards the earth, nor cause others to act so, nor allow others to act so" (1:1.3; anon. 1968, p. 5), that one "should not kill, nor cause others to kill, nor consent to the killing of others" (1:3.2; anon. 1968, p. 31), and that "all breathing, existing, living, sentient beings should not be slain, nor treated with violence, nor abused, nor tormented, nor driven away. This is the pure, unchangeable, eternal law" (1:4.1; anon. 1968, p. 36). These passages outline the fundamental rule to be obeyed by all Jains: the observance of nonviolence (*ahimsa*). This exhortation extends not merely to behavior toward other humans but, as noted,

also to behavior toward the earth itself, toward the elements (water, fire, and air), and toward plants and animals. This earliest text outlines several techniques for avoiding violence to living beings, including not wearing clothing produced in ways that unduly harm mobile living beings, such as fur or silk garments; not consuming meat, fish, or eggs; and not moving about excessively during the rainy season (this last practice helps one to avoid stepping on the many insects that proliferate when it rains).

Jains remember twenty-four great religious leaders, of whom the most recent was Mahavira Vardhamana. Early Jain textual and archaeological materials indicate that Mahavira Vardhamana most likely lived in the fifth century BCE and taught a fivefold discipline of nonviolence, truthfulness, not stealing, sexual restraint, and nonpossession. He was preceded by Parsvanath, a Tirthankar (enlightened ascetic) who lived around 800 BCE. Later texts extol these twenty-four great teachers' accomplishments, especially the *Adipurana* of Jinasena (ninth century), which tells detailed stories about Rsibha, the first Tirthankar, and his son Bharata, the first world ruler. Like his successors, this first teacher, as an expression of his deep commitment to nonviolence, eventually renounced all clothing and entered death in old age by refusing food.

Jain literature and philosophy parallels that of the other two great ancient traditions: Brahmanic Hinduism and Buddhism. All three traditions concern themselves with making sense of the human condition. For Hinduism, adherence to one's dharma (duty), observance of ritual, and prayerful reflection and meditation constitute the good life. Buddhists seek to understand the root causes of human suffering and to follow an eightfold path of ethical behavior and meditation. Jainism emphasizes the role of ethics in advancing along a fourteenfold path toward total liberation. All three traditions include detailed assessments of karma, particularly in the Samkhya texts of Hinduism, the Abhidharma texts of Buddhism, and the extensive commentaries on Umasvati's *Tattvartha Sutra* (ca. 400) in Jainism, along with the *Karmagranthas*, the *Pancasamgraha*, and the *Karmaprakrti*. These texts make clear that action (*karma*) taken in the present will leave a residue or seed (*samskara*, *vasana*, *bija*) that will bear fruit (*phala*) at some future time. Consequently, ethics must be assiduously observed to assure a propitious outcome to human endeavors.

Jain philosophy accords particularly well with thinking about the state of the material world. According to Jainism, as poetically expressed by Mahavira and encapsulated in the aphorisms of Umasvati, life forms pervade the universe. From time without beginning, masses of living entities, known as *jivas*, have operated reciprocally with matter (*dravya*, *karma*) through movement (*dharma*) in time (*kala*). The *Acaranga Sutra* warns that life is to be found even in the particles of the earth itself, and that to avoid accruing harmful karma that will ripen inauspiciously, monks and nuns must shun any abuse to living creatures, including plants and the soil itself. Water must be strained to avoid ingesting small bugs, and food must be eaten before sunset so as to avoid inadvertently harming anything. In some traditions, various unusual observances can be found for protecting the status of one's karma. For instance, in the Sthanakvasi Svetambara branch of Jainism, monks and nuns generally wear a mouth covering (*muhpatti*) to avoid harm to the air and the beings living in the air through breathing or speaking too forcefully. The covering also prevents one from inhaling bugs. Even laypeople wear the *muhpatti* on special occasions, such as during temple visits, during particular holidays, or just to increase one's awareness while at home. All Jains espouse vegetarianism. Although they acknowledge that harm is done by taking the lives of plants, this is seen as necessary for survival. Periodic fasting is universally observed by all Jains, the most notable being the fast of Parysan, which occurs a few weeks before the fall equinox. Fasting ensures that no life forms have been injured or killed to support one's own life.

Jains have developed a scrupulous regimen for deciding what livelihoods are most conducive to the observance of nonviolence. As early as the *Acaranga Sutra*, lists were developed prohibiting Jains from participating in specific occupations that kill or injure animals (*Acaranga Sutra* 1:1.6; anon. 1968, p. 12). Consequently, Jains will not participate in butchery, livestock rearing, or agricultural practices that abuse animals. This concern results in the shunning of perhaps less obvious forms of violence as well: "dealing in charcoal, selling timber, driving oxcarts, dealing in ivory, manufacturing or selling alcohol, dealing in poisons or weapons, burning fields, draining water, breeding destructive animals" (Jaini 1979, p. 172). Six professions are approved: government, writing, farming, education, commerce, and crafts. The most preferred occupation for Jains is commerce. By some estimates, Jains constitute the single wealthiest group within India today—a result in large part of generations of conscious choice of profession.

Jains have developed a profound ethical awareness and conscience in their worldview, which sees life forms as passing through a cycle of birth after birth and regards every human being as having spent time as an almost unimaginable array of other life forms, including animals and bacteria (referred to by Jains as *nigoda*). Knowing that they were once sheep or goats or cows, they take special care to protect all animals. Even kindling fire becomes problematic for observant Jains, on account of the physical pain created by the friction of generating a flame. Jain monks and nuns never light or extinguish lamps or cook food. Lay Jains often avoid overusing

electricity, with some families eschewing air conditioning not for lack of wealth but out of concern not to steal from other life forms for the sake of one's own physical comfort.

Jains adhere to nonviolence to purify their own souls. Jainism does not escape anthropocentrism and in fact lauds human birth as a necessary prerequisite for the liberation of the soul. The ultimate goal, omniscience (*kevala*), exists beyond the concerns of birth, life, death, and rebirth. Jainism does not advocate love of nature in the sense that it might be practiced in New England, but preaches self-restraint and caution around nature. If one harms a being, that harm will return to hurt oneself. Jain literature, such as the story of Yashodhara, does not celebrate the beauty of plants and animals, but rather serves as a cautionary tale, warning its reader not to succumb to the violence and lust that runs rampant in nature (Chapple 2006, pp. 241–249).

Various Jains in the past several decades have taken leadership roles in calling attention to problems of pollution and environmental degradation. In 1949 Acarya Tulsi, a confidant and adviser to Mahatma Gandhi, promulgated a list of twelve vows, starting with a vow not to commit violence in any form, and ending with "I will do my best to avoid contributing to pollution" (Kumar and Prakash 1997, p. 71). L. M. Singhvi, a member of Parliament who also served on India's Supreme Court, published *The Jain Declaration on Nature*, which lists the core teachings (nonviolence, interdependence, the doctrine of manifold aspects, equanimity, and compassion) that constitute the foundation for a Jain ecological ethics. He reiterates that in Jain cosmology, life pervades the world, appearing as "earth-bodies, water-bodies, fire-bodies, air-bodies, vegetable-bodies, and mobile bodies ranging from bacteria, insects, worms, birds and larger animals to human beings, infernal beings, and celestial beings." Singhvi asserts that by applying the five traditional vows and practicing kindness to animals, vegetarianism, avoidance of waste, and charity, one can find "a viable route plan for humanity's common pilgrimage for holistic environmental protection, peace, and harmony" (Chapple 2002, p. 222).

The traditional worldview developed by the Jain community over the course of several centuries could not directly anticipate the environmental crises of the twenty-first century. It does, however, provide conceptual resources that might be marshaled and applied to specific problems as they arise. The complexity of environmental issues requires approaching each situation from a variety of perspectives. The Jain philosophy of many-sidedness (*anekanta*) can be instructive in this regard. John Cort has pointed out that one of the Jain environmental initiatives in India, planting trees to reforest the mountain that houses the renowned Satrunjaya temple complex, has prevented shepherds from grazing their sheep on lands once accessible in common (Chapple 2002, p. 89). Environmental justice, though perhaps enhanced by vegetarianism and kindness to animals and monastic communities that leave a negligible footprint on the earth's resources, requires a level of social and economic analysis broader than the simple observance of a moral code. Interpreting and applying the principles and practices of Jainism to the environmental problems of the early twenty-first century presents new challenges to this ancient faith.

Jains are well poised to make strategic business decisions to help protect the environment. In India they are well known for their ownership of major newspapers, steel companies, mining concerns, and insurance companies. As knowledge comes to light regarding the potentially devastating effects that global climate change will have on India, Jains hold positions of leadership and can provide an important voice for change. As the Himalayan glaciers continue to melt, some have estimated that by 2050 the Ganges River will go dry for a few months each year. Jain industrialists and jurists may support legislation that can slow the progress of global climate change. Relief agencies will need continued support from Jains as flooding and heat spikes create a need for emergency food and shelter. Jain engineering firms might also help design and implement water-catchment systems to compensate for lost river water. Jains are well positioned and hopefully will respond to the challenges posed by climate change.

SEE ALSO *Animal Ethics; Asian Philosophy; Buddhism; Environmental Justice; Global Climate Change; Hinduism; India and South Asia; Pollution; Vegetarianism.*

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Christopher Key Chapple

JAMIESON, DALE
1947–

Dale Jamieson was born in Sioux City, Iowa, on October 21, 1947, and received a doctorate in philosophy from the University of North Carolina in 1976. He is currently a professor of environmental studies and philosophy, an affiliated professor of law, and the director of environmental studies at New York University. He is the author of *Morality's Progress* (2002) and *Ethics and the Environment: An Introduction* (2008), the editor of *A Companion to Environmental Philosophy* (2001) and *Singer and His Critics* (1999), and the coeditor of *Reflecting on Nature* (1994) with Lori Gruen and *Readings in Animal Cognition* (1996) with Marc Bekoff.

Jamieson approaches environmental philosophy from a perspective that is "philosophically naturalist, morally consequentialist, and metaethically constructivist" (Jamieson 2002, p. vii). His contributions to the discipline have been so broad and deep as to defy easy summary, but the following aims to give a sense of some of the most prominent work.

First, Jamieson has published extensively on the ethics of the treatment and study of nonhuman animals, especially on cognitive ethology, animal cognition, and animal experimentation. In general, he defends an animal welfare approach that is based on a utilitarian ethic that places substantial value on individual liberty for both humans and animals. Perhaps his most famous essay in this area is "Against Zoos" (1986), which has been widely anthologized. In it he argues for two claims: Although there is something to be said for the usual defenses of zoos—for example, that they educate people about animals and assist in preserving endangered species—these defenses provide reasons for different types of zoos, and these reasons are in tension with each other; and, despite their positive aspects, all things considered zoos ought to be abolished because they deny liberty to individual animals, cause significant suffering in other respects, and "teach us a false … [and also 'dangerous'] … sense of our place in the world" (Jamieson 1986, p. 175).

Second, Jamieson has written a number of influential articles that critically examine, and reject, key environmental concepts such as ecosystem health and sustainability. In general, he believes that people should be wary of attempts to articulate environmental concerns through the invention of new quasi-scientific terms because "the environmental problems we face are not fundamentally scientific problems … but [problems] in our institutions of governance, our systems of value, and our ways of knowing" (Jamieson 2002, p. 224). Instead, they should seek positive visions of ways to relate to animals and nature that have been absent from the Western tradition to this point.

Third, Jamieson has worked to undermine a number of important schisms in environmental philosophy, such as those between animal advocates and environmentalists (Jamieson 1998), between metaphysical realists and subjectivists (Jamieson 2003), and between those concerned with environmental justice between humans and those concerned with the human relationship to nature (Jamieson 1994).

Finally, Jamieson has been a pioneer of work on the ethical aspects of climate change. His many articles on the topic include the early paper "Ethics, Public Policy and Global Warming" (1992), which assails contemporary economics as a useful paradigm for understanding climate change; "Adaptation, Mitigation, and Justice" (2005), which argues that both adaptation and mitigation need to be addressed in a serious climate policy; "Ethics and Intentional Climate Change" (1996), which explores the moral constraints that should be imposed on any attempt to "geoengineer" the climate; and "When Utilitarians Should Be Virtue Theorists" (2007), which argues that, in order to confront the looming environmental crisis, utilitarians should embrace an uncompromising set of green virtues.

In addition to his substantial research effort, Jamieson has made major contributions to the development of the field. He coedited an early reader on the topic (Gruen and Jamieson 1994) and helped the discipline come of age with his monumental *A Companion to Environmental Philosophy* (2001). More generally, Jamieson has spent many decades acting as an effective bridge between

mainstream academic philosophy and environmental issues, not only playing a significant role in encouraging the younger philosophers in the field but also explaining and defending the usefulness and integrity of applied ethics in general to a sometimes skeptical wider audience. On this topic, his essay "Is Applied Ethics Worth Doing?" (1988) is widely regarded as a classic.

SEE ALSO *Animal Ethics; Global Climate Change; Life: Respect/Reverence; Utilitarianism.*

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Stephen Gardiner

JAPAN

Encompassing some 3,000 islands in the Pacific Ocean in East Asia, Japan is one of the great economic success stories of the post–World War II era. Although it ranks tenth in the world in population (127,433,494 as estimated in 2007), it is the world's third-largest economy (behind the United States and China) by one measure (purchasing power parity) and the second-largest (behind the United States) by other yardsticks (real gross domestic product [GDP] and nominal GDP). Japan's economic might is all the more remarkable considering the starting point—the country was in economic ruins after its defeat in World War II but applied its collective energy and entrepreneurial ingenuity in achieving a spectacular recovery: near-miraculous annual growth rates of an average of 10 percent in the 1950s and 1960s, 5 percent in the 1970s, with declining but steady rates of growth since then. Home to the world's largest automaker—Toyota—and one of the world's most powerful media and electronics conglomerates—Sony—Japan has led the way among industrial powers in confronting the tradeoffs between economic growth and environmental protection. Toyota and Honda were among the first auto companies to offer hybrid vehicles, and their fleets of cars rank among the highest in fuel efficiency and the lowest in emissions. Japan hosted the 1997 conference that promulgated the Kyoto Protocols on climate change (to which it is a signatory).

JAPANESE RELIGION AND NATURE

Japanese attitudes toward nature and the environment have deep roots in the religious traditions that have shaped the country's cultural ethos. Japan's indigenous religion, Shinto, is a form of animistic nature worship, in which the divine "kami" (deities, spirits, or gods) are believed to reside in animals, trees, rice fields, and certain human beings. Viewed from a contemporary perspective, Shinto might be called an ecoholistic religion because not only sentient beings but also whole mountains and the land itself are the objects of worship. Every village once had its own Shinto shrines, many of which still exist today. Buddhism, Taoism, and Confucianism found their way into this religious context but were transformed and melded into native Japanese traditions.

Buddhism thrived in the Nara and Heian era (710–1180). The Buddhist monks Kukai (774–835) and Saicho (767–822) propounded the belief that "mountain, river, grass, and trees have attained Buddhahood." This thesis is different from the sentient/nonsentient dualism of original Buddhism and expresses the ecological continuity of beings. In the Kamakura era, Zen Buddhism thrived, represented by Dōgen Zenji (1200–1253) (Callicott 1994).

After a period of civil war, Japan was united. Thus began the Edo Era (1603–1867). Edo (today's Tokyo) was densely populated (roughly 1 million people resided there in the seventeenth century) and because the ruling class itself was not wealthy, the difference between rich and poor was small. Meat eating and land development were illegal. Edo society retained and even enriched the natural environment by its symbiotic human/nature interactions.

When Jesuit missionaries visited Japan, some major local rulers accepted Christianity, but later the missionaries were exiled, and Japan became a closed country with the exception of the admission of occasional foreign traders. The principal ideological opponent of Christianity was Hukan Fabian (1565–1621), the author of *Refuting Deus*. By then Buddhism had become the national religion; every family had both Shinto and Buddhist altars in its house. Further, Confucianism was adopted as a governmental ideology, and its implicitly ecological world view thus complemented the combined Buddhism and Shinto traditions of Japan.

Japanese Confucianism was founded by Kaibara Ekken and developed and practiced by Ogyu Sorai (1666-1728) and Ninomiya Sontoku. For Japanese Confucians, "heaven" ("heaven-earth-nature" or *ten-chi-sizen*) was a symbol of the natural environment. Although the social ethics of these thinkers was similar to today's European and North American utilitarianism, their environmental views were ecoholistic, giving serious consideration to nature's welfare or well-being. Sorai's ethicopolitical outlook respected heaven and the happiness of people; hence human happiness was embedded in an ecological worldview. Sorai's motto was "happiness of people and world peace."

When Japan was forced to open it economy and culture to Europe and North America in the 1850s, the goal of "rich country, strong army," based on European Enlightenment ideals, became the guiding spirit of the age. Japan's national independence became an overriding concern of public policy. Yet the leading philosophers such as Nakamura Keiu were originally Confucians. Keiu combined his own belief in a Confucian heaven with a Christian God. Uchimura Kanzo (1861–1930), a leading Christian thinker, argued for an agriculture-based (instead of industry-based) state, "small-countryism" and "non-warism," positions that ran against the tide of industrialization and imperialism. Contrary to other Enlightenment thinkers, they accepted utilitarianism in the social and ethical spheres while retaining a traditional Confucian view of nature.

Although Japan began to evolve into a capitalist-industrial society under the influence and pressure of the United States and European powers, the culture remained steeped in traditional Shinto, Confucian, and Buddhist thinking while critically evaluating and absorbing European ideas. Out of this confluence original Japanese philosophies have emerged. The so-called Kyoto School, led by Nishida Kitaro (1870–1945), created a nondualistic philosophy based on Zen Buddhism. Some of the members of this school argued against European and North American modernism. Their philosophies were mainly concerned with religion, aesthetics, and culture. Today the Kyoto School is reviving, but it has not yet given much attention to the global ecological crisis, despite the influence on global environmentalist thought by Nishida's friend Daisetz Teitaro Suzuki (1870–1966).

ENVIRONMENTAL CONCERNS SINCE WORLD WAR II

Japan's defeat in World War II drastically shifted people's attitudes and values toward modern anthropocentric concerns. Under the guidance of the occupation authority, traditional thought was suppressed and channeled toward European and North American modernism. Modern democratic values eclipsed traditional morals. The attack against traditional thought—now denigrated as the ideology of a feudal, class society—prevailed and become institutionalized.

Japan's economic success—attained through aggressive industrialization—brought with it domestic environmental degradation and, indeed, some environmental calamities that were subsequently ameliorated. The most notorious was Minamata disease, a neurological syndrome caused by severe mercury poisoning. It was caused by the methyl mercury in the effluent from the Chisso chemical factory from 1932 to 1968; this effluence bioaccumulated in the marine life of Japan's Minamata Bay and the Shiranui Sea. Those eating seafood from these waters were the principal victims; their misfortunes made the dangers of heavy-metals pollution well known to medical science.

More subtly destructive was the introduction of the rich lifestyle of affluent societies, which displaced the traditional symbiotic way of life. Mass consumption and mass abandonment replaced traditional recycling systems. Indeed, the industrialization of densely populated Asian countries, following the models of European and North American modernism, is a major force in the contemporary global ecological crisis.

Those Japanese thinkers who are disciples of European and North American modernism have paid scant attention to the contemporary environmental crisis. However, if Japanese thinkers honestly confront the global environmental crisis, criticize the modernism (including industrialization) that produced it, and revive the traditional philosophies with their rich heritage of environmental

Victim of Mercury Poisoning, Minamata, Japan. *A woman holds a victim of "Minamata Disease," or mercury poisoning, in Japan in 1973. Many of the victims of the disease suffer from physical deformities, such as the malformed hand of the girl shown. Between 1932 and 1968, Chisso Corporation, originally a Japanese fertilizer and carbicle company, dumped an estimated 27 tonnes of mercury compounds into Minamata Bay.* **AP IMAGES.**

ethics, then a distinctive environmental philosophy can emerge in Japan (Callicott 1994).

Since the 1960s Japan has seen the emergence of various green civil movements, sometimes spurred by overseas aid programs focused on environmental quality. Books concerning green movements in other parts of the world (such as Vandana Shiva's [2005]) are being translated and introduced to the Japanese public. In academic circles various research projects on the environment have arisen, including the founding of the Society for Studies on Entropy, a group that brings together physicists, economists, and environmentalists to discuss the nature of living systems, technology, and sustainable modes of economic growth (1994–2003).

SEE ALSO *Buddhism; Confucianism; Pollution; Utilitarianism.*

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JEFFERS, ROBINSON
1887–1962

Robinson Jeffers, born in Pittsburgh, Pennsylvania, on January 10, 1887, was a regional poet. His work is rooted in California, but it speaks of larger themes, such as the cycles of life, the cruelty of humans, the dance of death and renewal, and the ways in which culture and civilization can blind people to the beauty of the world. Jeffers published over fifteen volumes of poetry in his lifetime. He wrote epic narrative and lyrical poetry. He laid a foundation for bioregionalists and environmentalists concerned with place and human obligations to nature.

In September of 1914, Jeffers and his wife Una moved to Carmel, California. There, under the influence of the Big Sur coast and its people, Jeffers found his voice. His collection *Californians* (1916) described the Big Sur region and explored ideas about the decline and future of Western civilization. By 1919 Jeffers and his family had moved two miles south of Carmel to live on the windswept, rocky coast. Jeffers learned the craft of stonemasonry. With local granite, he built Tor House for his family residence and Hawk Tower, a four-story tower overlooking the Pacific. Jeffers wrote poetry in the morning. In the afternoon, he worked with stone and tended to the trees he had planted, a grove of over two thousand eucalyptus, cypress, and pine trees. His poetry and his life grew out of his attachment to this place along the Big Sur coast. It was a landscape of rock, stormy skies, kelp, sea lions, and intense, passionate people. Jeffers remarked that his poems grew like a plant out of particular places—a canyon; a promontory; a relationship of rock, water, wood, and grass.

Jeffers's poetry not merely described these places, but plunged into symbolic and metaphorical depth. The West was the place of the Pacific Ocean, but also of the end of

Robinson Jeffers, 1934. *Robinson Jeffers was an early twentieth-century poet known for his symbolic and metaphorical depictions of the natural world. Jeffers also developed the concept of "inhumanism," seeing the nonhuman as significant.* **COURTESY OF THE BANCROFT LIBRARY, UNIVERSITY OF CALIFORNIA, BERKELEY.**

western migration and the end of human civilization. In such collections of poetry as *Tamar and Other Poems* (1924), *Roan Stallion, Tamar, and Other Poems* (1925), *The Women at Point Sur* (1927), and *Give Your Heart to the Hawks and Other Poems* (1933), Jeffers developed themes that would remain consistent throughout his work. He believed that poetry should be of beauty and of larger things; poetry was a way to deepen our awareness of the nature of the world—the flux, the beauty, the cycle of death and rebirth. His long, epic narratives are laden with violence, murder, and incest. These narratives are indebted to Greek tragedy and are based on stories and people from the Big Sur region. The characters are rough, violent, passionate, and driven to destruction. Jeffers despaired of human cruelty and self-centeredness. For Jeffers, it was civilization that blinded people to the beauty and divine nature of the world. His poetry is a reminder and a tribute to the natural world. His lines are filled with hawks, water, rocks, cypress trees, pelicans, and horses. His poetry brings attention to the natural world and asks that people participate in it.

Jeffers developed the concept of inhumanism, in contrast to the idea of humanism. Inhumanism represents a shift from seeing humans as significant to seeing the nonhuman as significant. Inhumanism is a move away from egocentrism to an acknowledgment of the divine beauty of the world. People must overcome self-centeredness to keep their integrity and appreciate nature. In "The Answer," Jeffers writes,

For Jeffers, we must move away from an
obsession with self to love things greater than ourselves. To do otherwise is to suffer pain and confusion.

Loren Eiseley, in the foreword to *Not Man Apart* (1965), shows how Jeffers, his poetry, and the Big Sur coast are all connected. Eiseley writes, "The sea-beaten coast, the fierce freedom of its hunting hawks, possessed and spoke through [Jeffers]. It was one of the most uncanny and complete relationships between a man and his natural background that I know in literature" (p. 23). The rocky, windy coast of Big Sur carved Jeffers and his poetry.

SEE ALSO *Deep Ecology; Regionalism.*

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Lisa Gerber

JUDAISM

Judaism's teachings, including those on environmental matters, derive their authority from being found in,

traced to, or implied by the Torah. In Hebrew, *torah* means "instruction." As a proper name, it refers primarily to the laws divinely revealed in the Pentateuch (the first five books of the Bible). Secondarily, it refers to the Hebrew Bible and its teachings as a whole. These include, above all, belief in an all-powerful, all-knowing God who has created the world (Gen. 1:1–2:4), revealed a definitive set of laws for the Jewish people (Ex. 20:1–23:33, 25:1–31:17; Lev. 1:1–7:38, 11:1–24:9, 25:1–26:2, 27:1–34; Num. 27:8–11, 28:1–30:17, 34:50–35:34, 36:7–9; Deut. 4:15–19, 5:6–18,12:1–26:19), and promised to reward obedience to those laws with communal prosperity and punish disobedience with political, social, and environmental ruin (Lev. 26:2–45; Deut. 11:10–17, 28:1–69, 29:9–30:20). Except for laws that spell out some minimum standards of moral decency which are meant to be appropriate for any political society (Gen. 9:3–7; Sacks 1990, 66), the Torah's laws are not directly intended for non-Jews, though they do invite prudent emulation (Deut. 4:6–7).

Central to the Torah's laws are the institutions of the Sabbatical and Jubilee Years (Sacks 1990, 94–114). Their general purpose is to protect and foster community life in the Promised Land (ancient Israel) insofar as its flourishing depends on each patriarchal family's ancestral farm. The Sabbatical laws (Ex. 21:2–6, 23:10–11; Lev. 25:1–7; Deut. 15:1–3, 24:19–22, 31:10–13) stipulate that every seventh year farms must lie fallow. Meanwhile spontaneous vegetation must be left unharvested and unfenced for any passers-by (including animals) to consume. Also, all debts must be forgiven. Finally, heads of families nation-wide must assemble to hear a public reading of the laws. The Jubilee laws (Lev. 25:8–55, with Ex. 21:2–6 and Deut. 15:12–18) add that farms can never be sold, only leased. All leases expire every fiftieth year, when each farm reverts to its ancestral owners. Simultaneously, all slaves must be freed, with one-on-one economic assistance to prevent their relapse into slavery. As for the theological and political importance of these laws, the prophet Jeremiah laments (Jer. 34:13–22) that it was neglect of the Sabbatical and Jubilee Years which brought God's punishment in the form of the Babylonian conquest and the resulting exile of the Jewish people from their land in 586 BCE.

Preparing for Sukkot. *An Ultra Orthodox Jew inspects willow branches for Sukkot, the fall harvest celebration when pious Jews thank God for the rains that irrigate farms, forests, oases, and rivers. Responding to critiques of being anti-environmental, several Revisionist proposals have been suggested in an effort to "green" Judaism.* **DAVID SILVERMAN/GETTY IMAGES.**

THE ORAL LAW

Judaism's post-biblical legal and related writings are called the "Oral Torah" (or "Oral Law"). These extend the Pentateuch's "Written Law" to the circumstances of Jewish life in exile. Foremost among such writings are the Mishnah (a legal code compiled around 200 CE), the Talmud (containing the Mishnah with wide-ranging legal and homiletical controversy and commentary, called Gemara, compiled around 500 CE), and Midrash (contemporaneous compilations of brief homilies, or mini-sermons, loosely geared to biblical texts). There are also ongoing Teshuvot ("responses" by authorities in the Oral Law to specific legal inquiries), Bible translations (from Hebrew into vernacular languages) and, eventually, detailed biblical, legal, ethical, and theological commentaries. Also authoritative is Moses Maimonides' *Mishneh Torah* ("recapitulation of Torah," circa 1170–1180 CE), a codified digest of the Talmud whose invisible backdrop is Platonic-Aristotelian philosophy. The Oral Law's purely legal component is called Halakhah ("walking," i.e., rulings reached step-by-step). The Halakhah's original formulators were the Pharisees ("separatists," i.e., innovators), who also instituted synagogue worship, personal prayers, and ritual blessings to be recited over mundane activities such as eating. Its subsequent authorities are called Rabbis ("teachers" of the Oral Law).

Nowadays Jews are divided into Orthodox and non-Orthodox denominations, according to how strictly they adhere to the Oral Law. Demographically, most Jews are non-Orthodox—Reform Jews considering themselves only loosely or voluntarily bound to the Oral Law, Conservative Jews adhering somewhat more strictly. These differences show up in Judaism's discussions of environmental matters as follows. How well, it is asked, does the Oral Law address the unprecedented legal and moral issues posed by the environmental crisis of the twentieth and twenty-first centuries—the massive pollution of the air, water, and land as a side effect of the steadily accumulating advances of modern technology, with the resulting threats to the flourishing of plant, animal, and

human life? Orthodox scholars find the Oral Law adequately equipped with precedents for meeting today's crisis. Among other things, they note its prohibitions against wanton or needless destruction (called by the Rabbis *bal tashchit*, "Don't destroy!") and against causing animals pain (called *tsa'ar ba'alei chayyim*, "animal suffering"), as well as to its Sabbatical and Jubilee provisions. In contrast, various non-Orthodox scholars have proposed radically revising—or *greening*—Judaism with a view to letting it speak to the crisis more directly. Their proposals have resulted in a variety of syncretistic arguments—innovative syntheses of Jewish and environmentalist views—shaped partly by traditional Jewish teachings, partly by how the religious implications of the crisis happen to be understood (or perhaps misunderstood) by prominent green authors, notably the historian Lynn T. White Jr. (1967).

WHITE, LEOPOLD, AND TOYNBEE VERSUS THE BIBLE

In "The Historical Roots of our Ecologic Crisis" (1967), White alleged that the source of the contemporary environmental crisis was Genesis 1:28—where God tells the first humans to "fill the earth and master it; and exercise dominion over the fish of the sea, the birds of the sky, and all the living things that creep on the earth." White's allegation echoed similar allegations by the forest ecologist Aldo Leopold, who protested against what he called "our Abrahamic concept of land"—by which he meant regarding the land "as a commodity belonging to us"—and who commented sarcastically that "Abraham knew exactly what the land was for: it was to drip milk and honey into Abraham's mouth" (Leopold 1949, viii, 204f.). White's and Leopold's allegations resonated further in the historian Arnold Toynbee (1972), who called for a return to pagan nature-worship, on the supposition that it would protect us against the environmental deterioration accompanying modern industrialization and commercialization, which the Bible (he asserted) had inspired. Neither White nor Leopold nor Toynbee, however, adduced much more than a biblical verse or two, cited out of context, to substantiate their far-reaching, if historically dubious, claims.

Nor did they examine other, more direct sources for the modern view of the relation between human beings and their natural environment. In particular, they overlooked the detailed arguments for the environmentally invasive project to "conquer nature . . . for the relief of man's estate" and make human beings "like masters and owners of nature" which are found in the writings of the philosophical founders of modern technology, Francis Bacon and René Descartes, respectively (Yaffe 2001, 66 nn. 28–29, 70 n. 73). Bacon, for example, in his rhetorical appeal to the early chapters of Genesis to underwrite that project (Bacon 1963, 296–297), bypasses Genesis 1:28 altogether. He refers instead to the biblical description of the neediness of human beings after they had been expelled from the Garden of Eden for having acquired "knowledge of good and evil" (Gen. 2:9, 17, 3:1–7a) and could no longer look to God to supply their wants but had to rely entirely on their own initiative and industriousness (Gen. 3:7b, 17–19, 23). Here Bacon mentions, as precursors to his own project, figures of an "active" bent—Cain, the first tiller of the ground (Gen. 4:2, 17), and Cain's offspring, including the inventors of the musical and metalworking arts and the builders of the Tower of Babel (Gen. 4:21–22, 11:3–5)—whose very inventiveness the Bible criticizes as evidence of their ongoing rebellion against God (Gen. 4:10–14, 23–24, 11:5–9), as Bacon duly notes. For Bacon, the project to bring about "the limitless scientific mastery of nature and the technologizing of human life," being of strictly human origin, is not to be identified with the way of life mandated by the divine command set forth in Genesis 1:28, with which it is in direct competition (Kennington 2004, 5–6, 70, with 123–144 on Bacon's thoroughgoing influence on Descartes).

THE ENVIRONMENTAL CREDENTIALS OF JUDAISM

Jewish environmental ethics—as distinct from Judaism's traditional theological and ethical discussions—emerged once contemporary scholars saw a pressing need to defend Jewish texts and practices against the unsupported allegations by White and the others. In their various counterarguments, Orthodox and non-Orthodox scholars alike consider three interrelated questions—historical, ethical, and philosophical. Historically, they ask, what is Judaism's ecological track record? Ethically, they add, how should Jews as Jews face the crisis here and now? And, they wonder philosophically, does contemporary environmentalism fit, or fail to fit, with traditional Jewish piety? These questions are not easily separated. Moreover, they are often followed out all too incompletely, intermittently, and haltingly. Nor is there strict unanimity of answers. Also, as already stated, Orthodox and non-Orthodox scholars differ on whether their task is simply to recount Judaism's traditional teachings with an eye to today's environmental concerns, or to revise (or green) those teachings. Last but not least, the allegations by White and the others force scholars who would defend Judaism's ecological heritage to construe it in terms of "nature," a notion for which there is no exact equivalent in the Torah. As a result, Jewish green responses to White and the others often fall short in addressing the full issue at stake.

The shortcomings have to do with how the Torah's silence about "nature" and science correlates with its articulateness about "creation" and law. Generally speaking, either living things and their habitats are "natural" (that is, self-originating, self-maintaining, and scientifically intelligible in their own terms) or they are "created" (that is, originated, arranged, and provided for by a divine Creator). By assuming the second of these two incompatible alternatives, the Torah implicitly excludes the first (Maimonides 1963, 281–360). Its reticence about "nature" cannot be ascribed simply to a lack of scientific sophistication or an excess of mythological imagination, however, since the Torah, by its own lights, is neither "science" nor "myth"—biblical Hebrew lacks terms for these as well—but revealed law. The Torah's presenting things as created (rather than "natural") is tailored to its practical interest in the extra-human or supra-human support for law-abidingness. It spells out that support in a manner that is intelligible and persuasive to its immediate adherents. Thus, for example, its account of day two of the first week of creation, when God is said to separate the primordial watery chaos into "waters above" and "waters below" and to maintain that separation henceforth (Gen. 1:2, 6–8), is meant as a straightforward description of God's ongoing separating activity, and not, say, as a poetic description of a "natural" separation on the part of the waters themselves. The straightforward implication is that God could in principle abandon or otherwise modify his activity whenever appropriate for disciplinary or instructional purposes. Such purposes are evident, for example, in God's allowing the "waters above" to collapse into the "waters below" during Noah's flood (Gen. 6:17–8:19), and subsequently—in keeping with a post-flood covenant whereby God vows never to allow that collapse again and stipulates in return that human beings must henceforth govern their behavior by written law (Gen. 8:20–9:17)—in God's promising to provide seasonable rain as a reward for obeying the Sabbatical and Jubilee laws in particular and threatening to withhold the rain as a punishment for disregarding those laws (Lev. 26:3–5, 18–20; Deut. 11:10–17). In short, from the Torah's viewpoint, the stability and flourishing of human beings and their larger environment depend on the will of their Creator as revealed for the sake of fostering adherence to law, rather than on "nature." The conceptual and other shortcomings that show up in Jewish environmental ethics are, generally speaking, traceable to its following White and Leopold and Toynbee uncritically in ignoring the likelihood that the differences between the Torah, with its theological supposition that the earth and its inhabitants are creatures of God, and Baconian science, with its philosophical supposition that they are to be mastered by human beings, are, at bottom, irreconcilable (Spinoza 2004, 67–101).

THE ECOLOGICAL TRACK RECORD OF JUDAISM

Be that as it may, the main historical counterargument against White and the others (Ehrenfeld and Bentley 2001) is that Genesis 1:28 does not give humans unrestricted sway over nature, but only caretaking authority, or stewardship. Much theological support is found for this view. Biblically speaking, all the land—or earth (*arets* in Hebrew means both)—belongs to God (Ex. 9:29; Lev. 25:23; Deut. 10:14; Ps. 24:1). God is said to govern the earth providentially so as to reward law-abidingness and punish rebelliousness (Kay 2001; Allen 2001), especially by supplying or withholding rain in the manner already mentioned. *Sukkot*, the fall harvest festival, is also a water festival (Schaffer 2001), whose ritually displayed plant species—willow branches, date-palm fronds, myrtle twigs, citrons—celebrate ancient Israel's divinely-bestowed water abundance in its four ecologically distinct regions: riverine wetlands (willow), desert oases (palm), forested highlands (myrtle), and cultivated farmlands (citron). In addition, post-biblical Midrashim criticize the very notion that humans should be masters over all other creatures (Cohen 2001, 74ff.), since although they resemble angels in being created in God's image, they also resemble beasts in being procreated and mortal—and thereby susceptible to lawlessness.

Halakhic evidence for Judaism's environmental conscientiousness is also considerable. Deuteronomy 20:19–20's prohibition against destroying fruit trees for siegeworks during wartime serves as precedent for the Oral Law's *bal tashchit* prescriptions (Cohen 2001, 77ff.; Schwartz 2001). Ambiguity about whether the Torah's concern here is—in today's parlance—biocentric (that is, for the trees) or anthropocentric (that is, for their human beneficiaries) permeates Talmudic rulings as well. For example, according to the Mishnah (*Baba Kamma* 8:6), destroying any fruit tree is punishable by a fine. The tree's owner is exempt, however, on the presumption that no one willingly destroys one's own property needlessly. Here the Mishnah surrounds a biocentric principle (saving a tree for its own sake) with an anthropocentric restriction (accommodating the needs of its owner). Nor is this all. The Gemara (*Baba Kamma* 91b–92a) adds that the owner's need must be specific—the tree's unprofitability, say, or its inconvenience to others. Here the Gemara trims the aforementioned restriction (the owner's putative need) so as not to obstruct the basic principle (the tree's presumptive right to exist and flourish as a living creature). As in the foregoing, a continual need to reconcile anthropocentric and biocentric (or, as we shall see, zoocentric) considerations also guides post-Talmudic case-law deliberations in this and other matters—including questions of *tsa'ar ba'alei chayyim*, about which more shortly.

The evidence just cited shows that the allegations by White and Leopold and Toynbee are ill-informed about biblical and post-biblical Jewish law. Nevertheless it does not dispose of those allegations altogether. This would require showing, in addition, that the meaning of Genesis 1:28 is absorbed without remainder into the Torah's legal and moral prescriptions. On the contrary, in its immediate context Genesis 1:28 invites its reader to consider, if only for a moment, the possibility of a way of life which is not only completely free of legal restraints and oriented to the unimpeded human domination of the earth but, even so, backed by God's blessing (Sacks 2001, 153ff.)—as White and the others surmise—although or because the Torah goes on to replace the foregoing possibility with that of life under a divinely revealed law that is, in turn, both ethically and ecologically enlightened (Kass 2001, 384, 409). Here, perhaps, White and Leopold and Toynbee share some moral and intellectual high-ground with the Torah after all. That is, despite their unfounded resentment and unscholarly presumptions about the Torah, White and the others may have a viable, if one-sided, insight into the human-all-too-human starting-point that prompts its environmental teachings—namely, unrestricted human freedom and the environmental and other risks that would and do arise from it. Current defenders of Judaism's ecological track record would do well to explore this high-ground more fully.

FACING THE CONTEMPORARY CRISIS

Three noteworthy proposals would revise traditional Jewish teachings so as to incorporate contemporary environmental activism. Another noteworthy proposal would adjust contemporary environmental activism so as to incorporate traditional Jewish teachings. In addition, several Jewish activist organizations and projects are worth noting.

One revisionist proposal (Artson 2001, 161, 171) would extend the putative sacredness of Israel's environment to the entire earth. Israel's environment is sacred, it is argued, as the original location for obeying the Mitzvot (divine "commandments"). Because the Mitzvot remain binding on Jews in the Galut ("Exile"), that is, in post-biblical circumstances anywhere on the earth, it follows that the latter's environment must to that extent be sacred too. Meanwhile Israel's exclusivity is preserved, on the premise that the ultimate purpose of the Mitzvot is to live piously in the Land of Israel. This argument manifestly privileges *aliyah* ("ascent" or immigration to Israel). A difficulty with its premise, however, is that it discounts the intrinsic value of Mitzvot whose evident purpose is simple moral decency, regardless of location (Ex. 23:1–9; Lev. 19:13–18; Deut. 15:1–18, 22:6–7).

Another revisionist proposal (Troster 2001) would amalgamate Gaia worship with Judaism, on the premise that the earth ("Gaia") is God's creature. A difficulty here is the Torah's uncompromising prohibition of creature-worship (Ex. 20:3–6; Deut. 5:7–10 with 4:15–19; Wyschogrod 2001).

A third revisionist proposal (Benstein 2001) would offset the Mishnah's warning against being distracted from Torah study while looking at trees and fields (*Pirkei Avot* 3:7; Schwarzschild 2001), by supplementing the two traditional categories of Mitzvot—ethical obligations to fellow humans and ritual obligations to God—with a third category: obligations to one's natural environment. Fitting scientific ecology neatly into this new category, however, would depend on whether or not the aforementioned tension between "nature" and "creation" is resolvable within the purview of Jewish law (Jonas 2001).

A non-revisionist proposal (Rosenblum 2001) would educate environmental activists generally in the ecological benefits of the Sabbatical and Jubilee Years: Resting farms every seven years would reverse the soil-depleting effects of steady planting. Remitting debts would relieve economic pressures on poor farmers to exhaust their land's resources. Explicating the laws in public forums would foster communal environmental awareness. Returning farms to their original land-grant owners every half-century would forestall absentee land-accumulators who might abuse the land with impunity. Finally, freeing indentured servants and offering one-on-one economic assistance might keep them out of the impoverished underclasses, who are especially hard on the environment. If these policies seem utopian and unlikely to be implemented, they nevertheless provide a lodestar for activists and a measuring-stick for their successes.

Among Jewish activist organizations is COEJL (Coalition on the Environment and Jewish Life), an umbrella group that facilitates green projects in Jewish communities both locally, with activities such as nature-walks and guest-speakers, and nationally, with campaigns to purchase energy-efficient light-bulbs, and green political advocacy in general. Teva Learning Center (*teva* is the post-biblical Hebrew word for "nature") supplies green educational materials, teacher-training, and recreational opportunities for Jewish schools, camps, and youth groups. Shomrei Adamah ("Guardians of the Earth") is a popular label for Jewish green programs in various localities. Finally, the Heschel Center for Environmental Learning and Leadership is an educational and policy think-tank located in Israel. (For a longer list of organizations, see Waskow 2000, I:290–92.)

CONTEMPORARY ENVIRONMENTALISM AND JEWISH PIETY

The foregoing defenses against White and Leopold and Toynbee result in a philosophical quandary. On the one hand, revisionist proposals for greening Judaism risk forfeiting traditional Jewish teachings that are otherwise indispensable. On the other hand, traditionalist attempts to read Genesis 1:28 exclusively as a mission-statement for environmental stewardship ignore its surface connotation as a permission-slip (subsequently withdrawn) for environmental recklessness. This quandary is intellectually humbling, but not hopeless. Given that our present crisis is no mere academic exercise, we need not expect our philosophical reflections simply to underwrite this or that ecologically friendly view, whether traditional or revisionist, which we may have favored before we started thinking about it. The tension between environmental ethics and Jewish piety—between an independent-minded search for clarity about our ecological predicament, and reverent devotion to the teachings of the Torah—is perhaps unbridgeable. But one may come to grips with it by being either a philosophical inquirer open to Judaism's ecological insights, or a piously observant Jew open to those of philosophy.

Consider, in this regard, current controversies over animals' welfare. Prodded to some extent by White and Leopold and Toynbee, advocates of animal rights and vegetarianism wonder about Judaism's notion of *tsa'ar ba'alei chayyim*. At issue here is not whether Jewish teachings promote animals' welfare, but whether they do so as far as they might. Certainly the Torah prohibits, for example, working animals on the Sabbath (Ex. 20:10, 23:12; Deut. 5:14), overburdening draft-animals (Ex. 23:5), and muzzling oxen treading edible grain (Deut. 25:4). And the Talmud goes on to forbid, for example, dismembering live animals, hunting animals for sport, and leaving animals hungry while humans eat (Bleich 2001, 333–38). But, it is asked, what about possible cruelties inflicted when using animals in laboratory experiments or even slaughtering animals for meat (Levy 2001)? Would espousing animal rights not make Jewish teachings more up-to-date and consistent? As in cases of *bal tashchit*, however, there is a need to reconcile, in this case, animals' welfare with that of human beings. As for animal experimentation, Orthodox and non-Orthodox scholars alike would reply that humans need ongoing scientific medical research. Besides, Jewish teachings are designed to ennoble character (Bleich 2001, 349–52), not just regulate behavior. Hence pious Jews are expected to recognize, and refrain from, inflicting or endorsing cruelty and unbearable suffering anywhere, even or especially in laboratories (Bleich 2001, 344–49). As for animal slaughtering, rules for *kashrut* (dietary certification) specify butchering methods aimed at—and effective in—minimizing if not eliminating animals' pain (Bleich 2001, 338–44). Also, even though vegetarianism is permissible halakhically (Bleich 2001, 371–83), meat eating in conformity with *kashrut* restrictions remains desirable for theological reasons. On reflection, kosher land-animals, fish, and birds turn out to be "pure" (or "clean"; the Hebrew *tahor* means both) in the ecological sense that each as a species inhabits its own generic environment-sector—land, water, or air—as designated at the time of creation (Lev. 11 with Gen. 1; Kass 2001, 386–93, 397–403), none mimics in its motility genera outside its own, each has a "clean" or clearly delineated shape, and none is carnivorous (except that kosher fish may eat other kosher fish; Kass 2001, 408f. n. 29). Piously and self-consciously restricting meat-eating choices to these—following proper ritual slaughtering and after reciting appropriate blessings—reminds Jews versed in the Torah of the diverse and mind-engaging character of creation itself, therefore, and of Jews' long-standing obligations to its Creator.

SEE ALSO *Bible; Christianity; Leopold, Aldo; Stewardship; White, Lynn, Jr.*

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Martin D. Yaffe

K

KOREA, NORTH AND SOUTH

The history of post–World War II Korea is a tale of two countries—or, more accurately, one country split in two. The two parts of this divided nation share a name (informally South Korea and North Korea, formally the Republic of Korea and the Democratic People's Republic of Korea, respectively), a landmass, a language, and a culture, but are bitterly divided by ideology, economic circumstances, and geopolitical pressures.

A Japanese colony until the end of World War II, Korea was divided into two administrative zones at the war's end: the Soviet Union occupied the territory north of the 38th parallel, and the United States was in charge of the area to the south. With the collapse of postwar reunification talks, the northern zone declared itself the Korean Democratic People's Republic on May 1, 1948. On June 25, 1950, North Korean troops invaded the southern zone with Soviet and Chinese backing, seeking to unify the country under a communist regime. United Nations troops, under U.S. leadership, fought off the invaders, and the war ended in a standoff in 1953, with the country indefinitely divided.

Since then the capitalist economy of South Korea has registered spectacular rates of growth, skyrocketing from a per capita gross domestic product (GDP) of $100 in 1963 to $10,000 in 1995; its economy now ranks tenth in the world as measured by nominal GDP. North Korea, meanwhile, has stagnated under its planned, centralized communist economy; it is one of the poorest countries in the world, ranking 156th in total GDP with a per capita GDP of roughly $1,000. Beginning in the 1990s, the country's ideologically rigid leadership began to make grudging initiatives in the direction of limited free-market experiments, especially in its tentative economic exchanges with South Korea.

SOUTH KOREAN ENVIRONMENTALISM

South Korea's transformation from a traditional agricultural society into a modern industrial economic powerhouse began in the 1960s. Until the 1970s and mid-1980s, pollution was the main environmental issue, and antipollution movements took the form of victim demands for damage compensation or farmers' and fishermen's protests concerning the siting of industrial facilities. Civil protests against industrial and urban pollution were not taken seriously, however, because of the government's headlong pursuit of economic development.

The Korean Pollution Research Institute (PRI, *Gonghae-Yonguhoe*), established in 1982 by progressive Christian clergymen, made determined efforts to support victims of pollution, to research various environmental problems, and to educate the public about such issues. The majority of the group's supporters were intellectuals and antigovernment activists under the leadership of Yeol Choi. The PRI allied itself with the nationalist-democratic movement, a merger that has led many analysts to view the PRI's environmentalism as part of the left. Yeol Choi later became copresident of the Korean Antipollution Movement Association (KAPMA, *Kongchuryon*), founded in 1988. Its ideology remained broadly leftist, demanding environmental justice combined with criticism of the monopolizing capitalist power.

But South Korean environmentalism was not monopolized by leftist activism. Quite apart from KAPMA and other environmental movements, the national forestation policy, a public campaign for tree planting, and the effort to preserve greenbelts in urban and suburban areas were initiated by the government as early as the 1950s and carried out from then through the time of President Park Chung-hee's regime (1961–1979) effectively enough to secure a comparatively solid ecological foundation for agricultural productivity and sound rural landscape at least in the southern part of the peninsula.

Notable ideological changes of the environmental movement began to occur in South Korea in the late 1980s, namely from leftist activism to a moderate professionalism, and from the radical antipollution movement to a realistic ecological conservationism. While KAPMA regarded huge industrial corporations and political rulers in South Korea as the main violators of ecological balance, Citizens' Coalition for Economic Justice (CCEJ, *Kyungshilyon*), YMCA, and YWCA, for example, criticized the radical strategy of the former antipollution activists.

The South Korean government began, though late, to keep pace with increasing public consciousness that the natural environment must not be sacrificed in pursuit of economic development and that economic value should be harmonized with environmental value through the legal and political systems. As the 1990s began, increasing pollution and environmental degradation were brought under control with higher efficiency on the basis of advanced scientific research and green technologies. The government's earlier repressive attitude toward antipollution activists changed to that of a more responsive as well as responsible and reasonable policy maker. The Ministry of Environment was inaugurated in January 1994, replacing the former National Environment Agency. New laws were enacted in the early 1990s to complement the existing legal measures for environmental policy, including the Environmental Conservation Law, the Fundamental Law for Environmental Policy, the Air Pollution Control Act, the Water Pollution Prevention Act, the Conciliation Law for Environmental Pollution Conflict, and others.

But a variety of hot-button environmental issues continued to arise in South Korea during the 1990s and after 2000. They took in general the form of civil protest against the government's development plans. But the real controversy arose often out of the conflicts between civil interest groups. In some cases, they became nationwide struggles, involving public opinion as well as the political and legal systems, to preserve ecologically valuable resources or endangered rare species of flora and fauna.

Protesters who tried to preserve wide mud flat regions along the west coast of the Korea Peninsula couldn't stop the Shihwa Lake project in Kyunggi Province and the Saemangeum Mud Flat project in Cholla Province. But central and local governments had to cancel the Dong River Dam project in Kangwon Province and the Buan Radioactive Waste Depot project in Cholla Province because of tenacious protests and legal battles to defend the natural landscape and ecological living conditions of the human and biotic inhabitants throughout a wide range of related areas. Protesters rallied against the Cheonseong-Keumjeong Mountain Tunnel project and express railway construction in Kyungsang Province to preserve the habitat of the Korean clawed salamander (*Onychodactylus fischeri*). Only following intervention by the South Korean president and the Supreme Court was tunnel construction able to continue after it waited three years for the final legal decision.

Other notable developments have fostered increased attention to environmental issues in South Korea: the sandy wind blowing every spring from Mongolia and China, the reduction of habitat areas for migratory birds, fish, and marine animals that inhabit or stop on and around the peninsula, and international projects for the protection and preservation of flora and fauna on the peninsula and in the Demilitarized Zone (DMZ) that separates the two Koreas. The United Nations Conference on Environment and Development (UNCED) in 1992 also motivated the Korean people to pay more attention to global environmental issues than they had before. A major contributor to the growing public awareness of environmental problems has been the bimonthly magazine *Green Criticism* (*Noksaek Pyongron*), founded in October 1991 by Jongchul Kim, a poet and professor of English literature. This magazine provides the public with copious information and critical essays on environmentalism, Deep Ecology, critiques of modern civilization, and thoughts on alternative ways of living and their practicability.

The ethical significance of the issues that arose in the 1990s stimulated academic research and philosophical discussions about the most fundamental themes of environmental ethics and the ecological sustainability of human civilization. The Korean Society for the Study of Environmental Philosophy was founded in 1995 and has published its journal, *Environmental Philosophy (Hwankyung Cheolhak)*, since 2002. Scholars and theologians have awakened anew to the ecological wisdom of the religious traditions of Asia (especially, Buddhism, Daoism, and worship of spirits) and in native Korean ideas of nature (e.g., Ch'i-ecology, worship of mountains, and cosmology of heaven-earth-human).

Noteworthy private institutions for the promotion of green culture include the Canaan Farming School (founded by Young-Gi Kim, presbyter, 1962), the Toji (Earth)

Foundation of Culture (founded by Kyung-ree Park, novelist, 1999), the Korea Green Foundation (founded by Yeol Choi, agriculturist, 2002), Green University (founded by Hoeick Chang, professor emeritus, physicist, 2003), and the World Life-Culture Forum (initiated by Jiha Kim, poet, 2003).

GROWING CONSCIOUSNESS IN NORTH KOREA

Since its founding, North Korea has been governed by one-ruler dictatorship, first Kim Il-sung till 1994, then his son Kim Jong-il, with the support of one political party system. It may be assumed that all of North Korean environmental policy has been directed or supported by the same centralized governing structure. The dominant environmental issue in the years before and after the Korean War was forestation policy. It aimed to restore the forest resources that were exploited during the Japanese colonization (1910–1945), and was carried out so effectively that timber production in the 1970s quadrupled that of the late 1940s. But North Korea has had to cope with other environmental issues since the 1950s, in particular, industrial pollution that began in the late 1950s; and the adverse effects of the agricultural development policies introduced in 1976 by Kim Il-sung.

North Korea's industrial development, which had begun earlier than in South Korea, was effective enough that its industry made up 74 percent of the whole national economy in the early 1970s, while it made up only 34 percent in 1956. This process of development must have raised problems of industry pollution and public health. Kim Il-sung himself emphasized continuously in his official speeches beginning in 1972 the seriousness of water, air, and land pollution caused by toxic materials that were emitted from factories and in the urban areas. Material evidence suggests that he didn't stop to promote administrative and legal measures against every kind of pollution. The Land Law, enacted in 1977, contains regulations for environmental protection both in industrial sites and in urban and rural areas. The Pollution Research Institute (later renamed Research Institute for Environmental Protection) was founded also in 1977. Three years later the People's Health Protection Law was enacted following the will of the Supreme People's Assembly to mobilize all the possible antipollution measures.

The Environmental Protection Law, enacted in 1986, introduced environmental protectionism as North Korea's state ideology together with socialism and communism.

An amendment to North Korea's National Constitution in 1992 gave priority to environmental protection over the growth of economic production. Many other new laws and enforcement regulations for environmental protection were continuously enacted almost every year until 1998. But the environmental situation in North Korea worsened during the 1990s as repeated floods and droughts brought disastrous famine, destruction of water supply facilities, a drop in agricultural productivity, and the spread of waterborne epidemics.

Analysts believe that ecological collapse must be, if not the primary, at least one of the main reasons for North Korea's agricultural collapse, economic stagnation, and failure to increase its energy supply in the 1990s, and that the primary reason for the ecological collapse was a false agricultural policy. Kim Il-sung, whose political goal was to realize a self-sufficient national economy, had introduced his Terraced Farm Policy (*Darakbat Campaign*) in 1976 to raise agricultural productivity. But this policy was executed so excessively that after ten years every hill and grassland in the provinces had been converted to plow lands, while the transformation of mountain tops and the devastation of forests had caused other forms of geographic and climate calamities, including earth erosion, aridity, a decrease of fertility, drying up of streams and groundwater, and diminished ecological habitats for flora and fauna species.

Fortunately, North Koreans have learned from their experiences. Since 1998 they have introduced new plans for securing water resources and new policies for environmental protection. A new long-term plan for forestation was started in 2000. The Floodgate Law, the National Land Planning Law, and the River Act were enacted for environmental protection, and systematic reservation plans for the preservation of biotic species were introduced in 2003. North Koreans are enlarging various cooperative measures and possibilities of exchange plans with South Korea not only for industry, agriculture, and energy supply but also in agriculture, forestation, and environmental conservation.

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Sung-Jin Kim

L

LAND ETHIC

Aldo Leopold's land ethic is perhaps the most prominent American articulation of an environmental ethic. Leopold's "The Land Ethic" was published posthumously as the capstone essay in *A Sand County Almanac, and Sketches Here and There* (1949). In the view of most readers the substance of his ethic was stated when he asserted that an interaction with nature "is right when it tends to preserve the integrity, stability, and beauty of the biotic community" and "is wrong when it tends otherwise" (Leopold 1949, pp. 224–225). Leopold's ethic has drawn wide attention and conflicting responses, particularly after critical study of it gained momentum in the 1980s. According to one exponent, J. Baird Callicott, Leopold's ethic has been the "most popular among professional conservationists and least popular among professional philosophers" (Callicott 1999, p. 59). Whether lauded or challenged, Leopold's land ethic has cast a long shadow; it would not be an exaggeration to claim that it is the central pillar of contemporary environmental philosophy.

Leopold's land ethic rests on an understanding that humans exist within an integrated community of life that also includes other animals, plants, rocks, soils, and waters. Particularly in his later years Leopold referred to this assemblage as the "biotic community" or, more simply, "the land." Humans are "plain members and citizens" of this biotic community, Leopold contended (Leopold 1949, p. 204), and therefore have a moral obligation to act consistently with the long-term welfare of that community. That welfare is linked to the ways a community functions ecologically; to its capacity, under human use, to remain fertile and productive over the long term.

Leopold devoted considerable effort to understanding how the biotic community functions and needs to function if it is to retain its productive capacity. Late in life he synthesized his conclusions into a normative concept of ecological functioning that he termed "land health." Leopold viewed land health as an appropriate and much-needed goal for all conservation efforts. Just before his death he encouraged colleagues in the conservation movement to embrace it as their goal. With his land ethic Leopold transformed land health from a communal goal into an ethical norm to guide individual behavior. As Leopold explained, the land ethic "reflects a conviction of individual responsibility for the health of the land" (Leopold 1949, p. 221). He restated that point a few paragraphs later by naming the elements of land health: Human actions are morally right when they uphold the "integrity, stability, and beauty" of the biotic community (pp. 224–225).

Leopold's ethic has given respectability to ethical stances that extend moral value beyond human communities (tribe, nation, global village) to cover collections and assemblies of living things such as species and ecosystems. It also has encouraged ethicists to take science seriously as they frame their ethical norms. Leopold summarized the complexity of nature in terms of the ways landscapes function ecologically rather than, for instance, in terms of their physical or biological composition. By making normative use of the modes of functioning of nature, Leopold invited others to embrace ethical stances that respect nature in functional terms. Leopold's ethic emerged out of a lifelong effort to motivate people, particularly private landowners, to live on land in ways that are sustainable. His land ethic, he hoped, would yield practical

Aldo Leopold, Seated Near a Shack, circa 1940. *"The Land Ethic" is possibly Aldo Leopold's most famous writing, and is one of the most prominent works of U.S. environmental ethical literature. Leopold's background as a wildlife scientist and manager lent itself to the development of his environmental ethic.* **COURTESY OF THE ALDO LEOPOLD FOUNDATION ARCHIVES.**

conservation benefits in terms of improved land-use practices. He implicitly encouraged later conservation advocates to integrate philosophical ideas with on-the-ground conservation labors and evaluate alternative perspectives on the basis of practical consequences.

During his lifetime Leopold (1887–1948) was best known as a wildlife scientist and manager. His professional knowledge extended to multiple-use forestry, grassland management, and the challenges of soil erosion. He disclaimed expertise in agricultural sciences even though farmers and farm organizations regularly sought his professional advice and his academic appointment at the University of Wisconsin was in the Department of Agricultural Economics.

Leopold's early writings on wilderness preservation drew considerable attention, as did his accumulated evidence that wildlife conservation was in many settings best promoted by improving wildlife habitats rather than by imposing tighter limits on hunting, creating additional game preserves, and employing artificial propagation. The frequently quoted essay "Thinking Like a Mountain" in *A Sand County Almanac* has prompted many readers to assume that Leopold was comparatively late in recognizing the ecological roles of predators. However, a broader study of his writings suggests that by the mid-1920s Leopold was aware of the functional benefits of predators. A working forester at the time, however, Leopold also recognized that livestock grazers had a practical need to control predators. Further, he understood that predator control could help private landowners enhance crops of wild game on their lands and that game cropping, even with predator control, could improve alternative land uses. Nonetheless, by the mid-1920s Leopold criticized excessive predator control and pushed for measures to protect predators.

CRUCIAL ISSUES IN THE LAND ETHIC

Critical secondary writing on Leopold's land ethic has tended to dwell chiefly on five overlapping issues:

1. What is the origin of the moral norm in Leopold's ethic?
2. How well does Leopold's concern for the land community as such fit with moral concerns for its human and nonhuman parts?
3. What is the substantive force or content of the land ethic; that is, what did Leopold mean by preserving the biotic community's "integrity, stability, and beauty"?
4. How did Leopold imagine that his ethic might gain traction over time, building on earlier extensions of communal norms?
5. Is Leopold's ethic now largely irrelevant or in need of material revision because of changes in the ways ecologists understand the functioning of nature?

Leopold understood ethics as a body of normative ideals that constrain individuals in daily life as they pursue their self-interest. Individuals are prone to do what is expedient for them personally, he asserted. Applicable ethical schemes require them to broaden their selfish concerns to take account of the welfare of other community members and the "community as such" (Leopold 1949, p. 204). Rarely did Leopold discuss the ethical implications of direct interactions between two or more individuals. Instead, he concentrated on what he saw as the clash between the welfare (expediency) of the individual and the welfare of the surrounding community. He discussed this clash in many other writings, particularly those dealing with conservation economics. In light of this framing of the conservation predicament, the size, composition, and functioning of the relevant moral community were of vital importance for Leopold.

When discussing ethics, Leopold showed special interest in how relevant moral communities expand in size and composition over time, beginning with early peoples. He perceived a slow, long-term expansion in such communities. In several writings he wondered whether this long-term evolution could and would continue, expanding the moral community to include the land as an integrated whole.

Also influential in Leopold's ethical thinking was his conviction that humans are limited beings. As he expressed it, there is much that humans do not know and probably never will know. Humans also have limits on their ability to reason and the expressive capacities of their languages. Even trained scientists, Leopold asserted, know little about the functioning of the land, a reality that exacerbates the challenge of defining land health. Because of these limits, Leopold concluded, it makes sense for people to rely on sentiments and intuitions as well as known facts and reason. It makes sense for them to act humbly and draw lessons from the behaviors of species that have thrived far longer than has *Homo sapiens*.

Leopold viewed his ethic as more than a rule of conduct governing behavior. It was a proposal for a wide-ranging shift in the ways people conceive of and interact with nature, from being separate and apart to being full-fledged community members. His land ethic, Leopold explained, requires "an internal change in our intellectual emphasis, loyalties, affections, and convictions" (Leopold 1949, p. 210). It requires changes in what people want, what they value, and what they deem beautiful.

ORIGIN OF LEOPOLD'S ETHIC

Philosophers studying Leopold's ethic have paid close attention to its moral grounding and to the way it compares with leading approaches to interpersonal ethics. Did Leopold's emphatic concern for the welfare of the biotic community arise out of a belief in the intrinsic moral value of that community apart from the instrumental values that attach to its parts? Is his land ethic, that is, both nonanthropocentric and holistic? Alternatively, did Leopold focus his ethic on the functioning of the community not because the community itself is morally considerable but because the lasting health of the community is instrumentally essential to long-term human welfare? Also, is Leopold's ethic best understood, as it is formally expressed, as a deontological claim, admonishing humans to fulfill their moral duties, or is it better interpreted chiefly as the distillation of pragmatic thinking and experimentation aimed at long-term conservation?

Callicott has asserted that Leopold's ethic is best understood as a claim that the land community as such has intrinsic value and that humans are duty-bound to respect it by fostering its ecological functioning. Thus, Callicott sees Leopold's land ethic as nonanthropocentric and both holistic, extending moral value beyond humans to the land community, and deontological. In supporting his interpretation Callicott has emphasized that Leopold distinguished between conduct that is expedient and conduct that is ethical.

A contrary interpretation was staked out by the philosopher Bryan Norton, also beginning in the 1980s. Norton has viewed Leopold's ethic chiefly as an outgrowth of pragmatic efforts to promote land conservation. Leopold's aim, Norton contends, was to craft an ethic that would prompt people to live in ways that foster long-term human welfare. Leopold's ethic thus remains within the standard anthropocentric ethical paradigm and is best analogized not to Kantian or other deontological perspectives but to the pragmatic moral reasoning of William James, Charles Sanders Peirce, and John Dewey. In Norton's interpretation the land community for Leopold does not possess moral value as such; his ethic thus is neither deontological nor holistic. Instead, the community is simply the soundest practical focus for conservation efforts designed to promote long-term human flourishing. Norton interprets Leopold's distinctions between expediency and ethics as referring only to conflicts about satisfying short-term human preferences at the expense of long-term human well-being. In the long term and taking all humankind into account, expediency and ethics come together.

Both Callicott and Norton have endeavored to promote nature conservation. As they did so, their conflict over interpretations of Leopold quickly turned into a broader dispute about the best way to frame a contemporary environmental ethic. As Leopold scholars, however, they seemed largely to agree on central elements of Leopold's thought. Both read Leopold to include future generations within the relevant moral community. Both conclude that Leopold equated long-term human welfare with the long-term welfare of the biotic community as a whole, thus eliminating conflict between humans and nature. Both believe that Leopold was influenced strongly by Darwinian theories of ethical evolution and, behind them, theories of moral sentiments and virtue-based reasoning.

Few scholars have challenged Leopold's readiness to extend moral value to future generations, a problematic step for many philosophers. In addition, little has been said about his unusual perspective on human welfare. Leopold described human welfare holistically, as a unified totality, not in terms of the summed welfare of individual humans. In addition, Leopold spoke of human welfare after humans embraced the kind of ecological awakening that he deemed essential. Such humans would forgo superfluous wants and would be satisfied by the aesthetic and spiritual benefits of living in a whole and healthy biotic community.

MORAL VALUE OF THE PARTS OF THE COMMUNITY

In a controversial 1980 essay, "Animal Liberation: A Triangular Affair" (Callicott 1989), Callicott asserted that Leopold's concern for community welfare trumped the moral duties that humans owe to other community

members as individuals, duties that Leopold also recognized. His essay drew strong responses, leading to an important clarification of Leopold's ethical vision.

For several decades academic philosophers ignored Leopold's ethic chiefly on the ground that moral considerability could never attach, as Leopold seemed to propose, to an intangible aggregate such as the land community. Even ethicists who could take that step found Callicott's interpretation of Leopold troubling. To elevate the whole over the parts was to make the parts morally subordinate. By implication, it seemed morally permissible, if not obligatory, to reduce species populations, humans included, when lower numbers are needed to uphold the healthy functioning of the community. This was the charge of ecofascism: In the name of protecting the land community, humans could and indeed should be killed.

Callicott responded with a refined interpretation of Leopold's land ethic. That ethic, Callicott contended in *In Defense of the Land Ethic,* was not intended to displace existing standards of interpersonal ethics. Instead, it was to be added to them. Leopold's holistic stance, in fact, did justify lethal methods to reduce populations of nonhuman species but certainly not the killing of people. With this reasoning Callicott undercut the charge that Leopold's holism is a form of fascism. Yet as he recognized, he left Leopold's ethic unable to provide clear guidance when the claims of morally worthy individuals call for actions that clash with moral respect for the land community. Thus, to implement Leopold's ethic it became necessary to generate a second-order rule that would integrate the land ethic with existing interpersonal standards.

In several of his writings Leopold commented on the "biotic rights" of parts of nature to continued existence. He applied the term, however, only to species and rare natural communities, not to individual organisms. In the practical work of conservation, efforts to preserve such collective wholes are unlikely to collide with efforts to sustain land health. Accordingly, Leopold's respect for the biotic rights of species and rare communities seems not to conflict with the moral primacy of community health.

SUBSTANCE OF THE LAND ETHIC

Nearly all discussions of the land ethic quote Leopold's famous summation of it. Few commentators, though, have attempted to figure out what Leopold meant when speaking of the "integrity, stability, and beauty" of the land. The word *stability* in particular has been problematic. The term seems to endorse a view of healthy nature as static or unchanging that contemporary ecologists reject. The word *integrity* also has created difficulties. The term typically refers to the totality of species and perhaps also to the full range of biological assemblies that existed in a particular landscape before humans arrived or, more arbitrarily, before humans of European descent arrived. When integrity is defined in this way, people can preserve it only by leaving land untouched and undoing prior human changes, a practical impossibility in places where people live and work. Commentators rarely have taken Leopold's reference to beauty seriously. Beauty, it is assumed, is too vague and subjective a concept to provide objective guidance.

In his writings on Leopold, Callicott examined late twentieth-century writings in ecology to figure out which of several contemporary meanings of stability (and, to a lesser extent, integrity) make the most sense when applied to Leopold's ethic. In a more recent study, *Aldo Leopold's Odyssey* (2006), Julianne Newton (now Warren) attempted to identify with precision the meanings Leopold personally attached to those key words rather than beginning with definitions composed by others. Newton's conclusion is that the substance of Leopold's land ethic cannot be understood without grasping what Leopold meant by land health. His key words, she concludes, were intended to incorporate into his ethic the full body of his writings about land sickness and health. Leopold's writing on land health in turn built on his lengthy effort to construct, from studies of differing landscapes, a "common concept" of how land in general works.

The key attribute of healthy land for Leopold, according to Newton, was apparently stability, by which Leopold meant not a community with an unchanging biological membership but a biotic system that possesses and retains an ability to cycle nutrients over and over at high levels of efficiency without significant loss. "Land is stable," Leopold explained in "Biotic Land-Use" (circa 1942), "when its food chains are so organized as to be able to circulate the same food an indefinite number of times" (Leopold 1999, p. 205). Similarly, integrity for Leopold apparently referred to the suite of species required in a landscape for that landscape to retain its stability. Leopold preferred that positions in nutrient chains be filled by native species but defined health in a way that allows exotics to substitute for native species and permits significant simplifications in community membership as long as nutrient flows remain lengthy and efficient. Beauty for Leopold apparently was an attribute of lands that retained their health, particularly lands that displayed their native integrity.

In this interpretation—that Leopold's key words linked his land ethic to his ideal of land health—insights on Leopold's ethic and its practical implications are best obtained by studying the symptoms of land sickness as he explained them, Leopold's more extended comments on land health, and the illustrations he used in "The Land Ethic" and elsewhere of lands that retain their health despite long human use. Also useful for this purpose are

Leopold's observations that natural communities over evolutionary time tend to increase in biological composition and in their ability to cycle nutrients efficiently without loss. The best land uses, Leopold suggested, are ones that do not impede these apparent evolutionary trends.

EVOLUTION OF A LAND ETHIC

Writing on Leopold's ethic also has paid attention to Leopold's many comments on how ethics emerge over time within moral communities. Most visibly in "The Land Ethic," Leopold drew on the writings of Charles Darwin describing the evolutionary forces that seemingly push communities, over time, to expand the reach of their ethical ideals. Leopold defined an ethic as "the tendency of interdependent individuals or groups to evolve modes of co-operation" (Leopold 1949, p. 202). With little conscious thought, he believed, members of a moral community gradually expand the size and composition of their community, pushed by invisible evolutionary forces. The key to the continued expansion of ethics, then, is to broaden the moral community beyond humans to include the parts of nature with which humans are interdependent. Such an expansion, Leopold believed, is an evolutionary possibility as well as an ecological necessity.

Drawing on the conclusions of anthropologists and historians, several commentators have cast serious doubt on Leopold's evolutionary theories and the conclusions he drew from them. Early peoples often included nonhuman life within their moral calculations. The expansion of ethics to include more people—different tribes, races, ethnic and religious groups, and the like—apparently was accompanied by a contraction in the moral value attributed to wild species. Leopold's errors as anthropologist, however, have not prompted commentators to call his ethic into question given that its moral force rests on different grounds. History aside, Leopold's speculations are vulnerable to claims that evolutionary processes at work in the past have been weakened or displaced by social welfare programs. People who degrade their home landscape may have the ability to remain in place and thrive—to survive in evolutionary terms—as a result of benefits supplied by distant governments; they are not forced to leave or to change their inappropriate land uses.

IS LEOPOLD'S ETHIC OUT OF DATE?

Callicott has been the most prominent commentator who has questioned the validity of Leopold's ethic because of changes in ecological thought since his day. Callicott's concerns are shared by many others, who view Leopold's ethic as a throwback to an earlier, discredited era of ecological understanding.

In his criticism Callicott assumed that Leopold shared the ecological ideas that dominated his day. Like his contemporaries, Leopold viewed natural systems as organized into coherent, persistent communities that retain their composition and functioning until disturbed by external, often anthropogenic, forces. Callicott has undertaken to revise Leopold's ethic to make it more dynamic: that is, to incorporate into it overt reference to the ongoing changes in nature and to the ability of people, without violating the ethics, to alter land at relatively slow spatial and temporal scales.

In her detailed study of Leopold's science and scientific influences Newton implicitly challenged the view that Leopold's science is out of date. She presents Leopold's scientific understandings as peculiar to him, not the same as those of his contemporaries. In her view Leopold and his contemporaries were far more aware of the dynamism of nature than standard historical accounts suggest. Further, Leopold's ethic did not focus chiefly on the biological composition of a community: the part of nature that ecologists see as most dynamic. Instead it focused on the ecological functioning of the community, particularly its ability to cycle nutrients efficiently, an aspect of community functioning that is less prone to change. Thus, contemporary emphases on dynamic changes in community composition may not pose the problems for the land ethic that Callicott discusses.

SEE ALSO *Adaptive Management; Callicott, J. Baird; Leopold, Aldo; Norton, Bryan.*

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Eric T. Freyfogle

LANDSCAPE ARCHITECTURE, DESIGN, AND PRESERVATION

Landscape architecture is a diverse but holistic discipline that has emerged since the 1850s as a leading profession in advocating sustainable land-use practices. Landscape architects focus their work on the intersection of human need, environmental sustainability, and aesthetics. Human need is broadly conceived to include practical matters of function, economic need, safety, mental and physical health, and less easily quantified needs such as comfort, engagement with social groups, and self-worth. Care for the natural environment considers how to integrate these human needs into natural systems so as to reduce environmental damage and allow systems to operate more closely to their natural pattern. All of this is done within the framework of creating pleasing landscapes, since those that are appreciated are more often cared for and protected.

As practitioners of a diverse discipline, landscape architects work at different scales and types. Projects can be as small as a walled courtyard or as large as a regional plan. The purposes of these projects may be as diverse as recreation, resource conservation, education, and housing. The field includes such subfields as planting design, natural-resource planning, site planning, heritage-landscape preservation, garden design, urban design, land-use planning, disturbed-land reclamation, wildlife planning, and environmental art. All of this work, no matter its size or scope, is linked by the underlying philosophies of stewardship for land, care for the natural systems that form it, and concern for the people who inhabit it.

EARLY EXAMPLES

These attitudes have evolved over a long period of time because landscape architecture, as an activity rather than as a specialized profession, has been part of human experience since prehistoric times. In the distant past, people learned about natural systems from intimate day-to-day contact. The simple technologies of prehistoric times limited people's ability to modify their environments. Gradually they began to make substantial changes to landscapes. They dammed rivers, channeled water to places it did not go naturally, leveled hills, and planted trees in areas distant from where they naturally occurred. Such activities created environmental problems. In ancient Greece (ca. 1200–323 BCE) and the Cambodian kingdom of Angkor (ninth to fifteenth centuries), for example, the harvesting of wood for agricultural land clearing, construction, and fuel led to extensive deforestation, which intensified local soil erosion.

With the emergence of the Renaissance in Europe, advances in science led to new knowledge about natural systems, as well as to changes in attitudes toward the environment. Medieval fear and awe of nature was replaced by an ever increasing sense that humans could, and should, alter it. Leonardo da Vinci, often cited as the epitome of the Renaissance mind, engineered a large-scale scheme to drain natural wetlands of the Chiana Valley in central Italy. He also advocated rerouting the Arno River to improve the geophysical setting for Florence. In the Renaissance such dreams at times outpaced technology—the Arno was not rerouted, but the marshy Chiana Valley was drained, and thereby transformed into one of the most productive agricultural regions of Tuscany.

Much post-Renaissance environmental thinking was framed within the philosophical perspective referred to today as the Enlightenment. This system emphasized rational thought and science as the basis for human decision making, as well as the importance of individual creativity in solving human problems. The Enlightenment, which influenced Europeanized parts of the world into the twentieth century, served as a critical philosophical system during formative periods of both the profession of landscape architecture and the environmental movement. Both fields came to appreciate natural complexity through Enlightenment philosophy. In the nineteenth century another philosophy, Romanticism, also began to influence human perceptions of nature. Romanticism emphasized emotional, sensory experience of the environment. Taken together, the two philosophies were behind many of the developments in landscape architecture and environmentalism that occurred in the eighteenth and nineteenth centuries.

EIGHTEENTH CENTURY

Developments in the eighteenth century illustrate the influences of both these philosophies. Rationality in economic thought led to an increasing focus on land as private capital and a resource for private, rather than communal, benefit. One resulting process in Great Britain was enclosure, a process that consolidated small feudal land holdings into monolithic estates and thus drove many tenant farmers from the land. Even more extreme were the large plantations of the American South, in which both

The Medieval Town of Cortona, in Tuscany, Italy. *Small towns such as Cortona evidence the delightful way that natural landscape and human-made architecture can complement one another. The town overlooks the Chiana Valley, which was drained during the Renaissance and is now one of the most agriculturally productive regions of Tuscany.* **© GILLIAN PRICE/ALAMY.**

land and people were exploited as the right of the landowning class. The Industrial Revolution, with its emphasis on science and engineering innovation, also reflected Enlightenment thought. In part as a reaction to industrialization, Romanticism countered with a view that idealized nature. A design approach variously known as the Landscape Gardening School, the Natural Style, the English Style, or the Picturesque evolved from Romantic philosophy and the arts that it influenced. These styles emphasized naturalistic appearance, but not natural processes or preservation of environmental resources.

NINETEENTH CENTURY

With the advent of the nineteenth century, the threads of thought and action began to emerge that eventually led to environmental problems or more recent decades, as well as approaches to their solutions. It is important to note that people were often fully aware of the environmental changes that their activities caused, but continued them out of economic need while experimenting with remedies. For example, owners of southern plantations were conscious, at least by the first decades of the 1800s, that their land clearing and tilling activities caused soil erosion. Planters often reported in agricultural journals both successful and unsuccessful experiments that they carried out to control erosion on their land. In other instances, the public expressed concern about potential environmental impacts from proposed projects. As a case in point, when construction of the Erie Canal was announced in the 1830s, a New York citizens' group raised the issue of possible pollution of Lake Erie with salt water from the Atlantic Ocean. In the middle of the century, thinking about the environment was influenced by Romanticism and other philosophies, especially Transcendentalism, as found in Ralph Waldo Emerson's *Nature* (1836).

Since the early part of the nineteenth century, observers, especially those in America, had noted the rapid pace of environmental change. Before 1820 the botanical explorer and horticulturist François André Michaux observed extensive deforestation in the American East. At around the same time, the painter George Catlin, surveying the drastic

Bridalveil Fall in Yosemite National Park. *Bridalveil Fall is an outstanding example of a waterfall issuing from a hanging valley far above the Yosemite Valley floor. The natural beauty of Yosemite served as a convincing argument for landscape preservation in the mid-1800s, when it became the first large-scale landscape set aside for public use.* **© J.A. THOMAS/U.S. GEOLOGICAL SURVEY.**

changes in the American West, especially the decimation of buffalo herds, made the farsighted proposal of establishing what he called a "nation's park" to preserve "Nature's works" (Catlin 1926 [1840], vol. 1, pp. 292–293). In fact, the first officially created park, though not a true national park, came less than ten years after he wrote, with the establishment of Hot Springs Reservation (now Hot Springs National Park) in Arkansas.

A different type of appreciation of the environment, focused on the negative effects of human activity, appeared in George Perkins Marsh's *Man and Nature, or Physical Geography as Modified by Human Action* (1864). Marsh's book gave those who had long expressed concern for the natural world, including many early landscape architects, ammunition to support their arguments.

Loss of natural features and systems was often framed in terms of beautiful scenery—a convincing argument in an age when Romantic thought dominated. Horace W. S. Cleveland and Frederick Law Olmsted Sr., both of whom emerged after the Civil War as leaders in landscape architecture, were early advocates of the preservation of beautiful and environmentally significant areas. In the 1850s Cleveland argued for preserving the Middlesex Fells landscape outside of Boston, and later for preserving Minnehaha Falls in Minnesota. In the 1860s Olmsted proposed placing Yosemite Valley under public control for its protection. Yosemite became the first large-scale landscape set aside for public use, but not by the federal government. Instead, it was the state of California, presaging its late-twentieth-century role in progressive environmental legislation, that made Yosemite Valley the first state park in the nation in 1864 (it later became a national park). Within a decade the federal government followed the lead of California. Based in part on the glowing descriptions of Ferdinand V. Hayden and accompanying painter Thomas Moran, over two million acres in the Yellowstone area became the first named national park. The awe inspired by western mountain landscapes led Canada to establish Banff as its first national park in 1885. Landscapes in the East were also deemed worthy of preservation. Niagara Falls became the first cross-border park—an effort that also involved Olmsted.

In the decades after the American Civil War (1861-1865), a number of national organizations formed to advocate active restoration and protection of environments or specific natural features. Among the first was the Arbor Day Foundation, founded by the scientific agriculturist J. Sterling Morton. Alarmed by deforestation in his home state of Nebraska and elsewhere, Morton promoted planting seedlings across the nation. The Audubon Society made protecting birds and their habitats its mission. Founded in 1886 by the appropriately named George Bird Grinnell (and incorporated as a national organization in 1905), the society first focused on reducing slaughter of plumage species. Later it employed conservation wardens, set up sanctuaries, and educated the public. John Muir and others formed the Sierra Club in 1892 to further preservation of California landscapes, especially Yosemite. The group quickly evolved into an advocate for more national parks. Its objectives, as well as differences in philosophies among founders of the group, became clarified when San Francisco revealed plans to dam and flood the scenic Hetch Hetchy Valley near Yosemite Valley. In this struggle, the old emphasis on scenic beauty worked against Hetch Hetchy, which would have been considered spectacular if it were not outshone by Yosemite Valley. O'Shaughnessy Dam was completed in 1923, and the valley was flooded, and remains so today. In the 1980s the U.S. Department of the Interior began considering removing the dam and restoring the valley—a cause that the Sierra Club continues to promote more than eighty years after it lost its first major environmental battle. The arguments that became part of the public debate over Hetch Hetchy, arguments between the value of natural systems in their own right and their value only as resources for human use, continue today.

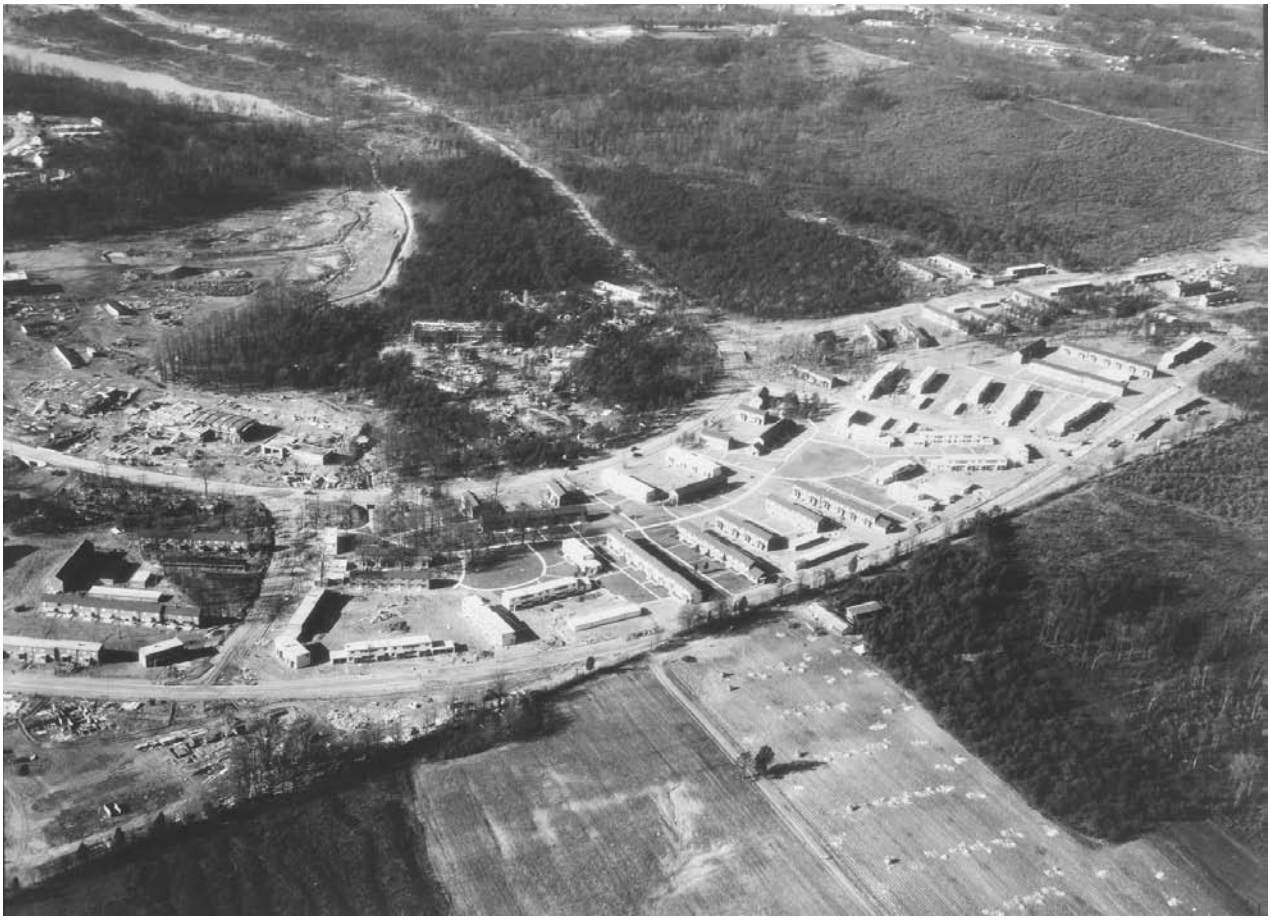
As influential as these private groups have been, it was through federal action that the largest tracks of land have been preserved, although not for purely environmental purposes. National forests were first established in 1891. Termed reserves, the forests were created to manage consumption with planned harvesting and replanting, rather than to keep trees inviolate. Under Gifford Pinchot, the first chief of the U.S. Forest Service, the service and the forests themselves became institutions professionally run on the basis of current scientific principles. Pinchot advocated wise use for a sustained yield, but did not believe that complete protection, even of outstanding natural areas, was required. This attitude led to much disagreement with Muir and others in the preservation movement.

EARLY TWENTIETH CENTURY

Federal action intensified in the twentieth century. The National Park Service, set up in 1916 with Stephen Mather as its first director, managed existing and future parks. The fledgling service hired its first landscape architect, Charles Punchard, in 1919. In language composed by Frederick Law Olmsted Jr., son of the famous nineteenth-century landscape architect and an inheritor of his firm, legislation establishing the parks set out their rationale as being "to conserve the scenery and natural ... objects and the wildlife therein ... by such means as will leave them unimpaired for the enjoyment of future generations" (as quoted in Albright 1985, p. 36). Unfortunately, just what constituted leaving parks unimpaired meant different things to different groups. Hence, the varied stakeholders in park activities have rarely agreed on the proper direction of park management.

Many landscape architects of the early twentieth century were just as active in environmental causes and issues as had been their nineteenth-century predecessors. Their activities affected all areas of practice, but had special influence on planting design, urban planning, and regional planning. Use of native plants had been a part of landscape architecture since Ossian Simonds proposed use of prairie plants in his projects, such as Graceland Cemetery in Chicago. Others expanded on native plants in designs by suggesting natural groupings for disturbed lands. Frank Waugh, of the University of Massachusetts and later the U.S. Forest Service, advocated study of native plant arrangements and their use in roadside plantings—ideas that he articulated in his classic work *The Natural Style in Landscape Gardening* (1917). Others as well focused on use of native plants, including Beatrix Jones Farrand, who devoted her estate home at Reef Point in Bar Harbor, Maine, to the cultivation of New England natives. Jens Jensen not only valued plants native to the prairie states, but also proposed their use in similar settings in the natural landscapes of Wisconsin, Illinois, Iowa, and Indiana. His designs for parks of the West Side of Chicago typically included miniature versions of regional landscape features: wide, slowly moving streams, which he referred to as prairie lagoons; rockscapes that mimicked the limestone outcroppings found in glaciated regions of Illinois; and large open prairielike spaces fringed with tree species typically found at the fringes of real prairies.

Even in their practice of urban planning, landscape architects of the early twentieth century achieved impressive examples of environmental preservation. This was done largely in the planning of park systems, but also occurred in the design of individual subdivisions. For example, Frederick Law Olmsted Jr. protected the Rock Creek riparian area in Washington, D.C., as part of the park system proposed by the Senate Park Commission of 1900. Walter Burley Griffin designed the Rock Crest subdivision in Mason City, Iowa, to preserve the creek that ran through it by placing house sites on high ground surrounding it and making the stream corridor a wooded backyard for each house.



Aerial View of Greenbelt, Maryland, 1937. *As the economy of the United States and the world declined in the 1930s, many landscape architects took jobs in government programs to plan, design, and oversee work as diverse as park building, community design, water-control construction, and soil stabilization. The city of Greenbelt was a planned community, modeled after English garden cities of the 19th century.* **THE LIBRARY OF CONGRESS.**

Landscape architects can rightly be considered full participants in the environmental progressive movement of the early twentieth century. This is especially true of those who focused on regional and resource planning. Warren Manning, Clarence Stein, John Nolen, and Frederick Law Olmsted Jr. provided leadership in this effort. Manning's plan for Harrisburg, Pennsylvania, proposed that a minimum of 5 percent of the natural landscape within the city be set aside for protection, a high figure for the early twentieth century. Stein, a cofounder of the Regional Planning Association of America, worked to establish the Appalachian Trail as the first modern multistate footpath. Nolen, although today best known as an inspiration to new urbanists, believed that plans should conform to natural topography, and that land use should fit natural capacities, as he outlined in his 1908 plan for San Diego. Olmsted balanced his more common work in city planning with interest in national parks. Through his firm he worked on a number of environmentally sensitive sites, including Acadia National Park in Maine, Everglades National Park in Florida, and Redwoods National Park in California.

MID-TWENTIETH CENTURY

As much as had been achieved in the early 1900s, it took the twin disasters of the crash of 1929 and the Dust Bowl of the early 1930s to really bring environmental concerns and sustainable-landscape treatments to the forefront of public thought and professional practice. As the economy of the United States and the world declined in the 1930s, many landscape architects, unable to continue private employment, took jobs in government programs to plan, design, and oversee work as diverse as park building, community design, water-control construction, and soil stabilization. For example, landscape architects designed many of the state-park sites and facilities constructed by Civilian Conservation Corps workers. They were also active in the Green

Cities program of the Resettlement Administration, which planned and built model low-cost communities, like Greenbelt, Maryland.

The Dust Bowl, a massive wind-erosion event that crippled the Great Plains for several years, made the general public aware of the effects of environmental damage. A number of concerns voiced earlier, such as that concerning soil erosion, became the basis of new governmental programs. Hugh Hammond Bennett had attempted to point out the potentially drastic consequences of soil erosion, but it took the Dust Bowl to make his arguments graphic. As a result, the Soil Conservation Service, now the National Resources Conservation Service, formed during the 1930s to educate the public on proper soil-preservation strategies. Although staffed largely by soil scientists, the service employed some landscape architects in the planning of some soil-control demonstration sites, particularly near cities.

Environmental concerns took a backseat to military and political survival during the 1940s. World War II and its aftermath caused serious environmental damage in both Europe and Asia. After the war, resource degradation continued as people struggled merely to live. In the United States, which escaped direct war damage, environmental problems resulted from industrial production in munitions production, mining, and other support activities. In some cases, efforts that had started to support the war continued for peacetime use with little consideration about the air, soil, and water pollution that they caused.

As prosperity returned in the 1950s, people began to examine conditions in the environment and take initial steps to lessen damage. The Nature Conservancy was one of the first new organizations to form after the war as a result of these concerns. In 1955 it began the mission for which it is best known, land acquisition, with the purchase of sixty acres (now over seven hundred acres) for the Mianus River Gorge Preserve in Bedford, New York. Other organizations quickly emerged or expanded. This was also a period in which books extolled the value of the environment or warned about the damage being done to it. Marjory Stoneman Douglas championed preserving the Everglades in her classic volume *The Everglades: River of Grass* (1947). She went on to battle wetland destruction by developers and the U.S. Army Corps of Engineers, eventually founding Friends of the Everglades. Aldo Leopold, a noted wildlife expert, scientifically studied nature and emoted about it. He ultimately presented his observations in *A Sand County Almanac* (1949). Although published after death, he was able through its words to communicate what he referred to as a "land ethic," a social and political conscience intended to influence any human intervention in natural landscapes. In *Silent Spring* (1962), Rachel Carson chronicled the damage done through modern pollution, especially from pesticides, using affecting imagery to make her point about the causes of declining bird populations.

LATE TWENTIETH AND EARLY TWENTY-FIRST CENTURIES

Several pivotal events occurred in the 1960s. In middecade Congress passed the Wilderness Act, which permanently protected over 9 million acres of significant land from development. Among other pieces of environmental legislation, in 1966 the Endangered Species Preservation Act passed, and then two years later came the Wild and Scenic Rivers Act. But a milestone of U.S. and world environmental policy came in 1969 with passage of the National Environmental Policy Act. This law prescribed a formal process that considers the environmental consequences of any activity receiving federal funding, including public review. This process was codified in required environmental impact statements, many of which were written by landscape architects in consultation with scientists.

The landscape architects Philip Lewis and Ian McHarg brought scientific analysis of landscape capabilities to the discipline by developing the overlay method to study natural and human systems—an approach today done digitally through Geographical Information Systems (GIS). In his seminal work *Design with Nature* (1969), McHarg articulated both a study method and an application of that process to sound land planning, as his firm had done in the Plan for the Valleys in Baltimore County, Maryland. The methods that he outlined in the book and taught at the University of Pennsylvania became the standard by which landscape architects evaluated sites.

As the century progressed, new issues emerged to challenge the profession. Worldwide growth of tourism required consideration of the environmental impacts of both large numbers of visitors and massive tourist facilities on delicate ecosystems. In this discussion, questions of landscape management were central: How could the carrying capacity of an area be determined? Which means of access would protect the ecology? How could sites be used to educate the public on the value of natural systems? Out of these issues there were developed important design guidelines, such as the use of boardwalks for access in sensitive areas.

Such significant philosophical and administrative questions were at one level of the practice of landscape architecture. At other levels, more direct, practical concerns were addressed, such as how to house people in environmentally sensitive and sustainable communities. Village Homes in Davis, California, begun in 1974, demonstrated that sound land-use planning, including retention of onsite runoff and planting of productive species, could be coupled with socially sensitive community building. Village

A Prairie Crossing Home in Grayslake, Illinois. *The Prairie Crossing is a nationally recognized conservation community, planned by Peter Walker and William Johnson. The community contains 359 single family homes, and was built on such ecofriendly principles as environmental protection, healthy living (including all organic farming), and energy conservation.*
© KIM KARPELES/ALAMY.

Homes became a model of innovative sustainable community design. Other developments took different approaches. Planning at the Woodlands, Texas, aimed at preserving a vital water recharge area for an aquifer that served Houston. As planned by Wallace, McHarg, Roberts, and Todd, a Philadelphia firm of landscape architects and planners, housing occupied less sensitive areas, ponds were created to let water soak into the soil above the aquifer, and numerous pine woods were preserved to retard runoff. Prairie Crossing in Grayslake, Illinois, planned by Peter Walker and William Johnson, represented a different approach to community planning. There buildable sites were clustered tighter than is typical to preserve more land for open space, which includes protected farm land, river corridors, and wildlife habitat.

On a smaller scale, an extensive array of design strategies are now being used to make sites more sustainable and thereby reduce environmental damage. Techniques include xeriscaping (the use of native and adaptable plants to reduce water and other resource consumption), construction of retention and detention ponds to prevent or limit the amount of runoff that leaves a site (as an aid in flood control downstream), energy conservation through site design (including proper building orientation and shading of structures), use of recycled or renewable materials (such as shredded tires to make playground surfaces), and construction of wetlands to purify contaminated water. Landscape architects take seriously the charge to act locally, making sound decisions for a sustainable environment at every scale of work.

Landscape architecture continues in the forefront of efforts in the early twenty-first century to create a more sustainable future for the world. Its practice affects every aspect of sustainability and goes beyond theory and general principles to apply both philosophy and science to real world situations used by people daily. Every action in the landscape—from the most mundane, such as shrub clearing, to the large-scale, such as the construction of a new town—has significant consequences for the local environment. When these local outcomes become aggregated, serious global environmental change can occur. The overriding goal of landscape architecture is, in the words of Robert L. Thayer, to create places "where human communities, resource uses, and the carrying capacity of surrounding ecosystems can all be perpetually maintained" (1994, p. 235).

SEE ALSO *Audubon Society; Environmental Law; Hetch Hetchy; Land Ethic; Landscape Painters and Environmental Photography; Leopold, Aldo; Marsh, George Perkins; Preservation; Sierra Club; Space/Place; Sustainability; Urban Environments; U.S. Forest Service; U.S. National Park Service.*

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Nancy Volkman

LANDSCAPE PAINTERS AND ENVIRONMENTAL PHOTOGRAPHY

Landscape painting, which began in the late Middle Ages, has played an important role in environmental thought and environmental philosophy, especially in the first eight decades of the nineteenth century in the United States. Although the type of painting that promoted nature preservation ceased to be mainstream art by the end of the nineteenth century, landscape photography, after 1860, began to play a comparable role and has continued to do so to this day.

VIEWS OF NATURE IN THE MIDDLE AGES

In the Middle Ages educated people were taught that nature was not beautiful, for the theology that pervaded the culture of the time saw nature as competing with and detracting from the love of God. For example, Petrarch (1304–1374), while climbing a moutain in 1336 and taking pleasure in the view, reprimanded himself for "admiring earthly things" (Clark 1976, p. 10). Realistic depictions of nature were rare. Images of earthly or natural objects were intended to be symbolic rather than representational. This focus was a characteristic form of thought of the time—"symbolic thinking"—according to which images were associated with biblical stories (Huizinga 1924). The landscape painting of the Middle Ages was essentially a "landscape of symbols" (Clark 1976, chap. 1, pp. 1–31). Mountains, for example, symbolized the wrath of God at the time of the Flood of Noah.

The darkness in depictions of forests reflected a general fear of nature and its estrangement from God, who was otherworldly. In the centuries that followed, the understory of forests gradually brightened with light, signifying the presence of God in nature. By the nineteenth century, the conflict between God and nature was broken. It was possible to love God while loving nature in what otherwise appeared to be realistic, secular painting.

EARLY MODERN VIEWS OF NATURE

As the Middle Ages waned, symbolic thinking was displaced by representational thinking as the primary mode of thought. In the early modern period representation was especially important in the rise of science, but its role was no less important in painting. A central feature of modern painting was the development of perspective, which led to the realistic depiction of spatial relations. In addition, artists began to try to accurately represent the details of nature, which gradually led them to incorporate the science of natural history into their work—especially biology, botany, and geology.

Painters developed close ties with the science of natural history because they were attending to the same properties of natural objects: secondary properties (color, taste, smell, texture, and sound), in terms of the distinction developed by Galileo Galilei and René-Descartes between primary and secondary qualities. Biologists, botanists, and geologists used these properties to classify the objects of their scientific interest. Painters rendered these properties in their artistic work. Writers followed suit, making use of additional secondary properties in their poetry and prose.

Although the transition from the "landscape of symbols" to the "landscape of fact" (Clark 1976) can be presented as a general development among nearly all European artists, American painters of the nineteenth century identified three artists as especially important: Titian (c. 1485–1576), Salvator Rosa (1615–1673), and Claude Lorrain (1600–1682). Titian was considered the first painter to use landscape as background. The human figures, however, were large and the central feature of the paintings. The landscapes themselves were simply generic background decoration. Rosa introduced the sublime into painting in terms of jagged, broken geological features and stormy, tempestuous skies. A weathered stump of a tree in the lower left corner of painters became a tradition among the artists that followed after him. The sublime was an aesthetic appreciation of nature involving the transformation of properties of God into properties of nature. Mountains symbolizing the wrath of God came to be regarded as terrifying but breathtaking natural phenomena (Nicolson 1963). Claude pioneered picturesque beauty in painting.

Initially, the sublime was viewed as the opposite of the beautiful and the primary aesthetic attribute of nature. The sublime was big, the beautiful small; the sublime rough, the beautiful smooth; the sublime terrifying, the beautiful pleasant. The dichotomy between the sublime and the beautiful was established by the philosopher Edmund Burke (1729–1797) in his book *A Philosophical Enquiry into the Origin of Our Ideas of the Sublime and the Beautiful* (1757). William Gilpin (1724–1804), a writer,

Italian Landscape, 1640, by Claude Lorrain. *Claude Lorrain was an early landscape painter whose techniques had a significant influence on nineteenth-century American painters. He is considered the pioneer of the "picturesque," an aesthetic category that seemed to combine both the sublime and the beautiful in landscape painting. Prior to this historical period, landscapes alone were not considered to be an appropriate subject matter for serious painting.* **THE ART ARCHIVE/TATE GALLERY LONDON.**

artist, and clergyman, attacked Burke's distinction in a series of books analyzing the aesthetic elements of natural scenery, particularly river valleys, arguing that nature also could be beautiful as well as sublime—that is, picturesque. Claude's paintings were the model of picturesque beauty, which combines elements of both the sublime and the beautiful (Hussey 1927): some roughness without being frightening; some harmony without being formal.

The scenic elements of Claude paintings are harmonious rather than chaotic. The human figures are small, but the paintings include ruins or castles to provide a humanizing element. In the nineteenth century the paintings of Rosa (epitomizing the sublime) and Claude (epitomizing the picturesque) served as alternative formulaic styles for American landscape painters.

The admiration for the painting of natural scenery gradually led to an aesthetic appreciation of landscapes similar to those depicted in picturesque painting. People became fascinated with particular landscapes during travel, and it slowly dawned on them that the scenery reminded them of Claude paintings. The transition proved to be a difficult one. In order to facilitate the development of a taste for natural scenery, people used "Claude glasses," a mirror surrounded by a small picture frame, which, when standing with one's back to the natural scene, permitted the traveler to rearview the natural scene much like a framed painting. The glass of the mirror was stained to match the golden brown of the varnish Claude used on his paintings so as to enhance the picturesque aesthetic effect.

VIEWS OF NATURE DURING THE NINETEENTH CENTURY

Although he was not a landscape painter, the writer Henry David Thoreau (1817–1862) articulated a view of nature that emerged out of two traditions that were central to landscape painting: the science of natural history and picturesque travel. Thoreau was considered an important amateur naturalist. In addition, his early writing attempts were heavily influenced by Gilpin. Thoreau began writing *A Week on the Concord and Merrimack Rivers* (1849) shortly after reading twelve of Gilpin's picturesque travel books.

American painting started with a strong focus on portrait painting because it was the most reliable way for artists to receive payment for their work. The first major American landscape painter was Thomas Cole (1801–1848), who is considered the founder of the Hudson River School, a group of artists in New York and New England who became known for the painting of natural scenes, especially in the Adirondacks and the Catskills. Cole focused on landscape painting in large part because he had little ability as a portrait painter. Cole was troubled throughout his career about the type of paintings that would sell. He preferred to paint ideal or composed paintings in which the scene depicted arose from the artist's imagination. Cole believed that the depiction of a real landscape was merely imitation and therefore could not be appreciated for the creativity of the artist, only for the artist's technical skills in painting. Unfortunately, from Cole's perspective, Americans preferred paintings of real places and often wanted to know where they could go to compare his paintings with actual locations in nature. He lamented that, because of the poor tastes of the American people, he was never able to become the great artist he should have been (Novak 1969). On occasion he did paint real places: For example, *The Oxbow (The Connecticut River near Northampton)* (1836) is the kind of painting for which he is best remembered and which served as the inspiration for the rest of the Hudson River School. *The Oxbow* was admired especially because it replaced the formulaic tumultuous sky of Salvator Rosa with a representation of a recognizable meteorological front. Cole was most interested in his religious paintings, but his place in history is based primarily on his work as a landscape painter.

Most members of the Hudson River School did not share Cole's preference for "composed" paintings. After Cole's death, Asher Durand (1796–1886), as the editor of *The Crayon,* a newsletter for artists, became the leader of the Hudson River School. In an editorial in *The Crayon,* he argued for the accurate depiction of real places in landscape painting:

> Let it be remembered that the subject of the picture, the material object or objects from which it is constructed, are the essential parts of it. If you have no love for them, you can have no genuine feeling for the picture which represents them. You may have a kind of admiration for the masterly treatment, and remarkable qualities, but that does not constitute love of Art—it is only an intellectual perception of power.... We *love* Nature and Beauty—we admire the artist who renders them in his works. (Durand 1855)

Durand also emphasized the relationship of landscape painting and nature poetry with one of his most famous paintings, *Kindred Spirits* (1849), which depicts Thomas Cole and William Cullen Bryant (1794–1878), an American Romantic poet. Bryant himself called attention to this connection with a two-volume illustrated book, *Picturesque America* (1872), filled with pen-and-ink drawings documenting the beauty of the United States.

Frederick Church, Cole's only student, became interested in the role of painting in the science of natural history after reading *The Cosmos* (1850) by Alexander von Humboldt (1769–1859), in which Humboldt lamented that he had not taken an artist with him to visually document his scientific studies in South America. A year later Church traveled to South America and retraced Humboldt's steps in order to paint the natural history of the region. Most of Church's paintings were "composed"—that is, not actual places—but he presented them as scientific summaries of the South American landscape. One of Church's currently most famous paintings, *Heart of the Andes* (1859), did not depict a real place but rather was a summary of the typical features of the landscape, with special attention to scientific detail. Art critics recommended that viewers consider portions of the painting separately, much as travelers do in viewing natural scenes. For example, one part of the painting shows a peasant praying before a cross by a road. Another part of the painting depicts a tree precariously growing on a bank that is being undercut by a stream below. The first says something about the religiosity of the region. The second presents a freeze-frame in dynamic natural history: The bank will continue to erode, and the tree will eventually fall into the river.

Church encouraged a fellow artist, Martin Heade, to travel to South America, where he painted studies of hummingbirds. These paintings—for example, *Brazilian Hummingbirds* (1865) and *Magnolia Grandiflora* (ca. 1880)—show that major artists were also influenced by the scientific illustration of eighteenth- and nineteenth-century biologists, botanists, and geologists. Because photography was very primitive until the second half of the nineteenth century, and even then produced only black-and-white images, scientists took art lessons as part of their scientific training and, as a result, developed the same aesthetic sensibilities as landscape painters. Even ideal or "composed" paintings by mainstream artists often

Heart of the Andes, *1859, Frederick Edwin Church.* *One of Church's most famous paintings, this scene does not represent an actual geographical location, but is rather a summary of various features the artist encountered while traveling through South America. Church was the only student of American painter Thomas Cole, the founder of the Hudson River School.*

produced reliable scientific information because the artist usually used plants, animals, and geological features typical of the region where they painted.

A characteristic feature of nineteenth-century American landscape painting was the presence of intense, bright light. John I. H. Baur (1954) linked all of this painting together, coining the term *Luminism*. The light performs two functions. First, it introduces a religious dimension into seemingly secular paintings. This light might, for example, be a beam coming out of the sky, characteristically accenting a waterfall or a radiant glow brightening the understory of a forest. Second, the light starkly intensifies the materiality of the natural objects represented in the paintings. The result is a presentation of a natural world that is both material and spiritual. (Compare Thomas Cole's *The Pilgrim of the Cross at the End of His Journey* [1844-1845], in which an area of bright light depicts the border between heaven and earth, and Albert Bierstadt's *Sierra Nevada Morning* [1870], in which the same lighting techniques produce a similar effect.)

The Luminists were guided by a belief that all nature is beautiful, as encapsulated in an oft-quoted remark by John Constable (1776–1837): ''No, madam, there is nothing ugly; *I never saw an ugly thing in my life:* for let the form of an object be what it may—light, shade, and perspective will always make it beautiful'' (Leslie 1951, p. 280). In a similar vein, Ralph Waldo Emerson (1803–1882) wrote, ''There is no object so foul that intense light will not make beautiful. . . . Even the corpse has its own beauty'' (Emerson 1836), and John Muir (1838–1914) wrote, ''none of Nature's landscapes are ugly so long as they are wild'' (Muir 1901, p. 4).

This position—that everything natural can be viewed as beautiful—has been named by Allen Carlson (Carlson 1984) as ''positive aesthetics.'' Carlson argues there that ''Art is created, while nature is discovered'' and that creativity is in the standards created by humans to describe nature but not in nature itself; there is no creativity in nature (Carlson 1984, p. 31). Eugene Hargrove has argued, to the contrary, that creativity is in nature and it is the same as the creativity attributed to God in the late Middle Ages, when the properties of God symbolically manifested in nature were transferred to nature itself in the concept of the sublime. The result is indifferent rather than artistic creativity (Hargrove 1996 [1989]).

ENVIRONMENTAL PHOTOGRAPHY

Luminist painting ceased to be cutting-edge, mainstream art in the 1880s, when it began to be displaced first by impressionism, then postimpressionism and cubism, and ultimately by abstract expressionism. With impressionism artists no longer painted objects lit by strong light and instead painted the light itself in such a way that the objects dropped out of consideration. With postimpressionism and cubism artists gradually abandoned linear perspective and with it the realistic depiction of material objects. With abstract expressionism the quest for accurate representation of nature, begun in the late Middle Ages, was completely abandoned. These new forms of painting severed the link between "art and nature" and instead sought a link between "art and self," making so-called modern art irrelevant environmentally. However, the tradition of representational art continued with the rapid emergence of photography, which quickly elevated itself to an art form in its own right.

Photography began with Louis Daguerre's invention, in France in 1839, of the daguerreotype, which remained the primary form of photography until 1859. Because daguerreotypes required long exposures, did not produce the detail needed for landscape photographs, and were not reproducible through print media, they were mostly limited to portraiture. The glass-plate process developed in the 1850s made landscape photography as we know it today possible and profitable, because multiple copies of each photograph could be easily produced. The technology was fully perfected by 1860, in time to produce chillingly detailed documents of the death tolls on Civil War battlefields in the United States. Shortly thereafter, however, it was put to more pleasant use in nature photography. The poor quality of daguerreotype photography can be strikingly seen in J. D. Hutton's photography of the Great Falls of the Missouri during the W. F. Reynolds's expedition of 1858–1859 (Naef and Wood 1975, p. 29), which is misidentified as a falls on the Yellowstone River. Although Hutton was attempting to reproduce a sketch of the falls made by Meriwether Lewis, the result is so poor that the photograph requires significant explanation to make it intelligible as a nature scene.

In addition to mammoth glass-plate cameras, stereoscopic cameras were also developed at this time, providing smaller three-dimensional views of nature with stunning effect. Nevertheless, the larger photographs, which were more like landscape paintings, proved to be more popular and commercially successful.

The importance of western American nature photography was firmly established internationally with the submission of photographs of Yosemite to the 1867 Paris International Exposition, where they won a bronze medal. Although the photographs were submitted under the name Thomas Houseworth (1828–1915), they are believed to have been made by C. L. Weed (1823–1903) or C. E. Watkins (1829–1916), photographers who worked for Houseworth's company. Weed and Watkins began photographing Yosemite in 1859 and 1861, respectively. Watkins competed with Weed, often photographing the same scenes previously photographed by Weed in order to prove his superiority as a photographer. Eadweard Muybridge (1830–1904) joined the competition, also photographing the same locations. This competition helped call attention to landscape photography as an art form and to Yosemite as a place of spectacular national importance.

Government-sponsored geological surveys also advanced landscape photography in the 1860s. The California State Geological Survey, which came to be a model for other state geological surveys, hired Watkins as a photographer in connection with the survey of Yosemite Valley that was to become a state park as a gift of the federal government. Clarence King, who later became the first head of the U.S. Geological Survey, happened to be in California looking for "the Cotopoxi of the West," a mountain that would be as aesthetically spectacular as an active volcano painted by Church in South America. King joined the California survey and was given the task of surveying Yosemite. There he worked with Watkins and learned the value of landscape photography in geological work. In 1867, when King became the head of the Fortieth Parallel Survey, he immediately hired Timothy O'Sullivan as a photographer. O'Sullivan's work was considered so spectacular and so useful in gaining additional congressional appropriations, that F. V. Hayden's survey of the territories and John Wesley Powell's survey of the Colorado River quickly followed his example. W. H. Jackson (1843–1942) became especially well known for his photographs of Yellowstone and Colorado while working for Hayden.

There was considerable interaction between artists and photographers during this period, especially on the geological surveys. Thomas Moran (1837–1926), most famous for his two paintings of the Great Falls of the Yellowstone, worked with Jackson and sometimes stood in his photographs for scale (see Naef and Wood 1975, p. 222). Bierstadt used a Watkins photograph of the Grizzly Giant in the Mariposa Grove in the creation of his famous painting of the same tree (c. 1864) (Naef and Wood 1975, p. 62). The aesthetic perspectives and goals of the artists and the photographers were the same.

Landscape painting and photography had a tremendous impact on nature preservation in the nineteenth century. Landscape paintings and photographs played a central role in the creation of Yosemite, a California state park, and, a few years later, Yellowstone National Park.

Uinta Mountains, Utah. *This photograph was taken by Timothy O'Sullivan in 1869 while working for the Fortieth Parallel, or King, Survey. The glass-plate process, which replaced daguerreotypes in the 1850s, made landscape photography both possible and profitable.* **PHOTO BY T.H. O'SULLIVAN/U.S. GEOLOGICAL SURVEY.**

Nearly all of the places painted and photographed by major artists and photographers during that time period are now national parks or national monuments. Frederick Law Olmsted (1822–1903) acknowledged this connection in his report on Yosemite Valley to the California legislature in which he recommended that half of the commissioners for the park be "students of natural science and landscape artists" (Olmsted 1952). A few years later, when landscape photography was better established, he would have most certainly added "landscape photographers."

The creation of these images of then-remote areas permitted the general public to learn about and care about these places, and congressional action to preserve these places quickly followed. In admiring the aesthetic qualities of the paintings and photographs, people were also admiring the aesthetic qualities of the places that the images represented, and their aesthetic enjoyment, as G. E. Moore (1873–1958) put it in another context in *Principia Ethica* (1903), depended on a true belief that the aesthetic qualities depicted continued to exist in the original (Hargrove 1996 [1989]). Just as images of natural objects in the Middle Ages, in terms of symbolic thinking, produced a religious, otherworldly aesthetic experience, the images of natural objects in the modern period, in terms of representational thinking, produced an aesthetic experience of the world as it actually existed a desire to preserve it in a natural state.

The link between images and natural places still plays a critical role in the environmental movement politically, for it makes it possible for people to become committed to protecting places that they may never visit. Without this representational link, the environmental

Yellowstone National Park, Wyoming. *Taken by W.H. Jackson in 1872 while working for the Hayden geological survey, Jackson became especially famous for his photographs of Yellowstone—such as this image of Old Faithful Geyser—and Colorado.* **U.S. GEOLOGICAL SURVEY.**

movement would have been a local rather than a national and international movement. The original impact of nineteenth-century landscape painting and photography is still appreciated in the work of Ansel Adams (1902–1984), who stands at the end of a tradition started by Weed, Watkins, and Muybridge. The impact, however, is pervasive, for the general public is surrounded by images in photographs and motion pictures that follow the principles and perspectives of nineteenth-century painting and photography. When tourists move back and forth at a scenic view while taking a photograph, they are intuitively employing the compositional techniques developed by those artists and photographers.

SEE ALSO *Environmental Aesthetics; Environmental Art; Hudson River School; Thoreau, Henry David.*

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Eugene C. Hargrove

LAST MAN ARGUMENTS

The *last man argument* was devised by Richard Sylvan (before 1983 Sylvan went by the name Richard Routley) and was first published in Routley's article "Is There a Need for a New, an Environmental, Ethic?" (1973). It is a thought experiment designed to show that the prevailing principles of the dominant European and North American tradition are unable to provide a satisfactory basis for an environmental ethic. An adequate ethic of concern for the nonhuman world must therefore have very different foundations.

The shared core assumptions of European and North American ethics (which Sylvan calls a "super ethic") include a *freedom principle,* according to which agents are permitted to act as they please provided that they do not (1) harm others (understood usually, though not always, as other *persons*) or (2) harm themselves irreparably. Sylvan labeled this anthropocentric principle *basic human chauvinism*, because it affirms that moral deliberation and choice involve only human interests and concerns. The last man thought experiment was devised to refute this core principle and thus expose the inadequacy of traditional European and North American ethics as a foundation for an environmental ethic.

Most scholars argue that ethical principles must be universal and therefore applicable not just to actual situations but to all possible situations. It is for this reason that thought experiments are important intuition pumps and play a central role in testing ethical principles. The last man thought experiment is as follows: "The last man (or person) surviving the collapse of the world system lays about him, eliminating, as far as he can, every living thing, animal or plant (but painlessly if you like, as at the best abattoirs). What he does is quite permissible according to basic [human] chauvinism, but on environmental grounds what he does is wrong" (Routley 1973, pp. 207–208).

Because he is the last human survivor, there are no other human interests to be considered, and the chauvinistic liberty principle therefore provides no grounds for moral condemnation of his actions. Nevertheless, it is clear to an environmentally enlightened conscience that the actions of the last man are morally dreadful. If you share Sylvan's intuition that these terminal actions are

morally reprehensible, and if there are no anthropocentric considerations to support this intuition, then there must be some nonanthropocentric considerations or values that explain the evil of the acts. (The last man argument is formulated at greater length in Routley and Routley (1980), which Sylvan (then Routley) authored jointly with his then-partner, who later took the name Val Plumwood.)

Holmes Rolston (1975) has set out a parallel "African butterfly" argument in support of nonanthropocentric environmental values. Gratuitous acts of "speciescide" carried out by unscrupulous butterfly collectors, like the actions of Sylvan's last man, are reprehensible to the environmentally enlightened conscience. Robin Attfield (1981) and Mary Anne Warren (1983) have also presented variants of the argument.

A thought experiment that anticipates some aspects of Sylvan's argument was proposed by G. E. Moore in a famous attempt to establish the objective value of beauty.

> Let us imagine one world exceedingly beautiful. Imagine it as beautiful as you can; put into it whatever on this earth you most admire—mountains, rivers, the sea; trees, and sunsets, stars and moon. Imagine these all combined in the most exquisite proportions, so that no one thing jars against another, but each contributes to increase the beauty of the whole. And then imagine the ugliest world you can possibly conceive. Imagine it simply one heap of filth, containing everything that is most disgusting to us, for whatever reason, and the whole, as far as may be, without one redeeming feature.... The only thing we are not entitled to imagine is that any human being ever has or ever, by any possibility, *can*, live in either, can ever see and enjoy the beauty of the one or hate the foulness of the other. Well, even so, supposing them quite apart from any possible contemplation by human beings; still, is it irrational to hold that it is better that the beautiful world should exist, than the one which is ugly? (1903, pp. 83–84)

Moore's intuition is that the beautiful world is objectively better than the heap of filth—and he suggests that this is so quite independently of whether any evaluators exist to contemplate the worlds in question. Nevertheless, according to David Hume (1740), we must be cautious about inferences, however appealing, that draw evaluative conclusions from descriptive premises.

Value intuitions depend crucially on the nature of evaluators. It is not difficult—given our aversion to dung—to share Moore's intuition. This preference, however, is shaped by our biological constitution. It is far from clear that our preference would be shared by, say, a dung beetle or a blowfly. Rather than establishing the objective value of beauty, Moore has established the existence of deep-seated intersubjective aesthetic intuitions shared by humans—and the difficulty of thinking like a blowfly.

Sylvan's argument similarly fails to establish secure objective grounds for nonanthropocentric values. Like other famous thought experiments, however—such as brains in vats (Brueckner 2004) and "trolley" problems (Thomson 1976)—it helps us to regiment our intuitions. The powerful visceral impact of the last man thought experiment reveals a widespread though perhaps not universal biophilia—an affinity for rich, diverse, complex, and beautiful biological systems. The use of cyanide and explosives for fishing on coral reefs, rather than sustainable practices, and the clear-felling and burning of old-growth forests, generate a similarly powerful visceral repugnance that is also widely shared but is also, alas, not universal. The last man thought experiment helps us to understand that the depletion of biodiversity impoverishes not just the biosphere but also the requirements for the sort of human life to which we are adapted and to which many of us aspire.

SEE ALSO *Environmental Philosophy: V. Contemporary Philosophy; Plumwood, Val; Rolston III, Holmes; Speciesism.*

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William Grey

LEOPOLD, ALDO

1887–1948

Aldo Leopold was born on January 11, 1887, in Burlington, Iowa, and became one of the most prominent environmental philosophers of the twentieth century. In his childhood he was an avid naturalist, ornithologist, hiker, and hunter. After finishing a master's degree in forestry at the Yale Forest School in 1909, he joined the U.S. Forest Service. Until 1924 Leopold worked exclusively in the Southwest, and from 1924 to 1928 he worked for the Forest Products Laboratory in Madison, Wisconsin. From 1928 to 1932 he conducted game management research for the Sporting Arms and Ammunitions Manufacturers' Institute, and in 1933 he accepted a position as professor of game management at the University of Wisconsin–Madison. He died in Wisconsin on April 21, 1948.

Leopold was among the founders of the field of wildlife management; his *Game Management,* the first text in that field, was published in 1933. He helped create the first designated wilderness area in the United States in 1924 and cofounded the Wilderness Society in 1935. Although he wrote over three hundred articles, he is best known for his posthumously published book *A Sand County Almanac* (1949).

Aldo Leopold, circa 1943. *Aldo Leopold is one of the most prominent environmental philosophers of the twentieth century. He is well known for his work with the U.S. Forest Service, and his famous essay, "The Land Ethic."* **COURTESY OF THE ALDO LEOPOLD FOUNDATION ARCHIVES.**

A SAND COUNTY ALMANAC

The last and most philosophical essay in the *Almanac* is "The Land Ethic." In that essay Leopold argued that human ethics can, must, and should evolve and that the sense of community on which human ethics is based must expand to include the land itself (i.e., all living and nonliving components of the environment). He went on to say that humans must transform themselves from ecological conquerors to ecological citizens and that changes in a nation's environmental policies must be preceded by similar philosophical changes in that nation's populace. Leopold held that land is a structured ecological mechanism that is replete with energy circuits, capable of being healthy or unhealthy, and vulnerable to sudden anthropogenic disturbances; purely economic, instrumental approaches to land use are ethically impoverished and unsustainable. The essay culminates with the well-known claim that land usage "is right when it tends to preserve the integrity, stability, and beauty of the biotic community. It is wrong when it tends otherwise" (Leopold 1949, pp. 224–225). The land ethic stands as the first systematically holistic ethic in environmental philosophy. However strong people's concern for individual members of the land community may be, concern for the land community itself should be much stronger.

As a whole the *Almanac* is difficult to characterize, partly because of Leopold's efforts to meet common expectations of what "nature books" should be like: personal and narrative, with analytical and theoretical comments tolerated only when "worked into a framework of actual field experience" (Ribbens 1987, p. 93). The overarching theme is an evolutionary and ecological worldview. Part I conveys it indirectly through personal and experiential narrative, Part II conveys it more directly and didactically, and Part III explores its normative implications. One of the most striking blends of personal narrative and philosophical commentary occurs in "Thinking Like a Mountain," a personal, confessional essay in which Leopold not only acknowledges his predator-eradicating past but credits it as a source of sudden and unexpected moral insight. The essay marks a humble approach to the difficulties of making progress on an unfamiliar moral frontier.

It is difficult to determine the ultimate motivation for Leopold's environmental philosophy. Is the land ethic fundamentally prudential and anthropocentric? If that is

not the case, is it possible to commend it, as Leopold often does, on grounds of seemingly antithetical enlightened self-interest?

INTERPRETATIONS OF LEOPOLD'S LAND ETHIC

Answering these questions has been a challenge for Leopold scholars. J. Baird Callicott characterized Leopold's land ethic as subjectively deontological but objectively prudential (Callicott 1987, p. 214). Bryan Norton interpreted Leopold as a pragmatist and a value pluralist who embraced "a standard of long-term survival as a noneconomic basis for evaluating a culture's practices and institutions" (Norton 2005, p. 75). Roderick Nash described Leopold as "a battle-scarred veteran of conservation policy wars" who appealed to enlightened self-interest only because it "was the best way to sell his philosophy in the 1930s and 1940s" (Nash 1987, p. 81). Julianne Lutz Newton and Curt Meine denied the presence of an ultimate motivation. Leopold simply encouraged people to evaluate their treatment of land "in both moral and prudential terms" (Newton 2006, p. 320) and "tried to strike a balance between the reality of economic necessity and the truth that standard economic definitions of 'necessity' did not suffice in conservation" (Meine 1988, p. 503). When it came to conservation, Leopold believed that "a profit motive was not enough. Nor, for that matter, was a sentimental motive" (Meine 1988, p. 503).

The scientific foundations of the Leopold land ethic are a source of both strength and vulnerability. Science is regarded as objective and credible, but it is also fallible and dynamic. Ecology no longer conceives biotic communities as stable over time or as exhibiting robust integrity. The Leopold land ethic may be undermined by the so-called shifting paradigm in contemporary ecology and the replacement of the notion of the balance of nature with that of the flux of nature. In that case contemporary environmental ethicists face the question: Can the land ethic be updated in light of the contemporary flux paradigm in ecology?

SEE ALSO *Environmental Philosophy: V. Contemporary Philosophy; Land Ethic; Wilderness.*

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Darren Domsky

LIFE: RESPECT/ REVERENCE

Albert Schweitzer (1875–1965) attempted to combine a systematic nature philosophy with a sense of mystical devotion to the phenomenon of life. Through his reverence for life ethic he sought to create a biocentric worldview that was informed by biological individualism. However, his argument was not developed formally in his written works.

Distracted by his fight against nuclear weapon research and testing after 1945 as well as his medical mission in French Equatorial Africa, Schweitzer made partial drafts but never completed the last two volumes of his *Philosophy of Civilization*. He hoped that his life's work would provide the needed clarity and the definitive example for his philosophy. However, unanswered questions have prevented his work from having a wider influence in environmental thought. It has been concluded by many that Schweitzer could not overcome the inherent problems in trying to reconcile a focus on biological individualism with ecocentric aims. Reverence for life has not been seen in academic circles as a practical ethic or a consistent philosophy.

SCHWEITZER'S ETHICAL MYSTICISM

More recent scholarship has revealed greater sophistication in Schweitzer's thought. Schweitzer intended his concept of ethical mysticism to serve as a balance between his argument for the respect due to all living beings and the need to set this against the reality to take other life to

survive. This tension is also at the heart of the conflict between animal rights activism and holistic environmental concerns. Resource managers, for example, often must destroy individuals within a managed population or eliminate invasive exotics entirely for the greater good.

Yet Schweitzer indicated that it is necessary to protect all life that comes within the reach of a moral agent. However, moral agents cannot live up to this standard fully because they must eat and alter their environment to live. The key for Schweitzer was to atone actively for the taking of life through devotional service to all "Life" by promoting a greater good. This creates a deepening and lifelong devotion to ethical duty. Schweitzer became an exemplar of this ethic through his fifty-year medical mission in Africa.

Schweitzer's inspiration came from the Lutheran theology of the Cross. Schweitzer was an ordained Lutheran minister and believed that all would-be disciples of Christ are called upon to follow Jesus's example of self-sacrificing love (*kenosis*) through compassionate missions to eliminate suffering wherever it is found. However, Schweitzer did not see reverence for life as an exclusively Christian ethic. He was a student of world religions and believed that all faiths contain the seeds of ethical mysticism, though he did not find all faiths equally satisfactory in terms of the ethical traditions they promoted.

In a article titled "The Ethics of Reverence for Life" Schweitzer presented the admonition "I see that evil is what annihilates, hampers, or hinders life … goodness, by the same token, is the saving or helping of life, the enabling of whatever life I can to attain its highest development" (Schweitzer 2002 [1936], p. 129). This argument was derived from German philosopher Arthur Schopenhauer's concept of the will-to-live. For Schopenhauer the will is not intention or desire but refers to the etiological changes in bodies through time. An acorn, for example, contains all the potential manifestations of an oak tree, yet these forms become actualized only over time. The will is the cause for the movement from potentiality into actuality. All bodies possess a will-to-live that gives an organism the instincts and dispositions necessary for the expression of its potential. For Schweitzer, helping all life reach its highest possible development of its will-to-live in light of the needs of others is the basic good in the reverence for life ethic.

APPLICATIONS AND REFINEMENTS

Schweitzer refused to lay down rules for every possible situation in which conflicts between saving life and taking life arise because that would externalize morality in a codified object, leaving it vulnerable to egotistical rationalization, depreciating negotiations, and superficial conviction. However, his life and work show that he recognized that it is necessary to take life to save other life. His practice as a physician, for example, required him to kill countless pathogenic bacteria and parasites to save the life of human and nonhuman patients. In this way he sought to widen and deepen public acceptance of reverence for life and recruit additional moral agents in the promotion of a greater good.

This position is not inconsistent or contradictory. An analogy with pacifism illustrates the underlying dynamics. A pacifist is confronted by a skeptic with the following dilemma: either kill the men who are threatening his or her neighbors or allow them to be killed. The pacifist replies, "I am not concerned primarily with what to do about these dilemmas when they arise; I am concerned with preventing them from arising to begin with through disarmament, institutions to secure world peace, and distributive justice to redress social wrongs." Similarly, the reverence for life ethic seeks ends that secure the best and highest good for all Life.

Schweitzer set out to offer a "path in the thicket" for a civilization that had lost its way (Schweitzer 1949, p. 185). He had come to see the ethical traditions of Kantianism and utilitarianism as morally bankrupt. In their place he sought to weave together several complementary strands of thought at the core of his reverence for life ethic. From Charles Darwin he took the shared evolutionary heritage with all life and the evidence for a social instinct; from David Hume, Arthur Schopenhauer, and Adam Smith, a philosophical basis for sympathy; and from the religious traditions of mysticism, a substantive and personal connection to ethical duty directed to the here and now. In the decades that followed, others moved to establish a life-centered philosophy with greater prescriptive clarity, with or without direct reference to Schweitzer. They include Kenneth E. Goodpaster, Paul W. Taylor (1986), Peter G. Brown, and David K. Goodin.

SEE ALSO *Deep Ecology; Invasive Species; Schweitzer, Albert.*

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Peter G. Brown
David K. Goodin

LIMITS TO GROWTH

The 1950s and 1960s were a time of growing awareness of environmental problems, with lethal smog in major cities, warnings that growing air pollution in New York would make the city uninhabitable, the Cuyahoga River catching fire, and predictions of imminent mass starvation and environmental catastrophe from unchecked population growth. Recognizing a crisis situation, the developed nations began to take important steps to address these issues; the United States, for example, created the Environmental Protection Agency, extended the Clean Air Act, and passed the National Environmental Policy Act, Clean Water Act, and Endangered Species Act, all between 1970 and 1973.

EARLY WARNINGS ABOUT GROWTH

In this atmosphere Donella Meadows and her coauthors published *Limits to Growth* (1972), a report on the results of a computer-systems model of the interactions between the human economy and the planetary ecosystem that sustains and contains it. Focusing on population growth, resource depletion, industrialization, pollution, and food production, and assuming exponential growth but finite resources, the model showed that existing trends would lead to resource exhaustion in the coming decades, with potentially catastrophic consequences by the middle of the coming century and perhaps sooner. The report advised that avoidance of this outcome required rapid stabilization of human populations, resource, use and waste emissions. The oil crisis of 1973 initially seemed to confirm some of these conclusions.

The Meadows report was certainly not alone it its conclusions. In *The Entropy Law and the Economic Process* (1971), Nicholas Georgescu-Roegen argued that our economic system, like all physical systems, is subject to the laws of thermodynamics. The laws of thermodynamics (matter-energy cannot be created or destroyed, useful energy dissipates, and disorder increases) limit the physical size of the economy on a finite planet. The increase in entropy entailed by economic production requires compensating inputs of low-entropy energy, and the economy systematically converts low-entropy resources into high-entropy waste, providing human welfare in the process. The economy has access to two sources of low entropy to maintain this process: finite stocks of fossil fuels and other natural resources that we can use as fast as we choose and the finite flow of solar energy, which arrives at a rate beyond our control. As finite stocks become exhausted, the size of the economy will be limited by the flow of solar energy. Eventually, all the material building blocks of our economy must become so dispersed that the fixed flow of solar energy will be inadequate to recycle them, and the economy must collapse. Economic growth can only speed our doom.

Herman Daly also recognized the limits to growth, but he more optimistically argued that a no-growth, steady state economy could be sustained indefinitely. However, the raw materials that serve as the inputs into economic production also serve as the structural building blocks of ecosystems. Structure generates function. Along with other valuable services, ecosystems provide irreplaceable life-support functions that are essential to human survival. Both the extraction of ecosystem structure for economic production and the emissions of waste (known together as throughput) degrade ecosystem services. Long before the threshold of collapse, the diminishing marginal benefits of increasing economic output are likely to fall below the rising marginal costs of ecological degradation, at which point continued economic growth—defined as a "quantitative increase in ... the rate of flow of matter and energy through the economy ... and the stock of human bodies and artifacts"—becomes uneconomic. Economic development—a "qualitative improvement in non-physical characteristics" (Daly 1987, p. 323)—remains possible, however. A sustainable economy cannot extract renewable natural resources faster than they can regenerate, extract nonrenewable resources faster than we can develop renewable substitutes, or spew waste emissions into the atmosphere faster than they can be absorbed. This position became known as strong sustainability. In Daly's view, the sustainable use and just distribution of resources takes precedence over their efficient (wealth-maximizing) allocation.

CORNUCOPIANS AND DOOMSDAYERS

Such claims of limits to growth were met with great skepticism, particularly by conventional economists, who branded their proponents as doomsdayers. Those skeptical of limits became known as cornucopians. From the perspective of the cornucopians, the doomsdayers ignored the capacity of human innovation in general and the free market in particular to adapt to scarcity. As resources become scarce, their prices increase, providing a market incentive to develop substitutes. Relative scarcity might exist, but not absolute scarcity. Almost two hundred years earlier, Thomas Robert Malthus predicted that geometric increases in human population must eventually outstrip linear increases in food production, leading to widespread starvation. Instead, by the time of the Meadows report, humanity was producing more food per capita than at any other time in history, and productivity was continuing to rise. William Stanley Jevons, a nineteenth-century English economist, warned that society must inevitably run out of coal and that "we must not dwell in such a fool's paradise as to imagine we can do without coal what we do with it" (Jevons 1865, p. 145). Both Malthus and Jevons had been proved wrong. In the words of Nobel laureate Robert

Solow, "If it is very easy to substitute other factors for natural resources, then there is, in principle, no problem. The world can, in effect, get along without natural resources" (Solow 1974, p. 11). We can adapt to scarcity simply by dematerializing the economy. Human ingenuity, the ultimate resource, would solve all problems (Simon 1996). The position that human-made capital could substitute for natural capital became known as *weak sustainability*.

The optimism of the cornucopians notwithstanding, wealthier societies made major investments in environmental protection; as a result, many measures of environmental quality began to improve, some dramatically. The doomsdayers claimed that society had acted appropriately on their recommendations. The cornucopians, in contrast, claimed that these outcomes were to be expected anyway. Economic growth, in fact, was not the cause of the problems the doomsdayers presented, but rather the solution. As societies became richer, birth rates declined, so economic growth was the solution to the population problem. A rising tide lifts all boats, in the view of the cornucopians, and in the presence of widespread poverty, growth is a moral imperative. In addition, pollution emissions formed an upside-down parabola when plotted against per capita gross national product (GNP)—poor countries have clean environments, but as they begin industrializing, pollution levels increase. However, as countries get rich enough, their citizens began to demand clean environments, a luxury good. A number of recent books by cornucopians argue that almost all environmental indicators are improving, that resource abundance continues to grow, and that limits-to-growth theorists have again been proved wrong (e.g., Simon 1996; Lomborg 2001).

The concerns of the doomsdayers have increased significantly: They argue that improvements are illusory, that wealthy nations have simply exported their most environmentally damaging industries to poorer nations, and that even if pollution levels taper off with growth, pollution will increase for decades to come. Population growth is slowing but is expected to stabilize at much higher levels than the planet can sustain. Increasing consumption to slow population growth is counterproductive.

CLIMATE CHANGE, RESOURCE DEPLETION, AND DISTRIBUTION

Climate change has convinced many that planetary waste-absorption capacity is the greatest constraint on growth, and some believe that we are already doomed to a catastrophically warmer planet. Diminishing fossil-fuel stocks and rising prices have convinced others that we have reached peak oil, the point at which increasing rates of use overwhelm declining rates of discovery and then begin a steady decline, threatening chaos in a system built on cheap energy. A third group is concerned with renewable-resource depletion and biodiversity loss; the concern is that these trends will result in the collapse of ecological life-support functions. Others believe that water shortages are the greatest threat, or population growth, or toxic wastes. Many believe that we are exceeding all of Daly's tenets for sustainability, overwhelming sources, sinks, and services simultaneously. Such systems thinkers believe we are well into overshoot, currently living off natural capital rather than its yield. They also recognize that we are dealing with complex, dynamically adaptive systems, in which precise prediction is essentially impossible. This is the position taken by the report *Limits to Growth: The 30-Year Update* (Meadows et al., 2004).

Topping off the doomsdayers' woes, distribution has become a major concern. *Limits to Growth* appeared at the end of a forty-five-year decline in both poverty rates and income inequality, which, with the exception of a brief interval in the 1990s, have climbed steadily since. Similar trends are occurring at the global level. In absolute terms the wealthiest nations have amassed far more additional wealth than the poorest—1 percent of gross domestic product (GDP) in the United States equals the GDP of the world's twenty-four poorest nations (Daly and Farley 2004). In relative terms, China, India, and a few other outliers appear to have grown faster than the wealthy nations but have simultaneously experienced unprecedented increases in domestic income inequality. Experiments with green accounting in China have shown that ecological damage and resource depletion accounts for up to one-third of GNP in some regions (Qiu 2007). Real incomes in sub-Saharan Africa, the region with the world's poorest countries, and in the poorest areas of Latin America have actually declined. To make matters worse, the environmental costs of growth, such as climate change, are likely to fall disproportionately on the poor. Growth has done little if anything to alleviate absolute poverty while exacerbating relative poverty.

Conventional economists nonetheless continue to play the role of optimists, their models frequently suggesting that the potential future costs of climate change, heavily discounted, are less than the current costs of mitigation, and that little should be done. The 2006 *Stern Review* on the economics of climate change is considered quite pessimistic and a call for action, but in reality it estimates that even if we do nothing about climate change, the economy will double or triple in size by 2050 (Stern et al., 2006). The report concludes that we should act to mitigate climate change, but under the report's assumptions, this would ironically require supposedly poorer generations to sacrifice for richer ones. The extreme of this cornucopian vision is presented by Thomas C. Schelling, a 2005 Nobel laureate in economics, and other economists who suggest that climate change will matter little because it primarily affects

agriculture, which is only a small percentage of GNP (Schelling 2007). Measured in dollars, any consumer good is apparently a perfect substitute for food.

Some argue not only that human wants and needs are satiable but also that, beyond a threshold already passed in the wealthy countries, increasing consumption makes us worse off. With our basic needs satisfied, it is primarily relative wealth that makes us better off, and increasing wealth for all helps no one. In addition to physical limits to growth, we have reached psychological limits, so continued economic growth is undesirable as well as impossible. The horn of plenty is overflowing. As scientists have reached near consensus on the danger of climate change, even some cornucopians and conventional economists are recognizing the need to act, and those who do not risk fading into irrelevance.

CONCLUSION

Arguments in the growth debate range from predictions of inevitable doom no matter what we do—through strong and then weak sustainability—to faith in inevitable sustainability as long as we trust in the market. In our complex ecological-economic system, with uncertain facts and a sample size of one, absolute proof for any position is impossible; uncertainty cannot be eliminated, and the past is a poor guide to the future. The decision whether to act on predictions of the doomsdayers or cornucopians must therefore be weighted by ethical considerations about future generations and risk. The worst-case scenario is acting on the beliefs of the cornucopians if the doomsdayers are correct. In contrast, suppose that we act on the beliefs of the doomsdayers and limit throughput; in that case, even if the cornucopians are correct, market forces will improve efficiency and provide substitutes, and no harm will have been done. If the neocornucopians are correct, the costs of addressing environmental problems are negligible or negative, so even if the chances of catastrophe are vanishingly small, we should act.

SEE ALSO *Consumption; Economics, Ecological; Economics, Environmental; Endangered Species Act; Energy; Environmental Law; Future Generations; Global Climate Change; Pollution; Population; Sustainability; U.S. Environmental Protection Agency.*

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Joshua Farley

M

MARSH, GEORGE PERKINS
1801–1882

George Perkins Marsh, diplomat, public servant, polymath scholar, and pioneer conservationist, was born in Woodstock, Vermont, on March 15, 1801, and died in Vallombrosa, Italy. Lawyer, congressman (1843–1849), U.S. envoy to the Ottoman Empire (1850–1854) and to Italy for an unparalleled twenty-one years (1861–1882), he was an intimate of the best-known scholars of his age on both sides of the Atlantic. A Dartmouth College graduate, Marsh was largely self-taught, notably in mastering twenty languages. Reputed in his own day as an authority on English language and literature, Marsh's enduring fame stems from his insightful study of human impacts on the environment. His classic *Man and Nature* revealed the menace of environmental misuse, explained its causes, and prescribed essential reforms. It linked the collapse of the Roman Empire with the soil exhaustion and erosion attendant on deforestation and exploitative agriculture, warning that similar pressures threatened the new world with the fate of the old. "The Earth is fast becoming an unfit home for its noblest inhabitant, and another era of equal human crime and human improvidence . . . would reduce it to such a condition of impoverished productiveness, of shattered surface, of climatic excess, as to threaten the depravation, barbarism, and perhaps even extinction of the species." Continuously in print since its publication in 1864, *Man and Nature* inaugurated much of today's ethical stance toward nature.

In linking culture with nature, science with history, *Man and Nature* was the most influential text of its time next to Charles Darwin's *On the Origin of Species*. With Darwin, Marsh challenged traditional belief in preordained harmony between humanity and the rest of creation. Many before Marsh had noted various specific facets of environmental impact; none had seen or traced the combined effects of human action. Moreover, such influence had previously been assumed largely benign; damage was thought trivial or short-lived. Marsh was the first to see that human impacts were not only enormous and fearsome, but potentially cataclysmic and irreversible.

The long-held general belief was that mankind's God-given mission was to fructify the earth, and the bounty that followed forest clearing, swamp draining, and cultivation attested divine approval. Adverse side effects were easily dismissed, especially in the United States. Soils eroded or exhausted were simply vacated for new lands farther west; forests logged and burned seemed trifling by comparison with the wealth of timber beyond the horizon. Meanwhile, nature left alone would heal itself.

But this recuperative scenario accorded less and less with witnessed facts. A single lifetime saw vast tracts cleared, cultivated—and despoiled. Occupied nature did not heal itself; land once exploited and then abandoned remained for ages, if not forever, depleted. Greed was only partly to blame; much damage was unintended, often unseen. Men did not mean to derange nature; they were blind to the ruin they wrought. But myopia was not incurable. The harm done did not preclude dominion over nature, in Marsh's view; to the contrary, it mandated more alertly intensive governance. Awareness could prompt reform: technology deployed to break nature might also mend it. Ecological processes that revivified

George Perkins Marsh. *A scholar, diplomat, and author, Marsh became a world-renowned champion of environmental conservation and the first to study the potentially damaging impact of humans on the environment.* **NPS PHOTO.**

the environment could be protected and emulated by man as a coworker with nature. For all its dire portents, a pragmatic optimism pervaded *Man and Nature*. Marsh believed that men could learn to manage the environment for their own sake and for nature's good.

Appearing at the peak of Western resource optimism, *Man and Nature* refuted the myth of limitless plenty and spelled out needs for conservation. In forestry, hydrography, and pedology, Marsh's ecological insights and warnings became virtual gospel, animating watershed management and resource stewardship internationally. Floods and soil erosion during the Dust Bowl and other 1930s disasters rekindled its salience. A 1965 reprint of *Man and Nature* quickened the Earth Day crusade launched by followers of Rachel Carson and Aldo Leopold.

What is known—and feared—about anthropogenic impact has vastly expanded since Marsh's day; anxiety extends to realms and terrors undreamed of by him. Marsh's vision of a self-regulating equilibrium in nature, if left alone, became Frederic Clements's ecological paradigm of the early twentieth century. Although no longer scientifically credible, it continues to pervade popular conceptions of nature among the general public, including many environmentalists. Yet Marsh's appraisal of forest cover and erosion remains largely valid, his watershed control cautions still cogent, his call for stewardship ever more pertinent.

Following *Man and Nature*, Marsh continued to champion ecologically sustainable and socially desirable practices in forestry, irrigation (notably in the American west), and the establishment of parks and nature reserves. Traduced by some as a hard-nosed, resource-focused utilitarian pragmatist, against the aesthetic and ethical idealism of Henry David Thoreau and John Muir, Marsh, in fact, shared their concern for the preservation of wild nature.

Marsh believed social and environmental reform must go hand in hand. His deistic Calvinist-Enlightenment-transcendentalist faith stressed commitment to durable community, aligning respect for past with concern for future generations. To understand and care for nature required rooted residential attachments woefully lacking in pioneer America. Nevertheless, Marsh at first believed that enlightened self-interest would suffice to effect needed reforms. But the overwhelming might of amoral corporate capitalism persuaded him that governmental regulation was essential, lest America suffer the fate of ancient Mediterranean societies ruined by heedless environmental abuse.

SEE ALSO *Darwin, Charles; Future Generations; Leopold, Aldo; Muir, John; Pragmatism; Stewardship; Thoreau, Henry David.*

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David Lowenthal

MARSHES

SEE *Wetlands.*

MENDES, CHICO
1944–1988

Francisco Alves Mendes Filho, better known as Chico Mendes, was born on December 15, 1944, on the Porto Rico rubber estate in the town of Xapuri, state of Acre, in the southwestern part of the Brazilian Amazon rain forest. The son of a rubber tapper, he began tapping rubber at age nine, accompanying his father through the forest as was customary for children at that time. Unlike most of his contemporaries, when he was fifteen, Chico was taught to read.

RUBBER PRODUCTION IN BRAZIL

The exploitation of rubber (*Hevea brasiliensis*), which is native to the Amazon, peaked at the turn of the nineteenth to the twentieth century and was characterized by the contrast between large fortunes and unjust social relations. Poor farmers from the northeast were recruited to work in the Amazon and, once there, were imprisoned by a system of indentured servitude for generations. The high price of rubber; the absence of state oversight in the areas of health, education, transportation services, and labor regulations; and isolation contributed to the social injustice. British rubber cultivation in Asia and the later development of synthetic rubber excluded the Amazon rain forest from the international rubber market.

During World War II a blockade of Asian rubber plantations led the U.S. government to sign agreements with Brazil to reactivate the old rubber estates (*seringais*). These were not plantations but native rubber areas. Brazil maintained that protective policy until the end of the 1960s, allowing thousands of rubber-tapper families to remain in the forest after the price of the raw material fell. Discouraged by low prices and unable to prove title to the land, the native rubber areas were left in the hands of the rubber tappers, who developed a way of life that was based on the use of forest-related products, including rubber, Brazil nuts, fish, game animals, and fruits.

However, that system did not last long. At the outset of the 1970s Brazilian government policy encouraged major landowners from the south to buy land in the Amazon basin for farming and cattle raising. To set up the new farms, forests had to be cleared, and conflict with the rubber tappers became inevitable.

ACTIVISM AND CHANGE

At the age of twenty Chico Mendes taught rubber tappers to read and write. He supported initiatives to help families become economically independent, an action that risked repression by the military regime. In 1973 he gained support from the Christian Base Communities, a Catholic initiative that supported the defense of human rights. In conjunction with the church, starting in 1975, the first rural worker unions began to appear in Acre. Chico soon became their leader.

In 1976, in Brasiléia, a neighboring town to Xapuri, rubber tappers decided to resist deforestation, organizing the first publicly recognized movement to defend the Amazon rain forest. Known as "*empate*" (nonviolent obstruction of tree felling), the tactic soon spread, giving rise to strong resistance to new farms. Although it involved defending the forest, the struggle actually was for social rights and conservation of the forest as a way of life for thousands of families.

After attempting to prevent deforestation, the rubber tappers sought to secure acknowledgment of their rights to the land and their need to make a living from forest-based products. With the support of anthropologists and researchers, the First National Meeting of Rubber Tappers was organized in Brasília in 1985. That meeting produced both the National Rubber Tappers Council, which continues to represent those groups, and the concept of extractive reserves (territorial areas protected by public authority, oriented toward conservation and sustainable use of extractive resources, regulated by concession contracts in accordance with a management plan approved by the environmental agency).

The confrontation between these two ways of using the land worsened in Xapuri, and on December 22, 1988, Mendes was murdered on orders from Darli Alves, a fugitive from justice for crimes committed in the southern part of Brazil. International support stimulated by prizes for and documentaries on Mendes's work from 1986 to 1988 led to the trial and imprisonment of the murderers and forced changes in Brazilian Amazon rain forest policy. In 1990 the first extractive reserves were created in the region, including one named for Mendes, with over 800,000 hectares, putting an end to land disputes in Xapuri.

From 1990 to 2007, 81 conservation units were established for traditional communities, with over 21 million hectares, accounting for 4.3 percent of the Brazilian Amazon and benefiting more than 400,000 people. Mendes's main legacy is the state's recognition of the right of such communities to a type of agrarian reform that respects traditional use of natural resources and ensures access to public education, health care, and development.

The legacy of Chico Mendes extended beyond the social groups to which he was linked. As a result of conflicts related to access to and use of natural resources, the concept of agrarian reform and development has changed, leading to the implementation of an innovative public policy throughout the Amazon basin. A new paradigm has emerged in which local communities that depend on the use of natural resources become conservation allies. As a result of rubber-tapper movements, public policies began prioritizing a new form of development

that reconciles environmental protection with social justice. In the years after Mendes's murder that initiative came to be known as sustainable development.

SEE ALSO *Sustainable Development.*

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Mary Helena Allegretti

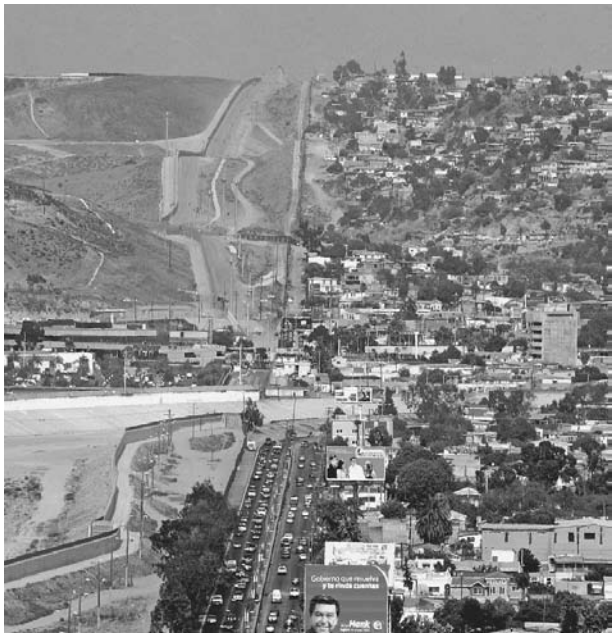
MEXICO AND CENTRAL AMERICA

Environmentalism in Mexico and Central America must be understood in the context of the environmental problems facing that region. Among those problems is a population explosion. Since 1940 Mexico has gone from 28 million to over 100 million inhabitants. Demographic pressures and the model of development (mostly state capitalism in Mexico) have led to a drop in support for conservancy programs and the deterioration of soils, waters, forests, and wildlife. Additionally, the expansion of urban centers has precluded the pursuit of a path to sustainable development. Between 1950 and 1990 Mexico City went from 2 million to 20 million inhabitants. Because of high population densities, unemployment, and a high concentration of industries, many cities in Mexico and Central America are overwhelmed by problems of transportation, air and water quality, garbage disposal, and human health.

ECONOMIC FACTORS

Environmental problems across the region have been accentuated since the transition to a free-market global economy in the late 1980s and early 1990s. The implementation of the North American Free Trade Agreement (NAFTA) in 1994 and the Central American Free Trade Agreement (CAFTA), which includes El Salvador, Guatemala, Nicaragua, Honduras, and Costa Rica, in 2006 has been particularly controversial. Balancing environmental responsibilities with the demands of economic growth has been a difficult challenge for national governments, regional and local nongovernmental organizations (NGOs), and the corporate community.

The emblematic illustration of this problem is the multinational factories constructed in cities along the Mexican-U.S. border that are called *maquiladoras.* Multinational corporations escaped environmental and occupational constraints elsewhere by moving to Mexico and other countries in Central America that have less stringent environmental laws and low labor costs. At the same time relatively attractive wages in combination with drought and unemployment in the central highlands of Mexico emptied villages as young people migrated to work in the *maquiladoras.* As a consequence of that migration, villages and towns grew around factories without water-treatment plants or sewage systems while the *maquiladoras* were dumping toxic waste into local rivers.



Maquiladoras *in Tijuana, Mexico.* *Multinational factories called* maquiladoras *can be found along the Mexican-U.S. border. Towns and factories on the Mexican side of the border grew up around factories without water-treatment plants or sewage systems while the* maquiladoras *dumped toxic waste into local rivers.* **LUIS ACOSTA/AFP/GETTY IMAGES.**

POLLUTION AND CLIMATE CHANGE

Other environmental problems in the region that grew more serious in the last decade of the twentieth century and first decade of the twenty-first include chemical pollution of soils, water, and air in large plantations devoted to export-oriented agriculture; desertification and increased demand for irrigation and drinking water; deforestation, which adds to the problem of water depletion (in spite of policies and regulations, indiscriminate felling and illegal timber trafficking are rampant); illegal trade in fauna and flora; and scarcity of agricultural products for domestic human consumption.

The peoples and environments of Mexico and Central America are affected by the impacts of global climate change. The region has been hit particularly hard by hurricanes since 1988. Seven of the ten most intense Atlantic hurricanes ever recorded have occurred since that time, including Mitch in 1998, the second deadliest on record.

LEGISLATIVE ACTIONS AND NONGOVERNMENTAL ORGANIZATIONS

What is an equitable burden for Latin Americans to assume in the international effort to remedy and limit global change? The current politics of hydrocarbon fuels illustrates the complexity of the problem. The projected economic growth in Latin America and the scarcity of energy in international and regional markets have created a demand for increased production and consumption of hydrocarbon fuels. However, regional and local environmental problems have created a demand for a smaller carbon footprint and a need to address the human and environmental dimensions of the use of hydrocarbon fuels.

Mexicans and Central Americans are aware of current and past ecological problems. The relatively new discipline of environmental history is rescuing from oblivion the contribution of past environmentalists and historical examples of balancing economic development and environmental protection. In this respect Miguel Angel de Quevedo stands out as the most prominent environmentalist of the late nineteenth and early twentieth centuries.

Latin American countries have passed many laws to protect the environment. For instance, in 1988 the Mexican legislature passed the General Law of Ecological Balance and Environmental Protection, an integrated response to the environmental problems of the country and those of Mexico City in particular. About that time the government created the Secretariat of Urban Development and Ecology (SEDUE). Environmental initiatives have driven the regional integration of Central American countries, as evidenced by the creation of institutions such as the Central American Commission on Environment and Development (CCAD) in 1989 and the Central American Alliance for Sustainable Development in 1994.

The philosophy of sustainable development began to emerge in the 1980s. At that time Mexico became an academic leader in Latin America on the theory and application of sustainable development. The Mexican philosopher Enrique Leff, who became the coordinator of the United Nations Environment Program office in Mexico, made many contributions in this area.

The 1990s witnessed the formation of more than a thousand environmental NGOs in Mexico. The unification and alliance of several of them gave birth to the *Partido Verde Ecologista de México* (Green Ecologist Party of Mexico). A milestone in the history of environmentalism in Mexico was the formation of the *Grupo de los Cien* (Group of 100) in 1985, led by the writer Homero Aridjis and founded when a hundred writers and artists published a declaration against pollution. Over the years the *Grupo de los Cien* has called attention to the widespread and unremitting destruction of the Mexican natural environment.

Among the various approaches to environmental concerns in Mexico and Central America the environmental-justice approach has called attention to inequity in the distribution of environmental burdens and risks. For instance, the relationship between public health and ecology has long been understood and its neglect denounced, particularly in regard to urban pollution and the hazards of the *maquiladora* sector near the border.

As North American transnational companies have razed forests and mountains in Central America, a growing number of Catholic clergy (cardinals, bishops, and priests) have come to see protection of the land and water as godly work. Church and community groups have pointed to studies that have found high levels of heavy metals in the soil and water near mines across the region. In spite of the jobs created by those companies, mining and logging are depleting the water table, drying up wells, and forcing formerly productive farming regions to import food. Catholic environmentalism in the region, with its challenges to the powerful and solidarity with the poor, resonates with liberation theology in the minds of many. However, Catholic clergypersons seem to be increasingly in tune with the Vatican's position on the environment. Official Catholic teaching on the environment is based on the belief that creation is a gift of God that must be protected, used responsibly, and shared equitably.

THE ENVIRONMENT AND SOCIAL JUSTICE

The integration of environmental problems and social justice issues is an achievement of environmentalist thinking and activism in Mexico and Central America. In fact, it could be argued that the intellectual tradition in Mexico since the nineteenth century has resisted the typically North American erasure of the human from environmental thinking. The inclusion of history and people in the representation of landscapes in different media and arts to a great extent has been a reaction to a perceived obsession among foreign travelers for representing Mexico and Central America as a wilderness deprived of human history and large urban centers. This vindication of the city is problematic as it also reflects a history of imperial domination by the urban over the rural.

The environmentalist positions taken by the Zapatista rebellion in 1994 in the state of Chiapas in southeastern

Mexico illustrates the complexity of the human-nature/urban-rural environmental thought characteristic of the region. Zapatista documents connect the call for environmental protection with the rights of rural citizens against the centralized authority of the government in Mexico City, political ecology (access to and control of natural resources), and environmental justice. The environmentalism of the Zapatistas also includes the spirituality and biocentrism of traditional indigenous values, which nurture not only Zapatista environmental philosophy but also its commitment to a political struggle without violence.

One response to the environmental crises produced by modernity has been the unearthing and reawakening of forgotten or repressed traditions. This cultural trend can be seen in the recovery of traditional environmental knowledge such as traditional agricultural techniques in Mesoamerica. Environmental and indigenous organizations have established alliances to promote sustainable agriculture and community autonomy in rural Mexico. However, this can lead, as in the case of the Nobel laureate poet and essayist Octavio Paz, to the deployment of poetry for purposes of exposing the legacy of political and ecological destruction over the course of the twentieth century. The connection between embracing environmental thinking and rejecting the legacy of violence associated with utopianism and millenarianism in the twentieth century should not be overlooked, particularly in the context of the civil wars that bled Central America in the 1980s. Mexican and Central American literature is an ideal site for observing this connection, as in the work of José Emilio Pacheco, Pablo Antonio Cuadra, and Ernesto Cardenal.

If the awareness of ecological problems and their many human dimensions among the public and government is not the issue, what is needed to address those problems in Mexico and Central America? The consensus is that in spite of the popularity of environmentalism, the region lacks a powerful environmental movement that would offer unified and strong political support for environmental justice and the protection of wildlife. The challenge has not been environmental awareness and progressive environmental policy and legislation; it has been the inability of governments to implement environmental policy and enforce environmental laws to protect ecosystems and the people who inhabit them.

SEE ALSO *Agriculture; Deserts and Desertification; Environmental Activism; Global Climate Change; Nongovernmental Organizations; North American Free Trade Agreement; Pollution; Sustainable Agriculture; United Nations Environment Programme.*

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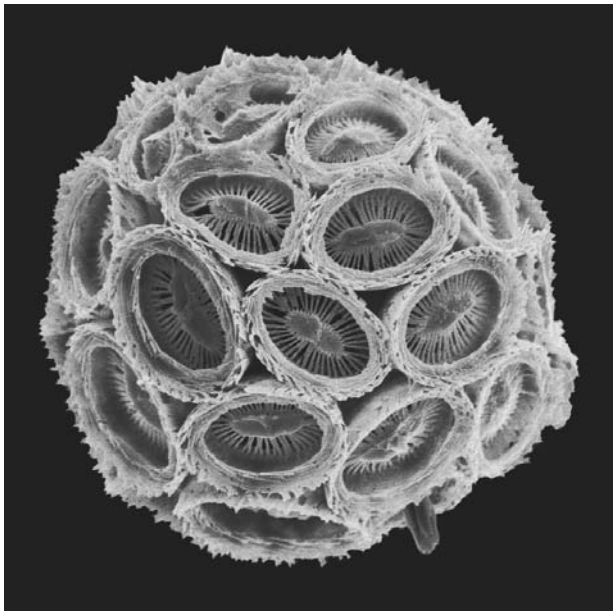
Jorge Marcone

MICROBES

Microbes carry out the functions of life. These entities, too small to see with the naked eye, have the wherewithal to reproduce with sufficient variation to enable evolutionary processes to proceed continually by natural selection. Humans, as with all other large animals and plants, are made up of tens of trillions of cells, whose dimensions are generally in the range of 10 to 30 microns (thousandths of a millimeter). Indeed, each such cell is actually a colony of some 1 to 500 smaller cells, with a 1-micron diameter, called mitochondria and chloroplasts—cells the size of free-living bacteria. Each such cell collective may be regarded as a single ecosystem. Thus ecosystems may range in size from volumes of less than a microliter (a 0.1-millimeter-sided cube) to a system the size of the planet Earth. In addition to cellular life forms, there are also viruses. These entities, having diameters of 20 to 200 nanometers (thousandths of a micron), may also be included in the category of microbes because they carry within them the genes that enable their reproduction, although they are incapable of reproducing in the absence of other living microbial cells.

While life at the microbial level began some 3.5 to 4 billion years ago, ethics is a relatively new invention of humans, who began to use words with the intention of affecting the behavior of other humans within the last 0.1 to 0.2 million years or so. Biologically, ethics are used to enhance the survival and reproductive chances of individual humans and/or groups, societies, or nation-states. Microbes play a role in determining the qualities of the environments that we humans inhabit. The composition of the air we breathe is largely determined by free-living microbes and by chloroplasts, microbes that have become entrapped within the cells of higher plants. Thus if



Coccolithopore, a Microbial Plant. *Microbes, too small to see with the naked eye, play a relatively large role in the maintenance of ecosystems. The coccolithopore, an algal organism seen here with scanning electron micrograph takes carbon dioxide from the air and converts it into calcium carbonate plates.* **STEVE GSCHMEISSNER/SCIENCE PHOTO LIBRARY/PHOTO RESEARCHERS, INC.**

environmental ethics seeks to enhance the survival and reproductive chances of human beings and human civilization, microbes and the ecosystems in which they vitally function should be included within the purview of environmental ethics.

In 1772 Daniel Rutherford discovered the nitrogen cycle driven by bacteria. Bacteria transform the nitrogen in dead organisms to gaseous ammonia and elemental nitrogen as a byproduct of their own metabolic processes. Other bacteria convert these two gases to nitrogenous salts, such as ammonium nitrate, as a byproduct of their metabolic processes. These salts eventually become incorporated, initially, into the proteins of other microbes, and then, via an extensive food chain, into the proteins of higher organisms, upon whose deaths the nitrogen becomes gaseous once more. A similar cycle processes carbon. In the case of carbon, the fossil fuels we burn, the food we eat, and our bodies when we die are in part transformed into carbon dioxide, which is liberated into the atmosphere to become a greenhouse gas. Carbon dioxide in turn becomes food for algae (microbial plants) and plants, which convert this gaseous carbon dioxide into sugars and carbohydrates. The coccolithophore, one such alga, lives in the oceans and is instrumental in acquiring carbon dioxide from the air and converting it into calcium carbonate plates of considerable beauty. This chalk then sinks to the bottom of shallow seas, where it forms the limestone of many coastal cliffs and hills.

Such cycles normally operate in the absence of human intervention. Yet humans modify them for their own purposes. For example, Fritz Haber in 1908 developed a process for artificially producing ammonia from nitrogen. Ammonia later became used to generate fertilizers for increasing crop yields. As a result, when nitrogen-rich salts run off fertilized land, river waters become enriched, and wild plants flourish in them. Here our human ethics requires us to produce food to feed people at the expense of polluted rivers. Similarly, humans interfere in the carbon cycle by producing some 26 billion tons of carbon dioxide per year, in addition to the more than 700 billion tons produced by the respiration of other living organisms both on land and in the oceans. While this provides more carbon dioxide for plants and coccolithophores to thrive on, it is also held to be responsible for part or all of the 0.6-degree-centigrade increase in the temperature of the planet that has occurred over the last century. How to reconcile the requirements of human ethics with those of environmental ethics is a complex and thorny problem.

Many diseases of humans, animals, and plants have microbial causes. The human response to this is to generate cures based on the products of other microbes grown in fermenters. For example, antibiotics such as penicillin are produced by the fungus *Penicillium chrysogenum*. This approach to diseases, mostly caused by bacteria, was received with open arms in the 1940s, when penicillin became widely available. Unfortunately, the overuse of antibiotics has led to the evolution of microbes resistant to such treatments. An alternative approach to diseases caused by microbes (bacteria, viruses, protozoa, and helminths) is to prevent their occurrence with vaccines. This approach led to the elimination of smallpox in 1977 and is close to eliminating polio. As we are beset with new diseases (HIV/AIDS, SARS, the avian flu), new approaches to the generation of vaccines are yielding effective agents to combat such diseases.

At the small end of the scale of living organisms, microbes have a greater influence on the environment than any other type of organism, humans included. They may hold many of the keys to solving the environmental crises that face us.

SEE ALSO *Disease; Energy; Evolution; Global Climate Change; Nanotechnology; Pollution.*

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Raymond E. Spier

MIDGLEY, MARY
1919–

The British philosopher Mary Midgley was born in Dulwich, East London, on September 13, 1919. She graduated from Oxford University in philosophy and ancient history in 1942 and worked as a civil servant and teacher during World War II. In 1950 she married and moved north to Newcastle, where she concentrated on reviewing books and bringing up a family. It was not until 1963 that she took up a lecturing position in the philosophy department at Newcastle University. After "retiring" in 1980, Midgley stayed in Newcastle, where she has continued to work as one of a rare breed: a freelance philosopher. She has published extensively in ethics and environmental philosophy and is an active social commentator on animal ethics, environmental issues, Gaia theory, and the role of science in society.

Animals and Why They Matter was published in 1983, at a time when ethical theory was still firmly entrenched behind human lines. She argued, alongside Peter Singer and a handful of other ethicists, that ethical obligations extend beyond our own species, carefully unraveling and exposing the intellectual confusions that lead to a denial of interspecies ethics and setting out the implications of cross-species ethical obligations for European and North American ethical thought. Unlike Singer's orthodox utilitarian approach to animal ethics, Midgley's is based on the more nuanced concept of human-animal "mixed communities." Her communitarian approach to animal ethics facilitates an otherwise elusive integration of animal ethics with the popular "land ethic" of Aldo Leopold, which is based on the concept of the "biotic community." Midgley's early focus on animals extended into a seminal discussion of our ethical relationships to the wider environment in the essay, "Duties concerning Islands."

A constant theme in Midgley's work is the attempt to uncover the often unnoticed intellectual frameworks or worldviews against which we live our lives, to show how these patterns of thinking affect how we live and act, and, above all, to open them up for critical scrutiny. In the context of environmental and social justice issues, the need for new mental models is, she argues, as crucial as the need for cleaner and more efficient technology. European and North American societies still struggle with corrosive forms of social atomism and individualism that militate against sustained effort to deal with collective human problems, such as hunger, on a global scale. And the dominant view of the environment as a set of resources for people, and of ourselves as detached managers of these resources, has arguably contributed to problems such as climate change and species extinction that now loom so large.

Drawing on Gaia theory as a key source, Midgley attempts to reconstruct our background worldview in a way that is not only more felicitous but that will afford profound understanding of our environmental problems—and inspire us to act. Earth, in her view, is not a lifeless jumble of commodities but an immense, living complexity of interrelated systems. She argues that we are not independent of this living whole but are deeply immersed in it. Once this simple truth is understood—emotionally as well as intellectually—then our reasons for taking care of the environment as an overriding priority become utterly and compellingly clear.

Midgley's work combines careful, detailed analysis with a constant return to wider questions about the place of humans and human activities—especially science—in the bigger scheme of things. This outlook has enabled her to show that apparently conflicting perspectives are, in fact, complementary aspects of a wider whole and that these positions can and should be reconciled. She has argued in this way against the polarization of animal welfare and environmental concerns. She reveals the close connections between reason and emotion through her exploration of the human mind in its evolutionary context, and she emphasizes the importance of imagination in reasoning processes. She argues, in works such as *Science and Poetry* and *The Myths We Live By,* against the supposed opposition between science and myth, science and spirituality. In all these cases she eschews the "intellectual tribalism" whereby one perspective or dimension of an issue is taken to be the whole story and is then ranged in battle against other perspectives. This mistake, she argues, can be noticed only when the wider context is brought into focus. Once this is done, it is possible to achieve bridge building and reconciliation, which in turn have tremendously constructive implications, both practical and theoretical.

The work of "bending thought around to look at itself" or "thinking about thinking," although difficult, is also intensely practical. Midgley's position reveals the potential of philosophy in general—and environmental philosophy in particular—as a practical activity that is both radical and necessary, affording us the much needed ability to rethink our economic social and political institutions when they become problematic—for example, by leading to ecological collapse. Her chief contribution to environmental philosophy is thus an approach concerned

not with cleverness and abstraction but with wisdom, with insight, and with change.

SEE ALSO *Animal Ethics; Environmental Philosophy: V. Contemporary Philosophy; Gaia Hypothesis.*

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Kate Rawles

MILL, JOHN STUART

SEE *Environmental Philosophy: IV. Nineteenth-Century Philosophy; Utilitarianism.*

MILLENNIUM ECOSYSTEM ASSESSMENT

The Millennium Ecosystem Assessment (MA) documents how people are transforming their environment and how environmental transformation is affecting human well-being. As a scientific assessment the report is supposed to be free of ethical judgments. At the same time the intention of the MA is to inform the public and policy makers so that ethical judgments embedded in behavioral and policy decisions are scientifically informed.

The MA was initiated largely by biological scientists who, at the end of the last millennium, were already concerned about the effects of ecological transformations on humanity's future. The four-year study was carried out by some 1,300 environmental scientists, economists, and other social scientists from developed and developing countries who came into the assessment with a wide range of perspectives on issues such as the prospects for new sustainable technologies or the possibility of market solutions to environmental problems. The study frames people's relation to nature in mostly economic terms. Ecosystems are portrayed as natural capital from which ecosystem services flow in support of the human economy, whereas human activities modify and typically deplete nature's capital and thereby also affect the flow of services and future well-being.

KEY FINDINGS

The four main findings of the 2,500-page study, published in four volumes and titled *Ecosystems and Human Well-Being* (2005a), are as follows:

1. Over the past 50 years, humans have changed ecosystems more rapidly and extensively than in any comparable period of time in human history, largely to meet rapidly growing demands for food, fresh water, timber, fiber, and fuel. This has resulted in a substantial and largely irreversible loss in the diversity of life on Earth.
2. The changes that have been made to ecosystems have contributed to substantial net gains in human well-being and economic development, but these gains have been achieved at growing costs in the form of the degradation of many ecosystem services, increased risks of nonlinear changes, and the exacerbation of poverty for some groups of people. These problems, unless addressed, will substantially diminish the benefits that future generations obtain from ecosystems.
3. The degradation of ecosystem services could grow significantly worse during the first half of this century and is a barrier to achieving the Millennium Development Goals (adopted by the United Nations in 2000).
4. The challenge of reversing the degradation of ecosystems while meeting increasing demands for their services can be partially met under some scenarios that the MA has considered, but these involve significant changes in policies, institutions, and practices, that are not currently under way. Many options exist to conserve or enhance specific ecosystem services in ways that reduce negative trade-offs or that provide positive synergies with other ecosystem services (Millennium Ecosystem Assessment 2005b, Synthesis Volume, p. 1).

The assessment investigates five key stressors on global ecosystems—habitat change, climate change, invasive species, overexploitation, and pollution (including both toxics and nutrification)—across thirteen broad ecosystem types: forest (boreal, temperate, and tropical), dryland (temperate grassland, Mediterranean, tropical grassland/savanna, and desert), inland water, coastal, marine, island, mountain, and polar. For the five drivers across thirteen ecosystem types, there was only one combination, habitat change in temperate forests, where the impact of the driver was lessening. Thus, for sixty-four of sixty-five possibilities, stresses on ecosystems are increasing.

The MA investigated alternative policy options to decrease, or even reverse, stresses on ecosystems. The elimination of subsidies that encourage destructive practices such as land conversion and greenhouse gas release would be effective in reducing many kinds of ecosystem transformations. Reducing ecosystem stressors further, however, requires combinations of new economic incentives, behavioral changes, and technological innovations, the specific mechanisms and combinations of which will vary across ecosystems; as well as social, cultural, and political contexts. Integrating complex, context-specific policy responses across stressors, ecosystems, geographic scales, and political boundaries is difficult to even contemplate, let alone describe coherently for policy makers.

IMPACT ON ENVIRONMENTAL UNDERSTANDING, VALUES, AND POLICY DECISIONS

The findings of the MA have been widely cited in academic and popular literature. Material from the MA can be found in the readings of many college courses and textbooks. Numerous regional assessments around the world are amassing knowledge for subsequent global analysis. Nevertheless, the impact of the MA on environmental understanding, values, and policy decisions remains unclear. While the climate assessments of the Intergovernmental Panel on Climate Change (IPCC) have been crucial in shaping climate knowledge, eliciting fresh concerns for the future and focusing policy debates, the MA is much less focused, and so its impacts on people's values, corporate decisions, and public policy are harder to pinpoint.

ETHICAL AND PHILOSOPHICAL ISSUES WITHIN THE ASSESSMENT PROCESS

The choice of a scientific framework for the MA has ethical implications simply because different frameworks highlight, and hence differentially value, different aspects of a problem. The assessment's characterization of ecosystems as capital and their benefits as services evinces a utilitarian ethics and an economic worldview. Perhaps this economic framework accounts for the MA's favorable portrayal of the economic approach known as "payments for ecosystem services." Selecting scientists from developing countries concerned with improving the material well-being of the poor balances the more ecocentric views of scientists from the developed countries. Conventional economists avoid the term *overconsumption*, but the inclusion of ecological economists and sociologists in the work of the assessment has led to an extensive exploration of this issue. Hence even scientific assessments reflect underlying, implicit ethical predispositions and decisions, even if they are never explicitly formulated.

The MA is an example of a new approach to applying science to the complex interactions between social and natural systems. This approach, used most famously in the climate assessments of the IPCC, entails the use of several thousand scientists from a wide range of disciplines to address key policy questions to explore and summarize the findings of the latest scientific literature. Although the focus of the assessment is on the interaction between social and natural systems, natural scientists' portrayals of ecosystems rarely include people, and social scientists rarely include nature in their descriptions of social systems. Numerous other methodological problems had to be overcome, including recognizing and transcending disciplinary assumptions and language in achieving insights into the issues of natural capital and ecosystem services. One of the most important by-products of the MA was the training of numerous scientists to think and communicate across disciplinary boundaries and to identify critical questions for future research.

SEE ALSO *Ecology: III. Ecosystems; Ecosystem Health; Environmental Policy; Future Generations; Global Climate Change; Intergovernmental Panel on Climate Change.*

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Richard B. Norgaard

MINING

This entry contains the following:

I. OVERVIEW

Mining is one of the most controversial uses of land. The extraction of materials from the earth is an invasive, nonreversible process that often causes extensive environmental damage, but it is the only known method of acquiring sufficient supplies of many of the raw materials needed to support human well-being. According to U.S. Geological Survey statistics, 2004 world mining production included 14.6 million metric tons of copper, 2,430 metric tons of gold, and approximately 1,340 million metric tons of iron ore.

Mining can be done only in places where there is an economically viable deposit of a desired material. Mineral deposits are the result of complex earth processes that concentrate certain elements in specific locations. Nature determines the distribution of mineral deposits and thus the possible locations for mining; people can choose whether to mine deposits that have been discovered but cannot dictate where the deposits are situated. Mines are often a long distance from the markets that consume their products. From the earliest times flint, salt, gold, and other commodities were traded extensively, making mining the first global industry.

Three sectors dominate the mining industry: metals such as copper, gold, lead, zinc, iron, and nickel; energy minerals, including coal and uranium; and industrial minerals such as sand and gravel for construction, clays for ceramics, and salt for many industrial uses. Each sector uses a range of extraction techniques and faces environmental issues related to the nature of the ore deposits, their chemical composition, and the environmental context of any specific deposit.

HISTORY

The history of mining is linked closely to developments in metallurgy and mineral processing and influenced by political and economic circumstances. Copper, gold, and lead were used in the Middle East by 3500 BCE. Early mining focused on collecting nuggets of pure metal. The recognition of veins of metal-bearing minerals and improved smelting methods to separate metals from rock were the foundations for the Bronze Age and Iron Age. The Romans were the most noteworthy ancient miners; in an advance that allowed miners to reach depths of over 650 feet, they replaced some slave labor with mechanical devices to drain water from mines. Technical innovations were few until the fifteenth and sixteenth centuries, when two methods of removing silver from copper ore—liquation and mercury amalgamation—led to the exportation of silver from the New World to the Old World.

Widespread industrial use of coal started in the eighteenth century in Britain and the nineteenth century elsewhere. Coal often occurs in aerially extensive flat-lying beds, unlike the narrow, often steeply dipping metal-bearing veins that were the main source of most metals except iron until the twentieth century. Coal at the surface of the earth is amenable to large-scale open-pit mining. It is difficult to support the roof of underground coal seams when the coal has been removed; this, combined with the combustible nature of coal and the associated gases, makes underground coal mining particularly dangerous.

TECHNOLOGY AND SOCIAL ASPECTS

Many advances in mining have been tied to improved sources of power. People wielding picks, wedges, and crowbars were the main source of energy until recent times. Explosives were not employed in Europe until the seventeenth century; their use increased greatly after Alfred Nobel's 1863 invention of dynamite. The introduction of steam power in the 1700s was significant, particularly as it powered the Cornish pump, which could remove large volumes of water from deep mines. Steam power was replaced by compressed air in the late 1800s and by electricity in the early 1900s. Much of the industry has been mechanized by combining these forms of power with modern, efficient rock-cutting materials and the introduction of robotics. Mechanized mining has enabled the economic development of large-scale open-pit mines, particularly for coal, iron, and low-grade deposits of base metals.

Important advances in processing include the 1886 discovery of the cyanidation process, in which cyanide is used to dissolve gold from crushed rock; the development in the early 1900s of the flotation process to separate copper, lead, and zinc from finely ground sulfide ore; the adaptation in the 1980s of solvent extraction-electrowinning to process copper and zinc oxide ores by chemically leaching the metal out of crushed rock and then extracting it from solution by electrical methods instead of smelting the ore; and the introduction of bioleaching, which uses bacteria to extract metal from crushed rock. In situ leach mining is an approach that was developed in the 1980s. Instead of removing and crushing the rock and then extracting the metals, a dilute chemical solution

Mining for Coal, West Virginia. *Draglines, such as this one at a mine in Boone County, West Virginia, can weigh millions of pounds and are tall enough to loom over a 20-story building. They are used to expose mountaintop coal seams. Mining practices can cause severe environmental damage in terms of physical ground impact and possible contamination of water, air, and soil.* **PHOTO COURTESY VIVIAN STOCKMAN/WWW.OHVEC.ORG.**

is circulated through the ore deposit in the ground to leach out the metals. The metal-bearing solution then is collected through extraction wells and processed to obtain the metals. Modern processing methods are generally less environmentally hazardous than older techniques.

The societal aspects of mining have been as important as the technological advances. The Roman Empire structured mining operations throughout much of Europe from about 100 BCE to 500 CE; independent miners returned to the fore when the empire collapsed. Spanish monarchs controlled mining in Central and South America in the sixteenth century. The middle to late nineteenth century saw a great territorial expansion in mining when independent miners opened up the goldfields of the western United States, western Australia, and southern Africa. In the first decade of the twenty-first century it was estimated that thirteen million people were operating similar small-scale independent, or artisanal, mining enterprises, particularly in developing nations. Small-scale informal mining poses special environmental and social problems because it operates largely outside the rule of law.

Modern mining companies emerged around the start of the twentieth century, when capital costs rose to levels far beyond the resources of individual miners. Major multinational mining companies based in Australia, Brazil, Britain, Canada, Chile, China, South Africa, and the United States came to dominate the industry. The balance of power between states, corporations, and local communities is constantly in flux, with alternating periods of nationalization and privatization of resources and growing awareness in the formal mining sector of the importance of sustainable development, social license, and reliable governance.

ENVIRONMENTAL IMPACTS

The environmental impacts of traditional mining can be severe. The physical impacts include large surface pits, noise and vibration during operations, subsidence caused by underground workings, piles of unconsolidated waste material leading to unstable ground, dust pollution, and the influx of sediment into watercourses. Chemical contamination of surface and ground water, air, and soil, which may be long lasting, can be caused by acid mine drainage and the release of metals or the chemicals used to process ore. Little attention was paid to the environmental consequences of mining until the middle to late twentieth century, when social agitation and government regulation forced mining companies to address the issue.

Almost all the environmental impacts of mining can be mitigated, although at a price. Most modern mining companies budget for and implement environmental mitigation programs in all their projects; it is more challenging both legally and technically to remediate the effects of past mining activities and ongoing small-scale mining. It is also difficult to quantify the social impacts of mining and develop appropriate mitigation strategies. Though the benefits of mining are distributed throughout society, the social and environmental costs are concentrated in areas where mines are situated. Defining appropriate distributions of the costs and benefits of mining and determining how much society is willing to pay to mitigate the environmental and social impacts in return for a reliable supply of raw materials are major challenges facing governments, civil society, and the mining industry.

SEE ALSO *Alternative Technology; Energy; Habitat Loss; Land Ethic; Mining: II. Acid Mine Drainage; Pollution; Sustainable Development; Technology.*

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II. ACID MINE DRAINAGE

Mineral resource production is vital to modern industrialized societies. The environmental consequences of mineral production, however, have resulted in degradation and destruction of air, water, soil, land, and biological resources. Quantitative estimates are difficult to make, but tens to hundreds of thousands of mine sites in the United States and hundreds of thousands more worldwide probably have caused environmental damage (Custer 2003; Young and Ayres 1992). Environmental restoration is expensive, time-consuming, and a substantial challenge to scientists and engineers. The total costs to clean up mine sites in the United States are thought to run to a few hundred billion dollars (Mining, Minerals, and Sustainable Development 2002). One of the most injurious consequences of metal mining is the formation of acid mine drainage (AMD), a major contaminant to surface and ground waters.

AMD is acidic effluent water discharged from metal mines or mineral-processing wastes containing high concentrations of acidity, sulfate, and metals that are toxic to most forms of life except certain species of microbes (Nordstrom and Alpers 1999). When fresh rock containing pyrite, FeS_2, is exposed to air and water, a rapid reaction ensues, catalyzed by acidophilic bacteria. The general reaction is represented by

$$FeS_2 + \frac{15}{4} O_2 + \frac{7}{2} H_2O \rightarrow Fe(OH)_3 + 2H_2SO_4$$

in which pyrite is oxidized and dissolved, sulfuric acid is produced, and some form of ferric hydroxide is precipitated. The precipitated iron can be seen as orange-red to brown staining or coating on rocks and sediments in mined areas. Other coexisting minerals dissolve rapidly in sulfuric acid and contribute other metals (copper, zinc, cadmium, lead, cobalt, nickel, chromium, aluminum, and manganese) to the water. Such effluent from mine portals, adits, waste rock, and tailings piles typically has pH values of 2 to 4, although in extreme cases the pH can decrease to below 0 (Nordstrom et al., 1999). The high metal concentrations are a greater source of toxicity than is the low pH. In contrast, drinking water has pH values of 6 to 8, and most metals are insoluble in those conditions.

Acid Mine Drainage. *A journalist with Danish Public Broadcasting and Owen Stout of Cabin Creek, West Virginia, examine acid mine drainage at the base of Kayford Mountain, about an hour south of West Virginia. The contaminated water flows constantly from an abandoned deep mine. The West Virginia Department of Environmental Protection has known about the acid mine drainage for years. The tainted water flows into Cabin Creek, which makes its way to the Kanawha River, then flows into the Ohio River, and on to the Mississippi River.* **PHOTO COURTESY VIVIAN STOCKMAN/WWW.OHVEC.ORG.**

Accidental releases of impounded AMD have caused major devastation to some rivers; for example, the Aznalcollar impoundment in southern Spain broke and released about 7 million tons of acid slurry into the Guadiamar River, contaminating agricultural land, destroying aquatic biota, and threatening the largest European bird refuge, Doñana National Park (Grimalt and Macpherson 1999).

Acid rock drainage (ARD) is a more general term that refers to both AMD and acidic drainage that occurs naturally in mineralized areas where there has been no mining. Mineralized and unmined areas often produce acid waters with elevated concentrations of metals (Runnells et al. 1992). The geochemical process is the same, but mining greatly enhances the rate by exposing much more pyrite-bearing rock to air and water. One estimate from studies at Iron Mountain, California, indicates that mining increased the sulfide-weathering rate by at least two orders of magnitude (Alpers et al. 2007).

The large-scale and hydrogeochemical complexities of the contamination have hindered remediation efforts, although remediation has succeeded at several mine sites worldwide (Fernandez-Rubio 2004). The most common treatment for AMD is lime/limestone neutralization, an effective short-term solution. Because AMD can continue for hundreds to thousands of years, long-term, passive treatment is recommended. Research on wetlands treatment, water management, disposal practices, land reclamation, and phytoremediation holds promise for the long term. New mines can greatly reduce the environmental consequences of mining by incorporating environmental planning and monitoring into the mine plans

before mining begins. This approach also saves considerable amounts of money compared to the costs of environmental restoration after mining is finished and compared to legal costs when mining companies are sued for the damages they caused.

Foreign mining companies have taken advantage of the lack of regulatory authority in some underdeveloped poor countries and caused large-scale pollution of resources that destroy or harm the livelihood of native peoples. Mining companies have an ethical and economic obligation to minimize or prevent damage to air, water, soil, land, and biological resources and to prevent injuries to local communities as they exploit mineral resources for the needs of modern society.

SEE ALSO *Ecological Restoration; Habitat Loss; Pollution; Rivers; Sustainability; Water.*

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D. Kirk Nordstrom

III. MOUNTAINTOP REMOVAL

Mountaintop removal is a method of strip mining for coal in mountain regions. Its violent effect on nature and society has generated public controversy in the United States, where it has been practiced since the mid-1980s. Though mountaintop removal mining is done worldwide, its oldest and largest footprint appears in central Appalachia in an area predicted to be the size of the state of Delaware by 2012. The massive scale of mountaintop removal, its irreversible destruction of biologically diverse ecosystems, and its legacy of postbiotic landform complexes distinguish mountaintop removal from earlier forms of strip mining.

THE METHOD

Mountaintop removal involves stripping all vegetative cover and then blasting open a mountain to loosen the overburden, the name the coal industry uses for the communities of soil and resident life forms, defined as "material of any nature . . . that lies on top of a deposit of useful materials, ores or coal" (Squillace 1990, p. 138). Mountain ranges have been reduced by as much as 1,000 feet in Kentucky and West Virginia, where up to 2,000 metric tons of explosives are used daily. In the wake of blasting, a twenty-story-high excavator known as a dragline then scoops up the exploded materials and loads them into rock dump trucks, which deposit them in an adjacent hollow to form what is known as a valley fill. The U.S. Environmental Protection Agency (EPA) has predicted that by 2012 more than 2 million acres of the central Appalachian coalfields will have been exploded, mined, regraded, and revegetated in this manner. By the first decade of the twenty-first century more than 2,000 miles of headwaters, including intermittent and perennial mountain streams, had been damaged severely or buried beneath mine spoil (U.S. Environmental Protection Agency 2005). The coal industry defends mountaintop removal mining as the safest and most cost-effective way to meet the energy needs of a nation that produces more than half of its electricity in coal-fired utility plants.

HISTORICAL BACKDROP: LAND ACQUISITION, TECHNOLOGY, AND SOCIAL COMPACTS

The relationship between the coal industry and coalfield communities is characterized by what the anthropologist Marshall Sahlins has called negative reciprocity. In the extractive, nonrenewable coal economy the industry must take out more than it puts back to make a profit. In the twentieth century that negative reciprocity was codified and protected through "instruments of writing" (legal documents) that resolved disputes over land, labor, and resources in favor of the coal industry (Williams 2001).

Those instruments, which form de facto social compacts, include the Broad Form Deeds executed between the 1880s and the 1930s, the 1950 accord between the United Mineworkers and the Bituminous Coal Operators, and the 1977 Surface Mine Control and Reclamation Act (PL 95–87), also known as SMCRA.

The Broad Form Deeds transferred mineral rights to absentee landowners through negotiations that allowed farmers to continue traditional patterns of land use. Between the 1880s and the 1920s thousands of transactions were drawn up between land companies and coalfield residents, deeding mineral rights to the companies in exchange for clear title to the surface. By means of the Broad Form Deed residents gave land companies unfettered access to minerals and timber in exchange for the right to continue farming the land. Ninety percent of the land in that region is owned outright by absentee companies.

In the 1960s and 1970s strip mining was used increasingly throughout the region, with the externalities of acid runoff, deadened streams, and deforested and scarred landscapes. Despite opposition from local communities, strip mining was justified as the most efficient way to get at seams of coal that were too thin to retrieve through underground mining, and residents were held to unfettered access for absentee owners that had been guaranteed by the Broad Form Deeds decades earlier. The giant earthmoving machines used during that period were diminutive precursors of the contemporary draglines and rock dump trucks. The strip mining of the 1960s and 1970s, referred to as highwall, contour, or augur mining (and now as prelaw, that is, before SMCRA, mining), operated by cutting a wedge into the side of a mountain, simultaneously creating a wall perpendicular to a level bench. The bench supported a machine that drilled or cut away the coal from the wall. Refuse, or gob, consisting of mine dust, shale, clay, and poor-quality coal was disposed of in nearby hollows and impounded behind slag dams built of larger chunks of shale and rocks. Water that accumulated behind the impoundments increased the likelihood of severe flooding during heavy rains.

In the 1960s the Pittston Coal Company built a series of slag dams in the Middle Branch at the head of Buffalo Creek in Logan County, West Virginia. In 1972 the uppermost dam burst after a heavy rainfall. What witnesses described as a "wall of blackwater" (Erikson 1976)—132 million gallons—roared through the narrow seventeen-mile-long valley of Buffalo Creek, killing 125 people, injuring 1,100, and leaving 4,000 homeless in a matter of minutes.

That disaster precipitated the 1977 passage of the SMCRA. In addition to prescribing safety standards for surface mining and reclamation operations, SMCRA integrated provisions of the National Environmental Policy Act, the Clean Air Act, the Clean Water Act, and the Historic Preservation Act to facilitate citizen input regarding the propriety and legality of surface mining activities. Some citizen groups, such as Save Our Cumberland Mountains, opposed SMCRA, arguing that environmentally responsible strip mining is not possible (Stacks 1972). In a key provision of SMCRA, Section 515c(1), a coal company is exempt from the requirement to restore the land to its approximate original contour (AOC) if it can demonstrate that flat land will be of greater economic value for postmining development. Claiming that flat land can serve postmining developments such as industrial parks, prisons, shopping malls, airports, and golf courses, coal companies have petitioned for and been granted this exemption in nearly all mountaintop removal mining permits filed since the mid-1980s. In the aggregate the fine print in such agreements has provided the loopholes through which the coal industry has internalized its profits while externalizing its costs.

SOCIAL AND ECOLOGICAL COSTS

The offsite impacts, also referred to as negative externalities, of strip mining and coal-fired utilities plants include the pollution of air, water, and soils; forest decline as a result of acid rain (Ayers et al. 1998); and boom and bust economies at the sites of extraction, resulting in government subsidies during recurrent periods of unemployment and disasters such as mine explosions and flooding. Mountaintop removal mining adds several unprecedented negative externalities to this list.

Impacts on Coalfield Communities Beginning in the mid-1980s, preparations for mountaintop removal mining in the Appalachian Mountains took place out of public view and beyond the awareness of nearby communities. Local citizens first learned that something was changing when customary routes through the mountains were closed. Eventually the use of explosives began shaking their homes, cracking foundations, and destroying water sources, including spring-fed streams and wells. The blasting also precipitated blowouts of water that had accumulated in underground mines, sometimes with enough force to flatten buildings. Rivers grew shallow with siltation and the runoff from denuded slopes and during heavy rains made creeks overflow their banks and roar through the hollows, twisting road signs, ripping apart bridges, and carrying away vehicles, animals, and sometimes people, eleven of whom drowned in the floods of 2001 and 2002. Millions of gallons of blackwater are stored in hollows near coal preparation plants that tower above schools and homes. Black plumes, indicating discharges, in local streams and rivers are reported frequently. As a storekeeper in Stickney, West Virginia,

Aerial View of Mountaintop Removal, at Marthatown, West Virginia. *The mountaintop removal method of strip mining for coal, practiced in the U.S. since the mid-1980s, is largely controversial for the devastating effects the practice causes to an ecosystem. The states of West Virginia and Kentucky have declared states of emergency several times since 2000, due to the severe environmental pollution caused in their Appalachian regions by this form of mining.* **FLYOVER COURTESY SOUTHWINGS.ORG/PHOTO COURTESY OF VIVIAN STOCKMAN/WWW.OHVEC.ORG.**

put it: "We fear the river above more than the river below" (Hufford 1995, p. 543).

Since 2000 the governors of Kentucky and West Virginia have declared states of emergency in mountaintop removal counties almost annually. On October 11, 2000, a Massey Coal Company impoundment broke in Martin County, Kentucky, sending 300 million gallons of slurry into the Tug Fork River, thirty times more pollution than was released by the *Exxon Valdez*. The EPA called it the worst environmental disaster in the history of the southeastern United States.

Impacts on Biodiversity and Ecology The social and ecological impacts of mountaintop removal mining become clear when one considers that the coves and ridges it destroys support the world's most biologically diverse temperate-zone hardwood forest system. Although this forest is threatened by acid rain from fossil fuel combustion, mountaintop removal adds a further dimension to the ecological assault. In traditional strip mining the location of undisturbed forest above the disturbed mine site allowed for the revegetation of sites downslope with native species. In mountaintop removal disturbed ground upstream of everything else must be reclaimed with exotic species that will grow in nutrient-poor conditions (Edmunds and Loucks 1998).

Postbiotic landform complexes have been replacing an ecosystem that evolved over 300 million years into the world's most biologically diverse temperate zone hardwood system. This system of cove, ridge, and valley associations includes 40 canopy species, with another 40 in the understory, in addition to 1,200 species of botanicals.

Never glaciated, the climate-ameliorating coves sheltered the seed stock that reforested the eastern United States after the Ice Age. The ecologist E. Lucy Braun named this system the mixed mesophytic. Ecologists call it the mother forest. Human interactions with this forest over many generations have resulted in a rich store of knowledge about how to engage its biodiversity. The effects of destroying this region and replacing it with desert species that can survive in the nutrient-poor soils left by strip mining are incalculable. Some ecologists say that it could take 500 years or more to grow hardwoods in such a place; in that span of time the animating bond between collective memory and ecology that formed thousands of years before the European conquest of North America will have been broken.

ETHICS, PHILOSOPHY, POLITICS AND THE LAW

The controversy over mountaintop removal points out a number of contradictions in the system that is supposed to protect private property rights while safeguarding public goods such as air and water quality, soils and biodiversity, and the cultural heritage of a community's surroundings.

Lawsuits and Legislative Battles It was not until the mid-1990s that mountaintop removal mining drew national attention and citizens began organizing against it. After it made the headlines in major journals and newspapers and was featured on television networks, coalitions of local, state, regional, and national citizen groups began campaigning around this issue. In 1998 a West Virginia lawyer named Joe Lovett represented a group that included residents of Pigeon Roost Hollow, the West Virginia Highlands Conservancy, and the Ohio Valley Environmental Coalition. In a landmark case, *Bragg v. Robertson,* the group sued state and federal agencies for breaching a provision of the Clean Water Act that prohibit mining activities within 100 feet of a stream. In allowing mining companies to create valley fills by dumping mine spoil in streams, the plaintiffs argued, the government had failed to protect the stream buffer zone. In 1999 a federal judge ruled in favor of the plaintiffs, noting that valley fills violate the Clean Water Act. Two other judges later issued concurring rulings. The industry has appealed those rulings, and its lobbyists have been working to persuade federal legislators to revise the definition of fill material so that the U.S. Army Corps of Engineers may continue authorizing the dumping of mine waste into headwaters. A protracted battle has continued on the legislative and judicial fronts over the rights of coal companies to violate the stream buffer zone.

Politics: Technology's Subversion of Democracy The effort to overturn the stream buffer zone provision of the Clean Water Act ignores the function that political philosophers ascribe to substantive goods in a democratic polity. Hannah Arendt ascribes twin functions to the physical commons, which serves both to unite stakeholders while forming a buffer that preserves distinct positions (1958). The stream buffer zone functions in both ways. The coal industry, supported by the international banking system, invested its profits in a technology that displaced human workers and communities, and then argued that the laws protecting the commons of clean air and water had to be changed to accommodate the technology of giant earth-moving machinery. Shifting from citizens to engineers the authority to make environmental decisions, the coal industry and its supporters in state and national governments privatize the public goods that give citizens a voice in government. Destroying the headwaters, the coal industry destroys the political grounding of local, regional, and national publics. For local communities, the streams and their names are landmarks for navigating contemporary and historical space. The names for streams also form a set of mnemonic cues to the histories of mountain community life going back many generations. The streams are therefore vital resources for cultural identity and reproduction. Regions may be defined as the ecological limits of large watersheds, in which citizens share a biological stake in the quality of waters upstream. Protected by federal law, the headwaters also provide an anchorage in public life for every citizen in the United States, for whom the capacity to protect the health of headwaters is an indicator of viable democracy. The changing of laws to accommodate technology shifts decision-making authority to corporate engineers, diminishing the substantive commons, and dangerously weakening local, regional, and national democratic capacity.

Epistemological Errors Mountaintop removal mining epitomizes a fundamental error of Western epistemology—the Cartesian mind/body split. This is manifested as the separability of humans from their environments, and the location of human communities outside of ecological systems. Phenomenologists such as Martin Heidegger and Maurice Merleau Ponty, and pragmatists such as John Dewey have identified conceptual trailheads to the way out of this problem. Heidegger, in his *The Question Concerning Technology*, warns against an orientation to technology as a means of development that "challenges forth" a desired outcome rather than "bringing forth" what is already underway in existing relationships. In this regard, he mentions strip-mining and hydro-electric dams, which extract energy as something that can be stockpiled and which threaten to freeze the world (including human beings) into a set of "standing reserves" (Heidegger 1977). Sundering what Dewey calls "the bond that binds the living creature to his environment," (Dewey 1934,

p. 252), the fixed identity of the standing reserve prevents the "bringing forth" of that which is implicit in existing relationships between human and non-human nature. Such relationships would form the object of development in democracy as Dewey envisions it: "the creation of a freer and more human experience in which all share, to which all contribute." (1993, pp. 244–245).

Linking Social and Environmental Justice The federal policies that benefit the coal industry and maintain the status of coal as a source of more than half the electricity produced in the United States have turned the central Appalachian Mountains into a standing reserve of coal. This fixed identity blocks the development of potential alternatives. One term commonly used for the region, *the national sacrifice zone,* highlights the disadvantage at which residents are placed because they experience a disproportionate percentage of the negative externalities generated to meet national energy demands. The groups placed at such a disadvantage are often ethnic minorities who share the conditions of poverty and unemployment that are used to rationalize the concentration of undesirable forms of production and employment such as mineral extraction, petrochemical production, and low-paying factory and service industry jobs.

Some activist groups have used the concept of environmental justice to combat mountaintop removal. That concept highlights the interconnectedness of social and environmental issues in a region that has been neglected by mainstream environmental groups as well as government agencies. In 2003, for example, the Sierra Club mounted an environmental justice campaign against mountaintop removal, and a coalition of groups based in West Virginia, Tennessee, Kentucky, and southeastern Virginia has sponsored Mountain Justice Summer, an annual training camp for citizens interested in working on alternatives to mountaintop removal. Building relationships around the commons of headwaters and biodiversity among citizens from disjunct regions and sectors around the country, such efforts promise to engender and sustain the "genuine care for common experience" called for by Herbert Reid and Betsy Taylor (citing McDermott 1987, p. 91; see also Reid and Taylor, 2003) foundational to democratic capacity and mountaintop retention.

SEE ALSO *Biodiversity; Dams; Energy; Environmental Activism; Environmental Justice; Environmental Law; Environmental Policy; Habitat Loss; Land Ethic; Mountains; Pollution.*

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Mary T. Hufford

MOUNTAINS

Mountains are dominant features of our physical environment. Covering more than one-fourth of the earth's land surface, mountains occur on all continents and at all latitudes. They are found in 75 percent of the world's nations and provide a home for 10 percent of its human population. Mountains provide abundant natural resources and ecosystem services that support and sustain both mountain dwellers and lowland residents.

Mountains also are rich in cultural significance. Around the globe and throughout history, humans have responded to the evocative presence of mountains in diverse—and sometimes contradictory—ways. These responses have been shaped by the cultural conditions out of which they emerge and find expression in a dizzying array of beliefs and practices, myths and stories, philosophical ideas, and works of art. These socially constructed meanings frame the ways in which human beings perceive, understand, and relate to mountains and mountain environments.

PHYSICAL CHARACTERISTICS

The chief characteristics of mountains are verticality and slope, which together produce wide climatic variability and biological diversity over relatively short distances. For this reason, mountains often serve as ecological islands and refugia (areas where isolated populations of formerly widespread species still exist) that provide critical habitats for many species of rare, often endemic, flora and fauna.

Along with great diversity, mountains are notable for their high geomorphic energy and fragility. The same tectonic processes that build mountains (faulting, folding, thrusting, subduction, earthquakes, and volcanoes) also contribute to their fragility and instability. The presence of steep slopes covered with young, erosive soils further adds to the fragility of mountain environments and increases the potential for severe, long-lasting ecological disturbance.

The diversity and fragility of mountain environments is mirrored in the rich—and threatened—cultural diversity found among mountain communities throughout the world. Relative isolation and inaccessibility, as well as diverse ecosystems, have contributed to a great variety among mountain cultures; at the same time,'remoteness and isolation have marginalized these communities and contributed to extreme poverty in some mountain regions. Twentieth-century advances in communications and transportation technology have greatly increased accessibility to mountain regions, bringing both opportunities and challenges to traditional mountain cultures.

MOUNTAIN RESOURCES AND ECOSYSTEM SERVICES

Mountains provide a number of valuable natural resources and ecosystem services for both mountain communities and lowland populations. Many of the plants used as foods and medicines around the world come from mountain regions. The Andes, for example, are the source of more than 200 indigenous varieties of potatoes, and the Himalayas account for approximately 2,000 varieties of rice. The world's population uses medicines developed from plants that grow in mountain environments.

Mountain regions contain 28 percent of the world's forested areas. Besides providing a number of important resources, including timber, fiber, fuels, foods, and fodder for livestock, these forests contribute countless ecosystem services. They provide stability for steep mountain slopes, intercept precipitation, reduce soil erosion, protect water quality, moderate surface temperatures, and provide habitats for numerous forest-dwelling organisms. For many years their relative inaccessibility protected mountain forests and their subsistence-based communities. In recent years, however, growing demand for forest products and increased access to mountain regions have greatly accelerated the rate of deforestation in these areas.

Mountains shape hydrological processes in numerous ways. They influence precipitation patterns, store fresh water in snowfields and glaciers, and regulate the direction and flow of streams and rivers. Most of the major river systems of the world have their headwaters in mountain regions, and mountains provide 80 percent of the earth's surface water. More than one-half of the world's population depends directly upon mountains for the water they use to drink, grow crops, generate electricity, and support industrial processes.

MOUNTAINS AND MINING

Mountains also contain rich deposits of mineral resources, and the history of mining is intimately tied to the history of humanity's relations to mountains, because the tectonic forces responsible for creating most of the world's mountain ranges also provide the intense heat and pressure needed to produce ore deposits of economically valuable metals such as gold, silver, and copper. The discovery and extraction of mountain minerals, as well as key developments in metallurgical processes, have had a dramatic influence on the rise—and fall—of many great civilizations around the world. Gold from the

highlands of Nubia and the Sinai Peninsula supplied the great wealth of ancient Egypt. The mountains of southern Spain provided a rich source of tin, lead, silver, copper, iron, and gold for Phoenicians, Carthaginians and other early Mediterranean civilizations. Silver, lead, and gold from the Laurium mines in the mountains of Greece supported the rise of ancient Athens, while the rich gold and silver mines of Mount Pangaeus helped finance the rise of Macedonia under King Philip and Alexander the Great. For more than 400 years, the hills and mountains of Spain, Greece, Britain, Anatolia, Austria, and Transylvania supplied the gold, silver, lead, iron, and tin (a key ingredient in the production of bronze) that contributed to the great material wealth and military might of the Roman Empire.

During the Middle Ages, mountainous regions in Saxony and Bohemia became centers of metal mining in Europe. Between the tenth and twelfth centuries, major copper, silver, and lead mines were established in the Harz Mountains of Lower Saxony and the Erzgebirge (''Ore Mountains'') region near the headwaters of the Elbe River. In the centuries that followed, a variety of social, political, and economic factors contributed to the continued expansion of mining activities in Europe, as well as to significant advances in mining techniques and metallurgical processes. These developments culminated in a mining boom in Europe that began in approximately 1450; within the next hundred years, the production of silver in Germany increased fivefold, with much of this production coming from the Harz Mountains.

Rumors of golden cities of El Dorado and ''mountains that gushed silver'' fueled the imagination of fortune-seeking Europeans arriving in the Americas in the sixteenth century. Less than five years after Hernán Cortés conquered the Aztecs in 1521, Spanish mines were producing silver in several locations across Mexico. Within the next fifty years, major silver strikes in Guanajuato and Zacatecas resulted in the establishment of silver mines throughout the Sierra Madre that yielded tremendous wealth for the new colonial power.

With Francisco Pizarro's defeat of the Inca Atahuallpa in 1533, this pattern repeated itself in the Andes Mountains of Peru, Ecuador, and Bolivia. In 1545 Spanish colonists learned of the rich silver deposits lying beneath Cerro de Potosi in Bolivia, and within a year the Potosi mine was extracting silver from the 15,827-foot mountain. Soon, Cerro de Potosi became known as Cerro Rico (''rich mountain''), and the Spanish idiomatic expression, *valer un potosi* (''worth a potosi''—a fortune) appeared in Miguel de Cervantes' *Don Quixote.* Between 1556 and 1783, the mines of Potosi produced more than 45,000 tons of pure silver. It also is estimated that more than 8 million Indian miners died while working in the Potosi mines.

The discovery of precious metals and other minerals helped drive the westward expansion of the United States and the settlement of the country's western mountains. In 1848 gold was discovered at John Sutter's sawmill, and the California gold rush began in the foothills of the Sierra Nevada. This was followed by major gold strikes during the 1850s and 1860s in places such as Carson City, Nevada; Leadville, Silverton, and Telluride, Colorado; and Helena, Virginia City, and Butte, Montana. Although gold mining in Butte proved to be short-lived, the presence of vast silver and copper reserves earned the city its reputation as ''the richest hill on earth.'' In 1876 European American settlers discovered gold in the Black Hills of South Dakota, which resulted in the establishment of the Homestake Mine in 1877 and the removal of the Sioux Indians from their traditional homelands.

Since the 1990s mountaintop-removal mining has become an increasingly common method of extracting coal from the Appalachian Mountains of the eastern United States. In this process, forests, top soil, and overburden rock are removed from the mountaintops to expose seams of bituminous coal. The coal is then extracted and processed, while the overburden and waste rock are left in nearby valleys and hollows as valley fill. Waste water from processing methods is known as slurry and is impounded in storage pools on site. At current rates, the United States Environmental Protection Agency estimates that approximately 1.4 million acres in the Appalachian Mountains (primarily in West Virginia and eastern Kentucky) will have been mined using mountaintop removal methods by 2010. Although this process is lucrative for mining companies, critics cite a host of environmental and social problems associated with mountaintop-removal mining, including deforestation, habitat loss, surface and groundwater contamination, air pollution, mudslides, and flooding.

People have always looked to mountains as storehouses of valuable natural resources and potential wealth. Humans have used mountain minerals to make tools and weapons; establish currencies; decorate their bodies, artwork and buildings; supply energy; and drive industrial processes. However, the extraction, processing, and use of this mineral bounty have been accompanied by significant environmental and social costs. The tension between the benefits and costs of mineral development in mountain regions has profoundly influenced how humans understand their relationship with mountain environments and their role as agents of environmental change profoundly influenced how people relate to mountain environments and how they understand humanity's role as an agent of environmental change.

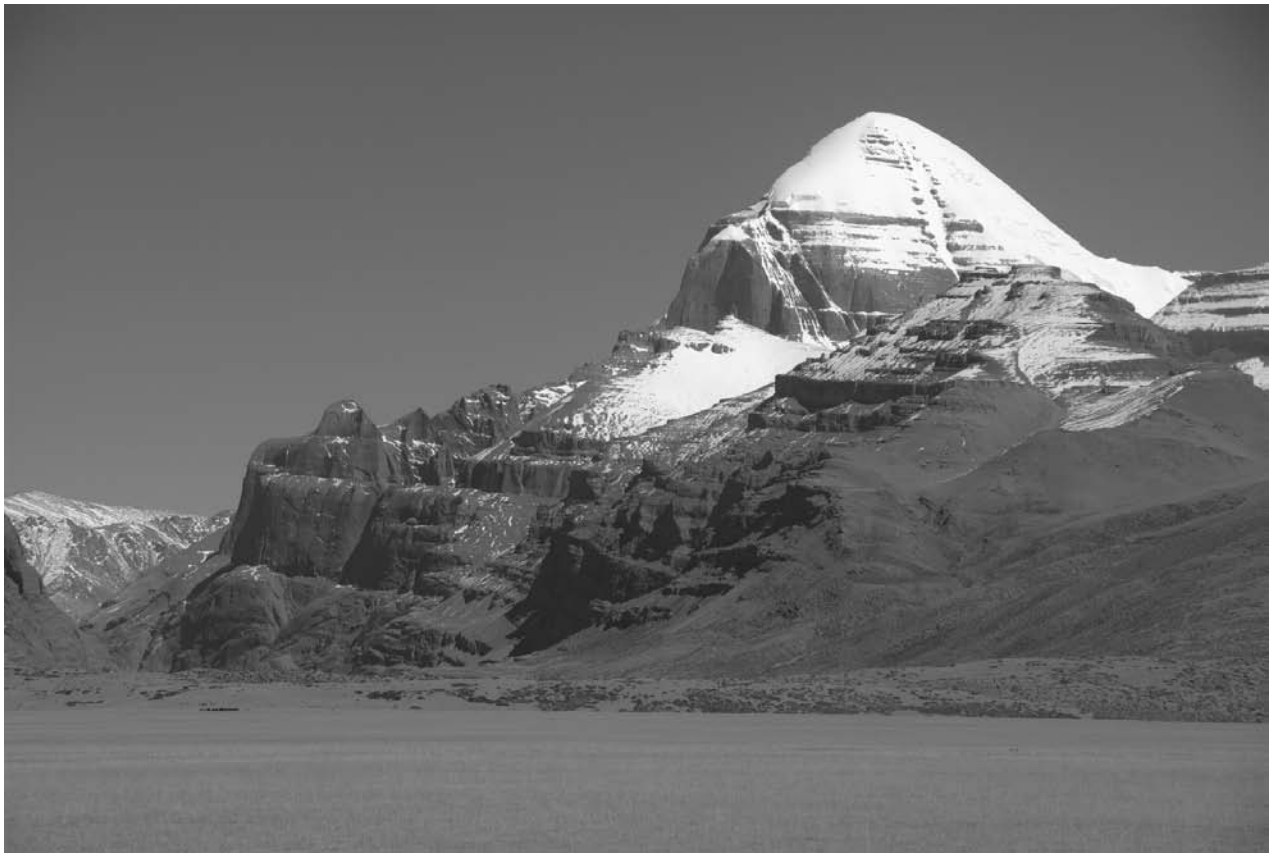
Mountaintop Removal. *The towering dragline, center, is dwarfed by the size of this mountaintop removal operation in Boone County, West Virginia, May 2003.* **FLYOVER COURTESY SOUTHWINGS.ORG/PHOTO COUTESY OF VIVIAN STOCKMAN/WWW.OHVEC.ORG.**

MOUNTAINS AND THE CULTURAL IMAGINATION

In addition to providing an abundant supply of the natural resources and ecosystem services needed to sustain human communities, mountains are extremely rich in cultural significance. Throughout history and across the globe, mountains have spoken to the human sense of the sacred, and the human response to this powerful address has manifested itself in countless forms of religious expression.

Sacred Mountains In many cultures throughout the world, mountain peaks are considered dwelling places of the gods. For the ancient Greeks, Mount Olympus was the home of Zeus and palace of the twelve major gods. For many Hindus, the god Shiva and his consort Parvati (daughter of the god Himalaya) reside on Mount Kailas in Tibet. Other imposing Himalayan peaks also are associated with the divine couple, including Shivling (India), Nanda Devi (India), and Annapurna One (Nepal). Among Tibetan Buddhists, Mount Kailas is the home of Demchog, the Buddha of Supreme Bliss. In Japan, Mount Fuji is the abode of the goddess Konohana Sakuya Hime; in Hawaii, the goddess Pele dwells atop the volcano Kilauea. All major Andean peaks are inhabited by mountain gods known as *apus,* with the supreme *apu* residing atop towering Mount Ausangate (Peru). Many of these sacred mountains serve as temples, shrines, altars, and pilgrimage sites, where devotees go to pray, do penance, and perform sacrifices. For the faithful these mountains serve as fountains of physical and spiritual blessings, bestowing—or withholding—a wide range of divine gifts, including rain, fertility, healing, wisdom, happiness, and success.

In other cultures the gods and their messengers may not live atop mountains, but the mountain heights serve as important meeting places where the divine and human realms intersect. In these cases mountains are sites of



Mount Kailas, Tibet. *Mount Kailas is a sacred site to both Buddhists and Hindus in western Tibet. In addition to their often symbolic importance, mountains provide many valuable natural resources and ecosystem services.*

divine revelation. For example, Moses went up Mount Sinai to receive the law and establish the covenant between Yahweh and the children of Israel. In a cave on Mount Hira, the Archangel Gabriel visited Muhammad and began the series of revelations that are recorded in the Koran. For the Plains Indians of North America, the tops of mountains and buttes serve as vision quest sites, where people seek out divine power, protection, and guidance through fasting and prayer.

Mountains also establish sacred geographies. Numerous mountains throughout the world act as the *axis mundi*, or world axis, that stands at the center of the universe, organizing space and uniting the various levels of existence. For Hindus and Buddhists the mythic mountains of Meru and Sumeru, respectively, are located at the center of the world, embodied in the physical form of Mount Kailas. For the Hopi Indians of the southwestern United States, the San Francisco Peaks are the location of the *sipapuni*, or center hole, from which the people emerged and through which they maintain contact with ancestors dwelling below. For the ancient Greeks a similar center hole or world navel (*omphalos*) was located on the slopes of Mount Parnassus, near the site of the famous temple of the oracle at Delphi. Other mountains stand not at the center but at the periphery of the world, holding up the heavens, ordering the landscape, and establishing boundaries. For the Navajo, Apache, and Pueblo Indians of the American Southwest, identifiable peaks mark the four cardinal directions that define and enclose their respective worlds.

The sacred power of mountains does not always manifest itself as divine; it also may take the form of the demonic. Mountains have often been experienced as terrifying and desolate places that inspire fear. For centuries the European Alps were considered a forbidding and dangerous place populated by witches, dragons, ogres, and demons. Mount Hekla, an active volcano in Iceland, was considered the entrance to hell. In many cultures throughout the world, mountains are places from which one's ancestors came and to which, upon death, they return.

Contemporary Mountain Meanings in Europe and North America As these examples and countless others suggest, mountains have held tremendous religious significance

MOUNTAIN TOURISM IN NEPAL

The environmental and social impacts of mountain tourism in the Himalayas are most evident in Nepal. Although closed to foreign visitors as recently as 1950, over the past several decades Nepal has promoted mass mountain tourism through private-sector initiatives with minimal regulation, monitoring, and control. As a result, nearly one million overseas tourists now visit Nepal each year. Most of these visitors participate in some form of mountain tourism, with approximately 25 percent engaging in mountaineering or trekking. The great majority of Nepal's mountain tourism activity is concentrated in the regions surrounding the Annapurna Conservation Area, Langtang National Park, and Sagarmatha National Park (Mount Everest), areas made famous through the writings of foreign mountaineers exploring Nepal in the 1950s and 1960s.

The tremendous influx of foreign tourists since the 1970s has had significant environmental impacts. Increased demand for fuelwood has resulted in dramatic losses in tree and shrub cover. This problem is especially acute in higher-elevation alpine zones, where the harvesting of slow-growing juniper shrubs for fuelwood has resulted in increased soil erosion and denuded landscapes. Other environmental problems associated with high-volume mountain tourism include degraded trails, contaminated water supplies, and large amounts of garbage. The severity of the latter problem has led some to dub Mount Everest the "highest dump on earth."

Mass tourism also has had tremendous social and economic effects on Nepal. On the positive side it generates revenues for tourism-related enterprises and creates employment opportunities. For the Sherpas of the Everest region and for the Gurung, Thakali, and Magar living near Annapurna, tourism revenues have invigorated local economies, raised the standard of living, and supported numerous infrastructure improvements and community-development projects. On the negative side, the influx of tourist money has inflated the costs of basic consumer goods and services and increased economic inequalities and social stratification in some local communities. Much of the revenue generated by tourism does not remain in local mountain communities; instead, it flows back to tourist-generating countries and Nepalese urban centers like Kathmandu. Most tourism jobs pay low wages and are subject to seasonal fluctuations. Negative social consequences associated with mass tourism include the deterioration of traditional values, loss of cultural practices and lifeways, and alienation caused by overwhelming numbers of foreign visitors. During peak seasons the number of nonresidents in the Everest region may be four times greater than the number of native Sherpa residents.

For the people of Nepal, mountain tourism has been, at best, a mixed blessing. Overcoming the host of environmental and social problems associated with mass tourism will require the development of sustainable and equitable policies and effective regulatory practices that conserve fragile mountain environments and benefit local communities.

throughout human history. In contemporary European and North American society, many traditional religious meanings of mountains have taken on secular form. No less powerful than their religious counterparts, these secularized mountain meanings contribute to a rich constellation of ideas and images that continue to inform contemporary understandings of, and relationships to, mountains. For example, the hulking and immovable presence of mountains continues to suggest stability and permanence in a rapidly changing world. Their lofty, snow-covered peaks bespeak purity, wildness, beauty, and transcendence, and they are looked upon by many with awe, wonder, and reverence. They may symbolize one's greatest struggles, trials, and challenges, as well as one's highest goals, vision, and aspirations. They are sought out as sources of inspiration, transformation, and recreation, where many go to test and renew themselves—physically, spiritually, and emotionally.

In Europe and North America, these various mountain meanings have become so well-established that it is tempting to take them as universal. The idea that mountains might evoke images of the demonic rather than divine, that they might represent negative qualities of hubris and unbridled ambition, or that they might be viewed as hideous and ugly deformities seems implausible to many contemporary Europeans and North Americans. Nevertheless, these negative mountain meanings were precisely those that prevailed among many Europeans as recently as the seventeenth century. In *Mountain Gloom and Mountain Glory: The Development of the Aesthetics of the Infinite* (1997 [1959]), Marjorie Hope Nicolson

ALPS

The Alps are a domain of great biological diversity, because of widely varying climate, exposure to sunlight, geology, morphology, hydrology; and also of cultural diversity, with widely varying language, religion, ethnic groups, history and politics. Yet, in any part of the Alps, patterns of life, economy, social and spatial organization are also similar in many respects.

As the main mountain range in Europe, the Alps were for centuries an obstacle to human communication and travel. They were viewed as a hostile terrain due to the imagined presence of negative supernatural forces, and the (often actual) presence of threatening natural or human forces. By the eighteenth century, however, the Alps had begun to attract artists and scientists, and became an example of an inhospitable environment victoriously challenged by humans. Its "sublime" character fascinated visitors, and this "delightful horror" contributed to the growing popularity of Alpinism and tourism. Humans, insignificant and weak, face alpine Nature, infinite and powerful, but they win the confrontation with it by means of mind and spirit (e.g., see Percy B. Shelley's ode *Mont Blanc* and George Gordon Byron's poetic drama *Manfred*, both written in 1816) (Marjorie Hope Nicolson 1959 [1997]).

Following industrialization, and the agricultural, industrial, and commercial development of cities and lowlands, there was a crisis in the Alpine economy and problems of migration and depopulation.

Nonetheless, transit across the Alps increased: Roads crossed the Alps in the early nineteenth century, then railways and tunnels, and finally highways. The traffic was concentrated along some valleys, promoting their economies, but also causing noise and air pollution. Since the late nineteenth century, alpine watercourses have been exploited for hydroelectric plants.

So the Alps were subject to opposing processes: on the one hand, intensive exploitation of transit corridors and tourist areas (with a seasonal overcoming of capacity limits), and on the other hand the depopulation of large areas which reverted to a wild state, where wild animals—predators included—reappeared, and ecological cycles broken for some time were reestablished. This "re-wilding" process is appreciated by ecologists because it favors biodiversity, but farmers, worried about cattle and crops, fight it: Therefore the authorities often allow the killing of wild animals, even members of protected species (wolves, bears).

Some alpine regions maintained a vital culture and economy and a well-balanced relationship with the natural environment without depopulation. This happened where, for instance, local population reached a critical mass, and alpine economy enjoyed comparative advantages in agriculture and manufacture of typically alpine products (e.g., cheese, wine, sausages, delicatessen, in Gruyère, Emmenthal, Val d'Aoste, Valtellina, Trentine, Tirol, and so on), in comparison with the standardized ones of the lowlands; or where demographic and social resistance flows from ideological and political factors (e.g., where ethnic minorities are located).

Around the turn of the twenty-first century, however, climate changes (temperature rise, snow precipitation decrease) hindered winter tourism, which faced growing difficulties. Winter sports development favors bigger and higher tourist resorts, which leads to investing in ski-plants at higher altitude and snowmaking, and penalizes the smaller, lower resorts. This causes a further concentration of development in fewer sites, but in these places there is overbuilding and pollution.

The bigger problems in the Alps thus derive from a paradox: To survive, economically and demographically, either societies open up to the outside, losing their cultural identities and destroying their environments, their two greatest assets; or they close in on themselves, separating from the mainstream of modernity, without suffering its hazards but also without enjoying its opportunities.

The possible solution is the protection of fundamental cultural and natural values through the rule of modernity's local processes. This is only possible if communities do not retire into themselves for an impossible self-defense, but produce a real identification with the land and control the present modifications and opportunities, which are ambivalent because they can have, according to local circumstances, positive or negative issues to communities themselves.

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Guglielmo Scaramellini

notes that when seventeenth-century English poets wrote about mountains, they usually portrayed them as ugly and repellent deformities, dangerous to both body and soul. Poets such as John Donne, Andrew Marvell, and their peers drew their images of mountains less from personal experience than from a received literary tradition influenced by several factors: a biblical morality in which mountains symbolized sinful pride; Roman poetry that portrayed mountains as aloof, inhospitable, and hostile; classical notions of beauty emphasizing symmetry, regularity, and proportion; and allegorical and abstract treatments of mountains found in the works of authors such as Augustine and Dante Alighieri. All of these sources contributed to the negative view of mountains that pervades much of seventeenth-century English poetry.

At the close of the century, however, important developments in theology, philosophy, astronomy, and geology were beginning to alter how Europeans conceived of their place in the cosmos and their relationship to the natural world. Although Thomas Burnet's *Sacred Theory of the Earth* (1965 [1684]) still described a world in decline, where the perfectly smooth and rounded orb of God's original creation was now defiled by mountains and other irregularities in the aftermath of the Great Flood, other theologians and philosophers offered a more positive, progressive view of the world, in which nature reflected the orderly design and benevolent purposes of its creator. At the same time, a growing awareness of the vastness of space and time contributed to an emerging aesthetics of the infinite.

Almost immediately, these ideas infused the poets' traditional mountain gloom with an element of ecstatic enthusiasm, typified by the "delightful Horrour and terrible Joy" that John Dennis experienced while traveling through the Alps in 1688. This conflicted emotional response provided the foundation for a new mountain aesthetic of the sublime, with English poets glorifying the awe-inspiring heights of mountains and extolling their irregularities and wildness as glorious expressions of God's plenitude. This new attitude toward mountains reached its highest expression in the works of great Romantic poets such as William Wordsworth, Lord George Gordon Byron, and Percy Bysshe Shelley, all of whom sought out mountains as sources of inspiration and sung praises to their sublime beauty, glory, and divinity.

Nineteenth-century Romanticism exerted a tremendous influence on American transcendentalists such as Ralph Waldo Emerson and Henry David Thoreau, as well as John Muir and other pioneering figures in the American environmental movement. Understood as sources of inspiration, objects of veneration, and places of spiritual renewal, mountains have been a major focus of conservation efforts in the United States. Muir, for example, founded the Sierra Club primarily to protect his beloved Sierra Nevada in California. National parks such as Yosemite, Yellowstone, Grand Teton, Glacier, Denali, and Great Smoky Mountains were established to protect the country's most treasured mountain environments, and the preponderance of mountain regions included in the country's national parks system and wilderness preservation system testifies to the great cultural value Americans attribute to mountains.

Changing attitudes toward mountains among Europeans of the late eighteenth and early nineteenth centuries also are reflected in the rise of mountaineering. No longer forbidding, repulsive, or hostile, the Alps quickly became a tourist destination as Europeans began climbing mountains for sport and adventure. Beginning with Mont Blanc in 1786, climbers reached the summits of all major Alpine peaks in the next hundred years. In 1857 the Alpine Club, the first of many alpine organizations, was established in London, with mountaineering journals and guidebooks appearing shortly thereafter. By the end of the nineteenth century, European mountaineers were looking for new challenges beyond the Alps and exploring the distant peaks of the Caucasus, Karakoram, and Himalayas.

As Europeans came to regard mountains and mountain regions in an increasingly positive light, these changing perceptions found expression in the literature and art of the nineteenth and twentieth centuries. In many cases these new mountain meanings were blended with traditional religious imagery. In Friedrich Nietzsche's *Thus Spoke Zarathustra* (1969 [1883–1885]), for example, mountains retain their traditional role as sites of purification, training, and revelation. The book's prologue begins with Zarathustra, upon attaining wisdom, descending the mountain, like Moses from Sinai, to proclaim his message to humankind below. Hans Castorp, the protagonist of Thomas Mann's novel *The Magic Mountain* (1924), undergoes an extended period of spiritual gestation in a mountain sanatorium that culminates in a revelatory vision of spiritual awakening and rebirth.

In the paintings of the Renaissance, baroque, and neoclassical periods, if mountains appeared at all, they usually provided a highly stylized backdrop for human action. By the nineteenth century, however, mountains began to take center stage in the works of Romantic landscape painters like Albert Bierstadt (1830–1902) and fellow members of the Hudson River School. Bierstadt's mountain scenes are filled with jagged and precipitous peaks, often surrounded with ethereal clouds and illuminated by rays of heavenly light. In paintings such as *Among the Sierra Nevada Mountains*, Bierstadt presents mountains as places of divine splendor and sublime beauty, drawing upon traditional religious imagery and Romantic sensibilities.

Albert Bierstadt,* Among the Sierra Nevada Mountains, California, *1868. *Bierstadt's oil on canvas painting is an example of the numerous depictions of mountains throughout the centuries in the arts. The representation of mountains has assumed various meanings throughout the centuries. They may connote stability and permanence, beauty and transcendence, or even the struggles and trials of contemporary life.* SMITHSONIAN AMERICAN ART MUSEUM, WASHINGTON DC, ART RESOURCE, NY.

Mountains and Conflicts of Meaning Many environmental conflicts of the twentieth and twenty-first centuries have involved mountains and their sometimes conflicting cultural meanings. The heated public debate over the damming of the Hetch Hetchy Valley in Yosemite National Park that occurred from 1900 to 1913 offers a prime example. Opponents of dam construction, led by John Muir, compared the flooding of the mountain valley to the destruction of a sacred temple. Using arguments loaded with religious and Romantic imagery, Muir celebrated the sublime beauty of the mountain landscape. Dam proponents like Gifford Pinchot, meanwhile, saw the Hetch Hetchy Valley and Tuolumne River as a valuable source of freshwater for lowland residents of San Francisco and surrounding communities. Arguing from utilitarian and democratic principles, Pinchot believed the "greatest good of the greatest number" could best be served by flooding the mountain valley to create a reservoir that would provide a reliable supply of freshwater for the growing metropolitan area.

In the 1970s the Hopi Indians of the southwestern United States argued, unsuccessfully, that the expansion of a ski area in the San Francisco Peaks would desecrate their holy mountains and interfere with their religious practices. In this case traditional religious meanings of mountains conflicted with European-American interests in mountain recreation. Similar arguments have been put forward by Native Hawaiians seeking to block geothermal development on the slopes of Kilauea and by Blackfeet Indians opposed to oil and gas drilling in the Badger-Two Medicine area of Montana's Rocky Mountains. Across the globe, such intercultural conflicts are likely to increase as mountain regions become more accessible and the global demand for, and consumption of, mountain goods and services increases. In Nepal and other Himalayan countries the relative ease with which international tourists can now access this once-remote area has resulted in the explosion of a mountain-tourism industry that is rapidly transforming the region's natural and cultural landscape (see sidebar on mountain tourism in Nepal).

MOUNTAIN CONSERVATION AND SUSTAINABLE DEVELOPMENT

In many parts of the world, rapid and unsustainable development is threatening the rich biological and cultural diversity of fragile mountain environments and diminishing the quality and value of the important ecosystem goods and services they provide. In response to

these threats, members of the global environmental community have recognized the need to develop policies and practices that promote conservation and sustainable, equitable development in mountain regions. At the Rio Earth Summit in 1992, delegates adopted a global action plan for sustainable development (*Agenda 21*) that includes an entire chapter devoted exclusively to mountains, titled "Managing Fragile Ecosystems: Sustainable Mountain Development."

Since 1992 mountain advocates have been working to implement the strategies outlined in *Agenda 21* (United Nations). The United Nations highlighted the importance of mountain issues by declaring 2002 the International Year of the Mountains, an event that culminated at the Bishkek Global Mountain Summit held in Kyrgyzstan. Recognizing the tremendous diversity of mountain regions and mountain communities throughout the world, the Bishkek Mountain Platform advocates regionally specific conservation and development processes that address the concerns of mountain regions and the lowland communities that depend on them. Through such efforts, mountain advocates are working to protect fragile mountain ecosystems and ensure that the world's mountains will continue to provide for the sustenance—and inspiration—of human communities far into the future.

SEE ALSO *Biodiversity; Earth Summit; Forests; Hetch Hetchy; Mining: I. Overview; Muir, John; Regionalism; U.S. Environmental Protection Agency; U.S. National Park Service.*

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Scott Friskics

MUIR, JOHN
1838–1914

John Muir was born in Dunbar, Scotland, on April 21, 1838. At age eleven he moved with his family to Wisconsin. Muir is best known for helping shape the modern notion of national parks and helping found the American conservation movement. He was the first to attribute rights to all creatures from snakes to microbes, and his concept of balance and harmony in nature, together with a sense of interdependence among all aspects of the environment, gave his earliest writings an underlying notion of ecology before the term, which was coined in 1866 by Ernst Haeckel, came to America. Muir died in Los Angeles, California, on December 24, 1914.

Muir developed these notions by using a metaphorical and impassioned style of writing rather than making explicit philosophical statements. A strong sense of the human capacity for hubris led him from a position of religious awe to that of a canny conservationist. His democratic belief in the influence of the voting public in recognizing the intrinsic value of the exploited forests and mineral-bearing American landscapes led to his

John Muir, circa 1902. *Muir was a writer and conservationist best known for establishing the modern notion of national parks and as the founder of the Sierra Club. In his writings, Muir espoused a truly nonanthropocentric appreciation of nature in all its forms.* **THE LIBRARY OF CONGRESS.**

campaign for the establishment of forest reserves and national parks and the formation of the Sierra Club.

In the journal (1867–1869) later published as *A Thousand-Mile Walk to the Gulf* (1992a [1916]) Muir developed a style that not only challenged common assumptions about notions of good and evil in nature but adopted a holistic mode of understanding natural processes. Reacting against the narrow and oppressive Calvinism of his upbringing, Muir took Emersonian transcendentalism into new realms of ecological inclusiveness. For example, the snakes and alligators in the swamps of Florida not only were "unfallen" in religious terms but were "cared for [by God] with the same species of tenderness and love as is bestowed on angels in heaven or saints on earth" (1992 [1916], p. 148).

Combining a holistic sense of the divine with ecological insight, he articulated a nonanthropocentric environmental ethic: "The antipathies existing in the Lord's great animal family must be wisely planned, like balanced repulsion and attraction in the mineral kingdom. How narrow we selfish, conceited creatures are in our sympathies! How blind to the rights of the rest of all creation!" (1992b, p. 148). The fundamental balance in predator-prey dynamics has to be observed as dispassionately as are the analogous dynamics in minerals if the community of animals, plants, minerals, landscapes, and weather is to be appreciated in all its interrelationships: "When we try to pick out anything by itself, we find it hitched to everything else in the universe" (1992b, p. 248). The natural processes by which things are hitched to one another must be viewed dispassionately, including destructive processes.

For Muir, the traditional judgments of culture that separated death and destruction from creation and growth had prevented ecological insights into the processes of nature. For example, when people can see that "everything is flowing—going somewhere, animals and so-called lifeless rocks as well as water," they may see that in Alaska "out of all the cold darkness and glacial crushing and grinding comes this warm abounding beauty and life to teach us that what we in our faithless ignorance and fear call destruction is creation finer and finer" (1992b, p. 841).

Muir deployed different modes of writing for different purposes and different audiences. He was an empirical scientist, celebratory nature writer, campaigning conservationist, authoritative naturalist, and wilderness polemicist. The keys to his concept of a series of "nation's parks" were long-term protection for future generations and short-term renewal through direct contact with nature by urban populations that then would vote for the protection of those iconic landscapes and their ecologies. Muir thus embraced tourism as an inspirational and educational conservation strategy.

Early in his writing life he came to see that the urban and Eastern audiences for his writing could become a constituency for the preservation of forests, wilderness, and iconic landscapes. On successive trips to Alaska he developed a growing respect for indigenous lifestyles and skills, together with concern about the future of those communities. For Muir culture, in the form of his writings, was a mode of communication with nature that could be used to mediate a sustainable relationship with it. If this required a preaching tone in his writing, he could rise to the challenge: "The outcries we hear against forest reservations come mostly from thieves who are wealthy and steal timber by wholesale. . . . Any fool can destroy trees. . . . But [God] cannot save them from fools—only Uncle Sam can do that" (1992b, pp. 604–605).

Muir had the ability to conduct an environmental campaign and employ the power of pressure-group environmental politics. He worked for a bill to preserve Yosemite National Park, teaming with Robert Underwood Johnson: Johnson lobbied in Washington, and Muir wrote up the evidence and arguments in a series of articles for Johnson's *Century Magazine*. Muir also worked with Charles Sargent's Forestry Commission on a tour of American forests to establish thirteen forest reserves in the face of opposition from lumber and mineral interests. As the founding president of the Sierra Club, Muir set up a pressure group of influential Bay Area businesspersons to defend the new Yosemite National Park and, through outings and meetings, expand the club's sphere of influence. The strain of the club's campaign against the building of Hetch Hetchy Dam, and the campaign's eventual failure, hastened the end of Muir's life but became a crucial lesson in his legacy.

SEE ALSO *Conservation; Ecology: I. Overview; Environmental Politics; Hetch Hetchy; Holism; Sierra Club; Wilderness.*

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Terry Gifford

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NAESS, ARNE
1912–

The philosopher Arne Naess was born in Oslo, Norway, on January 27, 1912, and received a doctorate in philosophy from the University of Oslo in 1938. He is best known for his invention of the term *deep ecology* to indicate that environmental issues are questions of ethics and philosophy rather than science and politics. Through a combination of his ideas and his persona, Naess was probably the most influential living environmental philosopher in the first decade of the twenty-first century.

EDUCATION AND EARLY WORKS

In the 1930s Naess traveled to Vienna as a young student to join the Vienna Circle, working closely with Moritz Schlick and Rudolf Carnap in the field of analytic philosophy. In 1937 Naess became the youngest full professor in Norwegian history, and over subsequent decades he wrote a series of textbooks on introductory logic and the history of philosophy that became the foundation for reform of his nation's university system, which required for many years that all students take a semester of philosophy before working in their chosen disciplines. His first book, *Truth as Conceived by Those Who Are Not Themselves Professional Philosophers* (1938), used a survey approach to demonstrate that ordinary people hold a range of views on truth similar to those voiced by philosophers.

During World War II Naess was active in the clandestine resistance against the Nazi occupiers, and after the war he led a reconciliation project to bring war criminals together with the parents of the Norwegian soldiers they tortured and killed. In the Cold War period, Naess was asked by the United Nations to lead a philosophical effort to study the worldwide uses of the term *democracy*. The resulting book, *Democracy in a World of Tensions* (1951), revealed that the word could mean almost anything; because of that disturbing conclusion, the book never was reprinted.

LATER WORKS AND INFLUENCE ON ENVIRONMENTAL ETHICS

In mainstream philosophy Naess is best known for his work in the philosophy of language in *Interpretation and Preciseness* (1953) and *Communication and Argument* (1966). Other major theoretical works in English include *Scepticism* (1968), *Gandhi and Group Conflict* (1974), and *The Pluralist and Possibilist Aspect of the Scientific Enterprise* (1969).

Naess is a mountaineer and for a few years in the early 1950s, with his ascent of Tirich Mir, held the record for the highest mountain ever climbed. A decade later, inspired by Rachel Carson, he resigned from his professorship to devote himself to environmental issues. *Ecology, Community, and Lifestyle* (1989 [in Norwegian 1976]) is his main theoretical work in environmental philosophy and the work in which the theory of Deep Ecology is articulated in depth. It is an environmental philosophy, not an ethic, that encourages each individual to think of nature as the ground of his or her own interest so that the greatest sense of self-realization will encompass a "Self" of the environment and become "Self-realization." People should situate their identities and interests in nature uniquely, developing their own "ecosophies" that build on a personal sense of place and a duty of care for the earth and fit into their immediate surroundings with greater attention and dignity.

Together with George Sessions, Naess politicized Deep Ecology by putting forth a platform of eight points that turned his concept into an ethical manifesto:

1. The flourishing of human and nonhuman life on the earth has intrinsic value. The value of nonhuman life-forms is independent of the usefulness they have for narrow human purposes.
2. The richness and diversity of life-forms are values in themselves.
3. Humans have no right to reduce that richness and diversity except to satisfy vital needs.
4. Present human interference with the nonhuman world is excessive, and the situation is worsening rapidly.
5. The flourishing of human life and cultures is compatible with a substantial decrease in the human population.
6. Significant change of life conditions for the better requires change in economic and technological policies.
7. Quality of life should be given more primacy than a high standard of living.
8. Those who subscribe to these points have an obligation to implement the necessary changes.

This platform was adopted by radical environmental groups such as Earth First! as their guiding philosophy, but Deep Ecology might have reached its greatest popular prominence when Senator Al Gore wrote in his 1992 book *Earth in the Balance* that "we must change the fundamental values at the heart of our civilization" to solve global environmental problems (p. 144). By the dawn of the twenty-first century many people embraced this view even if they did not realize where the idea came from.

In 2002, at age eighty-eight, Naess published *Life's Philosophy*, a personal account of his history through ideas. It became the number one best-seller in Norway and catapulted its author to a new level of fame. In 2005 the *Selected Works of Arne Naess* was published in ten volumes. It is perhaps the most comprehensive publication of the works of any living philosopher.

At age ninety-five Naess continued to speak out in the name of nature and conservation and remained optimistic that humanity will be able to improve its relationship to the world around it "by the twenty-second century" (Sessions 1995, p. 501).

SEE ALSO *Deep Ecology; Earth First!; Environmental Philosophy: V. Contemporary Philosophy.*

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David Rothenberg

NANOTECHNOLOGY

Nanotechnology is defined by the U.S. National Nanotechnology Initiative as the "understanding and control of matter at dimensions of roughly 1 to 100 nanometers, where unique phenomena enable novel applications." At this small scale (1 billionth of a meter), matter takes on novel properties, such as greater reactivity, electrical conductivity, and penetrability. Nanotechnology was used as long ago as 10 C.E. in the first century to develop paints of different colors that varied only by the size of the particles. Yet it was not until 1959 that the idea of nanotechnology was introduced by Richard Feynman, a physicist at the California Institute of Technology, in a talk titled "There's Plenty of Room at the Bottom." Although Feynman did not use the word *nanotechnology*, he suggested the possibility of precisely manipulating atoms and molecules. In size, nanoparticles range from the size of several atoms to the size of biological molecules, such as proteins. Although nanoparticles exist in nature, only recently developed tools such as atomic-force microscopy and better scientific understanding of materials have allowed humans to manipulate matter at the nanoscale to achieve certain goals. As an example, in 1989 IBM performed a famous experiment using atomic-force microscopy to move individual xenon atoms to form the letters "IBM."

Nanotechnology is a broad term that encompasses a diverse set of applications, tools, and methods linked together primarily by scale. The technology can be applied to medicine, food, agriculture, manufacturing, health, consumer products, and environmental science and remediation. In medicine, gold and dendrimers (complex organic molecules) are used to specifically target and destroy cancer cells without the horrible side effects of chemotherapy. In renewable energy, barriers to greater use of solar energy include the high cost of materials for the panels. Some nanoparticles convert light to energy with greater efficiency,

and so less material is needed. Hence, nanomaterials can be used in solar panels to lower their cost. In the environment, iron oxide nanoparticles are used to remove arsenic, a potent toxin, from drinking water, and DNA-based nanoparticles are being developed for tracking pollution in natural environments. Finally, in agriculture, nanosensors are being considered for detecting agricultural growing conditions and responding only when needed for the timed release of fertilizer, water, or pesticides.

Environmental issues and ethics intersect with nanotechnology in several ways. Ensuring the environmental safety of nanomaterials, making decisions about funding priorities or their environmental release, and developing systems for broader oversight all involve value judgments. Ethical issues associated with nanotechnology generally fall into categories that also apply to other technologies, such as utilitarian accounting of risks, costs, and benefits and the examination of fundamental moral principles such as autonomy, justice, nonmalfeasance, or beneficence (Beauchamp and Walters 1999). Environmental ethics includes questions related to how nanotechnology affects the preservation of natural, nonhuman living systems; what obligation nanomaterial producers have to protect the environment; and how much certainty about environmental safety is needed prior to environmental release.

FUNDING

Several nations have significant research programs in nanotechnology, including Japan, the United States, and nations of the European Union. The United States was one of the first nations to fund nanotechnology research and development in a coordinated fashion at the federal level. The U.S. National Nanotechnology Initiative (NNI) formally began in 2000 with a research program funded at $400 billion. Key figures in the formation of the initiative were Mihail Roco of the National Science Foundation (NSF) and Neal Lane, President Bill Clinton's science adviser. The budget for the initiative grew to $1.4 billion in 2008. Over half of this funding goes to the U.S. Department of Defense, and a significant proportion goes to the NSF, the Department of Energy, and the National Institutes of Health. Smaller amounts are allocated to the Department of Commerce, Department of Agriculture, U.S. Environmental Protection Agency (EPA), Department of Transportation, and other agencies. Nearly every public agency has some responsibility for nanotechnology on account of the diverse methods, products, and applications of the technology.

In 2006, the NNI channeled about 8 percent of its funds into the societal dimensions of nanotechnology, which includes educational programs, research, and programs focused on ethical, legal, and social implications (ELSI); and environmental health and safety (EHS) research (National Research Council 2006). This designation of funding is an important statement on the part of the U.S. government: an acknowledgment that emerging technologies are embedded within social and cultural systems and that it is important to study societal dimensions alongside technological development. Yet some scholars argue that ELSI programs and research have not received as much support as they should. In the first four years of the NNI, Ira Bennet and Daniel Sarewitz (2006) estimate that less than 0.5 percent has specifically gone to ELSI work. Regardless, several interdisciplinary research teams across the United States are studying a range of ELSI issues from proper oversight of nanomaterials to public attitudes about nanotechnology and ethical issues arising from future nanotechnology applications. In 2005, the NSF funded the Center for Nanotechnology and Society at Arizona State University and the University of California, Santa Barbara.

Arguably, there has also been little funding for the study of environmental health and safety issues associated with nanotechnology. Funding for risk-related research is about 1 percent of total funding for the NI (Maynard 2006), and only a portion of this goes specifically to studies of environmental risk. In 2008 legislative hearings in the United States focused on the need to increase that percentage. The lack of significant levels of funding for EHS issues has created a situation in which over five hundred nanotechnology products are on the market while little is known about their environmental transport, fate, and toxicity. Applications are growing and will continue to progress from chemical nanomaterials in consumer products (passive nanostructures) to active biologically based nanostructures and nanosystems that can respond, change, and move through human and natural systems (Roco and Bainbridge 2005).

Toxicology studies suggest that nanoparticles are more toxic at lower concentrations than their larger counterparts, owing to their higher surface-area-to-mass ratio and greater reactivity. Little is known, however, on the amounts and nature of nanomaterials released into the environment (e.g., from manufacturing plants), and there are few comprehensive, field-based studies on nanoparticles and their risks to the environment, although frameworks for risk analysis have been developed (Morgan 2005). Buckyballs (made out of 60 carbon atoms and shaped like a soccer ball) and carbon nanotubes (thin-walled tubes made of carbon atoms) are two types of nanoparticles that have been shown to be harmful to fish and microorganisms. In 2008 government organizations in Japan, the European Union, and the United States proposed increasing resources for environmental health and safety studies of nanotechnology applications.

OVERSIGHT

A subset of ethical questions focuses on oversight of nanotechnology products. Typically, formal government regulation is limited to utilitarian considerations such as the risks, costs, and benefits of commercial approval. Yet oversight also encompasses ethical principles of fairness and justice, for example, through the distribution of risks and benefits among human communities and ecosystems. Another oversight question involves who or what entities should bear primary responsibility for overseeing nanotechnology products. Still another oversight issue is whether consumers and patients should have rights to know and choose products generated from nanotechnology (the ethical principle of autonomy). Finally, should oversight consider harm to natural systems and human responsibilities to protect the environment for its intrinsic value or for its use by future generations?

U.S. oversight of nanotechnology currently relies on agencies and regulations that have provided oversight for related technologies or products. There is no specific statute or mechanism for oversight of nanotechnology products. Yet existing laws and systems may not adequately address the novel properties and unique challenges of nanoproducts (Kuzma 2006; Davies 2007). National and international stakeholders and government organizations are currently considering how best to oversee the applications and products of nanotechnology.

Most chemical and consumer nanotechnology products do not require premarket testing and safety data. The EPA (2007) administers a voluntary stewardship program in which data generated by industry are collected by the agency, but there are no formal requirements for regulatory approval. The stated policy of the U.S. Food and Drug Administration (FDA; 2007) is to treat nanoscale drugs, devices, food products, and biologics as substantially equivalent to their larger counterparts. The nonprofit group Environmental Defense Fund partnered with DuPont to develop a risk-analysis framework for nanomaterials, and they are encouraging companies to use it. On the international level, the Organization for Economic Cooperation and Development is helping to form partnerships among nations to generate and share data about the safety of nanomaterials. The International Standards Organization and other standard-setting bodies are designing safety standards for nanotechnology products.

CONTROVERSY

Some stakeholders, citizen groups, and organizations, citing negative past experiences with other emerging technologies, such as biotechnology, are skeptical of the promise of nanotechnology. Although there has not been massive public outrage about nanotechnology, several interest groups have objected to the voluntary approaches to overseeing nanotechnology in place in 2008. The Erosion, Technology, and Concentration Group called for a moratorium on nanotechnology products in the marketplace until more information is obtained. The British Royal Society recommended a precautionary approach to the environmental release of freestanding nanoparticles until more is known about their transport and effects. The International Center for Technology Assessment (2007), in partnership with several other nonprofit organizations, has developed principles for regulation that include public transparency and mandatory premarket testing by independent experts. The center has also filed a legal petition against the FDA for its lack of premarket safety testing of cosmetics and sunscreens with nanoparticles.

One prominent example of debate about nanotechnology in the environment involves silver-coated nanomaterials. There are on the market in nanosilver washing machines, refrigerators, socks, and food-packaging materials. Silver ions kill microorganisms, and products coated with nanosilver stay fresh longer. Initially, these products were entering the marketplace with no premarket testing. However, several environmental and other interest groups brought attention to the potential release of silver ions into the environment (e.g., from the wash cycle of nanosilver-coated washing machines) and petitioned the EPA to regulate them. After about a year of consideration, the EPA decided in 2007 to regulate nanosilver under the U.S. pesticide law, the Federal Insecticide, Rodenticide, and Fungicide Act. This relatively strong statute requires premarket tests to be submitted to the EPA and products to be registered. However, the manufacturer must claim that its product is designed to kill pests or germs. As a result, some companies that produce nanosilver materials are removing this pest-killing claim from their products to avoid regulation.

As of 2008, producers of most nanomaterials are primarily responsible for ensuring the safety of their products through voluntary programs. This approach seems fair in that the financial burden of safety testing is placed on the entity that stands to profit. However, a body of literature suggests that citizens are less confident when oversight is placed in the hands of those who have vested interests. Public confidence is greater when independent bodies are responsible for oversight and regulation is mandated by government (Macoubrie 2006).

People also prefer that information about nanotechnology products be made available to them (Macoubrie 2006). As of 2008, there is a lack of transparency associated with what nanoproducts are in the marketplace and what environmental health and safety studies have been done on them. Manufacturers hold the information, since protecting their confidential business information and intellectual property is important for their survival.

The dilemma is that this lack of transparency, which seems necessary for business, may violate consumer rights to know and choose nanoproducts (autonomy).

To explore and increase dialogue about these and other policy issues, scholars have called for "upstream public engagement" as a mechanism for integrating the public's views about nanotechnology into decision making early in the process (Wilsdon and Willis 2004). Some upstream-public-engagement exercises have been conducted for nanotechnology (Toumey 2006), although there is not yet a formal and systematic way to get the public's input on nanotechnology oversight.

Ethical arguments about nanotechnology and the natural environment include viewpoints about the sanctity of nature. Nanotechnology involves the control and manipulation of matter at the atomic scale, and some people believe that humans do not have the right to tamper with nature at this fundamental level. Similar debates occurred in the context of genetically engineered organisms. Several groups are considering appropriate oversight for nanotechnology and the best way to learn from past technologies (David and Thompson 2008; Paradise et al. 2008).

In the context of nanotechnology, broad questions about the role of humans in the environment, human obligations to protect ecosystems at all or some costs, and the intrinsic value of nonhuman entities and Earth need more consideration. Because there are only a handful of environmental applications of nanotechnology on the market, there is an opportunity to study the ethical and societal implications of nanotechnology, create upstream-public-engagement activities, and proactively develop oversight-assessment strategies prior to full-scale development, use, and release. Also calling for quick yet careful consideration are the environmental impacts of nanomaterials released into the environment as by-products or waste from manufacturing, since there are hundreds of consumer products with nanomaterials already on the market.

SEE ALSO *Future Generations; Industrial Ecology; U.S. Environmental Protection Agency; U.S. Food and Drug Administration.*

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Jennifer Kuzma

NATIONAL PARK SERVICE

SEE *U.S. National Park Service.*

NATIONAL SCIENCE FOUNDATION

The statute creating the U.S. National Science Foundation (NSF), which President Harry Truman signed in 1950, specified that the agency support the mathematical, physical, biological, and engineering sciences. The

emphasis on hard science, on big science, and on training engineers, meant to counter scientific advances in the Soviet Union, became entrenched with the 1957 launch of the Soviet satellite *Sputnik*. The governing National Science Board, raising concerns about "objectivity, verifiability, and generality," opposed the use of funds to support the social sciences. One member likened the social sciences to Pandora's box, except in limited areas, such as demography, where the science could be closely tied to empirical, mathematical, and experimental methods. When President John F. Kennedy sought to move the NSF toward applied and socially relevant research, the NSF began to support some projects in the social sciences. Pressure from Congress, culminating in 1968 with a radical amendment to its underlying statute, compelled the NSF to apply research to national needs, and as the agency funded projects dealing with politically salient and controversial issues, such as the environment, it created programs for the social sciences, such as economics. The requirement to fund applied, rather than just basic, research not only brought more support to the social sciences but also opened what had been a closed question: whether the NSF could support projects examining the social, legal, and ethical implications of science and technology. This entry describes how the NSF has responded to that question.

By the early 1970s, many NSF officials, especially those in the biological sciences, had become aware of public controversies over new technologies and recognized the need to investigate the normative conditions and consequences of the increasing power, and hence responsibility, that science gave society. Skeptics questioned whether research into values was suitably scientific, how it would be organized, and whether it would unduly emphasize risks over benefits. In 1976, following the recommendation of the Ethical and Human Values in Science and Technology program, an advisory committee established with the National Endowment for the Humanities, the NSF made its first grants in this area, some cofunded by the National Endowment for the Humanities until the latter withdrew in 1980.

The budget cuts of the Ronald Reagan administration in the early 1980s, which were aimed especially at the social sciences and at science education under the NSF, would have eliminated the Ethical and Human Values in Science and Technology program had not it moved to the Directorate for Scientific, Technological, and International Affairs. Although the program suffered substantial budget cuts, support from the scientific community and from NSF Director John Slaughter helped preserve the program. In 1986 a new NSF director posed an even greater threat by proposing to zero-out the roughly $1 million budget of the Ethics and Values in Science and Technology program in favor of funding large-scale engineering research centers. Dr. Rachelle Hollander, who had become the director of the program in 1980, helped bring the scientific community, including such groups the American Association for the Advancement of Science, into a lobbying effort that persuaded the Congressional oversight committees to restore program funding. Ethics and Values in Science and Technology, now housed in the Directorate for Biological, Behavioral, and Social Sciences, saw its funds distributed through an "ethics across the foundation" approach, which required a proposal-by-proposal management and negotiation effort. In this effort Hollander, by persuasion and collaboration, worked with a growing number of NSF programs, obtaining from them contributions that in effect increased by one-third the overall budget of the Ethics and Values in Science and Technology program.

Between 1977 and 1985 the Ethics and Values in Science and Technology program made more than 150 awards, many in the areas of the environment, hazards, and agriculture, including animal welfare. The timing of this support (along with the intellectual oversight of managers of the Ethics and Values in Science and Technology program) accounts in large part for the successful development of the field of environmental ethics, which drew little enthusiasm from mainstream departments of philosophy. Between 1986 and 1994, a period of bureaucratic turmoil and reorganization at the NSF, the Ethics and Values in Science and Technology program (renamed the Ethics and Values Studies program), together with the Science and Technology Studies program, moved into the new Directorate for Biological, Behavioral, and Social Sciences, under the general rubric of the Societal Dimensions of Engineering, Science, and Technology.

As public concern over the social, ethical, and cultural implications of emerging technologies grew—one need only think of nuclear power, recombinant DNA technology, pesticides, and the assessment of environmental risk—the NSF, from 1994, included in its budget specific funding for research in ethics and values studies and in science and technology studies. The Ethics and Values Studies program also continued to collaborate with, and thus garner additional support from, larger NSF projects. An ethics component is included in several big-ticket NSF initiatives, for example, the foundation-wide Integrative Graduate Education and Research Training program, which makes individual grants in excess of $2.5 million.

Congressional and public concern continued to direct the NSF toward applied research that would lead to measurable results in solving national problems. In 1996 a task force recommended that the competitive review of proposals center on two questions: "(1) What is the intellectual

merit of the proposed activity? (2) What are the broader impacts of the proposed activity?'' These criteria, which were implemented in 1997, required applicants to integrate the intellectual merits of their proposed research with its broader impacts (the social merits). The consideration of the impacts and thus the social value of proposed research brought a normative dimension to every project. At the same time, the NSF gave greater weight to the relation of science and society and to research, including normative and conceptual analysis, concerning the formation of science policy.

In 1976 only two major academic centers for ethics and public policy existed: the Hastings Center in New York, which specializes in medical ethics, and the Center (now Institute) for Philosophy and Public Policy at the University of Maryland. With NSF support—and later funding from the program on the Ethical, Legal, and Social Implications of the Human Genome Project at the National Institutes of Health—ethics and policy programs and centers have now become established in universities across the country. Professional organizations, for example, the Association for Practical and Professional Ethics (1991), formed for philosophers, social scientists, and scientists who see the study of the normative dimensions of science and technology as a legitimate field of scholarship. Several journals, such as *Science, Technology, and Human Values* and *Science and Engineering Ethics*, were founded to publish papers exploring the ''value,'' or social and cultural, dimensions of engineering, information technology, the environmental and social sciences, and technology.

Grants made under the Societal Dimensions of Engineering, Science, and Technology rubric have included normative and conceptual analyses of issues in the social sciences, but far more often address the social implications of environmental, engineering, and biological sciences and technology. Thus principal investigators in Ethics and Values Studies projects are as likely to be humanists (for example, philosophers) and natural scientists as social scientists. By ensuring that the projects it funded directly related to the social consequences and ethical implications of science and technology, the Ethics and Values Studies program to some extent avoided the skepticism often directed toward the social sciences within the NSF and by oversight committees. The Ethics and Values Studies program now appears integral to the attempt to understand and evaluate the broader impacts of scientific research.

As of 2007 scholars seeking support for research on the normative dimensions and social implications of science and technology may apply not only to the now integrated Science and Society Program, which includes the Societal Dimensions of Engineering, Science, and Technology program and awards grants from an annual budget of approximately $3 million, but also to other NSF programs, such as those involving science policy, ethics in engineering, and nanotechnology, all of which have been sensitized to the need for normative analysis. Much of this progress can be attributed to Hollander's nearly thirty years of leadership at the Ethics and Values Studies program. She retired in 2006.

SEE ALSO *Nanotechnology; Risk Assessment; Technology.*

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Mark Sagoff

NATIVE AMERICANS

The cosmologies, ways of knowing, and value systems of North American indigenous peoples (NAIPs) have attracted the attention of environmental philosophers and ethicists worldwide. A central reason for this attraction is the inspiration NAIP worldviews have provided for critics of the dominant Western European worldview and practices. NAIP worldviews articulate alternatives to the exploitative and ecologically destructive attitudes of the dominant society by directing thought, perception, and action in ways that promote a more harmonious, sustainable, and respectful human-environment relationship.

NAIP AND WESTERN WORLDVIEWS

In its *Agenda 21* of 1992 the United Nations has drawn attention to the environmental practices of indigenous people around the world as models of holistic thinking, ecological sustainability, and environmental protection. Although it is difficult to characterize this relationship precisely, the ideas of being connected to the earth, coming from or being intimately connected to the land, belonging to the land, and being keepers of the land express how most NAIP worldviews frame the relationship between people and the land.

These ideas are indicative of a holistic way of understanding and engaging the world. Accordingly, they are used to criticize the fragmenting tendencies of Western

thought, such as the idea of a radical separation between rational human beings and the land, which has characterized Western thought from Plato through Thomas Aquinas, René Descartes, and Immanuel Kant. The attraction to the worldviews of indigenous peoples has resulted from what critics view as fundamental failures and inadequacies of Western European metaphysical, epistemological, and normative systems. Metaphysical systems are ultimate explanations of the fundamental properties of nature and why things happen. Epistemological systems articulate ways of knowing or principles of knowledge acquisition. Normative systems tell people what is of value and what people ought to value.

DEFINITIONS AND NOMENCLATURE

The use of the term *North American indigenous peoples* in this entry represents an attempt to avoid some of the problems that labels create. The term *Indian* is acceptable to some people even though it is not based in NAIP languages. Others find it unacceptable because it helps propagate colonial attitudes. Some accept *Indigenous* (or *indigenous*) *peoples*, but this term generally is used to refer to the wider global community of what have been called native peoples. Some people insist on being called by their national names (e.g., Haudenosaunee, Anishnaabek). For this entry the more neutral term has been chosen

NAIP worldviews typically do not assume a radical detachment of body from mind, nature from culture, and rational beings from nonrational beings. They emphasize the importance of acting in accordance with Earth and its balances and respect for a creator or a greater power. The lowercase term *creator* is used in this entry to refer to both concepts. Many NAIP cultures today use expressions such as *all my relations* to indicate how they view their connection to the earth. People are fully relational beings; they are what they are by virtue of their relations to all others, including trees and rocks. People are first members of a community of beings and second distinct and private individuals. Origin stories describe how humans emerged from the land, not from an intellectual, noncorporeal realm.

The NAIPs who have been at the center of this attention belong to two linguistic groups: the Algonquian and Iroquoian. The reason for this focus is partly historical. British tradition has dominated the writing of North American history in regard to NAIP worldviews, and the British were engaged primarily with Algonquian and Iroquoian peoples; therefore, these three traditions have come to dominate the way in which NAIP worldviews have been conceived in the environmental arena. Other nations and cultures have become foci of study, partly because more NAIPs are participating in the dominant scholarly and publishing systems. The appeal of the environmental movement to Plains (especially Sioux) and West Coast NAIPs also has received more attention. Only a few of the roughly five hundred nations and two hundred linguistic communities that lived in the Americas before contact with Europeans, not to mention other continents, are mentioned in this entry. This is unfortunate, because the NAIP presence was far from insignificant. William Denevan (2007) figures the total NAIP population at contact was 40 million to 100 million (the U.S. census of 2000 puts that number between 2,475,956 and 2,663,818, or fewer than 1 percent of the U.S. total population).

The environmental practices and principles of NAIPs, such as taking only what is needed, avoiding the burning of woodlands and prairies, and using everything one takes, have been cited in an attempt to change the behavior of the so-called developed world and its conception of its relationship to ecosystems. Because NAIP worldviews would have people perceive the world as alive and occupied by other persons (nonhuman animals, trees, and rocks) who are conceived as relatives, they encourage Westerners to come into more intimate contact with and develop an awareness of the world as a community and in so doing become more respectful of Earth.

Many of the Algonquian and Iroquoian people have articulated this view in the concept of Mother Earth, the living giver and sustainer of life, who is owed the deepest respect. Accordingly, the practice of thanksgiving for members of the Earth community who give themselves so that others can live is guided by the principle of reciprocity (e.g., giving tobacco in exchange for the life they take to sustain themselves). This conception of Earth grounds what has come to be known as traditional ecological/environmental knowledge (TEK). Such knowledge involves different modes of becoming aware of the life force that is Earth. The drumming circle, for instance, produces the sound that represents the heartbeat of Mother Earth to which drummers, singers, and dancers connect.

CARICATURES OF NAIP WORLDVIEWS

NAIP cultures often have been romanticized, and the concept of the NAIP personality has been constructed as the noble savage (or ignoble savage). These caricatures have deep roots in North American and European history. From the seventeenth century through the eighteenth misrepresentations by, among others, Thomas Hobbes, John Locke, and Jean-Jacques Rousseau have cast NAIPs as politically and legally naive and/or innocent. Archie Belaney (Grey Owl) and Thomas Seton (the Boy Scout movement), with a different intent, viewed

Makah Indians at a Whaling, 1999. *The environmental practices of Native American indigenous peoples (NAIPs) are often seen as more ecologically friendly than Western practices. Certain principles, such as taking only what is needed and using everything one takes, are often cited as criticism of the "developed" world. However, this comparison does not always hold, as many environmentalists disapprove of other NAIP practices, such as the Makah whale hunt in Washington State.* **AP IMAGES.**

NAIPs as incapable of harming the land because they live in an honorable and constant harmony with it.

This caricature implies that NAIPs lack the capacity for reasoning and decision making and thus operate at the level of animal intuition. Where Rousseau saw this state as a golden age of humanity, Locke saw it as a ground for justifying the appropriation of NAIP land. A number of influential colonists used this conception to declare the lands of North America *vacuum domicilium* ("empty place"; in Australia the term *terra nullius* was used) because, as nonrational people, NAIPs did not understand what it meant to own the land and thus could not lay proper claim to it. The term *noble savage* was used by Rousseau and others to criticize what they saw as the degeneration of their own societies. Baron Lahontan, for example, recalled or perhaps fabricated accounts of his discussions with Adario (the Huron sachem [leader] Kondarionk) as a series of syllogistic arguments. He constructed those accounts to contrast the uncorrupted Indian mind with the degenerate European mind. To some extent later writers (e.g., Henry David Thoreau, J. Fenimore Cooper) and more contemporary proponents of wilderness awareness (e.g., Tom Brown Jr.) continue to propagate such ideas. Tom Brown was educated in the art of tracking by Stalking Wolf, one of the last Apaches to be trained in the old ways. He, along with others, continues the commentary on the degeneration of Western civilization.

REFUTATIONS OF THE CARICATURES

These one-sided and often distorted descriptions are challenged not only by NAIP teachers and scholars but by non-NAIP scholars as well. Careful perusal of early colonial records such as the Records of Indian Affairs of the 1600 and 1700s supports stories of shrewd Indian businessmen trading at Albany and Montreal and with

the Hudson Bay Company. They describe treaty-making processes that involved articles of agreement and arguments over the foundations of an intercultural law. Oral tradition, as John Borrows (2002) (Anishnaabe) and J. Baird Callicott (1989) show, corroborates the view that the NAIP relationship to the land was law-governed or normative. Many stories in these traditions are not about naive, innocent Indians living in perfect harmony with Mother Earth but about a people who could violate the creator's law and face consequences for doing so (e.g., stories involving Nanabush). Engagement with the land is a struggle to find balances between good and evil, individuality and community, peace and war. Humans must establish a balance of opposites, to use a phrase borrowed from the 1999 work of Taiaiake (Gerald) Alfred (Kanien'kehaka, Mohawk).

Stories of failing to achieve balance are corroborated by archival and archaeological records. The Haudenosaunee, aided by guns supplied by the Dutch, for example, used those weapons in what were known as the Beaver Wars to conquer Huronia (southern Ontario) and control the beaver trade. Long before those wars the origin story of the Iroquois Confederacy told of the creator's displeasure with the warring ways of the Haudenosaunee. Deganawidah, the peacemaker, was sent to bring the Great Law of Peace to the Haudenosaunee precisely because they were not living in peace and harmony even before contact. Poor irrigation methods resulted in salinization of soil, forcing communities such as the Hohokam to move. After contact, overtrapping in colonized areas resulted in a shift of the fur trade toward the west. Mistakes were made by NAIPs because of wrong intent (e.g., greed), inadequate planning (poor engineering), and bad judgment about the limits of what could be taken from Earth; hence, there was a need for normative direction.

It is wrong to suggest that seeking harmony implies an absence of human intervention and alteration of the land from a NAIP point of view. From the Aztecs, Incas, and Maya to the Anasazi and Cahokia, Native Americans were builders of towns and cities, devisers of political institutions, and planters of vast fields of crops long before contact. William Cronon (1983) describes how controlled burns were used to engineer environments. According to many practitioners of TEK, that practice extended all the way to the West Coast. Controlled burns fostered the maintenance of grazing lands for ungulates that the people would hunt. Increasing work in ethnobotany in collaboration with NAIPs is beginning to show how NAIPs used various techniques to shape the landscape for the production of edible plants, particularly berry-producing plants. Others used systems of weirs to trap fish. Still others developed manufacturing facilities for the production of trade goods such as wampum beads, turquoise, and copper.

With the historical understanding of NAIPs becoming more complex, conceptions of their worldviews have become more nuanced. As increasing numbers of NAIP writers, such as Vine Deloria Jr., Paula Gunn Allen, and N. Scott Momaday, have found it necessary to enter the dominant scholarly fray to correct and better represent NAIP perspectives and cultures, this complexity has become more evident. Until approximately the 1970s almost all that was written about NAIP environmental thought was by non-NAIP writers. However, since that time a growing number of NAIPs have helped enable the philosophical complexities of NAIP environmental thought to be brought to the attention of scholars, artists, and those in the general social/political arena. Others, such as Thurman Lee Hester, Sandy Grande, Viola Cordova, Jace Weaver, and Dennis McPherson, have brought those complexities more specifically into the environmental thought/ethics arena. Publications by NAIPs in the journal of environmental philosophy *Environmental Ethics* are also on the rise.

NAIP ENVIRONMENTAL PHILOSOPHY

As interpretive horizons have opened, awareness of NAIP environmental philosophy has deepened. The more people understand about dodemic (totemic) identification, for instance, the more they understand how complex the connection to the land is. Iroquoian and Algonquian peoples were and still are organized into clans according to their dodemic identity (e.g., wolf, turtle, bear). In various ways, dodems differentiate people's and clans' roles and responsibilities. Dodemic identity is connected to normative function. If one considers other cultural practices, such as the pipe ceremony and wampum belts and strings, and the way they were used in condolence ceremonies, acts of reciprocity, and the giving of thanks—all of which prepared minds and hearts to face the creator—it becomes clear that the connection to Earth was and still is not only of a normative but of a spiritual order. Prayers of thanksgiving for the waters, the plants, the creatures of Earth and air, and the wind are constant reminders of what it takes to have a good mind and lead a good life. This kind of awareness engages a sense of the sacred in the world, because the creator is in some way immanent, infused in all creation. This idea sometimes is captured in the idea of a sacred circle of life, a living mystery. Giving thanks, then, is more than an obligation or expression of gratitude for what is provided; it represents a recognition of the responsibility to maintain clarity and sincerity.

The connection to Earth also involves evil. Haudenosaunee at-the-woods-edge ceremonies took place when

travelers arrived at a community. They would be greeted just outside the community where they would be fed and allowed to rest. Wampum belts and strings would be used to "wipe away" the sweat from their bodies and the blood that the thorns and briars of the forest had inflicted on them. The forest was not just a kind benefactor of humanity but also a place where evil lurked. Moreover, in Algonquian traditions, manitous (some of whom are evil) sought to deceive and kill humans. To be connected to the land, therefore, was also to be attuned to its destructive forces.

To further complicate matters, the role of the trickster brings ambiguity to NAIP epistemologies. The trickster (e.g., Coyote, Raven) can take many human and nonhuman shapes. What appears to be a human being can in fact be a coyote and vice versa. It is not clear, therefore, what could verify a perception. Epistemic sensibilities thus must become attuned to a range of possibilities that go beyond what people might perceive to be the truth. Knowledge acquisition is not a straightforward task but involves reflection at various levels. It is not difficult to understand, then, why NAIPs avoid making confident assumptions about, for instance, rights to exploit and own the land.

THE NAIP CONCEPT OF LAND AND TERRITORY

North American history is replete with instances of colonials systematically employing misrepresentations of NAIP thought in order to exploit the NAIPs and their lands. Governor John Winthrop (known for his appeal to *vacuum domicilium*), for example, argued that because Indians had taken payment for a piece of land, that land belonged to the English. Roger Williams, who better understood his NAIP neighbors, countered Winthrop's claim by arguing that when sachems such as Miantonomo agreed to allow colonists onto their land, they were not transferring ownership but were giving rights to use the land.

Thus, the concept of territory is much more appropriate than that of property. Although others might have had a right to use a territory, they first had to establish an agreement with its occupiers. If they wanted to hunt in or travel through a territory, emissaries carrying wampum belts or strings would be sent to the villages of that territory to request permission. Failure to follow this protocol or an equivalent (e.g., carrying a calumet or peace pipe) while traveling or hunting on another group's land could be construed as an act of aggression and justification for war.

Part of the reason land ownership could not be transferred as it could be in European practices was the fact that territory was a communal responsibility. Communities, not individuals, laid claim to territory. They were keepers of the land. Thus, to impose the concept of property in the sense of having the right to alienate or exploit what is owned was a means for undermining NAIP systems of territorial governance and the underlying conceptual framework of those systems.

NAIPS AND THE ENVIRONMENTAL MOVEMENT

Similarly, NAIP environmental thought has been misrepresented and manipulated in service of the environmental movement. Despite good intentions, that movement has exploited certain caricatures, such as the image of the ecologically sensitive "Crying Indian" (Iron Eyes Cody, who was not a NAIP) in the "Keep America Beautiful" campaign of 1971. Some environmental historians trace the use of the idea of the ecological Indian to an 1810 meeting between the Shawnee war chief Tecumseh (Tekamthi), who led the western nations against the United States in the War of 1812, and General William Henry Harrison, who led the U.S. Army. Tecumseh is alleged to have said to Harrison after being invited to sit on a chair, "The sun is my father and the earth is my mother; she gives me nourishment and I repose upon her bosom."

By 1877, the connection had become popularized and the idea of Mother Earth began to be used by NAIPs (e.g., the Wanapum chief Smoholla) to gain popular support in their fight to retain traditional territories and resist colonial expansion. Sam Gill (1987) suggests that the emergence of the concept of Mother Earth in NAIP cultures is a political fiction based on Western ideas and images; it serves as a critique of U.S. expansionism by establishing an unassailable moral authority for the NAIP position. However, there are periodic references to an earth mother in earlier records, and previous descriptions of NAIP cosmologies suggest that Mother Earth is not incompatible with NAIP traditions. Origin stories, including those recorded by the Jesuits in the seventeenth and eighteenth centuries, form a pattern that implies an emergence of humanity from the earth. It is possible, then, that the popularization of the concept in the 1800s was part of a cultural and political evolution in which the Mother Earth cosmology was given more explicit expression after having been precipitated by the NAIP struggle for political recognition.

Since the 1800s various forms of activism and resistance have been employed by NAIPs in their struggle to establish land management practices (fairer resource allocations), protect sacred sites, and safeguard health. The ongoing Yucca Mountain case in Nevada, involving the storing of nuclear energy wastes, has been resisted by Shoshone and Paiute people partly to protect Mother Earth and partly to assert treaty rights. Tulalip efforts to gain resource management rights in Washington (a struggle related to the 1974 Bolt decision recognizing comanagement rights for the Tulalip) are similarly motivated. In other areas, NAIPs have used road

blockades and armed resistance (as in the Oka crisis in Canada) to reclaim land, protect sacred sites against development, and assert their treaty and aboriginal rights. The Oka crisis in Canada in 1990 began with Kahnasatake Mohawk efforts to reclaim a sacred site that was being developed for a golf course, and terminated in an armed standoff against Quebec police and the Canadian military. The Grassy Narrows Ojibway have been victims of mercury poisoning from pulp plants on the English River in northern Ontario, and the James Bay Cree have resisted initiatives to remove them from their land so that hydroelectric developments could proceed. The long list of environmental and legal disputes over disproportionate distribution of harms and benefits from waste management and resource extraction continues to grow as NAIPs struggle for a voice in the areas of policy making and decision making. Justice issues that concern the land can be divided roughly into two categories: (1) giving voice to NAIPs and recognizing treaty and aboriginal rights; and (2) balancing the harms and benefits (Vecsey and Venables 1980; Weaver 1996).

Conflicts between environmentalists and NAIPs over various environmental practices such as hunting suggest that the attempted marriage between environmental and NAIP philosophy and ethics may not be an entirely happy one. The Makah whale hunt (Washington State), hunting in national parks, and the harvesting of whales for ceremonial muktuk in the north are examples of conflict between conservationists and NAIP principles. These conflicts warn against making simplistic connections between NAIP philosophy and the aims of environmental protection.

SEE ALSO *Animal Ethics; Biocentrism; Black Elk; Callicott, J. Baird; Environmental Justice; Holism; Land Ethic; North America; Pantheism; Sustainability; Traditional Ecological Knowledge.*

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Bruce Morito

NATURAL LAW THEORY

Natural law theory—the theory that the laws of human morality can be derived from an ordered, rational, and purposive universe—has existed in various forms since ancient Greek times. Central to natural law theory is the idea that the laws guiding human conduct are greater than or predate personal self-interest, the needs of the community, and the good of the state. Those laws are

natural in that they are the same as the laws that govern the natural world. They can be identified through the use of rational thinking combined with right-minded observation of the physical universe. Many advocates of natural law theory are theists and subscribe to the notion of a rational divine will as the supreme ordering force, but the concept does not depend on the existence of a divinity.

In general, natural law theories of morality assert three things:

1. The principles for human conduct exist in a universe governed by rational laws.
2. Those laws can be discerned by human reason to determine the moral good.
3. Moral principles are universal and unchanging.

HISTORICAL BACKGROUND

Ancient Greek philosophy emphasizes the concept of virtue (*arête* in Greek), which requires a constant striving toward perfection in accordance with one's true nature. Inherent in this principle is one of the kernels of natural law theory: Nature has provided fundamental principles that guide the development of all living things. Aristotle (384–322 B.C.E.) often is recognized as the father of natural law. In the *Rhetoric* he noted that, aside from the "particular" laws that each people has set up for itself, there is a "common" law that is in accordance with nature.

Natural law theory was developed further in Hellenistic and Roman stoicism. The stoics believed that there are empirical standards of truth and justice that are revealed to people by right reason according to nature. Theirs was a philosophy of cosmic determinism, or a world governed by inviolable natural laws. Stoicism includes an account of human freedom that holds that human reason is free to choose either to follow or to turn away from the laws of nature. Virtue consists of a will that is in accordance with nature. The most influential natural law stoics were Cicero (106–43 B.C.E.), Seneca (4 B.C.E.–65 C.E.), Epictetus (55–135 C.E.), and Marcus Aurelius (121–180).

Thomas Aquinas (1225–1274), especially in the *Summa Theologica,* established the concepts of natural law morality still used by the Catholic Church. The fundamental principle of Catholic natural law is that good is to be done and evil is to be avoided. The source of good is God, who is perfect actuality: "The only perfectly good thing in existence is God, who is pure actuality. But anything else is good to the extent that its potentialities are brought to actuality. A fully developed oak tree is better than a warped or stunted one" (Aquinas quoted in O'Conner 1968, p. 19).

The modern period in natural law theory began with Hugo Grotius (1583–1645), who argued that natural law does not depend on the existence of God. That argument went directly against Aquinas's doctrine of natural law.

Natural law is associated with, though not identical to, the concept of natural rights. In the seventeenth century natural law was linked to a liberal political theory. On the eve of the French Revolution, John Locke (1632–1704) envisioned humans as being born into a state of nature in which they are rational, tolerant, and happy. In that state humans enjoy the natural rights of life, liberty, and property. Society, according to his theory, exists to protect those individual natural rights.

CONTEMPORARY USE

Natural law in the ancient and theistic sense requires belief in a teleological universe, one that is purposive and in accordance with some higher principle, a concept that is challenged by a contemporary post-Darwinian view of the universe as a cosmic accident and/or belief in personal divinity. Recently, though, there has been a resurgence of natural law theorists. This movement sometimes is called the new natural law, or neo-natural law. The most prominent contemporary natural law theorists are the Australian John Finnis (1979), the Americans Germain Grisez and Robert P. George, and the Canadian Joseph Boyle. New natural law is usually nontheistic and focuses on "basic human goods," such as human life, knowledge, and aesthetic experience, which are self-evidently and intrinsically worthwhile.

Natural law is invoked in current public policy debates about biotechnology. Theorists affirm the need for biotechnological research to promote the vital natural goods of human health and human knowledge but emphasize the need to focus on technologies that produce those goods in nondefective ways, or ways that respect the integrity of the human person. For this reason they condemn the use of human embryos for research or new technologies. They also condemn assisted suicide, human cloning, and genetic selection of offspring.

APPLICATION TO ENVIRONMENTAL ETHICS

At its most basic, natural law requires that everything in the universe act in accordance with its nature. This principle applies not only to humans but also to nonrational natural beings. Because of its appeal to nature to guide human action, natural law theory is compelling to some in the field of environmental ethics. It is seen as restoring the proper relationship of humankind to the natural world. Traditionally, however, natural law theory is applicable only to humans. As rational beings, humans are the only entities who can participate in the rational laws of the universe. Also, it was used most often by those who related the concept of an ordered universe to the

idea that there is a state of equilibrium in nature. As that idea has fallen out of favor in ecology, so have appeals to natural law in environmental ethics.

There has been a connection between Catholic natural law and environmental ethics. Pope Benedict XVI saw in the environmental movement a promising route for the recovery of the natural law tradition and an antidote to the cultural situation in the West, in which notions of spirituality and morality have been excluded from the idea of rationality. For Benedict moral norms are a priori and absolute, not matters of individual taste and subjectivity, as they commonly are thought to be in contemporary Western culture. Benedict argued that contemporary ecological knowledge supports the idea of limits in nature that humans disregard at their own peril.

SEE ALSO *Environmental Law; Environmental Philosophy: III. Early Modern Philosophy; Private Property; Utilitarianism.*

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Erin Moore

NATURE CONSERVANCY

The Nature Conservancy (TNC) is the world's largest environmental organization by amount of revenue. Created in 1950 and incorporated in Washington, D.C., in 1951, it attempted initially to protect land valued by its founders, largely university ecologists who wanted to save properties useful for studying unique biological features undisturbed by humans. Those scientists were pioneers in establishing the preservation of natural conditions as a primary environmental issue.

EARLY MISSION

In its first twenty years TNC succeeded in the narrow mission of buying properties in their natural state to stop development. It earned a reputation as the real estate arm of the conservation movement. Whereas other groups lobbied politicians and regulators or educated the public, TNC simply bought property. Most of its early efforts were confined to the eastern United States.

In the early years its scientific goals became blurred by opportunism. In a rush to amass acreage, it bought not just undisturbed ecological treasures but purchased green space of all kinds, including woodlots and part of a golf course. In 1971 alarmed ecologists on the board of governors hired a science director, Robert Jenkins, who had earned a doctorate at Harvard, to restore a science-based land-acquisition process.

Jenkins refocused the mission on protecting natural diversity, as biodiversity was called at that time. He launched TNC's most enduring legacy in 1974: the Natural Heritage Program. By 1989 he had opened offices for the program in every state. The state offices, staffed by scientists, assembled a computerized catalog of unique species and ecosystems. Those data enabled TNC to identify sites with true diversity, enabling the group to fulfill its mission: "to preserve plants, animals and natural communities that represent the diversity of life on Earth by protecting the lands and waters they need to survive."

BIODIVERSITY AND LAND PRESERVATION

In 2000 TNC spun off the Natural Heritage Program into a separate organization: NatureServe. That move accompanied a marked shift in the way the organization identified lands for protection. TNC began to move away from its single-minded focus of a quarter century of saving lands and waters rich in biodiversity. It moved toward saving lands and waters of every kind, no matter how rich. In that effort it began working with the World Wildlife Fund, Conservation International, and other groups.

Although not abandoning the Natural Heritage data, TNC divided the planet into thirteen "habitat types," such as boreal forests, savannas, and tropical grasslands. It then set a target, in concert with other conservation groups, to save 10 percent of all those habitat types globally by 2015. Using that new perspective, TNC research showed that many habitats that had been taken for granted had lost far more acreage than had "treasures" such as tropical rain forests. A far greater percentage of temperate grasslands had been lost, for example, than tropical rain forests. Biodiversity associated with less-vaunted habitat types thus was at equal risk.

As TNC's methods to identify lands evolved, so did its methods for protecting them. TNC protected land in its early years mainly through the use of fee-simple purchase, but it soon embraced conservation easements. In an easement TNC would buy development rights, leaving other rights with the landowner. The use of easements exploded

late in the twentieth century, and many groups began to use them to conserve land nationwide.

In the 1990s TNC staff in far-flung field offices adopted a flurry of other tools to save land. They engaged in community activism, regulatory influence, public land management, lobbying, and even for-profit enterprise to foster business development compatible with conservation. Throughout that period TNC continuously expanded its reach overseas, with operations in Canada, Latin America, the Pacific Islands, and Asia.

Overseas, TNC's flexible approach to saving land became especially prominent. In South America, for example, it partnered with a U.S. corporation, American Electric Power (AEP), to save a vast undeveloped forest in Bolivia. AEP, a Columbus, Ohio–based coal-burning utility, sought land for carbon credits to manage global climate change. In China it signed a deal to develop a conservation plan for 67,000 square kilometers in Yunnan. It negotiated in 2008 to manage floodplain risks downstream from the Three Gorges Dam.

As TNC began to protect biodiversity by all means possible, it promoted new thinking about the value of nature. Like no other organization, it put boots on the ground to back the conviction of a small band of scientists in the wake of World War II who believed that ecological preservation matters to everyone. TNC's entrepreneurial conservationists continued to press their efforts to stop irreversible loss of biodiversity as renowned ecologists such as E. O. Wilson, one of Jenkins's professors at Harvard, continued to trumpet the cause later in the century. TNC thus helped make a concern that had been the concern only of scientists a worry of the public at large.

At the same time TNC promoted the use of the capitalist system to protect natural resources. The leaders of the organization did not let the philosophical debate between environmental idealism and capitalism hinder their actions. Decades before other conservation groups they engaged business professionals in finance, real estate, law, and marketing to work with leaders from the nonprofit and for-profit sectors to advance conservation.

MEANS VERSUS ENDS

TNC insiders periodically wrestled with the obvious contradictions in their work between means and ends. However, pragmatism—"following the money" and a willingness to work with anyone—remained the guiding force. In the 1970s the president, Patrick Noonan, a champion of that notion, was accused of taking tainted money to fund conservation. His trademark response typifies the approach taken by TNC and, increasingly, other groups: "The problem with tainted money is there taint enough."

SEE ALSO *Biodiversity; Environmental Activism; Land Ethic; Nongovernmental Organizations; Preservation.*

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Bill Birchard

NEW ENVIRONMENTAL PARADIGM

In the 1970s the rapid growth of environmental awareness in the United States stimulated the development of ecological perspectives across a range of academic disciplines in addition to those which already existed in ecology and were developing in environmental science, earth science, and other natural sciences. As philosophers were elaborating versions of an environmental ethic, particularly those acknowledging the intrinsic value of the natural world, social scientists began to flesh out an environmental paradigm. Whereas philosophical efforts to develop an environmental ethic had a strong normative element, social scientists tended to adopt a Kuhnian perspective (see Kuhn 1996) by positing the need for an environmental paradigm to account for the anomalies of ecological problems and limits. The efforts of the social scientists tended to be less normative but shared with the philosophical work a desire to break with the strong anthropocentrism that had dominated Western thinking among scholars and laypersons.

DISCIPLINARY PARADIGMS AND SOCIETAL WORLDVIEWS

The concept of a new environmental paradigm (NEP), which was stimulated by the work of natural scientists such as Rachel Carson, Paul Ehrlich, Barry Commoner, and Garrett Hardin, had two general thrusts: At the disciplinary level social scientists critiqued the dominant anthropocentric assumptions (paradigms) of their disciplines and urged the adoption of a new environmental paradigm (later termed an ecological paradigm) to enable social scientists to appreciate the significance of ecological problems and their implications for modern industrial societies (Dunlap 1980).

At the societal level social scientists attempted to clarify the dominant social paradigm (DSP) through which Western societies viewed the world and demonstrate how its anthropocentrism contributed to environmentally destructive practices. They also explicated an alternative social paradigm or worldview that could help foster a more ecologically sustainable society and began to assess empirically the degree to which one was emerging. Efforts at the disciplinary and societal levels had the shared goal of overcoming an anthropocentric outlook and were designed to encourage both scholars and laypeople to "view the world ecologically" (Olsen et al. 1992).

Within academia efforts to establish an environmental/ecological paradigm have met with considerable success not only in the natural sciences, where fields such as ecology and environmental science are firmly grounded in such a paradigm, but also in the social sciences. Until the 1970s mainstream social science operated from a strongly anthropocentric human exemptionalism paradigm built on the largely implicit assumption that the exceptional characteristics of modern societies—heavy reliance on science, technology, and sophisticated social organization—exempted humans from the ecological constraints faced by other species and primitive societies. The prominence of global problems such as ozone depletion, loss of biodiversity, and climate change has made an exemptionalist stance increasingly difficult to defend, and the emergence of fields such as ecological economics, conservation psychology, and environmental sociology represents the institutionalization of a new environmental/ecological paradigm in the social sciences.

A Kuhnian paradigm shift has occurred or is in progress across numerous academic disciplines. An environmental/ecological perspective acknowledging that modern industrial societies remain ecosystem-dependent despite their technological sophistication and may be undermining their ecological viability because of unbridled technological development has taken root in many natural and social science disciplines. Unlike the Copernican, Darwinian, and Freudian paradigmatic revolutions that preceded it, the shift from human exemptionalism to an environmental/ecological paradigm does not have a singular instigator, although figures as far back as George Perkins Marsh helped lay the groundwork for Carson, Commoner, Ehrlich, Hardin, and the many other popularizers of the new paradigm.

EMPIRICAL RESEARCH

As scientific evidence supporting an environmental/ecological paradigm emerged in the 1970s, environmentalists used it to claim that contemporary societies are ecologically destructive and need to shift toward more sustainable practices. In the process many environmental activists and environmentally concerned citizens saw the necessity of replacing the current DSP—based on the assumption that limitless resources, promethean science and technology, and the ingenuity of humans ensure inevitable progress and a future of abundance—with a more ecologically realistic worldview. This potential shift in societal worldviews, which is analogous to the shift in disciplinary paradigms, attracted the attention of social scientists.

An early effort to measure public acceptance of a new environmental paradigm through the use of an NEP scale consisting of items that tap beliefs about the balance of nature, limits to growth, and human domination of nature soon was supplemented by more methodologically complex approaches. Stephen Cotgrove (1982); Lester Milbrath (1984); and Marvin Olsen, Dora Lodwick, and Riley Dunlap (1992) developed sets of bipolar items posing NEP and DSP choices as opposite ends of a continuum and asked survey respondents to choose between them. Their studies also drew on increasingly elaborated depictions of the two contrasting paradigms offered by numerous social analysts that included a wider range of components such as centralization versus decentralization and participatory democracy versus top-down decision making.

Those studies provided insights into the competing perspectives of groups such as environmental activists and industrialists, finding that environmentalists strongly endorsed the NEP and industrialists endorsed the DSP. However, what first appeared to be a rapid growth in acceptance of the NEP began to ebb with the sociopolitical shifts in the 1980s exemplified by the election of Ronald Reagan in the United States and Margaret Thatcher in the United Kingdom. Both personified the DSP, and the conservative trend they led slowed the growth of the NEP even though the discovery of new ecological problems continued to pose anomalies for the DSP. Societal worldviews are less affected by disconfirming evidence than are scientific paradigms, and particularly in the United States the growing power of the conservative movement and its success in demonizing "environmental extremism" hindered growth of the NEP.

Also, the emergence of sustainable development as a compromise between the traditional growth-is-good perspective and the 1970s limits-to-growth perspective created a more complicated situation. The endorsement of sustainable development (and implicit acknowledgment that past growth generated negative ecological impacts) by progressive industrialists, government officials, and laypersons as well as by most of the environmental community has made it more difficult to capture alternative worldviews by using a simple DSP/NEP dichotomy.

MENTAL MODELS AND THE NEP SCALE

As a result, efforts to measure the DSP and the NEP as polar opposites have faded, and a revision of the original NEP Scale has become the preferred measure of ecological worldviews (Dunlap, Van Liere, Mertig, and Jones 2000). Its validity was strengthened when anthropologists found that the mental models laypersons employ to understand ecological problems consist of beliefs akin to those tapped by the NEP Scale (Kempton, Boster, and Hartley 1995). The NEP Scale continues to be used in a growing number of nations to assess the degree to which various publics and more specific groups endorse key components of an environmental/ecological paradigm or worldview. It should be helpful in tracking the evolution of the new environmental paradigm throughout societies worldwide.

SEE ALSO *Carson, Rachel; Ehrlich, Paul; Environmental Philosophy: V. Contemporary Philosophy; Future Generations; Limits to Growth; Sustainable Development.*

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Riley E. Dunlap

NIETZSCHE, FRIEDRICH

SEE *Environmental Philosophy: IV. Nineteenth-Century Philosophy.*

NONGOVERNMENTAL ORGANIZATIONS

By virtue of their numbers alone, which approached forty thousand worldwide in 2008 according to the Union of International Organizations, nongovernmental organizations (NGOs) have become significant players on the international stage. Much of their growth has been a product of heightened globalization spurred by the emergence of the Internet in the 1990s as NGO numbers increased from six thousand to twenty-six thousand (Nye 2004). That dramatic expansion tells only part of the story, however, for it is in their qualitative contributions that the role and growing importance of NGOs in the twenty-first century are best seen.

STRUCTURE

NGOs pluralize world politics by offering multiple channels of access across traditional nation-state borders. They act as both allies and adversaries to states, forming networks that advocate policy changes and define ethical standards.

Their activities affect almost every economic, political, or social facet, from health care to history, language to law, theology to ethics, and culture to security and defense. However, it is in the environmental arena where NGOs have had the greatest impact, from the climate change initiatives of the Sierra Club to the tropical forest protection programs of Rainforest Action Network to the campaign to protect the ozone layer by Environmental Defense Fund.

The environmental NGO community is not homogeneous, ranging from NGOs that work directly within the system and hire platoons of attorneys and MBAs to those which espouse monkeywrenching and embrace the label *ecoterrorists.* Just as there are many shades of green in the environmental NGO community, there is an array of advocacy methods among NGOs. Some groups focus on lobbying or litigation, others emphasize scientific research or property acquisition, and still others concentrate on monitoring international law. Beyond these mainstream approaches, participatory strategies such as grassroots networking and community education have gained more emphasis.

DEFINITION

However, despite agreement on their growing importance, there is no generally accepted definition of NGOs; the term has different connotations for different people. In one fundamental sense NGOs can be defined by what they are not: They are not governmental but nongovernmental. This is perhaps their greatest strength and greatest weakness. NGOs are nonparochial and much more flexible than states. They often are touted as the ideal antidote to traditional governmental bureaucracy, but this lack of statehood can be a handicap. NGOs are not subjects of international law and remain second-class citizens in international organization settings. Despite their frequent contributions to global governance, their only rights are those of observers, not voting entities.

The World Bank defines NGOs as "private organizations that pursue activities to relieve suffering, promote the interests of the poor, protect the environment, provide basic social services, or undertake community

development." The United Nations conceptualization offers a few more particulars, identifying four generally accepted characteristics. The United Nations, in fact, is largely responsible for the popular use of the term *NGO* as a result of its categorization in 1945 in Article 71 of Chapter X of the UN Charter granting consultative status through the Economic and Social Council (ECOSOC). The four UN characteristics start with the fact that an NGO is a nonprofit organization. Second, it operates independently of government; this is a complicated stipulation in that some NGOs receive governmental funding. Third, these groups must be noncriminal in nature. Fourth, NGOs are not constituted as political parties. Although they may be active in an election process, they do not run for office or serve.

Over the years, in this context, the socially constructed image of NGOs has come to be highly positive. Scholars such as Joseph Nye (2004) point out that NGOs utilize a vast reservoir of soft power to shape policy through attraction rather than compulsion of economic and military might. Others, such as Margaret Keck and Kathryn Sikkink (1998), point out that NGOs are a considerable democratic force, empowering disenfranchised areas of the world by giving voice to those who had none before. However, it is important to offer a few qualifiers. NGOs often have a narrow membership, and at times they exhibit little democratic accountability. Like their domestic counterparts, interest groups, NGOs have been accused of being elitist and operating on behalf of special interests. A key difference is that the interests NGOs pursue, unlike those of most interest groups, are not exclusionary benefits; people benefit from clean air or clean drinking water whether or not they support the Natural Resources Defense Council.

Because NGOs are not homogeneous, they are difficult to classify. To complicate matters, NGOs are constantly changing. Some smaller NGOs serve a specific purpose and die out. Others, such as Conservation International, are born out of political differences within a parent NGO, in this case The Nature Conservancy. More typically, the larger, richer NGOs of the global North actively foster the birth of smaller grassroots NGOs, hoping to continue a beneficial relationship for both parties in the future. Others, such as Birdlife International, offer an umbrella structure to link up with domestic-based organization such as the National Audubon Society in the United States.

ACTIVITIES

One way to categorize NGOs is by thematic scope. That is, what do NGOs seek to do? How is their mission oriented? Are they single-issue or multi-issue organizations? Do they target the protection of a particular set of species as in the case of the Royal Society for the Protection of Birds, or are they interested in broad biodiversity protection as in the case of the World Conservation Society?

Another approach is to categorize them by geographic scope. Where does the NGO operate? Is it a grassroots organization targeting specific local initiatives, such as the Friends of the Wekiva in central Florida or the Nobel Prize–winning Wangari Maathai's Greenbelt Movement in rural Kenya? Is it a nationally based group such as the Wilderness Society in the United States or perhaps more broadly but still regionally focused such as the Defenders of Wildlife in North America? Or is the NGO a truly global organization with both a global agenda and a global impact, such as the World Wildlife Fund and the World Wide Fund for Nature?

NGOs also vary widely in size, hierarchical structure, and financial budgets. The Sierra Club has over 1.3 million members in the United States alone, whereas Earthwatch has 20,000 globally. Some are highly centralized, such as Earthjustice Legal Defense Fund, whereas others have a loose federal structure, such as Greenpeace International. By and large, the wealthy environmental NGOs are found in the northern hemisphere, and the poorer groups in the southern hemisphere.

Environmental NGOs are an alternative power source to nation-states that enhance environmental justice around the world by creating new transnational political coalitions through the creation and maintenance of civil society. At times NGO activity targets business interests, particularly with "name and shame" tactics that hurt corporations such as Home Depot and Royal Dutch Shell in the pocketbook with the threat of consumer boycotts of their products: timber and petroleum, respectively. At other times this may entail direct clashes with states, as occurred when Greenpeace's *Rainbow Warrior* chased the French throughout the South Pacific to bear witness to that country's nuclear testing. Another example is Earth Island Institute filing a suit against the U.S. government for failing to enforce the Marine Mammal Protection Act and calling attention to Mexico's incidental takings of dolphin in fishing for tuna in the eastern tropical Pacific.

Sometimes the impact is much more conciliatory, such as Conservation International enhancing capacity building in Ghana with a shade coffee growing cooperative. Sometimes the activity of an NGO takes the form of participation in global dialogue, such as the 1992 United Nations Conference on Environment and Development (UNCED), popularly known as the Earth Summit, in Rio de Janeiro, Brazil, and the World Summit on Sustainable Development in Johannesburg, South Africa, in 2002. NGOs clearly are a set of actors with increasing influence in global politics, from the establishment of fundamental environmental ethical standards to specific policy formation.

SEE ALSO *Biodiversity; Earth Summit; Ecotage and Ecoterrorism; Forests; Global Climate Change; Globalization; Greenpeace; Ozone Depletion; Sierra Club.*

Major Nongovernmental Organizations

NGO	Contact Information	Mission	Area of Activity	Country Representation
National Audubon Society	225 Varick Street 7th floor New York, NY 10014 Phone: 212- 979-3000 http://www.audubon.org	Conservation and restoration, with particular focus on birds and their habitat	United States	United States
Birdlife International	Wellbrook Court Girton Road Cambridge CB3 0NA UK Phone: +44 (0)1223 277 318 Fax: +44 (0)1223 277 200 http://www.birdlife.org/	Conservation of bird habitat and biodiversity	Global	Belgium, Ecuador, Fiji, Japan, Jordan, Kenya, UK and partners worldwide
Center for International Environmental Law	1350 Connecticut Avenue, NW Suite #1100 Washington, DC 20036 Phone: 202-785-8700 Fax: 202-785-8701 http://www.ciel.org/	Legal counsel, policy research, advocacy and training to promote international law protecting environment and human health	Global	Switzerland and United States
Conservation International	2011 Crystal Drive, Suite 500 Arlington, VA 22202 Phone: 703-341-2400 http://www.conservation.org	Biodiversity Conservation	Global	Western Hemisphere, Africa, Asia-Pacific
Defenders of Wildlife	1130 17th Street, NW Washington, DC 20036 Phone: 202-682-9400 http://www.defenders.org	Biodiversity conservation, particularly regarding US Endangered Species Act	Canada, Mexico & United States	Canada, Mexico and United States
Earth First!	http://www.earthfirst.org/	Considers itself a movement (instead of an organization) for wilderness conservation through civil disobedience and monkey-wrenching	Global	Australia, Canada, Czech Republic, Netherlands, Philippines, UK, United States
Earth Island Institute	300 Broadway, Suite 28, San Francisco, CA 94133 Phone: 415-788-3666 http://www.earthisland.org/	Biological and cultural diversity protection	Global	United States
Earth Liberation Front	http://www.earthliberationfront.com/	Underground environmental movement with no leadership, membership or official spokesperson	United States	United States
Earthjustice Legal Defense Fund	426 17th Street, 6th Floor Oakland, CA 94612-2820 Phone: 510-550-6700 http://www.earthjustice.org/	Non-profit public interest law firm defending natural resources, wildlife, healthy environment for people	United States focus	United States with alliances in Canada, Latin America, and Russia
Earthwatch Institute	3 Clock Tower Place Suite 100 Box 75 Maynard, MA 01754 Phone: 978-461-0081 http://www.earthwatch.org/	Scientific field research and education to promote a sustainable environment	Global	Australia, Japan, UK, United States
Environmental Defense Fund	257 Park Avenue South New York, NY 10010 Telephone: 212-505-2100 http://www.edf.org	Protecting environmental rights, including access to clean air, water, food, healthy ecosystems	United States focus	United States
Friends of the Earth	1717 Massachusetts Avenue Suite 600 Washington, DC 20036 Phone: 202-783-7400 http://www.foe.org/	Promotes justice and a healthy environment	Global	United States

[Continued]

Table 1, part 1. CENGAGE LEARNING, GALE.

Major Nongovernmental Organizations

NGO	Contact Information	Mission	Area of Activity	Country Representation
Friends of the Earth International	Secretariat PO Box 19199, 1000 gd Amsterdam, The Netherlands Phone: +31 20 622 1369 http://www.foei.org/	Conservation and environmental rights	Global	Global
Greenpeace - International	Ottho Heldringstraat 5 1066 AZ Amsterdam, The Netherlands Phone: +31 20 7182000 http://www.greenpeace.org/international/	Began in opposition to whaling and nuclear testing while protecting Antarctica but now targets climate change and other global environmental issues	Global	Global
Greenpeace -USA	702 H Street, NW Washington, DC 20001 Phone: 202-462-1177 http://www.greenpeace.org	Began in opposition to whaling and nuclear testing while protecting Antarctica but now targets climate change and other global environmental issues	Global	United States
Izaak Walton League of America	707 Conservation Lane Gaithersburg, MD 20878 Phone: 301-548-0150 http://www.iwla.org/	Conservation	United States	United States
League of Conservation Voters	1920 L Street, NW Suite 800 Washington, DC 20036 Phone: 202-785-8683 http://www.lcv.org/	Advocates election pro-environmental candidates who will adopt and implement sound environmental policies	United States	United States
Natural Resources Defense Council	40 West 20th Street New York, NY 10011 Phone: 212-727-2700 http://www.nrdc.org/	Conservation	United States and Global	China and United States
National Wildlife Federation	11100 Wildlife Center Drive Reston, VA 20190-5362 Phone: 1-800-822-9919 http://www.nwf.org/	To inspire Americans to protect wildlife	United States	United States
The Nature Conservancy	4245 North Fairfax Drive, Suite 100 Arlington, VA 22203-1606 Phone: 703-841-4850 http://www.nature.org/	Conservation	Global	Global
The Ocean Conservancy	1300 19th Street NW 8th Floor Washington, DC 20036 Phone: 202-429-5609 http://www.oceanconservancy.org	Marine conservation	Global- Marine	United States
Rainforest Action Network	221 Pine Street, 5th Floor San Francisco, CA 94104 Phone: 415-398-4404 http://www.ran.org/	Conservation of rainforests and people near those forests	Rainforests across the globe	Japan and United States
Royal Society for the Protection of Birds	The Lodge Potton Road, Sandy Bedfordshire SG19 2DL Phone: +44 01767 680 551 http://www.rspb.org.uk/	Biodiversity conservation, especially wild birds	United Kingdom	United Kingdom
The Sea Shepherd Conservation Society	PO Box 2616 Friday Harbor WA 98250 Phone: 360-370-5650 http://www.seashepherd.org/	Marine conservation	Global - Marine	Australia, Brazil, Canada, Belgium, Ecuador, France, Netherlands, UK, United States
The Sierra Club	85 Second Street, 2nd Floor San Francisco, CA 94105 Phone: 415-977-5500 http://www.sierraclub.org/	Conservation	United States	United States

[Continued]

Table 1, part 2. **CENGAGE LEARNING, GALE.**

Major Nongovernmental Organizations

NGO	Contact Information	Mission	Area of Activity	Country Representation
The Wilderness Society	1615 M St, NW Washington, DC 20036 Phone: 1-800-THE-WILD http://www.wilderness.org/	Protect wilderness and inspire Americans to care for wild places	United States	United States
Union of Concerned Scientists	2 Brattle Square Cambridge, MA 02238-9105 Phone: 617-547-5552 Fax: 617-864-9405 http://www.ucsusa.org/	Researches practical solutions to global warming, nuclear weapons, vehicle pollution, GMOs, etc.	Global	United States
World Conservation Society	2300 Southern Boulevard Bronx, New York 10460 Phone: 718-220-5100 http://www.wcs.org/	Biodiversity conservation and management of urban wildlife parks such as the Bronx Zoo	Global	United States
World Resources Institute	10 G Street, NE - Suite 800 Washington, DC 20002 Phone: 202-729-7600 Fax: 202-729-7610 http://www.wri.org/	Think tank researching practical ways to protect the earth and improve people's lives	Global	United States
Worldwatch Institute	1776 Mass. Ave. N.W. Washington, DC 20036-1904 Phone: 202-452-1999 http://www.worldwatch.org/	Think tank focusing on sustainable development issues such as climate change, resource degradation, population growth, and poverty	Global	United States
World Wildlife Fund – WWF US	1250 24th Street NW Washington, DC Phone: 202-293-4800 Fax: 202-293-9211 http://www.worldwildlife.org/	Biodiversity Conservation	Global	United States
World Wide Fund for Nature – WWF International	Av. du Mont-Blanc 1196 Gland, Switzerland Phone: +41 22 364 91 11 Fax: +41 22 364 48 92 http://www.panda.org/	Biodiversity Conservation	Global	Global

Table 1, part 3. CENGAGE LEARNING, GALE.

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Michael M. Gunter Jr.

NORTH AMERICA

Distinct, influential, and sometimes conflicting philosophical images and values about what humans are, what nature is, and what the relationship between humans and nature is and should be have been at the root of environmental controversies in North America over the last 500 years. Before European contact and the subsequent settlement of North America very different philosophical images and values reigned; those perspectives persisted, along with modifications of them. The confluence of those distinct philosophical ideas shaped both the

George Catlin,* Buffalo Chase Over Prairie Bluffs, *1844. *Scholars are undecided as to the environmental impact of the first populants of Native America (beginning roughly 14,000 years ago). Although it is commonly assumed that North American Indians had an environmental ethic similar to that of contemporary philosophers, others claim that their population of the continent caused mass destruction of native flora and fauna.* **THE ART ARCHIVE.**

environmental attitudes of North Americans and the landscape of the continent.

NORTH AMERICA BEFORE 1492

Both the practices and the environmental ethics of pre-Columbian North Americans are contested. Roughly 14,000 years ago Asian big game hunters crossed the exposed land bridge between what is now Russia and Alaska and also sailed along the western coast of North America to populate or greatly increase the population of North America. According to one theory (Martin 1967), those skilled hunters quickly swept across North America, Central America, and part of South America, slaughtering the unfamiliar megafauna; indigenous populations were drawn by the easy pickings of unwary animals, leaving extinguished species in their wake. Other scholars (Krech 1999) have suggested that although the arrival of big game hunters and the disappearance of many North American species corresponded, the demise of those species was attributable as much to changes in climate and perhaps other factors as it was to the newly arrived human hunters.

In environmental circles it commonly is assumed that before contact North American Indians (First Nations in Canadian parlance) had an inclusive environmental ethic on a par with the most inclusive contemporary environmental ethics, such as Deep Ecology and Aldo Leopold's land ethic. Although details varied from tribe to tribe, North American Indians considered nonhuman animals, rocks, rivers, mountains, and traditional myths and stories to have direct moral standing (Callicott and Nelson 2004). Contemporary ideas about the behavior of native North American Indians range from the assumption that they were skilled and intensive managers of the land to the belief that they were passive denizens of North America, a perspective that seems inconsistent with prevailing ethnographic and archaeological evidence. How is it possible to reconcile an inclusive ethic with the Pleistocene

extinction hypothesis or the overshoot of ecological carrying capacity, such as overuse of water resources in the Southwest six to eight centuries ago? N. Scott Momaday (1976) suggested that a profound ethical change occurred when the big game hunters gradually came to see the land of North America as home, then as beautiful, and then as intrinsically valuable.

Although the argument about an indigenous North American land ethic is an ongoing debate, knowledge about the extent of Indian impact is becoming more extensive. Many assumptions about Indian environmental ethics are premised on what is known about what pre-Columbian Indians did. In the last two decades of the twentieth century and the first decade of the twenty-first, however, much of the dogma surrounding those practices was challenged. For example, until recently the dominant figure for the North American human population was approximately 1 million. Currently, it is known that there were at least 4 million and up to 16 million inhabitants in 1491. Researchers also have come to appreciate that those humans affected the North American continent for over 14,000 years, sometimes in a very intensive fashion. For example, in the midwestern United States it is known that there were large agricultural complexes, each of which covered up to 200 to 300 acres, that supported thousands of people. It also is known that humans, through the intensive use of fire, actively and continually maintained much of what is considered the original prairie of North America and determined the composition and shape of forest ecosystems throughout the continent. Additionally, vast complexes of ceremonial and burial mounds, complex systems of trading, and cities housing tens of thousands of people (e.g., Cahokia in Illinois, which eventually overshot its carrying capacity and scattered its residents) existed in North America.

However, the myths, stories, and legends of precontact Indians seem to indicate very inclusive systems of ethics that guided and continue to govern subsistence practices of hunting, fishing, and gathering; those practices cumulatively shaped species distribution, diversity, and productivity (Blackburn and Anderson 1993, Frey 2001). Arguably, it was the animism—the belief that nature and/or natural entities are imbued with an indwelling spirit (Nelson 2004) and therefore possess what might be considered a kind of intrinsic value—of native North Americans that undergirded that inclusive ethic.

1492 TO 1776

Although Europeans had made forays into North America for perhaps 500 years, European settlement (or invasion) began to affect North American inhabitants and landscapes more seriously in the early part of the sixteenth century. Most immediately, waves of European-introduced diseases, generally introduced accidentally, began to decimate the populations of native North Americans. Because that anthropogenic disease regime effectively reduced the native population by as much as 90 percent and because the disease spread ahead of the settlers, Europeans felt justified in concluding that North America was a wilderness of continental proportions that was theirs for the taking. That assumption was affirmed by a tendency to perceive native peoples as having more the status of nonhuman wildlife than that of full-fledged humans worthy of moral consideration and respect. In light of the Puritan religious background of the early New England colonists, it may be safe to say that the conquest of the North American inhabitants and landscape was more than a consistent proposition; it was an expected and highly moral vocation. The Puritan leader and witch hunter Cotton Mather summarized this mentality when he asserted that "what is not useful is vicious."

At the same time that that internal pressure created a willingness to affect the North American landscape with little regard for the land or its native inhabitants, a more global market created a lucrative outlet for the products of the relatively unexploited North American continent, and that confluence had a major impact on the fish and wildlife populations. North Atlantic cod, which when dried provided a rich and easily transportable source of protein, and beaver pelts from English and French colonies, which when felted provided sought-after hats, are two notable examples. Exploitation also occurred in Spanish colonies, but it existed alongside traditions of caring for the common good; for example, water resources were shared as a community responsibility in places such as California and New Mexico. Although all Europeans participated in global market arrangements, the British did so with the greatest enthusiasm and the steepest ecological costs.

The meeting between native North Americans and the newly arrived Europeans was as much a clash of ideologies and ethics as it was a clash of technologies. Europeans brought with them not only the ability to alter the landscape but also the willingness to do that. Native North Americans, in contrast, had the ability to alter their landscape more seriously than they did but lacked the willingness and need to do so. Inclusive native ethics were inconsistent with the narrowly anthropocentric ethic of the European settlers. Although tempered, that Euro-American ideology is still in operation.

1777 TO 1899

In 1893 the historian Frederick Jackson Turner pronounced that the American frontier had closed three years earlier. Although historians have challenged that interpretation, the idea of a closed frontier resonated with Americans who saw the transition from the completion of Manifest Destiny (the belief that westward expansion

and territorial acquisition all the way to the western coast of the United States was inevitable) to the beginnings of a new and gentler ethic of relationship with nature. Analogously, Canadians linked the development of their nation to the exploitation of raw natural resources—staples such as furs and wheat—but did not develop a strong conservation ethic from that economic precariousness. Temporally and effectively corresponding to the beginning and the height of the Industrial Revolution, the late eighteenth and early nineteenth centuries saw the most brazen exploitive environmental practices that the technology of the time would allow. In the early part of that period North Americans of all types seemed limited only by their technical ability to affect nature and not at all by their willingness to do so. However, arising with these exploitive customs were challenges to that prevailing environmental ethic.

After the American Revolution the United States began purchasing and conquering what is now the Lower 48, a process that was complete by 1853 and that established the geography needed for accelerated economic exploitation. Canada, remaining until the present under the sovereignty of the British Crown, effectively emerged from British colonialism by 1873. Farmers moved quickly to fill the temperate North American continent and displaced native peoples and their environmental practices, except in the subarctic and arctic northern territories of Canada and Russian-owned Alaska. Laws such as the U.S. Homestead Act of 1862 and the Canadian Dominion Lands Act of 1872 served as powerful examples of a philosophical and ethical predisposition that manifested itself first legally and then on the land. These and similar laws privatized the public domain with an emphasis on small farmers, but often corporations such as railroads and mining companies fraudulently took advantage of the laws and wreaked ecological havoc for short-term economic gain.

This era also saw the boom and eventually the bust of many of the extreme extractive practices in North America. For example, the end of Great North Woods lumbering and massive commercial hunting occurred during that period. That era also witnessed the removal of American Indians from some would-be park areas and the relegation of most American Indians in the United States to reservations. The abuse of the environment in the form of the intentional slaughter of the herds of buffalo that fed certain Indian tribes (arguably a kind of biological warfare) is an example of the indifference and even contempt that the inhabitants of European descent in North America had for both the rights of nature and the rights of the native peoples. Similarly, mining rushes in the West extracted immense mineral wealth from the earth without considering the attendant environmental damage, such as deforestation, erosion, pollution, and habitat destruction (Isenberg 2005). The end of those practices, however, was due primarily to the end of the readily accessible resources that were the focus of the cut-and-run practices of the extractive industries. However, two separate and at times competing natural resource philosophies—resourcism and preservationism—were emerging at that time, neither of which allowed for the types of abuses seen in the past. The era of unthoughtful and uncontested resource exploitation in North America came to an end at about the turn of the twentieth century.

Largely in response to the profligacy of nineteenth-century capitalist development, many Americans began to question practices and reform policies, especially those concerning public lands. Figures such as George Perkins Marsh and John Wesley Powell warned of the social and economic harm that was likely to result from continued environmental degradation. Fearing that privatizing public lands was proceeding without a plan and in wasteful ways, reformers moved the federal government toward protecting land in addition to selling or giving it away. In 1872 the U.S. Congress reserved the first national park at Yellowstone; Canada followed in 1887 by reserving Rocky Mountain Park, later renamed Banff National Park. By 1891 the U.S. president had the power to reserve lands from settlement in what were known as forest reserves and now are called national forests. By the early twentieth century the Canadian Forest Service began recognizing problems with traditional harvest practices, but its regulatory presence remained weak for decades. Still, government-protected areas such as the national parks and forests were limited in terms of the types of economic activities that could be pursued there. Thus, the reforms initiated government involvement in checking economic exploitation and effectively announced that some environments were better left alone or managed with a longer-term perspective.

Besides government reform, private individuals and organizations instituted change in environmental practices. Early in the nineteenth century a few reform-minded farmers recognized the problem of soil erosion and attempted to initiate new practices on their farms that would yield long-term economic benefits without the ecological costs associated with most farming techniques (Stoll 2002). Organizations were even more active. In 1887 the Boone and Crockett Club was established by Theodore Roosevelt, a complex environmental figure known as much for setting aside vast tracks of land for national forests as he was for slaughtering vast numbers of African wildlife for American museums. Equally complex was the mission of the Boone and Crockett Club. Although its focus was the conservation of dwindling game populations and the habitats in which they lived, the foundational value of the club seems anthropocentric. That changed, however, in 1892 when John Muir founded the Sierra Club. Although Muir's Sierra Club

did not shun activities that humans enjoyed, it had an ultimate goal of preserving wild nature. The Sierra Club operated under the philosophy that exposure to wild nature would increase people's knowledge of a place and thus prompt in them a love for wild areas and a willingness to act on their behalf.

In an important early paper in environmental ethics the historian Lynn White, Jr. (1969), argued that the environmental abuses visited upon the North American continent by its denizens of European descent were simply the manifestation of a certain interpretation of their imported religious tradition, Christianity. Although White blamed the despotic interpretation of the human-nature relationship in the Christian tradition (the interpretation that informs humans that the earth is there for their use and abuse, that it is God's desire that people "dominate and subdue" His creation), he did not blame Christianity itself, a point that often is missed in reactions to his argument. Hence, for White and for environmental philosophers after him it was the philosophical and ethical predisposition, coupled with the emerging technological power, of the Old World arrivals that facilitated the radical alteration of the North American landscape in that period. By the end of the nineteenth century North America thus had experienced both massive ecological devastation and the roots of philosophical shifts that would thwart or at least complicate continued the pursuit of profit at the expense of nature.

1900 TO 1955

The early part of the twentieth century was marked by perhaps the most dramatic environmental battle in North American history and certainly the most continuously recognized one. The battle over the Hetch Hetchy Valley in Yosemite National Park pitted two contrasting environmental philosophies against each other. As early as 1864 George Perkins Marsh, the U.S. ambassador to both Turkey and Italy, had challenged the narrow and ultimately paradoxical anthropocentric justification of resource exploitation that had reigned on the North America continent. Employing the notion of the usufruct (use without destruction), Marsh suggested that it was inappropriate to believe and act as if the earth had been given to humans for "consumption" or "profligate waste" (Marsh 1864, p. 34). In 1905 the equally broad-minded and European-trained Gifford Pinchot was appointed the first chief of the U.S. Forest Service. Both Marsh and Pinchot developed their environmental philosophies in reaction to what they viewed as an overly exclusive and shortsighted human use of natural resources that they encountered in Europe. Although Pinchot argued for a more democratic and far-reaching form of conservation than the one he had encountered in Europe—he suggested that people should strive for "the greatest good of the greatest number for the longest time" and defined conservation as "the wise use of the earth and its resources for the lasting good of men" (Pinchot 1998, pp. 326–327)—he remained an anthropocentrist, stating that "there are just two things on this material earth—people and natural resources" (Pinchot 1998, p. 326).

In the Hetch Hetchy battle Pinchot argued from the point of view that the valley should be dammed to provide publicly owned water and electricity for San Francisco because those were the higher human benefits of resource use (Righter 2005). That stance pitted Pinchot against his old friend John Muir, who argued that the valley should be left as it was, a position that came to be known as preservation. Muir's position was a manifestation of the nineteenth-century transcendental philosophy of Ralph Waldo Emerson and Henry David Thoreau, who believed that only in nature could one witness the handiwork of God and transcend ordinary existence to find higher truths. Hence, for Muir, to destroy Hetch Hetchy was to display "a perfect contempt for Nature" (Muir 1992, p. 716) akin to destroying temples and churches. Here, for the first time since the European conquest, one can see a North American environmental philosophy suggesting that nature has a kind of value that transcends instrumental and anthropocentric ends, although Muir and his allies believed that tourists should benefit from such preservation (Righter 2005).

In the mid-twentieth century Aldo Leopold attempted to meld those two environmental philosophies. Although he worked to improve farming techniques and secure other human ends, Leopold also argued that people should judge the morality of actions, policies, and laws by their tendency to "preserve the integrity, stability, and beauty of the biotic community" (Leopold 1949, pp. 224–225), a community inclusive of human beings. Perhaps most important, Leopold's environmental philosophy turned away from a Judeo-Christian worldview and toward an evolutionary-ecological one premised on an assumed continuity between humans and the nonhuman world. A good example of Leopold's melded philosophy can be found in his ideas about wilderness preservation. Leopold and other preeminent ecologists of that time suggested that certain places in the United States should be set aside as designated wilderness areas as early as the late 1910s. However, Leopold's early rationale for wilderness preservation was dominated by arguments for human recreation that were common among other early wilderness thinkers. Later in his thinking about wilderness Leopold began to supplement such arguments with nonanthropocentric viewpoints that suggested that wilderness should serve as a place to house otherwise unwelcome wildlife and ultimately as a base datum of healthy land.

Although the moral will to enact a more inclusive environmental ethic was present by the mid-twentieth century, certain distractions prevented its full blossoming. The financial and psychic cost of two world wars that came on either side of the Great Depression, the Dust Bowl, and the New Deal legacy of U.S. President Franklin Delano Roosevelt (employing economic stimulus practices such as the Civilian Conservation Corps that transformed nature in a dramatic and narrowly anthropocentric manner), in combination with the advent of urban sprawl and subsequent forms of pollution, had an impact on the land and served as distractions from the development of an environmental ethic distinct from anthropocentrism. Moreover, the institutionalization of conservation in bureaucracies such as the U.S. Forest Service/Canadian Forest Service, the U.S. National Park Service/Canadian Dominion Parks Branch, the U.S. Soil Conservation Service, and the U.S. Bureau of Reclamation all meant that the North American political economy proved most influential in shaping national environmental policies and practices in both the United States and Canada. The emphasis on resourcism in Canada tended to go unchallenged even longer than was the case in the United States. At the same time, however, the science of ecology was emerging and beginning to influence and alter environmental discourse. This fusion of science and ethics soon would manifest itself in powerful and far-reaching ways.

1955 TO 1970

In the early 1950s a near replica of the battle over Hetch Hetchy Valley occurred at Echo Park within Dinosaur National Monument in Colorado. This time, however, nature won and the dam was not built. The political compromise arising from the debate, though, allowed the construction of Glen Canyon Dam, effectively creating a conceptual cleavage between sacred lands (those within the national park system) and profane lands (those outside the system). This episode, which was fought in Congress and in the national media, marked a revival of wilderness activism and paved the way for an ascendant environmentalism with a focus on particular, local issues and problems.

Environmentalism was becoming a popular, as opposed to an exclusive, concern, at least among many middle-class white Americans. In fact, many people attribute the emergence of their personal environmental concern as well as the dawn of the environmental movement to Rachel Carson's *Silent Spring* (1962). Even though the DDT that the book warned of was not banned until 1972 in the United States and 1985 in Canada, Carson's warning about unrestrained alteration of and impact on the natural world triggered the popular perception that the environment was endangered and worth worrying about. Other debates, such as Paul Ehrlich and Barry Commoner's debate over whether human population or technological invention was the fundamental environmental issue, also helped popularize environmentalism. More than ever North Americans debated environmental questions publicly and began to challenge narrowly anthropocentric treatments of nature forcefully.

A number of legislative successes for environmental causes emerged from that popular concern. In 1963 (2006 in Canada) the United States passed the Clean Air Act. In 1964 the U.S. Wilderness Act was passed, which ultimately would preserve nearly 5 percent of the country (one-half of that in Alaska) as designated wilderness. The National Environmental Policy Act (NEPA) that was signed into law on January 1, 1970, required federal projects to prepare an environmental impact statement (EIS) cataloging expected effects along with various alternatives (the Canadian equivalent went into effect in 1995 and is known as the Canadian Environmental Assessment Act). NEPA also opened the EIS to a period of public comment, giving interested citizens an opportunity to voice their concerns and furnishing the opportunity for lawsuits to compel more environmentally ethical planning. In 1970 Senator Gaylord Nelson of Wisconsin formalized environmentalism as a popular and urgent matter by sponsoring legislation creating an annual Earth Day. Originally established as a day for "teach-ins" focused on environmental problems, it evolved into a celebration of ecological values.

Meanwhile, academia was witnessing a great change. Departments of ecology were springing up at universities all over the European and North American world, supporting research that could be and was being employed in defense of nature. With the dominance of the ecosystem concept, ecology also appeared to have arrived as a full-fledged and quantifiable science. After that period of explosive growth in North Americans' concern for and willingness to act on behalf of the environment, a variety of philosophically astute and environmentally conscientious philosophers and other academics began to get into the game.

1971 TO THE PRESENT

Environmental philosophy and ethics, along with a number of other environmental disciplines (from history to sociology, economics to literary criticism), emerged in the early 1970s. It can be said that North America, along with England, Australia, and Norway, has been a point of origin for the field of environmental philosophy and perhaps its epicenter. Impelled by the first Earth Day, J. Baird Callicott taught the first course in environmental ethics in the world in 1971 at the University of Wisconsin–Stevens Point. In 1979 Eugene Hargrove launched the discipline's first and still preeminent journal, *Environmental Ethics.* Although the University of Georgia took the early

Dinosaur National Monument, U.S. *Dinosaur National Monument is a part of the Uinta Mountains, sitting on the border between Colorado and Utah. In the 1950s, a plan was proposed to build a dam in Echo Park, in the middle of the monument. A nationwide campaign of protest prevented construction of the dam, and many consider this event as the start of a successful conservationist era.*

institutional lead as the seat of environmental philosophy, eventually the University of North Texas became the continent's and eventually the world's leading philosophy department focused on environmental philosophy. Pioneering Canadian environmental philosophers included Allen Carlson, Peter Miller, and Bob Jickling. Nearly every

North American university now teaches at least one course in environmental ethics (though not always in the department of philosophy), and many have at least one scholar who focuses on the field.

Between 1971 and 1979 philosophers interested in environmental ethics and philosophy worked in relative isolation from one another. By the time they began to discuss their work more publicly, various positions already had emerged. Those positions centered on the matter of who or what deserved direct moral standing and who or what merited only indirect moral standing. The seemingly dominant way to discuss this topic was in reference to who or what had intrinsic value and why. There are dozens of textbooks, five or six journals, thousands of articles, and hundreds of books in the field. Moreover, there are a few graduate degree programs in environmental philosophy, undergraduate majors, and related university programs and courses featuring the works of environmental philosophers. Environmental philosophers also have begun to infiltrate conservation science in various ways.

This period also marked the beginning of what might be called the second wave of the environmental movement, beginning in the mid-1980s. That wave had a much more global and systemic focus than its predecessor, concentrating, for example, on issues such as the precipitous loss of biodiversity and the impending sixth great extinction, stratospheric ozone depletion, acid rain, social justice and human rights, and rapid global climate change as much as it did on more local forms of environmental harms. Old distinctions such as that between conservation and preservation no longer seemed to fit or make sense, although some people still employed them.

At the same time, clearly prompted by environmental philosophies such as Deep Ecology, environmental activism became much more radicalized with activist groups such Earth First!, whose motto was "No compromise in defense of Mother Earth," and Greenpeace, a Vancouver-based organization that grew to have more than 2.5 million members. Environmental politics also became more polarized as the result of some profound shifts in values. The U.S. (1973) and Canadian (1996) endangered species acts, for example, represent a significant moral shift suggesting that species and other categories of animal populations merit direct moral standing and deserve to exist for their own sake, apart from the impact they may or may not have on more narrowly conceived human economic interests. Dramatic and ongoing battles over owls, wolves, grizzly bears, and salmon have been the direct result of, among other things, this philosophical and ethical change.

A number of current and near future topics promise to occupy North American environmental philosophy in the coming years. Although historically an exceptionally relevant and respected discipline, philosophy took a turn toward specialization in the twentieth century and, in the opinion of some people, lost some of its relevance and influence. Many environmental philosophers, however, seek to make their work relevant to science and policy. Although it holds great promise, this renewed commitment to relevance and interdisciplinarity will continue to present a challenge to environmental philosophy. Making a commitment to relevance and thinking of ways to account conceptually and ethically for the moral relevance of human and nonhuman individuals as well as the environmental collectives that serve as the focal point of much contemporary environmental concern and navigate between the good of each when they are in conflict are issues that present another challenge to environmental philosophers. Finally, working to craft philosophical and ethical systems that account for the dominant ecological paradigm focused on flux and change presents a particularly difficult problem for environmental philosophy and for much of environmental discourse.

SEE ALSO *Anthropocentrism; Christianity; Conservation; Deep Ecology; Ecology: V. Disequilibrium Ecology; Emerson, Ralph Waldo; Forests; Hetch Hetchy; Land Ethic; Leopold, Aldo; Marsh, George Perkins; Mexico and Central America; Muir, John; Pinchot, Gifford; Pollution; Preservation; Sierra Club; Species; Thoreau, Henry David; U.S. Forest Service; U.S. National Park Service; White, Lynn, Jr.; Wilderness.*

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NORTH AMERICAN FREE TRADE AGREEMENT

The North American Free Trade Agreement (NAFTA) between Canada, Mexico, and the United States entered into force in January 1994 after three years of negotiation and extensive public debate. Canada and the United States had established the Canada-U.S. Trade Agreement (CUSTA) in 1989, so the new arrangements involved the addition of bilateral agreements between Canada and Mexico and between the United States and Mexico. The primary purpose of any trade agreement is to reduce barriers to trade with the expectation that trade liberalization will contribute to greater economic growth and prosperity. Trade is one element of the general process of globalization along with capital flows (foreign investment), migration, cultural and religious exchanges, and others. Because trade and other forms of economic integration contribute to economic growth, they have an impact on human well-being and the use of natural and environmental resources. This impact in turn means that trade and globalization have ethical dimensions related to distributive justice, the rights of future generations, and the integrity of ecosystems. The implications of trade liberalization and globalization for the environment have been the subject of intense debate since the 1980s; the political controversy surrounding NAFTA has helped to crystallize various positions on these issues.

There are two general approaches to trade liberalization. Multilateral trade liberalization is carried out by the 152 countries that belong to the World Trade Organization (WTO) through negotiation and private judicial proceedings aimed at resolving trade disputes. Multilateral agreements in the context of the WTO are based on the requirement that member countries treat all other members in the same fashion. In contrast, regional and bilateral agreements, the other approach to trade liberalization, are discriminatory. NAFTA is a regional trade agreement in which lower trade barriers are extended by each member only to the other members, each of which is free to pursue whatever trade policies it wishes with nonmembers. More ambitious regional agreements such as the European Union (EU) require harmonization of trade policies by the members as well as other measures to free up the movement of capital and labor.

David Vogel (2000) suggests that increasing environmental regulation in the 1970s and 1980s, along with rapid growth in trade and a rising number of trade agreements, led to tensions between environmentalists and advocates of free trade. Those who favor trade liberalization worry that environmental regulations will become de facto trade barriers, whereas environmentalists fear that progress in protecting the environment will be undermined as firms either relocate to countries with lax environmental standards (sometimes referred to as "pollution havens") or use the threat of job losses to push the government to lower standards in the name of competitiveness. Environmentalists also note that trade itself is polluting as energy and other resources are used to carry out international shipping, which may also spread invasive species and other forms of pollution. Trade advocates point out that concern for the environment tends to increase as a country's standard of living rises; they further argue that, because trade contributes to rising living standards, trade agreements actually encourage the development of better environmental policies.

NAFTA went further than most free trade agreements in its inclusion of provisions on capital flows (investment) and the environment. Mary Tiemann (2000) notes that national technical standards related to the environment were expressly allowed by the agreement, which also subordinates its provisions on trade liberalization to international environmental agreements on the ozone layer, hazardous waste, and trade in endangered species. Despite

these provisions the debate leading up to the ratification vote in the United States was contentious, and President Bill Clinton elected to introduce side agreements on the environment and labor to increase the likelihood that Congress would approve the agreement. The North American Agreement on Environmental Cooperation (NAAEC) and the North American Agreement on Labor Cooperation (NAALC) were ratified along with NAFTA in late 1993.

The principal goal of the NAAEC is to ensure that the three governments actually enforce their environmental regulations. It also aims to promote cooperation on environmental issues and increased environmental safeguards. The organization created to oversee the agreement is the Commission for Environmental Cooperation (CEC), based in Montreal. The CEC is an international organization with several special features. First, in addition to a council made up of representatives from national governments, nongovernmental organizations (NGOs) can participate in its operations through membership in the joint public advisory committee. Further, individual citizens have the right to submit complaints to the CEC secretariat that a country's environmental laws are not being enforced, which reviews the complaint and provides technical information to the council, which adjudicates the case. The focus of the CEC is on air and atmosphere, biodoversity, pollutants, and water. The CEC has also been working on devising methods to measure the environmental impact of NAFTA in particular and, beginning in 2003, of trade in general.

Assessing the environmental impact of NAFTA is complicated because so many other events occurred as NAFTA was being implemented. Some observed changes that have taken place since NAFTA went into effect may have been caused or influenced by NAFTA, but many more would have happened even if NAFTA had not been approved. For example, based on data available from the Energy Information Administration (2008), North American greenhouse-gas emissions increased by more than 17 percent between 1993 and 2005. NAFTA probably played little if any role in this change, which was driven primarily by the energy and environmental policies of the United States, the producer of some 85 percent of North American greenhouse-gas emissions.

In addition to NAAEC, there are several agreements between the United States and Mexico directed at monitoring and controlling pollution along the border between the two countries. Chantal Carpentier (2004) and Vogel (2000) both conclude that cross-border trade under NAFTA has had a minor impact on the environment. Unfortunately, the various environmental agreements adopted in conjunction with NAFTA do not appear to have had positive impacts on the environments that were expected, perhaps because they have been underfunded by the three governments. But these arrangements do lay the groundwork for increased environmental cooperation in the future, and the innovative structure of the CEC holds out the possibility for extensive citizen participation in attaining important environmental goals.

SEE ALSO *Atmosphere; Biodiversity; Future Generations; Nongovernmental Organizations; Ozone Depletion; Pollution; Species; Water; World Trade Organization.*

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E. Wesley F. Peterson

NORTON, BRYAN

1944–

Bryan Norton was born on July 19, 1944, in Marshall, Michigan. He is best known in the field of environmental ethics for his rejection of nonanthropocentrism—a philosophical worldview in which nonhuman nature is treated as an object of independent moral concern—and challenging the view that an adequate environmental ethic must acknowledge intrinsic natural value and direct moral duties to nature. Norton has been the leading figure in the "pragmatist wave" that began in the mid-1990s, and his work is also significant for its practical, policy orientation and interdisciplinary character. He is among a handful of environmental philosophers who have expanded the intellectual universe of environmental ethics to incorporate disciplines in the natural and social sciences, including conservation biology, environmental economics, and environmental policy and management.

EARLY WORKS

As with most philosophers whose writing shaped the field during its first two decades, Norton's interest in environmental philosophy developed well after his graduate studies in the philosophy of language, science, and epistemology at

the University of Michigan, where he received a doctorate in 1970. At Ann Arbor he wrote a dissertation on the metaphilosophy of Vienna Circle philosopher Rudolf Carnap; that work later resulted in Norton's first book, *Linguistic Frameworks and Ontology* (1977).

Norton's career in environmental ethics and philosophy can be traced from its beginnings in environmental value theory in the 1980s, to a growing emphasis on epistemological issues (especially justification) in the late 1980s and early 1990s, to its later focus on language and the pragmatics of environmental communication. His first publications in the journal *Environmental Ethics* (Norton 1982, 1984) focused on the rights of nonhumans and future generations; the philosophical problems afflicting both positions led him to conclude that rights-based approaches in environmental ethics are not viable.

Norton was skeptical about environmental philosophers' emerging focus on the intrinsic value of nature, which he felt was both philosophically flawed and politically unnecessary. Accordingly, in the mid-1980s he developed "weak anthropocentrism," an approach that did not require the recognition of the intrinsic value of nature (Norton 1984). Norton described weak anthropocentrism as accommodating a broadly instrumentalist and pluralistic theory of environmental value within a humanistic worldview. His argument emphasized the role of nonhuman nature as a teacher of human ideals and a good shared between present and future generations. Weak anthropocentrism thus was positioned as a moderate alternative to both narrow forms of economic valuation ("strong anthropocentrism") and nonanthropocentric, intrinsic-value-of-nature arguments.

Norton continued to develop this line in his 1987 book *Why Preserve Natural Variety?*, which surveyed the range of economic and ethical options for valuing species and ecosystems (biodiversity). In that book Norton presented the concept of "transformative value" as the normative core of weak anthropocentrism. Contact with wild species and ecosystems could, he argued, prompt individuals to evaluate critically and transform their exploitative, consumer-centered preferences into more environmentally benign ideals compatible with an ecologically enlightened worldview (Norton 1987). The significance of his argument was that one could justify the protection of endangered species and ecosystems on anthropocentric grounds while steering clear of both economistic and nonanthropocentric arguments.

LATER WORKS

In the 1990s Norton's weak anthropocentric stance evolved into a more explicitly pragmatic approach to environmental philosophy. As early as 1988 he tapped into pragmatism in his 1988 contrarian reading of Aldo Leopold, author of *A Sand County Almanac*. Norton argued that Leopold subscribed to an informal pragmatist epistemology and theory of environmental value, an interpretation that went against the dominant reading of Leopold as perhaps the major nonanthropocentrist in the history of environmental ethics (Callicott 1989, 1999).

Norton's writing assumed an increasingly strong policy focus in the 1990s. Among other things, that orientation led him to reverse the traditional logic of applying philosophical principles to practical problems in favor of a greater emphasis on the problems themselves. That approach appeared in *Toward Unity among Environmentalists* (1991), in which he described an emerging policy consensus among environmental activists—in short, support for multivalue, sustainable ecosystem management—that existed despite disagreements over deeper environmental values and motives. In *Toward Unity,* Norton concluded that the anthropocentric-nonanthropocentric debate in environmental ethics was not as important as previously thought because it did not thwart political agreement on common policy goals. Termed the convergence hypothesis, Norton's argument proved controversial, attracting rebuttals from a number of nonanthropocentrists (Minteer 2009).

Later in the 1990s Norton's work continued to explore a range of philosophical and policy questions, including the relationship between economic and pragmatic approaches to environmental valuation, the role of ecological science in the policy process, and analyses of ecosystem health, biodiversity, and sustainability (Norton 2003). His 2005 book *Sustainability: A Philosophy of Adaptive Ecosystem Management* marked a return to the analytical pragmatism of Carnap that Norton had explored early in his career. In *Sustainability,* Norton proposed an integrated scientific and value discourse for discussions of sustainability across the environmental science, policy, and management domains. In doing so, he reframed environmental problems as linguistic failures rather than ethical ones, in the process setting a new agenda for environmental philosophy in the pragmatics of language and communication.

SEE ALSO *Biodiversity; Callicott, J. Baird; Carson, Rachel; Commoner, Barry; Conservation Biology; Convergence Hypothesis; Earth First!; Economics, Environmental; Ehrlich, Paul; Endangered Species Act; Environmental Philosophy: V. Contemporary Philosophy; Environmental Policy; Global Climate Change; Greenpeace; Hargrove, Eugene; Intrinsic and Instrumental Value; Leopold, Aldo; Pragmatism; Sustainability.*

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Ben A. Minteer

NUCLEAR POWER

When the nucleus of an atom is divided or joined to another nucleus, an enormous amount of energy is produced. When these processes of fission (division of the nucleus of an atom) or fusion (joining the nucleus of an atom with another) take place under controlled conditions, this energy can be used to drive turbines that can do work: for example, to propel a large vehicle such as a ship or to generate electricity. These same processes, however, can be adapted to produce weapons with massive destructive power. Nonmilitary uses of *nuclear power* refer to the generation of energy through a controlled process of fission in a nuclear reactor.

NUCLEAR POWER THROUGHOUT THE WORLD

According to figures of the Power Reactor Information System (PRIS) of the International Atomic Energy Agency (IAEA), an independent international organization that was established in 1957 to promote the safety and security of the peaceful use of nuclear science and technology, there were at the beginning of 2008 a total of 439 nuclear power plants in operation in the world in 30 countries, with a total net installed capacity of 372,202 Gigawatts. At this time, there were also five nuclear power plants in long term shutdown, whilst 34 nuclear power plants were under construction (IAEA 2008). At the end of 2006, there were 103 licensed nuclear power plants in the United States located at 65 sites, predominantly situated in the eastern half of the country. As of 2008, about 20 percent of the electricity used in the United States is generated by nuclear reactors, placing nuclear power second to electricity generated by coal (IAEA 2003a: 7-9; IAEA 2007a). In comparison, over 78 percent of the domestic energy production in France comes from its 59 nuclear reactors (IAEA 2007a). Other countries with relatively large numbers of nuclear reactors include Japan (with 55 operational nuclear reactors that generate 30 percent of its electricity), Russia (with 31 reactors that generate about 16 percent of its electricity), South Korea (with 20 reactors that generate about 39 percent of its electricity), the United Kingdom (with 19 reactors that generate just over 18 percent of its electricity), Canada (with 18 reactors that generate about 16 percent of its electricity), Germany (with 17 reactors that generate about 32 percent of its electricity), and Ukraine (with 15 reactors that generate 47.5 percent of its electricity) (IAEA 2007a).

In its *Annual Report 2006*, the IAEA (2007b: 3) points out that about three-quarters of the world's operating nuclear reactors are 20 or more years old. Since the life span of a nuclear reactor is between 20 and 40 years, depending on the type of technology and design used, it can be expected that decisions about decommissioning a large number of nuclear plants, as well as investing large sums of money to replace these reactors will have to be made over the next two decades. The British government already announced in January 2008 that up to 10 new nuclear reactors will have to be built in the United Kingdom by 2020 in order to replace those that need to be decommissioned. Similarly, Russia announced in March 2008 that it will put four new nuclear reactors into operation by 2020.

In the United States, no new nuclear power plants have been ordered since the late 1970s, since the anticipated growth in electricity demand slowed, and nuclear construction costs soared. The nuclear accident at Three Mile Island in 1979 strengthened the reluctance of utilities to further invest in nuclear reactors. Instead of ordering new reactors, the current trend in the U.S. is rather to increase the

Nuclear Plant near Berwick, Pennsylvania. *The use of nuclear power is becoming increasingly popular as a replacement for fossil fuels becomes more and more necessary. Proponents also cite the cheap cost of production and lack of carbon dioxide by-products as other reasons in support of nuclear power. However, the drawbacks of nuclear power in terms of safety and health can be seen in such instances as the Chernobyl disaster.* **AP IMAGES.**

efficiency of existing nuclear plants. The last new reactor (Watts Bar 1) was completed in 1996 (IAEA 2003a: 6-9). Most of the reactors that are currently under construction, or recently completed, are located in developing countries such as China, Russia, South Korea, and India.

THE BENEFITS AND DRAWBACKS OF NUCLEAR ENERGY

All commercial nuclear power plants generating electricity make use of fission technology, of which there are many varieties; the commercial use of fusion reactors is projected to become a reality only in forty to fifty years. Because nuclear fuel releases exponentially greater amounts of energy than that produced by chemical fuels, and because this fuel (usually uranium^{235}) is abundant and therefore relatively cheap, many policy makers view nuclear power as an attractive option for the provision of a steady supply of energy for the world's economy as the price of fossil fuels continues to rise. These proponents of nuclear power point to two other key advantages of nuclear power: It emits almost no carbon dioxide, one of the major greenhouse gases that have contributed so heavily to global climate change; and renewable energy sources like wind, the Sun, and waves are, in their present state of development, unable to replace fossil fuels.

The main concern of critics of nuclear power is that the by-products of fission are radioactive, and some of them remain so for hundreds of thousands of years. High doses of exposure to radioactive by-products can cause a variety of cancers and genetic deformities. Hence the generation of nuclear energy poses two major safety issues: the permanent disposal of nuclear waste and the operation and decommissioning of nuclear reactors. These concerns are not merely hypothetical: Widespread radioactive contamination resulted from the partial reactor meltdown in 1979 at Three Mile Island in Pennsylvania and from the 1986 disaster in Chernobyl, in Ukraine, which led to the evacuation and resettlement of more than 200,000 people. The risk of exposing present and future generations to unsafe levels of radioactivity is at the core of the political and ethical controversies that surround the use of nuclear energy.

THE MILITARY CONTEXT OF NUCLEAR ENERGY

The first fission nuclear reactors were built in the United States in the early 1940s. They were the product of research conducted by the Manhattan Project (1942–1946), a top-secret program (funded mainly by the United States with help from the United Kingdom) that met its goal of creating the world's first nuclear weapon in 1945. The military origins of nuclear energy are never far from the minds of its critics. Although touted by its champions as a purely peaceful, nonmilitary application of atomic energy, the use of nuclear power poses the risk that plutonium—one of the by-products of nuclear fission—can find its way back from civilian nuclear plants to military applications, thus contributing to the problem of the proliferation of nuclear weapons. With the emergence of so-called rogue states and increasing concerns about global terrorism since the attacks of September 11, 2001, the issue of nuclear proliferation has acquired renewed urgency, as reflected in the search for weapons of mass destruction in Iraq and the monitoring of nuclear programs in Iran and North Korea. Concerns have also arisen about the possibility that terrorist groups might acquire and use a dirty bomb, a "radiological dispersal device" (RDD) that spreads radioactive material with a conventional explosive, such as dynamite.

DEBATES OVER NUCLEAR ENERGY

Given the controversies that swirl around the use of nuclear energy, its future remains cloudy. Since the initial use of nuclear power for civilian purposes in the 1950s, a sociopolitical and ethical debate has raged, centering on the issues of operational safety, costs, permanent disposal of waste, and the risk of proliferation. These debates are dominated by two central questions: (1) Do the benefits of nuclear power outweigh its risks and costs? (2) What principles should guide decision making about nuclear power?

The first question usually elicits utilitarian answers on both sides: Proponents contend that even with all risks and costs considered, the widespread implementation of nuclear power would be a net gain for society; opponents argue that the long-term health and ecological risks are so dire that renewable energy sources are preferable. Both sides of this utilitarian cost-benefit analysis quote facts and figures, often citing sympathetic scientific authorities. Supporters of nuclear power such as the World Nuclear Association (WNA) typically claim that it will provide us with an endless supply of energy, that it is cheap, that it is safe if managed properly, that the problem of long-term storage of high-level nuclear waste will be solved in due course, that we do not have any viable alternatives to provide the energy needs of both industrialized (developed) and developing countries, and that it could help us to reduce emissions of greenhouse gases in the fight against global climate change (World Nuclear Association 2008). It is not just major lobbying groups such as the WNA who are pushing for this form of power—even some notable environmentalists, such as Greenpeace cofounder Patrick Moore, have done an about-face on the question of nuclear energy, viewing it as the only technologically feasible alternative to fossil fuels. He writes that "nuclear energy may just be the energy source that can save our planet from another possible disaster: catastrophic climate change" (Moore 2006).

Quoting different facts and figures, opponents of nuclear power (of which the various reports of Greenpeace [2008] or the Heinrich Böll Green Political Foundation [2008] are examples) typically claim that uranium mining is environmentally destructive and makes use of carbon-intensive technologies; that nuclear power is not safe; that it generates high-level waste that will need long-term management, even with underground burial facilities (geological disposal); that nuclear power is much more expensive than it is claimed to be if the costs of decommissioning of plants and the management of long-term waste storage are included; that nuclear power is economically viable only through direct or indirect state subsidies; that nuclear power exposes the world to the risks of radioactive materials and proliferation; and that nuclear power is not the solution to the challenge of climate change.

The irony is, however, that although this emphasis on quantifiable costs, risks, and benefits is highly important and revealing, the utilitarian debate about nuclear power has fallen into gridlock for a very long time now, with neither side able to convince the other of the merits of its arguments.

NUCLEAR ENERGY AND DECISION THEORY

A similar standoff has resulted from debates about what kind of principles should inform decision making about the development, use, maintenance, and management of nuclear power. Kristin Shrader-Frechette, in her critical analysis of the nuclear industry and its historical evolution (in which she has also contributed substantively to a critical analysis of quantitative risk assessment), argues that typical forms of governmental decision making about nuclear power run against the grain of the principle of prima facie political equality (1983a, 1983b, 1993, 2002). Instead of following the democratic principles of procedural justice and informed consent, nuclear power decisions usually exemplify a heavy-handed, top-down, authoritarian approach, dominated by secrecy and even deception. She seeks to demonstrate that such procedures engender environmental injustices that single out already

marginalized members of society, disproportionately exposing them to the risks of nuclear power while insulating those who benefit from it. A hypothetical example of such injustice would be to offer a very poor, drought-stricken country in sub-Saharan Africa the option of establishing several nuclear waste storage facilities within its borders with a view to stimulate the local economy.

Shrader-Frechette's approach clashes head-on with that of nuclear-power advocates who argue that the confidentiality of energy deliberations is a nonnegotiable principle because national security is at stake; strategic decisions about the provision of energy cannot, therefore, be exposed to public questioning and scrutiny. Such considerations, they believe, justify their rejection of appeals to incorporate measures of open discussion and deliberative democracy in decisions about nuclear energy.

This deadlock shows that further analyses are needed to gain an understanding of channels through which ethical issues related to nuclear power can be better understood and resolved. There have been promising contributions in these areas from the philosophy of science and sociology. Philosophers of science have focused on the relationship between science and technology, particularly on how conceptions about the nature of science can influence—indeed, have influenced—policy decisions about technology development, management, and use. Prominent examples of this approach are found in the work of Robert Frodeman, Carl Mitcham, Christine Turner, and Roger Pielke who show that a simplistic, positivist account has fostered the notion that science works with nothing but unequivocal empirical data and the logical conclusions that follow from them. From this view it follows that deliberations about the significance, use, and applications of science are left to politicians and managers, who eventually decide which technology-development paths should be followed or avoided.

Pielke (2003) points out the irony that, within this decisionistic model, so-called value free science is called upon by decision makers to provide objective facts on the basis of which policy choices can be made. Science is thus invoked to justify policy choices, but only by precluding public discussion of these choices on the grounds that the policies are portrayed as indubitable (scientific) truths. Within the nuclear debate this appeal to the inherent objectivity of science has been used in the past to settle policy issues (for instance, the very choice of adopting nuclear power as a source of energy) without a thorough discussion of the manner in which nuclear technology affects the values of society.

Some scholars propose a different conceptualization of science, one that views it as a social institution, not merely as an insular domain of objective truth. They argue that science affects society in ways that cannot be fully portrayed and assessed by science itself. Accordingly, they argue for a reconceptualization of the relationship between science and policy making, one that takes cognizance of the uses to which science can be put by various societal interest groups. Appeals to science itself often cannot settle disputes between these groups (Sarewitz 2000). Hence there is a need for a constant critical assessment of all claims about the significance and policy implications of science.

Pielke (2003) argues that scientists should actively participate in this process of assessment, whereas Frodeman and Mitcham (2007) introduce the notion of a broad, deep, and critical interdisciplinary approach that fosters collaboration among scholars from the sciences, social sciences, and humanities. They hope to encourage such cooperation not only by asking the "fundamentally humanistic question of what counts as *pertinent* knowledge: Knowledge for what?" but also by describing and assessing the values of society "as it struggles to address questions of social and environmental justice, human freedom and responsibility, and the proper roles of the public and private sectors." An example of such an interdisciplinary approach to nuclear power can be found in the work of Turner and Frodeman (1995), which combines the resources of philosophy and geology in asking how the proposed Yucca Mountain site for the permanent disposal of nuclear waste can be evaluated by the criteria of both science and social values (Frodeman 1995).

Frodeman and Mitcham (2000) have proposed the integration of science and the common good through a process of critical public conversation. Critics of their work have argued that it neglects the power dynamics at play in deep ethical differences about issues such as nuclear power or the permanent disposal of nuclear waste (Rouse 2000). Frodeman and Mitcham's later work on interdisciplinary approaches to these issues does critically address the power relations underlying such differences (2007).

Sociological perspectives on the "social, institutional and technical processes through which technologies become constructed, enacted and maintained" (Irwin et al. 2000, p. 81; Jasanoff et al. 1995) indicate a pathway that can be further explored to engage with some of the power relations that are implicit in any public conversation. Alan Irwin focuses on the discourse used by authoritative speakers to establish and maintain confidence in civilian nuclear power—even in the face of severe obstacles such as major nuclear accidents. He examines the justification of nuclear power (a) in a discourse of modernity in which nuclear power is portrayed as one of the first manifestations of Big Science and thus inevitably constitutes social progress; (b) in technical arguments based on the assumption that any technical problems will surely be ironed out by advancing scientific understanding (which means that nuclear "accidents can be dismissed as part of

the technological learning curve or else viewed as a consequence of non-scientific design choices''); (c) in a view of the environment ''as resilient and robust in the face of radioactive contaminants provided emissions are kept at a 'reasonable level'''; and (d) in the opinion that the acceptability of risks can be determined objectively and rationally on quantitative scales that function independently from institutional processes and particular contexts (Irwin et al. 2000, pp. 82–83).

Perhaps these critical perspectives from the philosophy of science and sociology will fail to find a receptive audience among real-world decision makers. But faced with the specters of global climate change and rising prices for ever scarcer fossil fuels, these officials will be searching for grounds on which to decide whether to replace aging nuclear plants with newer ones or to turn instead toward heavy investments in research into renewable energy technologies. The contributions of philosophers and sociologists can help to shift the debate about nuclear power from utilitarian arguments about its costs and benefits to dialogues about the form of rationality at work in science and policy making—perhaps even to public conversations between decision makers and the citizenry that can self-consciously and critically consider the impact of policy choices on the values, aspirations, and ideals of society.

SEE ALSO *Chernobyl; Energy.*

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O

OCEANS

The oceans, which cover about 71 percent of the surface of Earth, are composed of a great variety of life-filled habitats that range from the dark and cold of the deep ocean-floor trenches to the sunlight and warmth of tropical lagoons. The oceans support a tremendous degree of biological species diversity and account for just less than half of annual carbon fixation via photosynthesis. The great volume of ocean water absorbs carbon dioxide, oxygen, and other gases as well as heat from the Sun. Major currents such as the Gulf Stream and the Humboldt Current circulate both warm water and cold water across the face of the planet. Marine environments are thus critical to the composition of the atmosphere, the production of weather, and the long-term regulation of climate. Humans always have utilized marine resources ranging from edible algae, to cleansing sponges, to whale oil, to petroleum pumped from offshore platforms. Travel across the ocean surface is integral to the international shipping of goods. Coasts are prime locales for recreation, such as surfing and snorkeling. Humans have evolved unique maritime cultures, with art, myth, technology, and even religion focused on the sea.

RELIGIOUS AND MYTHIC TRADITIONS

In Middle Eastern and European myths the oceans are critical to primordial creation events. The opening chapter of Genesis gives aquatic and marine environments priority in the narrative of creation as God's spirit "moves over the face of the waters" (Genesis 1:2). God closes the separation of the land from the waters by declaring the physical structure of the emerging planet to be "good" and, by using the Hebrew word *tob* ("beautiful"), granting the oceans inherent worth. The ancient world associated the oceans with chaos, mystery, and uncontrolled physical force. The story of Noah's ark is one of many variants of the flood myth in cultures worldwide that describes the oceans exceeding their boundaries and serving as agents of divine displeasure or universal social reorganization.

In Greco-Roman cosmology water is one of the four basic elements, along with earth, air, and fire. The capricious and temperamental deity of the oceans, Poseidon or Neptune, although rewarding sailors who respect him with fair winds, often invokes his physical power, causing storms and other disasters. In ancient Roman art, sea monsters were associated with chaos, whereas dolphins symbolized rescue and therefore religious salvation or the afterlife. In the religions of eastern and southern Asia the oceans also convey universal values, such as the vastness and depth of the Buddha. Ancient Greco-Roman and biblical conceptualization of the oceans strongly influenced Western philosophical and literary perceptions until the modern era.

Regional religions, especially those of cultures dependent on oceanic resources, often personify sea creatures and emphasize their organic productivity. In the *Kumulipo,* a chant recounting the Hawaiian creation myth, the coral polyp, a keystone species of tropical reefs, is the first creature born of the divine pair of primary deities, Kumulipo and Po'ele. The *Kumulipo* describes the faunal diversity of the reef, including fishes, turtles, lobsters, and other invertebrates, such as starfish, sea cucumbers, limpets, and

mollusks. The impressive inventory classifies marine life by similarity of form and by habitat.

Tribes of the Pacific Northwest treated salmon as a separate animal society, with their villages situated beneath the waves. Regional religions often deify marine phenomena such as tidal waves and marine organisms such as sharks and whales, which also may serve as family or clan totems. Cultures dependent on oceanic resources utilize laws and rituals to guide the management of marine harvest. The cultures of the Pacific Northwest have a First Fish ceremony, which precludes the harvesting of salmon for several days at the beginning of an upstream run, ensuring the escape of an adequate number of spawning adults to replenish the stocks.

THE HISTORY OF MARITIME MANAGEMENT

The ancient Greeks were the first western philosophers to consider the oceans, and Aristotle (384–322 BCE) wrote treatises on the biology and diversity of marine organisms. Before the twentieth century, however, philosophical ethicists usually did not treat the oceans as a separate topic and thus wrote little that specifically concerns marine issues. Much of the intellectual tradition concerning the oceans is the product of legal thinkers such as Hugo Grotius, who in 1625 published *Mare Librum*, which argued for international freedom of the high seas for the shipping trade and other commercial uses. During the twentieth century the implementation of treaties and conventions concerning harvesting and environmental care of the oceans greatly expanded. Some early efforts in multinational cooperation include the North Pacific Fur Seal Treaty (1911), which restricted harvesting of both fur seals and sea otters; the Migratory Bird Treaty (1918), which regulated the capture, transport, and sale of migratory birds such as waterfowl; and the International Convention on the Regulation of Whaling (1946), which restricted the harvesting of whales and established the International Whaling Commission.

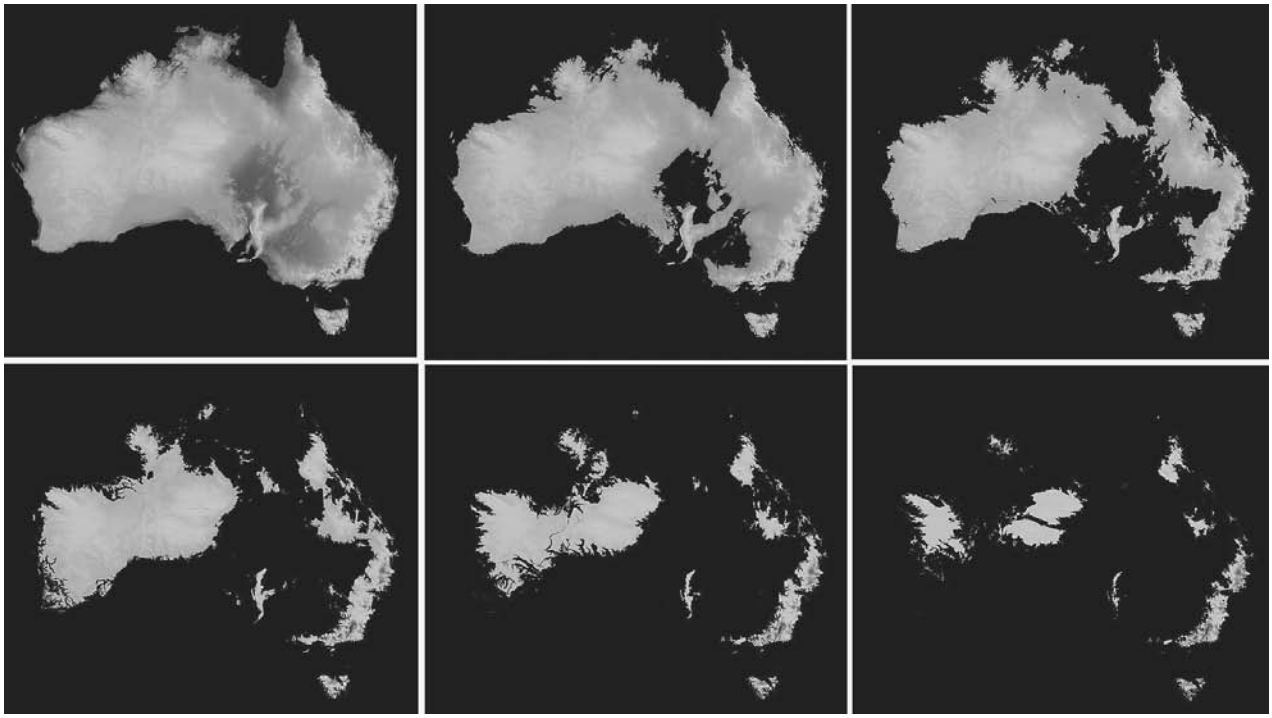
The regulatory trend since the 1970s has been toward negotiating conventions and agreements for managing specific regions such as the Mediterranean, protecting the high seas from destructive activities such as the dumping of radioactive waste, and expanding national jurisdictions farther offshore. A particularly influential instrument is the United Nations Convention on the Law of the Sea (UNCLOS III) of 1982, which has tied the right to manage the seas to responsibility to protect their biotic and environmental resources and encouraged individual countries to manage the adjoining continental shelves. Before World War II most nations claimed exclusive jurisdiction over three to six nautical miles of ocean contiguous to their shorelines. Since that time many nations, including the United States, have claimed Exclusive Economic Zones of two hundred nautical miles.

ENVIRONMENTAL ETHICS AND THE SEA

One of the first ethical models applied to fisheries in response to the environmental movement of the 1960s was Garrett Hardin's tragedy of the commons, which describes the human tendency to overutilize commonly held resources. Before the modern period the high seas were treated as common property, open to any nation able to send ships to harvest from them. That resulted in the depletion of a number of species of marine mammals, including the Atlantic gray whale and Steller's sea cow, both now extinct, and all three species of right whales, which are endangered. Hardin's model suggests not just regulating resource extraction but requiring those utilizing ocean resources to contribute to their care and management, a value reflected in UNCLOS III.

More recently the philosopher J. Baird Callicott (1992) proposed extending the principles of Aldo Leopold's land ethic to the oceans. This model encourages humans to view themselves as participants in the ocean community and recognize the inherent value of the living organisms that inhabit the seas. In 2004 Susan Bratton suggested using Rachel Carson's writings on the oceans to develop an ecotonal ethic of the oceans that compensates for human perceptual limitations in understanding ocean processes and ecosystems. The oceans present a suite of environmental issues that differ from those on land because of the prevalence of public domain, the limited exploration of the deep seas, and the international nature of ocean conservation. Recent volumes dedicated to ocean values include L. Anthea Brooks and Stacy VanDeveer's *Saving the Seas* (1997) and Dorinda Dallmeyer's *Values at Sea: Ethics for the Marine Environment* (2003). Since the 1970s academic dialogue and publication concerning ocean ethics have been oriented increasingly toward specific cases, four of which are discussed below.

Shoreline Development and Sea-Level Rise A major source of damage to inshore ecosystems such as those of barrier islands, tidal marshes, inlets, and coral reefs is the human attempt to stabilize the inherently dynamic boundary between the oceans and the land. Protection of docks and channels is of course necessary to shipping and international commerce. When they are not interfered with, natural processes such as major storms and long-term changes in climate restructure and relocate shorelines as sea levels rise and fall. Contemporary archaeologists find the remains of ancient cities and settlements below the current tide line.



Projection of Australia as Sea Levels Rise. *In this series of images, U.S. geographer Stephen Young has calculated how the Australian continent would appear if the seas were to rise by increments of 100 meters (a total of 500 meters in the final image). Such a rise in sea levels would transform Australia from a massive continent into an archipelago of smaller islands.* **STEPHEN YOUNG/SALEM STATE COLLEGE VIA GETTY IMAGES.**

At the height of the continental glaciations, ending about 18,000 years ago, shallow-water regions currently below the low tide line, such as part of the Irish Sea, were above sea level. This former terrestrial zone was flooded slowly as the glaciers melted. In the contemporary period accelerated changes in global climate and atmospheric change resulting from the use of fossil fuels and land clearing are speeding the recession of the ice caps; thus, sea levels are continuing to rise, threatening to flood many low-lying coastal regions, such as the coasts of Florida, the Polynesian islands, and much of Bangladesh. Aside from climate change, storms, tsunamis, and other disturbance events continually re-form coastlines through the processes of erosion and deposition. Hurricanes, typhoons, and other major weather events can move great volumes of material, overwashing barrier islands, cutting shorelines back many meters, and flattening entire dune systems. On Cape Hatteras, North Carolina, for example, one major storm can fill an inlet across the islands, leaving a bridge spanning sand flats while cutting through roads and forming new inlets completely across the islands at other locations.

Preindustrial cultures usually avoided permanent construction on unstable shorelines, elevated buildings above flood levels, or occupied beaches by using temporary camps and portable infrastructure. The demand for permanent facilities for industry served by paved roads and the development of recreational or seasonal residences within an easy walk of the ocean have made modern coastal communities vulnerable to severe damage and financial loss from both sea-level rise and storm-induced flooding. The sprawl and inflated land values of modern coastal cities also encourage construction on high-risk properties.

When Hurricane Katrina flooded New Orleans in 2005, the older portion of the city, established on higher ground, avoided complete inundation because of its elevation. Wards at lower elevations were under several meters of water, causing major loss of life and billions of dollars of property damage. New Orleans, with its hurricane-breached levees, is also a lesson in the difficulty of protecting coastal municipalities with artificial barriers. Immobile sea walls such as the one in Galveston, Texas, offer little protection from the most severe storm surge while disrupting the natural process of sand deposition, which provides the buffer zone between land and sea.

The current engineering solution to eroding shorelines is often to dredge millions of cubic meters of sand from the ocean bottom and ''nourish'' the beaches. The dredging damages ecosystems on the ocean bottom.

Many of the major sand deposits are of Pleistocene origin and are not being replenished, and so beach nourishment may not be a long-term solution, at least in terms of current geologic resources. Global climate change, especially if the primary trajectory is toward warmer temperatures and the melting of the glacial ice sheets, will increase the impacts of storm surge and coastal erosion caused by sea-level rise. Some scientific models also conclude that cyclonic storms of oceanic origin will have greater average intensity.

The issues presented by shoreline change include whether some natural environments should be exempt from human development, at-risk coastal environments should remain in the public domain, and governments should prevent development in coastal areas with a high risk of flooding. Ethicists have invoked the precautionary principle in the case of beaches known to be dynamic. Coastal regulations may require buffer zones or exclude highly unstable sites from construction. Barrier islands, for example, have high value for recreation and protect mainland shorelines from wave damage. The designation of Cape Hatteras and Cape Lookout as U.S. National Seashores has made those areas accessible to the public while reducing storm-inflicted property damage. The concept of sustainable energy production based on renewable energy is a concrete approach to the issue of accelerated sea-level rise because a reduction in emissions of greenhouse gases would slow global climate change.

Fisheries and Harvest of Marine Life Humans long ago discovered that inshore marine resources such as coral reefs are easily overexploited. Polynesian cultures have chiefs who regulate the taking of reef resources and enforce the seasons for the harvesting of different species as well as the numbers and sizes of the organisms removed. Tribes and nations have fought wars over access to lucrative fisheries, such as those for salmon and cod. Industrialization has increased the human capacity to deplete marine fisheries. When engine-powered craft and winches began to displace fishing with hand lines and nets hauled by muscle power in the nineteenth century, fishers who long had fished by hand protested the potential damage to spawning beds and to the invertebrates and bottom-dwelling creatures on which many fisheries depend. The tonnage harvested increased, as did the amount of by-catch, or marine creatures caught and killed by accident. Scientists of the nineteenth century, including Thomas Huxley, rejected the concerns of experienced commercial fishers, whom they considered uneducated. Huxley believed the oceans were so vast and productive that their fisheries could not decline significantly. The industrialized methods, however, damaged the fertile shallow banks off Britain, and fishers had to travel farther and farther out to sea to find fish.

Current ecological research indicates that many fisheries management programs that are based on obtaining maximum sustainable yield have resulted in declines not just in fish population numbers but also in the size and quality of the fish harvested. The mathematical formulas used to predict yield did not incorporate adequate information about fish demography, population geography, ocean food webs, or environmental variations in ocean conditions, such as fluctuations in ocean temperature caused by El Niño. Oceanographers using underwater cameras have surveyed ocean bottom sediments plowed by trawling and discovered that invertebrate populations critical to the food chains that support commercial fisheries have been disturbed. Another example is the Chesapeake Bay of the eastern United States, where the use of dredges has destroyed the oyster beds necessary for oyster larvae to establish and grow on the solid substrate of old shells.

The degradation of some ocean fisheries has been so great that many, such as the ground fisheries of Georges Bank off New England, have been closed temporarily by national governments or international agreements. The larger fishing vessels of heavily capitalized fleets and the wealthier countries often have driven less well financed or indigenous fisheries out of business. International fishing fleets are reducing fish availability for regional fisheries from the coasts of Africa to the shores of the Bering Sea. The human populations of forty countries worldwide are dependent on fish or marine food sources for a majority of their protein intake. All but one of those nations would be classified as less developed.

Ethical models applied to fisheries include the precautionary principle, sustainability, the inherent value of all species, and ecojustice or environmental justice. The precautionary principle holds that new capture and processing technologies should not be deployed to harvest an entire fishery or used under the supposition of extracting the maximum sustainable yield until the impacts of the technology have been studied fully and understood. Unfortunately, regulation of new fisheries often lags behind the development of the technology to exploit them, and so the international norm is still overharvesting of species such as orange roughy and Patagonian toothfish (Chilean sea bass).

The concept of sustainability requires leaving resources available for harvest in the immediate and distant future. This requires closing or limiting extraction from fisheries in decline and may mandate less destructive methods of capture, such as the use of hand lines. The concept of the inherent worth of all species requires reduction of incidental catch (by-catch) of nontarget organisms such as sea turtles and seabirds. This may be accomplished by banning technology prone to accumulating incidental harvest, such as drift nets; improving technology, for example, by installing turtle excluder devices on shrimp nets; or simply

closing offending fisheries by, for example, banning the use of trawl nets near seabird rookeries. Ecojustice calls for defense of the livelihood of indigenous and inshore fishing communities and fair access to ocean resources. These principles also encourage the preservation of cultural and linguistic diversity.

An additional issue for fisheries is the proliferation of fish and aquatic species culture. Salmon farming has displaced the harvesting of wild stocks through much of northern Europe. Salmon farms harbor diseases, produce waste, and disturb coastal ecosystems. Shrimp culture for export has spread ponds through coastal southeastern Asia, displacing mangrove forests and natural lagoons. Scientists are skeptical about the use of hatchery-reared salmon to replenish oceanic stocks. Interbreeding between hatchery fish and wild fish may decrease the genetic viability and ecological fitness of the salmon populations. Environmental ethical responses include ecosystemic rights in which there would be a requirement for the preservation of substantial and representative areas of natural ecosystems and the concept of maintaining wilderness areas or zones free of human interference, which may be applied to marine as well as terrestrial habitats. The global trend toward industrializing and privatizing fisheries is also an environmental justice issue in that it replaces family-owned fishing boats with large corporate fleets or fish farms.

Ocean Pollution Human pollution of ocean environments is of two geographic origins. The first is direct dumping or release of materials and toxins into the oceans either from ships or by discharge in ports or on the coast. Examples include ships spilling or leaking oil, sewage being pumped into estuaries by towns, oceanic dumping of sludge, freighters emptying bilges, and a ship's crew tossing garbage overboard. Lisa Newton, Catherine Dillingham, and Joanne Choly (2006) proposed three ethical imperatives that would prevent disasters such as the *Exxon Valdez* grounding in Prince William Sound, Alaska: holding those accountable legally responsible and enforcing the law, protecting the last remaining stretches of wild coast by restraining economic development, and pursuing sustainable energy polices that would reduce dependence on oil. Ocean drilling for oil and gas may also cause spills, and adds to greenhouse gas emissions. Offshore deposits of gas hydrates, such as methane hydrate, represent a major untapped energy source on the continental shelves, and may contain twice the carbon of all other fossil fuel reserves. Methane hydrate is trapped in ice crystals in relatively deep water; thus new technologies are necessary to exploit it. As methane is among the most powerful of greenhouse gases, the extraction of gas hydrates could add significantly to global climate change and sea-level rise.

The second source of ocean pollution is items and substances, often originating in the middle of continental landmasses, that are carried long distances by rivers or the atmosphere and eventually reach the ocean. Fertilizer spread in the midwestern United States reaches the Gulf of Mexico via the Mississippi River, and pesticides spread on marshes or farm fields make their way into aquatic food chains and eventually end up in coastal sediments. Atmospheric transport of nitrogen and sulfur compounds released by factories, electrical power generation, and automobiles produces acid rain over estuaries such as Chesapeake Bay. The additional nitrogen may act as a fertilizer, stimulating algal blooms. As the algae die and bacteria draw oxygen from the water during the process of decomposition, even marine environments can become anoxic (without oxygen) and thus fatal to fish and other animals.

Regulation of ocean pollution was slow to develop because much of the offending material was diluted or washed into international waters, where the impacts were not visible to the public. Although offshore disposal is regulated by the Convention on the Prevention of Marine Pollution by the Dumping of Wastes and Other Matter of 1972, also known as the London Dumping Convention, people still have difficulty comprehending the damage their activities do to the oceans. Among the environmental problems people have difficulty seeing—at least without the assistance of marine science—is the spread of dead or toxic zones where cities have deposited their sludge and other wastes or where major rivers have carried high loads of pollutants out to sea. A dead zone extending for many kilometers has appeared offshore from the Mississippi River Delta. Although the causes of this environmental disaster are not known completely, marine ecologists suspect pollutants such as fertilizers and industrial effluents. If this happened in a forested or agricultural region, the U.S. public would be outraged.

A potential environmental ethical response to both the damage caused by dead zones and the plowing of the ocean bottom with drag nets is to invoke ecosystemic equity and integrity: Humans should use the same standards for protecting ocean habitats that they use for managing habitats on land and should not protect some marine ecosystems while degrading others. Further, people should maintain the basic ecoystemic function and components of the ecosystems they purposefully harvest (bottom fisheries) or affect coincidentally (the dead zones). In the case of bottom disturbance, regulating more destructive fishing methods is appropriate and helps conserve the reproductive potential of the fish. In the case of dead zones, humans should reduce pollution inputs until the zones can recover their natural species diversity and food webs.

The public is more likely to observe trees dying from acid rain than to notice the impacts of additional

nitrogen on an estuary. Under the concept of ecosystemic equity, both a mountain spruce forest and submerged flats of eel or turtle grass merit human care and protection. Regulation of ocean pollution has made increasing use of the precautionary principle. The 1996 Protocol of the Convention on the Prevention of Marine Pollution by the Dumping of Wastes and Other Matter allows oceanic disposal only of listed materials; all other forms of waste are excluded until proved safe and officially added to the inventory of permitted wastes.

Marine Parks There has been a global expansion of networks of marine parks and reserves. The twentieth-century strategy was primarily to protect the aesthetic and the tourism-worthy. A majority of marine parks currently steward coral-studded lagoons, kelp forests, rocky reefs, and other ecosystems popular with swimmers, scuba divers, and recreational fishers. Application of the concept of ecosystem equity, however, implies that the representative areas of open continental shelves, deep trenches, and even shallow banks such as Georges Bank, which is critical to North Atlantic fisheries, should be protected from human disturbance. Recent scientific studies have found that setting aside protected areas in more ordinary habitats preserves fish spawning and feeding areas and maintains populations of a wide variety of marine organisms, including invertebrates taken as bycatch.

SEE ALSO *Coral Bleaching; Environmental Justice; Global Climate Change; Greenpeace; Hunting and Fishing: I. Overview; Hunting and Fishing: IV. Angling; Hunting and Fishing: V. Commercial Fishing; Hurricane Katrina; Land Ethic; Leopold, Aldo; Pollution; Polynesia; Precautionary Principle; Species; Sustainability; Tragedy of the Commons.*

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Susan Power Bratton

ODUM, EUGENE
1913–2002

Eugene Odum, born on September 17, 1913 in Newport, New Hampshire, was one of the most influential figures in twentieth-century ecology. Best known for his advocacy of the concept of ecosystems and holistic ecosystem-based perspectives in ecology and environmental problem solving, he has been called the father of modern ecology.

Gene Odum received his Ph.D. in zoology from the University of Illinois in 1939, writing a dissertation on environmental influences on bird physiology. While at the University of Illinois he came under the influence of the animal ecologist Victor Shelford. Odum's holistic conception of ecological systems was strongly influenced by Shelford's and Frederic E. Clements's conception of the plant-animal community as a complex superorganism. According to this conception, the plant-animal community responds as a dynamic unit to changes in abiotic conditions, progressing through a sequence of developmental stages until it reaches a self-perpetuating stable equilibrium. Odum defended a modified version of Clements's succession theory throughout his career, but instead of treating the plant-animal community as the fundamental unit of analysis, Odum adopted Arthur Tansley's concept of an ecosystem. Odum's mature theory of ecosystem growth and development draws on thermodynamic and cybernetic concepts found in the work of Alfred J. Lotka, Raymond Lindeman, G. Evelyn

Hutchinson, and his own younger brother Howard T. Odum.

In the 1940s at the University of Georgia, Gene Odum began writing *Fundamentals of Ecology*, which was to become the most successful textbook in the history of ecology. *Fundamentals of Ecology* was first published in 1953, a second edition (coauthored with his brother Howard) appearing in 1959, and a third edition in 1971. *Fundamentals of Ecology* is notable for its emphasis on the ecosystem as the fundamental unit of analysis for ecology and its systematic integration of general ecological principles, applied conservation science, and environmental advocacy. Odum believed that ecological science could and should function as a foundation for environmental problem solving and ecologically sustainable economic and social development. *Fundamentals of Ecology* is credited with attracting a generation of students that shared Odum's optimistic vision of ecology as an integrated-systems science with the potential to transform humanity's relationship with the natural environment in positive ways.

The popularity of Odum's style of ecosystem ecology reached its peak within academic ecology by the end of the 1960s. In plant-community ecology in the 1970s, Clements's succession theory was effectively replaced by more reductionistic models of plant communities that emphasized their lack of internal coherence and the radical contingency of successional trajectories. Evolutionary ecology also emerged as a powerful new integrative perspective that challenged the group-selectionist assumptions in Odum's model of ecosystem development. By the end of the 1980s, holistic, systems-oriented ecosystem ecology was effectively marginalized in academic ecology in the United States. Nevertheless, ecosystem ecology in the tradition of Gene and Howard Odum continues to be developed and practiced by ecologists around the world.

In the last two decades of his life, Gene Odum devoted more of his time to promoting and presenting his vision of ecology and sustainable living to a broader audience. In 1989 he published *Ecology and Our Endangered Life-Support Systems*, and in 1998, *Ecological Vignettes: Ecological Approaches to Dealing with Human Predicaments*. In these works Odum argued that principles of ecosystem growth and development apply equally to human socioeconomic systems, and he developed a prescriptive model of social organization based on these principles. For example, Odum believed that ecosystems with more extensive mutually beneficial interactions between system components are more stable than ecosystems with less such interactions, and that diversity of components promoted system stability by enabling redundancy in critical ecosystem functions. Consequently, he recommended modes of social organization that increased cooperative relationships and decreased competition, and argued for diversification of energy and food sources to ensure stable supplies of these resources.

Odum argued that this transformation of human social systems to ecological maturity requires a new set of ethical and political values. The values of free-market industrial capitalism may be adaptive in the early stages of economic and social growth, but become liabilities in later stages when limiting constraints on growth become evident. The transition to a more harmonious relationship between humanity and the natural environment requires a shift in values that promotes efficient use of resources, recycling and reduction of waste, higher degrees of cooperation and diversity among social groups, and greater appreciation of the dependence of human welfare on the quality of environmental resources. Such values promote the conditions for stability of mature social systems, just as they do the stability of mature ecosystems.

Odum's ethical writings have been compared to Aldo Leopold's land ethic, though Odum's rhetoric is more consistently anthropocentric than Leopold's. Nevertheless, Odum's style of ecosystem ecology has often been used to underwrite the views of nonanthropocentric environmental ethicists and deep ecologists.

SEE ALSO *Conservation Biology; Ecology: III. Ecosystems; Holism; Leopold, Aldo; Sustainability.*

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Kevin deLaplante

ORGANIC FARMING

The term *organic farming* was first used in 1940 by Lord Walter Northbourne in *Look to the Land* (p. 81), to describe an alternative to *chemical farming*. Organic farming is a method of agricultural production that eschews chemical fertilizers and pesticides. But organic farming is not simply a way of growing food; it is also a social movement. From its inception, strong ideological

notions relating to soil, health, nature, politics, science, and spirituality have offered both a critique of and alternative to modern orthodox farming practices. At times the subject of passionate and polarizing debates, organic farming has often been considered marginal, antiquated, or even subversive. Around the turn of the twenty-first century, it became increasingly important economically and culturally, but new questions have begun to emerge regarding the effect of this success on its ideological and philosophical underpinnings.

ORIGINS

Organic farming is based on traditional agricultural practices, but its emergence as both a method and a movement was mainly a reaction to the increasing industrialization of agriculture in the early twentieth century. Philip Conford describes the history of the early movement, centered in England, in *The Origins of the Organic Movement* (2001). At this time, organic farming was mainly promoted by members of the social and intellectual elite. Their political motives ranged widely, but organic thought was consistent in a number of aspects. Belief in the importance of soil and the necessity of humus (organic matter) for sustainable production of healthy crops has always been central. More than merely a scientific argument, this idea is based on a holistic worldview that emphasizes interconnectedness and an agriculture that mimics natural systems. Early organic advocates believed that healthy soil was connected to healthy crops, healthy crops to healthy people, and healthy people to healthy societies. This holistic worldview is fundamentally at odds with the scientific reductionism of modern agriculture, and the organic movement has long been based on opposition to this emerging orthodoxy.

Other concerns of the early movement included preserving rural populations, culture, and livelihoods. Organic proponents opposed agricultural mechanization and argued that agriculture rather than industry should form the basis for a healthy nation. In this way, the early organic movement embodied philosophical and political beliefs similar to the agrarianism of Thomas Jefferson and others. Early organic thought also parallels agrarian philosophy in its promotion of small, independent, diversified farms, and its rejection of agriculture singularly focused on economic efficiency.

Perhaps the most prominent and influential of the early organic proponents was Sir Albert Howard. Howard developed and promoted a systemic vision of agricultural production and land stewardship based on returning composted organic waste to farm fields, and rejected the economic materialism of industrial agriculture. Howard emphasized the role of organic farming in promoting individual and social health, and maintaining soil fertility for future generations. A prolific lecturer, Howard also presented his ideas in a number of published works, including *An Agricultural Testament* (1940) and *The Soil and Health: A Study of Organic Agriculture* (1947).

Though a trained scientist himself, Howard states in *An Agricultural Testament* that "Instead of breaking up the subject into fragments and studying agriculture in piecemeal fashion by the analytical methods of science, appropriate only to the discovery of new facts, we must adopt a synthetic approach, and look at the wheel of life as one great subject and not as if it were a patchwork of unrelated things" (p. 22). Like many in the early movement, his holistic vision of farming was connected to a Christian spirituality that included a concept of nature as divine. Like many others, he was also highly influenced by Asian thought.

Another important figure in the development of organic farming was the Austrian philosopher Rudolph Steiner. Like Howard, he rejected the materialism and reductionism of modern agricultural practices and emphasized the living soil as the basis for health, vitality, and spiritual connection. Steiner's philosophy was influenced by Franz Brentano, Friedrich Nietzsche, Hinduism, and Theosophy, but was based most heavily on the works of Johann Wolfgang von Goethe and Christian spirituality. Steiner published several works on Goethe's epistemology, spirituality, and concepts of nature and science. Though his writings span a variety of subjects, among his most important and lasting influences was his development of *Biodynamic Agriculture*, an intensive, integrated production method that conceives of the farm as a self-contained system balanced by the interconnected life-forces of both the earth and cosmos.

Both Steiner and Howard were important influences for Jerome Irving Rodale, a magazine publisher and health crusader who would become the foremost advocate for organic farming in the United States. Unlike most of his European counterparts, Rodale promoted organic in a way that was primarily pragmatic, secular, and apolitical. Among his most important contributions were his promotion of organic gardening, which introduced its methods to non-farmers, and his establishment of long-term research trials comparing organic and conventional production methods.

Rodale's publications were highly influential for the American counterculture, which embraced organic farming and gardening passionately during the late 1960s and early 1970s. During this time, young people participated in a vast rural migration to conduct utopian experiments in homesteading and communal living. Warren Belasco details this phenomenon in *Appetite for Change: How the Counterculture Took on the Food Industry* (1989). This "back to the land" movement was based on a neo-agrarian

Examining Organic Produce, Springfield, Virginia. *Ogranic food—produced without chemical pesticides —has become more and more popular, and is found in grocery stores and markets throughout the world. Proponents of organic food cite that it is more environmentally friendly than chemical dependent and/or land-intensive agriculture.* **AP IMAGES.**

worldview that rejected consumerism in favor of self-sufficiency, simplicity, and a closer connection to the natural world. Like the early organic movement, it emphasized small farms, soil conservation, and crop diversity, as well as environmentalism and energy conservation. In contrast, its social goals were promoted more through lifestyle decisions than political advocacy.

This movement formed the basis for a community of like-minded individuals who worked to develop, define, and promote organic farming and production standards. By the late 1980s organic food had gained significant popular status, and was beginning to command premium prices. At the same time, production standards had become more complex, and certification schemes were increasingly sophisticated and numerous. Recognition of the emerging economic importance of organic products and a perception that their commercial development was limited by the lack of consistent standards led to the legislative institutionalization of organic farming through the development of national certification programs.

A MOVEMENT IN CRISIS

In the United States, a National Organic Program (NOP) administered through the Department of Agriculture was authorized through the 1990 farm bill to establish rules defining appropriate practices and a process for certifying organic farms and production facilities. Initially organic growers and advocates were encouraged by this legitimization, but the implementation and repercussions of the NOP have caused considerable frustration and disillusionment over time. Appropriate materials and practices have always been controversial, and remain contested.

Enacted in 2002, the NOP Final Rule describes organic farming as ''A production system that is managed in accordance with the [Organic Foods Production] Act and regulations in this part to respond to site-specific conditions by integrating cultural, biological, and mechanical practices that foster cycling of resources, promote ecological balance, and conserve biodiversity'' (Subpart A, Section 205.2). As such, the NOP ignores social movement issues related to health, labor standards, farm size, energy conservation, and rural development. Critics have claimed that the NOP has robbed organic farming of its philosophical basis, and facilitated its commercialization and industrialization. Since its implementation there have been substantial increases in the size of organic farms, the number of farms growing both organic and conventional produce, the prevalence of organic products originating outside of the United States, and the concentration of ownership in the organic food processing and retail sectors.

In response, many traditional organic producers have sought to differentiate themselves and their products based on their adherence to traditional elements of the organic philosophy. One result has been the emergence of the terms *beyond organic* and *moreganic*, the *local food* movement, and the reframing of organic principles using terms such as *civic agriculture*, coined by Thomas Lyson in his 2004 book *Civic Agriculture: Reconnecting Farm, Food, and Community*. The rapid development of civic agriculture and the local food movement are evident in the proliferation of farmers markets and *community supported agriculture,* which invites consumers to participate directly in the labors, risks, and rewards of food production. The growth of such direct marketing practices is consistent with organic movement support for small, diverse, independent farm enterprises, and is being led by farmers committed to traditional organic production methods.

For almost a century, organic farming has been an evolving, negotiated, values-based activity related to ideological notions regarding the relationship between nature, society, and food production. Small, diverse, ecologically conscious growers continue to maintain farm operations based on the kind of holistic, postmaterialist, agrarian values that have been the hallmark of organic philosophy. Organic farming practice is thriving today, but the organic farming movement is very much in crisis. Caught between two equally uncertain and divergent scenarios, its adherents are struggling simultaneously to maintain as many of its principles as possible within the current rules, and to redefine a movement that has lost its name, and is unable to divest itself from the system that has usurped it.

SEE ALSO *Agriculture; Berry, Wendell; Factory Farms; Farms; Genetically Modified Organisms and Biotechnology; Jackson, Wes; Shiva, Vandana; Sustainable Agriculture; U.S. Department of Agriculture.*

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Taylor Reid

ORTEGA Y GASSET, JOSÉ
1883–1955

José Ortega y Gasset, the most important Spanish philosopher of the twentieth century, was born on May 9, 1883, in Madrid. He held the chair of metaphysics at the Central University of Madrid. He was elected to the constituent assembly during the Second Republic. After the outbreak of the Spanish Civil War, he lived in exile, first in Argentina and various parts of Europe, settling in Portugal 1945 and returning permanently to Spain in 1948.

THE FOUNDATIONS OF ORTEGA Y GASSET'S ENVIRONMENTAL PHILOSOPHY

Ortega y Gasset's philosophy, beginning with his programmatic statement (1914), "I am I and my circumstance" (Ortega y Gasset 1963, p. 45) has been called "the first expression of an ecological approach in philosophy" (Rogers 1994, p. 505), Ortega y Gasset's concept of "circumstance" having been influenced by Jakob von Uexküll's (1864–1944) concept of the *Umwelt* (surrounding world, environment) of the organism and by Edmund Husserl's (1859–1938) phenomenological concept of the *Umwelt* (Marías 1970). Uexküll's concept is biologically oriented, focusing on the structure of the organism. Husserl's concept is phenomenological, focusing on the practical world (later the "life-world") as it is given to consciousness. Rejecting Husserl's transcendental turn, Ortega y Gasset was able to draw on both Uexküll's naturalistic concept and Husserl's phenomenological concept.

Although Ortega y Gasset did not concentrate on environmental issues in the contemporary sense, he did emphasize the impact of the environment on culture and individuals. His theory of "vital reason" began to take shape in his account of a forest in El Escorial, the reality of which he views as a function of vital experiences (Ortega y Gasset 1963, pp. 59–69; Marías 1970). Noting the sad state of ethical theory, he wrote, "There are people who believe in good faith that we have no obligations toward the rocks and therefore have tolerated advertisers' smearing with pitch . . . the venerable rocks of the mountain ranges" (2007, p. 99). The rocks of the mountain can only be what they are, "venerable," as a function of individual perspectives (Marías 1970).

ORTEGA Y GASSET ON HUNTING

Ortega y Gasset's most important work on broadly environmental issues is his *Meditations on Hunting* (1942), originally written as a preface to a memoir on big game hunting by his friend Edward, Count Yebes. It has become one of the most influential philosophical works on this subject, especially among hunters. His approach is explicitly existential: "The life that we are given has its minutes numbered, and in addition it is given to us empty. . . . Thus, the essence of each life lies in its occupations" (2007, p. 35). Ortega y Gasset notes that most human work is unsatisfying, draining life rather than filling it up. Therefore, the human being "finds it essential to divert" himself or herself (2007, p. 29). Hunting—along with dancing, racing, and conversation—is one of the diversions traditionally practiced by human beings for their own sake. Hunting is an activity in which, rather than losing time, we are "gaining it, filling it satisfactorily and as it should be filled" (2007, p. 37).

Distinguishing hunting from fighting, Ortega y Gasset defines hunting as "what an animal does to take possession, dead or alive, of some other being that belongs to a species basically inferior to its own" (2007, p. 62). But Ortega y Gasset insists that it is essential to hunting that the hunted animal has its chance to avoid capture. "There is, then, in the hunt as a sport a

supremely free renunciation by man of the supremacy of his humanity. Instead of doing all that he could do as man, he restrains his excessive endowments and begins to imitate Nature—that is, for pleasure he returns to Nature and re-enters it" (2007, p. 63).

In addition to this hunter's ethos, Ortega y Gasset recognizes ethical issues pertaining to the activity of hunting itself. "Every good hunter is uneasy in the depths of his conscience when faced with the death he is about to inflict on the enchanting animal. He does not have the final and firm conviction that his conduct is correct. But neither, it should be understood, is he certain of the opposite" (2007, p. 98). But Ortega y Gasset insists that "the greatest and most moral homage we can pay to certain animals on certain occasions is to kill them with certain means and rituals" (2007, p. 101). He attacks "photographic hunting" as an ethical "mannerism" (2007, p. 103), because "In the preoccupation with doing things as they should be done—which is morality—there is a line past which we begin to think that what is purely our whim or mania is necessary. We fall . . . into a new immorality . . ., which is a matter of not knowing those very conditions without which things cannot be" (the goal of killing the animal is essential to hunting). "The hunter seeks this death because it is no less than the sign of reality for the whole hunting process. To sum up, one does not hunt in order to kill; on the contrary, one kills in order to have hunted" (2007, p. 105). Only in hunting is one truly an active participant in the countryside, intensely attuned to every aspect of it, perceiving it from both the hunter's and the prey's perspective. Hunting does not objectify the prey; it is the natural and appropriate response to the animal itself. "The only adequate response to a being that lives obsessed with avoiding capture is to try to catch it" (2007, p. 129).

Describing the hunter as "the alert man" (2007, p. 138), Ortega y Gasset views sport hunting as "a vacation from his human condition" (2007, p. 121), a reprieve from the draining tedium of everyday life. "Life is a terrible conflict. . . . Hunting submerges man deliberately in that formidable mystery and therefore contains something of religious rite and emotion in which homage is paid to what is divine, transcendent, in the laws of Nature" (2007, p. 106).

CRITICISMS OF ORTEGA Y GASSET'S VIEWS ON HUNTING

Questions about Ortega y Gasset's views on hunting can be raised from a number of perspectives. Ortega y Gasset's anthropocentric position is based in part on his hierarchical view of the natural world, but this view is itself difficult to sustain. There is no defensible sense in which the hunted animal is necessarily "inferior" to the hunter. The fact that Ortega y Gasset approaches sport hunting purely from the point of view of "diversion" limits the meaning that can be found in it. He makes it clear that eating the hunted animal is not part of hunting and has nothing to do with the meaning of the hunt. A truly ecological approach to hunting might replace Ortega y Gasset's hierarchy of superior hunter and inferior hunted with the notion of "webs" to which both hunter and hunted belong. One who hunts as an end in itself can do so as a member of an ecosystem, taking from it, by hunting, a portion of nourishment and giving back to it by participating in and protecting the very wildness that makes hunting possible in the first place. From this perspective hunting can be more than a mere diversion.

SEE ALSO *Animal Ethics; Hunting and Fishing: I. Overview; Hunting and Fishing: II. Recreational Hunting.*

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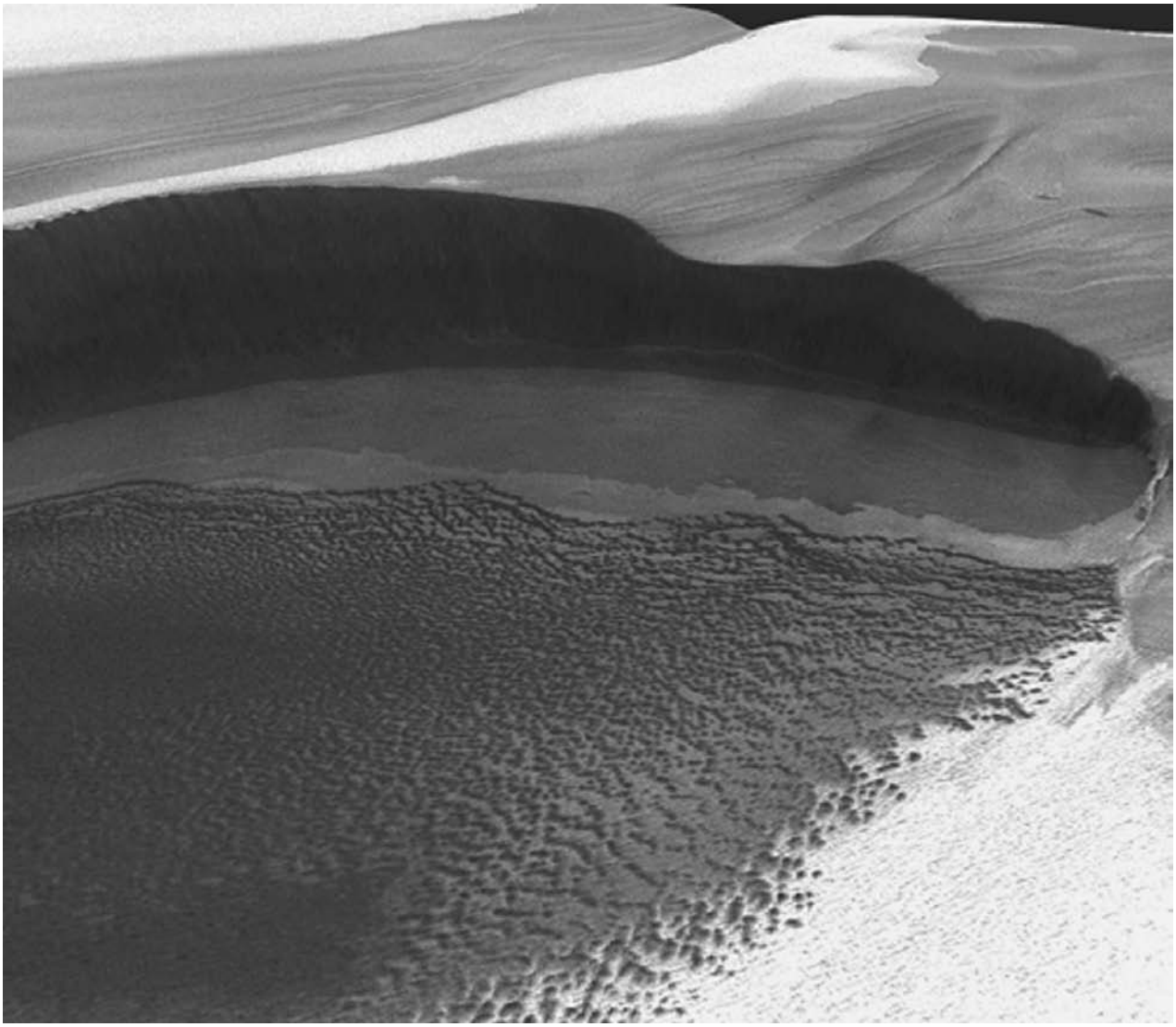
J. Claude Evans

OUTER SPACE

Humankind lives in a gravity cocoon that contains all the ingredients—rocks, gases, water—that allow life and consciousness to flourish. This cocoon is probably one of many similar tiny dots floating in the vastness of space, but whether there is life elsewhere is unknown. What is remarkable about Earth is that it is a distillation of a tiny fraction of the elements of the universe: the ones that provide rocks, water, and atmosphere. The universe consists mostly of hydrogen gas, but a small number of heavy rock-forming elements condense at certain distances from nascent stars.

Many terrestrial, or Earthlike, planets will have abundant water as long as they reside in their stellar habitable zone (Kasting et al. 1993). Water is one of the most abundant molecules in the universe, and typically clouds of ice-rich comets form at the outer reaches of the domain of a new star. Scattering of comets and asteroids into the inner or habitable zone planets ensures that water and volatile gases collect on the newly formed extrasolar terrestrial planets (Morbidelli et al. 2000).



Martian North Polar Ice Cap. *This image of the north polar region of Mars, taken from a high resolution camera on the European* Mars Express *spacecraft, shows layers of water, dust and ice in perspective view. The cliffs are nearly 2 kilometers high, and the dark material could be volcanic ash. The possibility of life on other planets would likely dramatically alter our conceptions of society and the environment. It seems clear that the tourism industry will be focusing on outer space sometime in the near future.* **PHOTO COURTESY OF ESA/DLR/FU BERLIN (G. NEUKUM).**

EXTRATERRESTRIAL SOCIETY

Earth arguably is a closed system in that human society is bound to it and to the limits of its resources. There may be other closed systems: terrestrial planets around nearby stars that have sentience and society as well. The detection of life in any location other than Earth will change what people think of as society. The global society, with its quirks and conveniences and homogeneity, has emerged in recent years. How will human views of society and environment change when people learn that versions of them exist on other worlds?

It is somewhat likely though not probable that scientists will find microbes in the Mars polar ices or along the edges of the steam vents of Saturn's moon Enceladus (Spencer and Grinspoon 2007). It is more likely that in the middle of the twenty-first century it will be possible to detect the composition of Earthlike atmospheres and surfaces around other stars. These observations could be of high enough fidelity to indicate whether a global biosphere altered the nature of that atmosphere or surface.

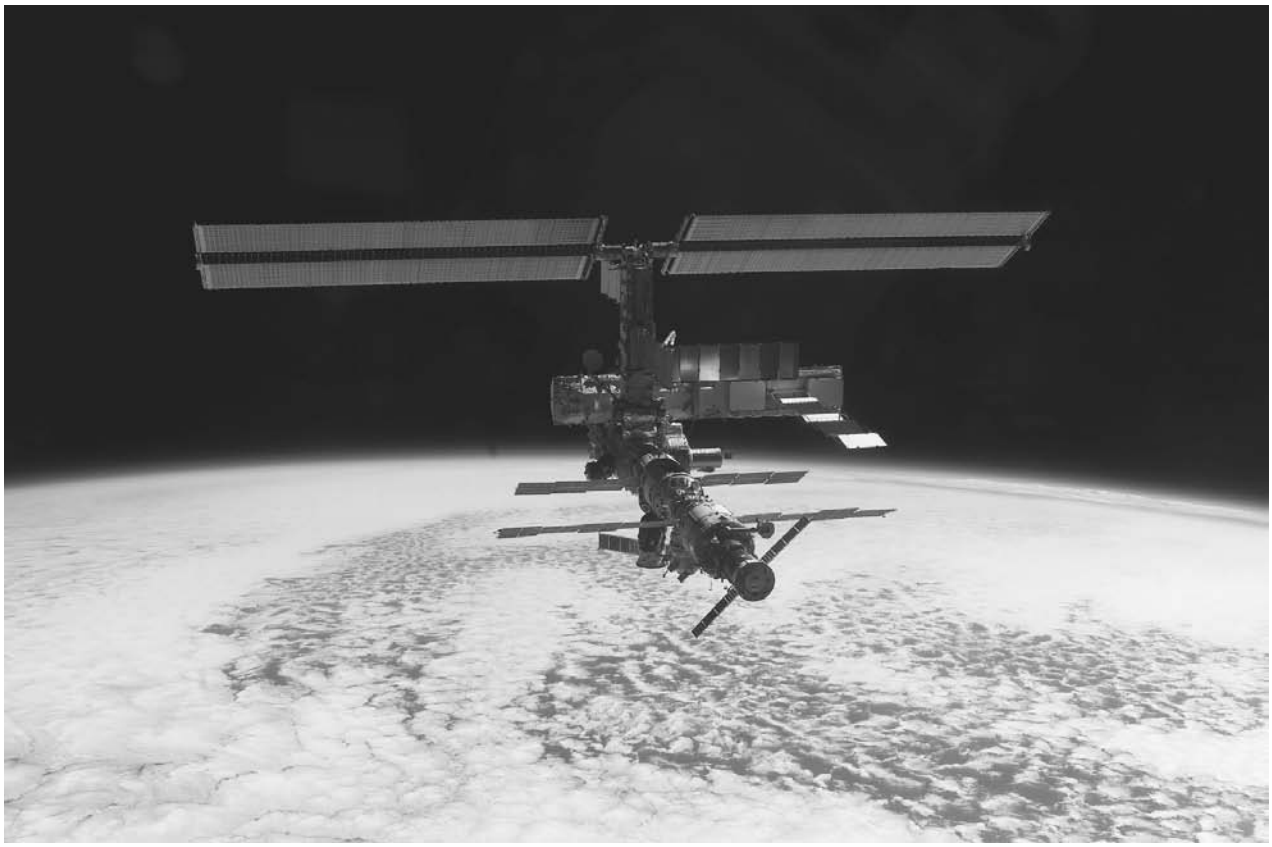
Humankind's view of life certainly will change if microbes are found on other bodies in the solar system.

Will they be related genetically to Earth organisms, or will they have worked out an evolutionary method all their own? During the first 600 million years after Earth formed, the inner planets still were being bombarded with leftover planetary building blocks. Calculations based on shock-wave physics from atomic explosions show that a certain percentage of the planetary surface, dislodged by those collisions and blasted into space, never experiences temperatures greater than 1,000 degrees Celsius. Rocky blocks would get transported throughout the solar system and fall on other planets as they do today (Gladman et al. 1996). During reentry into a new atmosphere, many of those blocks never experience temperatures greater than 1,000 degrees Celsius (Melosh 1988). Thus, from the perspective of life the early solar system is best viewed as a vast sea with constant transport of material across the voids and its delivery to other worlds. Life would have opportunities to take such rides. People would be forced to face the fact that the environment, if defined by life, would include fragile enclaves that might be found on Mars or the moons of Saturn. Some of the ancestors of human society may live elsewhere, but they will deserve respect if they are discovered.

Alternatively, the solutions that life worked out to use its environment to replicate and evolve may be entirely different on Mars or Enceladus. In this case people's sense of environment must be reexamined because this finding would show that life is able to evolve under conditions that people cannot now imagine.

THE NEW SPACE

The days of Earth as the cradle and unique home of human civilization are drawing to a close. In rapid succession there have been successful private trips to space, and a large number of investors and players in the new space business are preparing to take tourists, investigators, honeymooners, artists, poets, engineers, and doctors into space. Some go on suborbital flights with just minutes of microgravity. Others circle Earth and see their home planet for what it is: a globe



The Human Outpost in Space, 2002. *The International Space Station (ISS) is a massive scientific laboratory in low Earth orbit, allowing it to be seen with the naked eye. NASA's goal is to have a similar outpost on the Moon by 2026. One of the research areas aboard the ISS is biology; scientists hope to improve their understanding of the effects on the human body of long-term exposure in outer space. The results of this and similar research are expected to contribute to the possibility of human colonization in space.* **NASA.**

overflowing with life, floating in emptiness. In the early decades of the twenty-first century space hotels may accommodate visitors in an environment with relaxing zero gravity and spectacular vistas where sport, art, and culture may evolve in new ways. Eventually commercial trips may take passengers to the moon, and one day adventurers and tourists may explore lunar highlands and fissures never before seen by humans.

In civil space efforts the National Aeronautics and Space Administration (NASA) is spending billions of dollars to develop a new and safe transportation system that can shuttle astronauts to the International Space Station. That system also may be part of the means of transportation to the Moon and may play a prominent role in NASA's stated goal of building a human outpost on the nearest solar system by 2026. Investment in the future lunar infrastructure is strong, with NASA studies of habitats, vehicles, and in situ resource utilization ongoing. It is envisioned that some versions of these systems will be used to explore nearby asteroids, ancient rocks that can bring and have brought global disaster to Earth in an instant.

Perhaps most ominously or excitingly, it appears that another space race is shaping up. The United States will have to ground the space shuttles in 2010 and contract for rocket rides with Russia to visit the International Space Station (ISS). The new NASA manned space transportation architecture will not be ready until 2014, at which time it will be able to take over transport between Earth and the ISS. The Chinese have an aggressive program of lunar robotic and manned exploration of the moon. China has leveraged its soft power by partnering with countries that the United States does not want to deal with or regards as an investment risk. The influence of the Chinese space program has increased as it has helped develop space system capabilities for Third World countries that cannot afford them on their own.

A conservative 2006 estimate of the value of the potential market for space tourism by 2021 is $1 billion (Taylor 2006). Space tourists already have gone to the ISS despite objections from NASA. Economies of scale and rapidly developing technologies make it likely that space tourism will grow along with the international push to do more and invest more to put more humans into space.

ENVIRONMENTAL ETHICS IN SPACE

Society will be different in space. Some see a utopian or utopian-libertarian universe of infinite space and infinite possibilities. However, as far as can be foreseen, people will be transported in small, highly dependent groups. They will bring their sense of ethics and environment with them, but how will they adapt to the realities of living in space? Dropping a tool with a mass of a kilogram outside the space station during repairs is not a big deal because it can be tracked and the risks of collision with the ISS can be mitigated. However, those people will be living on palpably finite and severely limited resources for the first time, and colonies off Earth are likely to develop a set of environmental or conservation values and ethics very different from those of their forebears. Moreover, the distinctive experience of the minicultures that evolve when humans are isolated is well documented at scientific stations such as the one at the South Pole.

The Moon is vast: Is leaving a burned-out rocket engine behind on it a significant environmental concern? Can people explore the Moon scientifically without regard for what is happening to its environment now or, as a consequence of what they do now, in the future? There is already a lot of human-made debris on the Moon, including Apollo landers with their buggies and equipment for experiments and a dozen or so crashed probes that provided movies of approach and immolation. Are these relics garbage littering the otherwise pristine surface of the Moon, or are they proud monuments to the achievements of the human race? Would people be better off if their motto was "leave nothing but footprints"? The footprints left on the Moon during the Apollo visits will last many times longer than a plastic bag thrown on the ground in a park on Earth, yet it is difficult not to see the extraordinariness of this first lone human boot print on a world other than Earth.

The exploration of space already has led to the extraterrestrial exportation of a familiar environmental ethic: the unexamined, consumer-driven sense of infinite vastness to absorb humankind's effluent that people implicitly employ in their everyday lives on Earth. Leaks of atmospheric gases, chunks of metal, tools, gloves, waste, garbage, burned-out rocket stages, dead satellites, and abandoned landers on the Moon, Mars, and Venus are among the environmental legacies of humankind to space. The debate about space debris is in full swing, largely because low-Earth-orbit pollution, even in the vastness of space, is bad enough that it is likely to cause a catastrophe on the ISS, along with the threat that some of the larger objects pose to humans, other life-forms, and ecosystems on Earth when they fall back down through the atmosphere onto the surface of the planet.

A turning point in the issue of space debris occurred in October 2006, when the Chinese chose to test an antisatellite weapon on one of their dead communications satellites. The debris from the explosion instantly increased the total amount of space debris (10,000 tracked objects larger than 4 centimeters) by 10 percent. Worse, the orbit of the target was high enough that

debris scattered into orbits covering a wide range of altitudes, polluting some of the orbital ranges used most heavily by commercial satellites. Because of the high orbit of the target, much of the debris will take centuries to degrade into lower orbits as a result of friction with the upper reaches of the atmosphere. Most of the debris will burn up, but it will be raining pieces of Chinese space hardware for a century.

The United States performed a similar feat in the interest of keeping the world safe from hydrazine. A large military satellite had gone astray, and it was in a low enough orbit that blasting it to pieces would result in a debris cloud that would reenter the atmosphere in months. The U.S. test in February 2008 was equally successful, although because its stated goal was to destroy a hydrazine tank that if it survived reentry would be hazardous to people and the fact that it created a more responsible debris cloud constitute a weak argument that the United States holds the moral high ground on ground-based antisatellite tests.

Nevertheless, the fundamental ethical underpinnings of the lost gloves and wrenches floating in near-Earth space, the abandoned equipment on other planets, and the spraying of near-Earth space with debris from military exercises are the same. Space is an infinitely large sink; if one drops an empty bag of potato chips, nobody will ever see it and it will never be a part of the phenomenological landscape. It has been learned painfully on Earth that with increasing population density that type of thinking is flawed. If space, like land or ocean or sky, is to be exploited for human purposes, must it also become the ultimate wastebasket, as has been the history of the human use of all other media?

The expansion of people and then society into outer space inevitably will carry with it an environmental ethic. If the safety and survival of crews are at stake, it is certain that environmental protection or sustainability will be on the bottom of the list of priorities, and it can be assumed that space will be considered a convenient dumping ground. The occasional radioactive power source or debris cloud of heavy metals will be ejected randomly into space if it is expedient for the safety of the astronauts, whether they are governmental or private space voyagers.

Outer space is currently in the realm of science and engineering, yet when one considers that people soon may be exporting Earthly genes to other planets, one must conclude that they also will be exporting human culture. The conditions of a human mission to Mars are likely to be highly stressful; situations in which the moral and ethical fortitude of the astronauts will be tested are sure to arise. It is therefore important that a nascent colony or even an expedition be well informed about both ethics and environmental ethics. Stress reduction and time to adapt psychologically must have a high priority. Efficient and effective mechanisms for conflict resolution must be in place. Time and energy should be put into fostering a culture that places a premium on respect and boundaries, one in which each astronaut is motivated first and foremost by compassion for his or her colleagues. The possibility that romantic relationships may develop should be anticipated and analyzed, and a policy regarding such relationships must be formulated.

To some researchers the idea of living off new worlds and building colonies on other planets is absurd. The expense would be enormous, and the benefits and risks both to the colonists and to Earth-bound humanity are unknown. To others, however, it appears to be inevitable. It is human destiny to explore and then colonize. The frontier now is space, they think, and it has no limits.

Those who think that exploring space and colonizing other planets is absurd believe that the required spatial and temporal scaling of the concepts of exploration and colonization stretches those concepts to the breaking point. Christopher Columbus's voyage of discovery and colonization covered only 5,000 kilometers, and he made the pelagic crossing from the Canary Islands to Cuba in just over a month. Moreover, when he arrived, he could breathe the air and drink the water. He was back in Spain in less than a year. Mars, the nearest planet that can be explored by humans, is 23 million kilometers distant at its closest approach to Earth. By current means of propulsion it could be reached in at best 150 days. Once explorers arrive there, water must be mined from the ice, and the atmosphere is oxygenless. The nearest star, Alpha Centauri, is more than four light-years distant. Even if advanced propulsion could be developed for that journey, for the astronauts who attempt the trip it would mean forever leaving the society they know. If nearly unlimited energy could be harvested, it would be possible for humans to travel at speeds close to the speed of light. Albert Einstein's special relativity has been used to calculate both the energy necessary to get to Alpha Centauri and the effects of time dilation. For the astronauts on such a mission it might take ten years to get to the nearest star. During those years, moving at near-light speed relative to Earth, approximately ten thousand years would have gone by on Earth. Near-light speed is a time machine, and astronauts on a trip to Alpha Centauri would return twenty years older to an Earth that was twenty thousand years in the future. A nearly infinite supply of energy would be required to reach those velocities, although such a supply is not ruled out by the laws of physics.

Nevertheless, Carl Sagan (1994) and others have argued that there is a moral imperative to colonize other planets. By spreading its genes beyond one small world the human race would survive even in the case of a

Boot print of Buzz Aldrin. *This image commemorates one of the first steps ever taken on the Moon, by American astronaut Buzz Aldrin on the* Apollo 11 *mission in July 1969. In the pristine environment of the Moon, this boot print will last for millions of years, until it is slowly eroded away by atoms from the solar wind.* **NASA.**

planetary catastrophe. However, that thought may lead to the idea that there is little reason to try to avoid an anthropogenic planetary catastrophe. Having colonized other planets, the human race would survive even after a human-made catastrophe on Earth, so why should the prospect of such a catastrophe concern people from the point of view of environmental ethics? After humans use up Earth to the point where it is no longer habitable, they will emigrate to other planets; this is precisely the environmental ethic of the frontier.

THE OUTER SPACE WILDERNESS

For most of human civilization the world was infinite, with more land, trees, and resources than could be used. Now humankind lives on a small world where the fuels that have driven human technology are being depleted. Forests are disappearing. The limits of freshwater, ocean resources, and the atmosphere are being felt, but the ultimate consequences are unknown.

Habitat loss for wild species is one of the most profound changes that the planet has experienced as a result of human civilization. The interconnected nature of plants, animals, seasons, and water is disrupted over much of the planet, and as a result species extinction is occurring at a rate faster than it has after nonanthropogenic global catastrophes such as asteroid impacts.

National park and wilderness systems have been somewhat effective at preserving natural habitat in perpetuity. Wolves have returned to Yellowstone, and the entire ecosystem is adjusting. People treasure wild spaces not just for what Earth was before they arrived and flourished but also for their natural beauty and the diversity of animals and birds and insects, with which people have an evolutionary and genetic bond.

Space, the new frontier, is in most respects effectively infinite. The immediately accessible extraterrestrial surfaces, such as those of the Moon and Mars, are huge but not unlimited. However, beyond them are Ganymede and Titan and Pluto and eventually Earthlike worlds around other stars, most of them more light-years distant than the number of years in a human lifetime. Mars has about the same solid surface area as Earth because although it is smaller in circumference, it has no oceans.

Planetary park systems that would preserve unique and diverse elements of planetary environments have been proposed (Cockell and Horneck 2004, 2006). Through human exploration of Mars and other places with robotic spacecraft, it has been discovered that there is natural beauty on other worlds as well. A planetary park system would designate large swaths of planetary surfaces to be wilderness if that becomes necessary, although it would appear to be difficult to preserve a portion of the surface of any planet from the corrosive effects of oxygen if that planet is to have a breathable atmosphere. An anticolonial extraterrestrial environmental ethic, in contrast, might require that other planets not be touched by robotic or human spacecraft or be used as a dumping ground for hardware falling from orbit. Such an ethic carries with it more than the practical issues of preservation of the unique and beautiful; it extends the concept of wilderness and people's duty to consider their impacts on the environment into space.

On Mars there is the possibility that colonies of organisms live within the ice or in lava tubes. Current NASA planetary protection policies require primarily that a landed spacecraft on Mars not disrupt any life to the extent that it is not analyzable. Some consideration is given to avoiding contaminating a possible biosphere, and even greater consideration is given to avoiding contaminating Earth with alien microorganisms from returned samples.

THE CONDUCT OF HUMANS IN SPACE

These considerations suggest that the injection of environmental ethics into the use, exploration, and eventual colonization of space is necessary. Philosophical practices such as contemplation and meditation may play a vital role in establishing a self-sustaining and self-correcting astronaut minisociety on which future colonists can build to create an extraterrestrial society that is based on mutual respect and sustainability. Exploring methods of stress reduction and coping mechanisms to adapt psychologically to extended

periods away from Earth and its familiar environments must have a high priority. Efficient mechanisms for conflict resolution must be in place. Time and energy should be put into developing a culture that retains mutual respect and boundaries among the astronauts and the extraterrestrial environment, including space stations and spaceships and is motivated by compassion for colleagues. Whether this will result in a code of conduct that includes explicit respect for the space environment, a set of international laws, or both requires discussion. It is important to develop methods that introduce a conscious awareness of the values that spacefarers bring with them and to examine how they change with the realities of working and living in space.

SEE ALSO *China; Environmental Philosophy: V. Contemporary Philosophy; Intergenerational Justice; Land Ethic; Ozone Depletion; Preservation; Water; Wilderness.*

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Mark A. Bullock

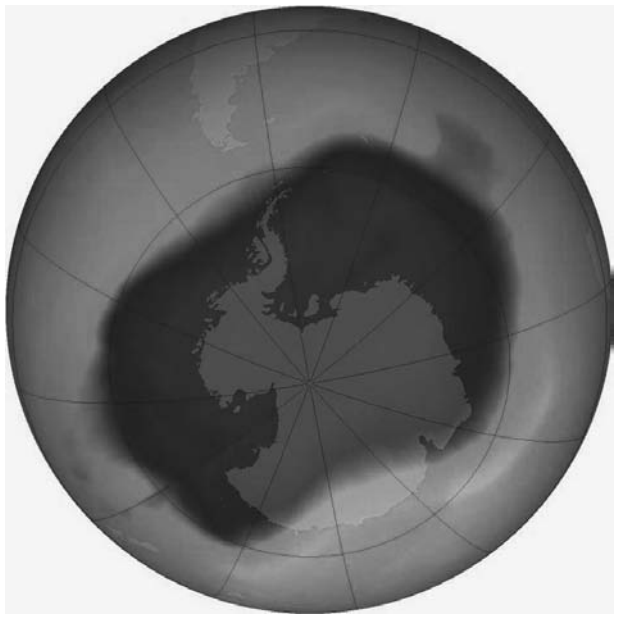
OZONE DEPLETION

Ozone depletion, the thinning of ozone in the upper atmosphere, has been observed since the late twentieth century and is due to anthropogenic emissions of ozone-depleting chemicals. Stratospheric ozone shields Earth's surface from damaging solar radiation, which can harm humans, other animals, plants, and ecosystems. Steps to control ozone-depleting chemicals began in the late 1970s in the United States and were followed by the institution of the international Montreal Protocol in 1987. Ozone depletion raises ethical issues associated with indirect and diffuse harm, collective action, and obligations under conditions of risk and uncertainty.

THE SCIENCE OF OZONE DEPLETION

Depletion of stratospheric ozone is caused primarily by anthropogenic emissions of halogen source gases—gases containing chlorine and bromine that break down in the upper atmosphere. Halogen source gases include chlorofluorocarbons, historically used in refrigeration, aerosol propellants, and air-conditioning systems; bromine-containing chemicals called halons, used as fire retardants; and methyl bromide, used as an agricultural fumigant. Although some halogen source gases arise from natural sources, these are not the primary cause of ozone depletion.

Ozone (O_3) is a molecule that occurs in the troposphere (lower atmosphere) and stratosphere (upper atmosphere). In the troposphere, excess ozone is considered a pollutant. It damages plant and animal tissues and is a major component of smog. Ozone in the upper atmosphere, however, has a protective effect. It shields Earth's surface from ultraviolet (UV) radiation—particularly UV-B radiation, with



Satellite Image of the Ozone Hole. *This image provided by NASA in 2006 shows the atmosphere's ozone "hole," a region where there is severe depletion in the layer of ozone (a form of oxygen) that protects Earth from the Sun's ultraviolet rays. At the time this image was recorded, on September 24, 2000, the Antarctic ozone hole was approximately 11.4 million square miles.* **AP IMAGES.**

wavelengths of 280 to 315 nanometers—which can cause health problems in humans and other animals as well as damage in wild plants and agricultural crops.

Stratospheric ozone breaks down through a set of chemical reactions involving reactive chlorine and bromine molecules. Although many ozone-depleting chemicals do not react directly with ozone, when these gases move from the troposphere to the stratosphere, they are converted into reactive halogen gases that catalyze the breakdown of ozone molecules.

The chemical breakdown of ozone by reactive halogen gases has had stronger effects on some parts of the globe than on others. Ozone depletion has been most significant at the poles, particularly over Antarctica, where seasonally severe ozone depletion, known as the ozone hole, has been observed since the 1980s. Winter weather conditions in the southern polar region favor rapid breakdown of ozone, and this leads to the formation of an ozone hole in austral late winter and early spring. Thus, although global ozone has been reduced on average by 4 percent, seasonal declines of up to 37 percent have been observed over Antarctica.

EFFECTS OF OZONE DEPLETION ON BIOLOGICAL SYSTEMS

Ozone depletion leads to increased ultraviolet radiation, and such radiation harms humans, other animals, crops, and ecosystems. Humans' increased exposure to ultraviolet radiation can cause skin cancer (both carcinoma and melanoma), cataracts, and suppression of the immune system. In addition, UV-B can damage the eggs of fish and amphibians; alter the DNA, lipids, and proteins of plants; modify plant-growth patterns; and reduce the yields of some crops. UV-B can also harm phytoplankton and has the potential to disrupt marine food webs. Though there are experimental studies showing effects of UV-B on plants and animals, the ecological consequences of increased ultraviolet radiation are not well understood, since they involve complex interactions.

POLICY RESPONSES TO OZONE DEPLETION

Scientific research linking anthropogenic chemicals to ozone depletion gained significant public attention in 1974 after the chemists Mario Molina and Sherwood Rowland published a paper in *Nature* outlining the mechanisms by which chlorofluorocarbons could destroy ozone. Later that year Molina and Rowland presented their work at a scientific meeting and publicized their findings to the press. Media coverage of their hypothesis led to significant debate and to reduced consumer use of chlorofluorocarbons. Then in 1978 the U.S. Environmental Protection Agency banned nonessential use of chlorofluorocarbons in aerosol sprays.

A comprehensive international response to ozone depletion came later. Shortly after a 1985 international meeting in Vienna to consider restrictions on ozone-depleting chemicals, new research revealed the Antarctic ozone hole, a severe thinning of stratospheric ozone over the South Pole. This renewed concern and led DuPont, a leading chlorofluorocarbon producer, to increase investment in the development of substitute chemicals. These events, in conjunction with pressure from U.S. environmental groups, laid the groundwork for the Montreal Protocol.

The Montreal Protocol on Substances that Deplete the Ozone Layer, an international treaty, was instituted in September 1987. The protocol, which went into effect in 1989, outlined a timeline for the reduction of certain chlorofluorocarbons and halons. The treaty required signatories from developed nations to cap chlorofluorocarbon emissions at 1986 levels by the middle of 1989, then to cut emissions to 50 percent of 1986 levels by 1998. Halons regulated under the treaty were to be reduced to 1986 levels by 1992. Less developed countries were allowed a ten-year grace period before restrictions went into force.

The initial cuts sought by the Montreal Protocol were modest and by themselves would not solve the problem of ozone depletion. However, the protocol included ongoing assessment provisions, which provided a process for collecting improved data on emissions of ozone-depleting chemicals, tracking ozone depletion, and synthesizing scientific research on its causes. These provisions allowed the protocol to be adapted as new data emerged showing ozone depletion to be worse than originally believed and identifying additional chemicals contributing to the problem.

In light of new data, the Montreal Protocol was strengthened at subsequent international meetings. A 1990 agreement entered into in London required complete phaseout of chlorofluorocarbons and halons by 2000; regulated two additional chemicals, carbon tetrachloride and methyl chloroform; and established a fund to assist developing nations in reducing ozone-depleting chemicals. Subsequent modifications to the treaty include the Copenhagen Amendment of 1992, which added controls on hydrochlorofluorocarbons and methyl bromide and accelerated timelines for reducing ozone-depleting chemicals; the Montreal Amendment of 1997, which sped reductions of methyl bromide; and the Beijing Amendment of 1999, which mandated earlier control of hydrochlorofluorocarbons.

The regulation of ozone-depleting chemicals kick-started industry investments in research on and development

of substitutes, including less-damaging chlorofluorocarbons, hydrochlorofluorocarbons, and hydrofluorocarbons. These alternative chemicals were much less potent than early chlorofluorocarbons. In addition, it was found that many aerosols could be produced without ozone-depleting chemicals at all. Mechanical pumps and chemical propellants such as carbon dioxide could be used instead. Effective substitutes for the strongest ozone-depleting chemicals also have been found for refrigerants, foams, solvents, and many fire retardants.

PROGNOSIS FOR OZONE RECOVERY

Although some ozone-depleting chemicals remain in use, overall production has declined substantially, and the total concentration of ozone-depleting chemicals has decreased since the 1990s. Because atmospheric lifetimes of some ozone-depleting chemicals are long (up to 100 years), a substantial lag time can occur between cuts in ozone-depleting chemicals and effects on ozone recovery. Nevertheless, according to the 2006 *Scientific Assessment on Ozone Depletion* (World Meteorological Organization 2007), stratospheric ozone levels outside the polar regions have stabilized. Severe ozone depletion continues to be observed at the poles, but variability in ozone levels in the polar regions is attributable to variable weather conditions rather than to increased concentrations of ozone-depleting chemicals. The 2006 assessment predicts a return to pre-1980 ozone levels by midcentury for most latitudes, with recovery over Antarctica occurring between 2060 and 2075.

ETHICS OF OZONE DEPLETION

Stratospheric ozone depletion raises a number of ethical issues. As mentioned above, ozone depletion can harm humans, nonhuman animals, plants, and ecosystems. Yet unlike paradigmatic cases of ethically significant harm, the harm caused by ozone-depleting chemicals was initially unknown, unintentional, indirect, and diffuse. Producers of ozone-depleting chemicals were at first unaware that their products could harm the environment and/or people, and they had no intention to cause harm. The harm was indirect because it was not the chemicals themselves, but rather the effects of the chemicals on stratospheric ozone, that caused damage. Lastly, the harm was diffuse in that it was not the action of a single individual, but rather the cumulative effects of many corporations and individuals producing and using ozone-depleting chemicals, that caused the problem.

The philosopher Dale Jamieson (2007) argues that nonparadigmatic ethical problems are more challenging than paradigmatic ones. Paradigmatic cases involve direct and immediate harm, with an obvious perpetrator and recipient, as when a single individual knowingly strikes another. In such cases, assignment of moral responsibility is straightforward. Nonparadigmatic cases are more complex. For example, should people be held responsible for harm that they did not know they were causing? Do corporations and nations have the same moral responsibilities as individuals? What obligations exist when the nature and magnitude of the harm are unknown? When harm is caused by the joint actions of many parties, how should responsibility be allocated?

Two types of issues are of central concern in the ozone case: issues of collective action, and issues of ignorance, risk, and precaution. Collective-action issues arise when the realization of a particular goal—in this case, prevention and mitigation of damage to stratospheric ozone—requires cooperation of multiple parties. Collective-action problems can be difficult to resolve when incentives for individual actors do not support collectively beneficial outcomes. In the ozone case, for example, in the absence of regulation, individual chemical companies had little incentive to invest in alternatives to ozone-depleting chemicals, because ozone-depleting chemicals were profitable and the costs of developing and producing alternatives were unknown. This collective-action problem was largely overcome by regulation. Once the Montreal Protocol went into effect, all companies were required to cut production of ozone-depleting chemicals and to seek alternatives.

It is controversial whether individual actors have moral obligations to refrain from contributing to collective-action problems in the absence of regulation or other forms of collective agreement. Some argue that unilateral restraint under such circumstances will accomplish little. In the ozone case, however, the unilateral move by the United States in the late 1970s to ban ozone-depleting chemicals in aerosol sprays may have induced later collective action to resolve the ozone problem.

A second issue of concern in the ozone case involves the appropriate ethical response to uncertainty and risk. Ozone depletion was suspected well before discovery of the Antarctic ozone hole. The initial science on ozone depletion was based on chemical theory and was borne out by empirical data only later. When the problem was first being discussed, the nature and extent of the problem and associated risks were unknown.

There is no philosophical consensus on the appropriate ethical response to risk, though it is widely agreed that the magnitude of the risks and the reversibility or irreversibility of potential harms are important factors to be considered. Some moral philosophers and environmental advocates favor a precautionary approach, where action is taken to avert harm associated with an activity even when the nature and magnitude of the potential harm are not fully known. Others hold that risks should be considered in the context of cost-benefit analyses, in which potential risks are weighed against potential benefits. In the ozone case, this would involve asking whether

the benefits of continuing to use ozone-depleting chemicals outweigh the risks of predicted ozone depletion. The cost-benefit approach is intuitively appealing and widely employed, but can be difficult to operationalize. Cost-benefit analysis requires quantification of risks and benefits to enable their comparison on a single scale (often monetary). Some object to cost-benefit analysis on the basis that not all goods are commensurable and that some goods should not be given a price. On the opposite side of the ledger, those who support cost-benefit analysis and oppose the precautionary principle emphasize that it is sometimes worth taking risks when significant benefits can be gleaned by doing so. In the ozone case, the debate over precaution was not fully resolved, yet by incorporating provisions for ongoing assessment, the Montreal Protocol stimulated research and innovation that clarified both the importance of restricting ozone-depleting chemicals and the feasibility of doing so.

The regulation of ozone-depleting chemicals through the Montreal Protocol and its successor agreements is often highlighted as an environmental success story from which we can learn. Indeed, international cooperation to address the ozone problem has been impressive, with each successive agreement accelerating reductions in ozone-depleting chemicals. Technological innovation has produced viable substitutes in almost all economic sectors, emissions of ozone-depleting chemicals have declined substantially, and full recovery to pre-1980 levels of stratospheric ozone is expected during this century.

Global climate change shares a number of features with ozone depletion: Effective control of greenhouse-gas emissions requires collective action, and while the scientific understanding has improved substantially, the precise magnitude and effects of climate change remain uncertain. Whether lessons from the ozone case can be applied to help address climate change will depend on similarities and differences in the structure of each problem from scientific, economic, political, and social perspectives. Despite parallels, there are important differences. While it may have been relatively easy for individual consumers to stop using aerosol sprays, for example, it may be more difficult for individuals significantly to reduce their use of fossil fuels. In addition, the kinds and sources of greenhouse gases are more diverse and diffuse than was the case with ozone-depleting chemicals, and this makes coordination to solve the problem more complex. Nevertheless, development of alternative technologies was much more successful than anticipated in the ozone case; perhaps the same will hold true for greenhouse gases and climate change.

SEE ALSO *Alternative Technology; Atmosphere; Cost-Benefit Analysis; Global Climate Change; Pollution; Precautionary Principle.*

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Marion Hourdequin

P

PAGANISM

Phenomena labeled *Pagan* vary considerably but have, or allegedly have, in common a stress on physical being and belonging. In the mid-twentieth century, *Paganism* was chosen as the name of a religious movement that claimed to be reviving ancient nature veneration and polytheism. In North America, it is common to call this religion *Neo-Paganism* to distinguish it from pre-Christian religions (such as those of classical Rome). *Pagan* is also used in a derogatory sense to allege that some people, religions, activities, attachments, and passions are worldly, bodily, and materialistic, and fail to value the transcendence privileged by Christianity and some other monotheistic religions.

ORIGINS AND APPLICATIONS

Pagan derives from a Latin term for an administrative district. A Roman *pagus* was something like a parish, a township, or a neighborhood perhaps. In the early twentieth century, however, it was thought that *pagus* originally referred to rural rather than urban places. The notion that people in the countryside live in close harmony with the seasons, and with their environment more generally, was linked to the theory that Christianity was initially more successful in the cities than in the conservative backwaters of rural agricultural communities. This understanding had obvious appeal to people who claimed to be reviving pre-Christian religions (initially drawing on classical Egyptian, Greek, and Roman sources), contested the denigration of nature, and were dissatisfied with the alienation from nature that they experienced in urban and suburban modernity. The designation of Paganism as a "nature religion," in contrast with religions that have either transcendent deities or self-realization as their primary focus, shows recognition of the central place that nature has in Paganism.

Paganism has also been used to label adherents of nonmonotheistic religions and cultures. In particular, indigenous people have been called *Pagan* when they continue to practice ancestral, local religions. Some indigenous people, rhetorically admitting to being *Pagan*, challenge others' rights to define them negatively and contest their denigration of place, land, and belonging. All uses of the term *Pagan*, whether as a chosen self-appellation or as a derogatory epithet, carry associations with physicality, materiality, belonging, and also require careful consideration of the categories "nature" and "natural."

SELF-IDENTIFIED PAGANS

As documented by Ronald Hutton in *Triumph of the Moon* (1999), Paganism was created as a new religion in the early to middle twentieth century by people who blended a number of elements together. In addition to stressing the positive value of natural (nonurban) places, Pagans popularized forms of European esotericism, such as the practice of magic, claimed to be reviving various forms of pre-Christian (Egyptian, Greek, Roman, Celtic, and Germanic) polytheism, and integrated these with folklore. Pagans developed attractive rituals and new calendar customs for natural living and earth-based spirituality. The continuing international spread and diversification of Paganism, discussed in Graham Harvey's *Listening People, Speaking Earth: Contemporary Paganism* (2006), is evidence of the popularity of this effort and its evolution.

Paganism has no single central authority or hierarchy, and no sacred scriptures. Pagans are inspired in their quest to understand and celebrate the natural world by a wide range of literature, including botanical treatises, ancient epics, archaeological reports, and fantasy fiction (see Clifton and Harvey 2004). Some Pagans belong to subdivisions or denominations, which they prefer to call "traditions" or "paths," such as Druidry, Heathenry, Witchcraft (or "the Craft"), and Goddess Spirituality. There are also many ethnic Paganisms (e.g., Hellenic, Lithuanian, Norse), drawing on regional and ancestral traditions, archaeology, history, and folklore. In some respects these efforts parallel indigenous revitalization movements that emphasize locally meaningful knowledge and lifestyles. The many variations in ways of being Pagan are usually celebrated by Pagans, some insisting that "diversity is natural, many different types of trees make up a forest."

Common ground among Pagan movements is found in seasonal and calendar festivals. Most Pagans mark the solstices and equinoxes with rituals, and many add other festivals to their annual cycles. These can be honored as key points in the changing seasons (the beginning of summer or the end of winter) or as significant moments in the relationship between Earth and Sun (the longest day or the longest night). Communal events can draw humans into seasonal relations and encourage them to see their personal life cycles as paralleled by changes in larger, cosmic events. Human birth, growth, aging, death, and possibly rebirth can be celebrated as matching the growing and diminishing strength of the Sun in the annual cycle of the seasons. Creativity, intentionality, and productivity are not only human attributes but are also recognizable in the natural world. Springtime festivals may celebrate the growth of plants, the birth of young animals, the increase of light and warmth, and an intention to live creatively in the following seasons.

POLYTHEISM AND MAGIC

In addition to the relationship between the Sun and Earth, full and new moons are of considerable importance to many Pagans. They are valued as particularly good times to venerate divine beings and perform magic. The moon is important to Pagan polytheism and magic because Pagans inherited the idea that the Moon is a favored manifestation of a divine being, a goddess, willing and eager to help people perform magic for the benefit of life.

Paganism is generally polytheistic. While this last term draws attention to a contrast with the monotheistic assertion that there is only one deity, the important issue for polytheists is not how many deities exist, but what results from engaging with a particular *kind* of deity. Polytheism generally encourages a celebration of the material, physical world and embodied life. Rather than an interest in a possible afterlife, it promotes locally meaningful attempts to live as good members of communities conceived of as including not only humans but all other living beings, including deities. Common elements in many Pagan rituals are songs and speeches addressed to the Goddess, where "the Goddess" can be an individual divine being or an entire community of deities. The "Goddess" can also serve as an all-embracing category equivalent to *life* or *nature*; and in some cases it refers to the powerful sense of unity experienced in ritual gatherings. Lack of dogma allows Pagans to celebrate together without requiring conformity to particular beliefs or manifestos. The essence of Paganism is the celebration and enhancement of life for oneself and others.

Pagans explain magic as the art of causing change according to will or the art of changing consciousness according to will. In these formulations, *will* refers to the best sense one has of oneself. Thus, magic requires effort to live up to one's highest standards and to seek to improve oneself. Practitioners are encouraged to think that in rituals they are empowered to change their consciousness about the way things are, improving their understanding and appreciation of the world (realizing that what is bad for an individual may be good for a community, or vice versa). Practitioners are also encouraged to seek to cause change to improve life. The precise means by which magic works, the natural or metaphysical energies that might be drawn on, and the tools for manipulating either consciousness or the world vary according to particular traditions and teachers. In all cases, magic promotes a participative and positive engagement with the world, rooted in the notion that all acts (however small they may seem) have effects that may be of considerable scope.

ANIMISM AND SHAMANISM

If polytheism has been labeled *Pagan* (whether in the positive or negative sense), so too have animism and shamanism. *Animism* has borne two meanings. Initially, it summarized a theory that religion is, by definition, founded in a "belief in spirits." Here, *spirits* meant "nonempirical entities" and the theory asserted the falsity of religions. However, when Pagans and indigenous people talk about spirits, they rarely focus on questions of belief or matters of definition. They might talk about spirits of ancestors, the elements (earth, air, fire, and water), or place, adding the term *spirits* to indicate that these are somehow living, communicative beings who participate in ceremonies. In a second, more useful use, *animism* refers to the view that the world is a community of persons, most of whom are not human, but all of whom deserve respect. *Persons* here points to the importance of

Pagan Celebration in Rakov, Belarus. *Neo-Pagans dance around a fire to celebrate Ivan Kupala, with festivities similar to those of Mardi Gras. Paganism is actually a newer religion, blending different forms of pre-Christian polytheism. Although Paganism is strongly associated with nature, it does not necessarily follow that all pagans are environmental activists.* **AP IMAGES.**

personal relationships with other beings. Like polytheistic Paganism, this variety of animism roots people in the everyday, physical world and even more radically rejects the transcendentalizing project of monotheism.

Along with the understanding of animism, the understanding of shamanism has also changed. *Shamanism* was initially attractive as a label for ecstatic techniques that seemed to result in powerful visions of alternative realities. But shamanism is beginning to be seen as the element of animism in which experts mediate between human and other-than-human communities. The individual experience of transcendence has been replaced by a desire to learn skills for communicating with neighboring beings. Animism and shamanism have become increasingly important as Paganism has moved from its Romantic roots and negated the dualism that separates culture from nature. Pagans may insist either that humans are part of nature, or that the whole world is cultural, in both cases pointing to the inadequacy of language influenced by dualism. Pagans have also insisted that a dualism of good and evil cannot be mapped onto the more messy relationships that make shamanism (as mediation) necessary. All of this may be seen as part of the process of indigenizing Paganism.

INDIGENIZING NATURE

Pagan understandings of nature have evolved quickly since the mid-twentieth century. The Romantic notion that authenticity and meaning are best found in wild places has been replaced by a more indigenous stress on the importance of belonging and participation. Wilderness may remain important, but now as a domain of richer diversity and communicative possibility, rather than in opposition to domains of human culture. Celebration of biodiversity may even lead to *more* (sub-)urban ritual as gardens are recognized as richer habitats than most agricultural land. Along with the shift in academic understandings of the origins of the term *Pagan* (from country dweller to local citizen), Pagans have increasingly insisted that all places are sacred, or at least part of

nature. Just as Roman shrines at key natural places enshrined or animated the concept of a limit to human utilization and commodification of the world, at least nodding toward the rights of other-than-human life, as Ken Dowden (2000) suggests, so contemporary Pagans have contested globalization on the grounds of a more participatory cosmology. In opposing anthropocentricism, Pagans seek to realign human culture away from consumerism toward respectful, local engagement. Experience of belonging in place and of valuing the rumors of ancient practices aid in this indigenizing process.

PAGAN ECOLOGY AND ENVIRONMENTALISM

Paganism is an umbrella term for a religion focused on nature following a variety of practices. Pagan festivals celebrate natural seasons and alignments between Earth, Sun, and Moon. They express the positive value of human participation in natural cycles, but may equally seek to inculcate the notion that plants, animals, and planets act intentionally and relationally, that is, culturally. Leitmotifs of Pagan discourse point to the centrality of materiality, physicality, performance, of secular belonging, of place and emplacement. This is not to assert, however, that as celebrants of a religion of nature, Pagans must be or inevitably are environmental activists. Nature is certainly central to Paganism, but Pagans may prefer to work out their Earth ethic in the quietist domains of their homes (eating organically and recycling) rather than to engage in confrontational activism. They may also insist that Paganism consists more in being at home in the world (one sense of *ecology*), as achieved during seasonal festivals that reconnect people to abiding patterns of cosmic life, than in engaging in environmental activism focused on human activities.

SEE ALSO *Biodiversity; Christianity; Environmental Activism; Pantheism; Romanticism; Urban Environments.*

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Graham Harvey

PANTHEISM

Western religious and philosophical traditions do not obviously ground an ecological and environmental ethic. Even those who favor such a program for grounding an environmental ethic might agree that any attempt to ground an environmental ethic in such traditions requires interpretive dexterity and a good deal of charity. Those who think that the route from such traditions to sound environmental ethics and attitudes is too tortuous, if it exists at all, may well look to other traditions for a philosophical or spiritual basis.

Pantheism, with roots in both Eastern and Western traditions, is an obvious source for grounding environmental ethics, because, from a pantheistic point of view, nature itself is divine, and what is in any sense divine is not something to be trifled with or exploited. As John Toland, author of the *Pantheisticon*, wrote, "In a Word, every Thing in the Earth is organic. . . . This justifies my Answer to a German Inn-Keeper, who impertinently importuned me to tell him, what Countryman I was? The Sun is my Father, the Earth my Mother, the World's my country, and all Men are my relations" (1976 [1751], pp. 32–33). Similarly, Bertrand Bronson sees the pantheistic ethos of John "Walking" Stewart as grounding not just an environmental ethic but all morality—or perhaps an environmental ethic is an ontological grounding of all other morality. "The universe is altogether composed of eternal and indestructible matter. All matter is one infinite whole . . . , Nature. . . . It follows from this community of matter that the interests of the whole material universe are intimately the interests of every individual man. This is the basic truth of morality" (1943, pp. 146–147).

WHAT IS PANTHEISM?

Pantheism is a metaphysical and religious position. It is broadly defined as the view that "God is everything and everything is God. . . . The world is either identical with God or in some way a self-expression of his nature" (Owen 1971, p. 74). Similarly, it is the view that everything that exists constitutes a unity, and that this all-inclusive unity is in some sense divine (MacIntyre 1967, p. 34). Baruch Spinoza's *Ethics* (1675) is regarded as the most thoroughgoing account of a pantheistic position. Aside from Spinoza, other possible philosopher pantheists include some of the pre-Socratics, Plato, Laozi, Plotinus, Friedrich Schelling, Georg Wilhelm Friedrich Hegel, Giordano Bruno, John Scotus Erigena, and Paul Tillich. Possible pantheists among literary figures include Ralph Waldo Emerson, Walt Whitman, D. H. Lawrence, and Robinson Jeffers. For a notion of just what pantheism is, the Force in *Star Wars*, while very different from Spinoza's "singular substance," is a good

popularization. Pantheism is the traditional religious alternative to theism, and many profess pantheistic beliefs, though obscurely. The central claims of pantheism are prima facie no more fantastic than those of theism, and possibly less so.

UNITY AND DIVINITY

Different versions of pantheism offer different accounts of unity and divinity. The central problem of pantheism is to determine how to understand these central terms. For example, philosophical Daoism is one of the best articulated and thoroughly pantheistic positions there is. The Way (*dao*) is the central unifying feature, but understanding just what is meant by the Way and how it operates and what its implications are is a hermeneutic and philosophical task in its own right. What kind of unity is, or should be, claimed by pantheists, and which, if any, is plausible? There may be acceptable alternative criteria, and each will have implications for a pantheistic understanding of ethics, including environmental ethics. Like theism, pantheism is by no means a univocal view.

Attributing unity to the world simply on the basis of all-inclusiveness is irrelevant to pantheism. To understand the world as everything is to attribute a sense of unity to the world, but there is no reason to suppose that this sense of all-inclusiveness is the pantheistically relevant unity. Similarly, mere numerical, class, or categorical unity is irrelevant, since just about anything (and everything) can be one or a unity in these senses. Unity may also be explained in terms of divinity. The all-inclusive whole may be a unity because it is divine, either in itself (Spinoza's substance) or because of a divine power informing it. The latter is the case in the thought of some pre-Socratics, for whom the unifying principle is divine because it is immortal and indestructible. Neither of these positions satisfactorily explains the relation between unity and divinity, or why divinity might be seen as a basis of unity. Less naturally, the question arises as to whether the all-inclusive whole is divine because it is a unity.

PANTHEISM, THEISM, ATHEISM

When pantheism is considered as an alternative to theism, it involves a denial of at least one, and usually both, central theistic claims. Theism is the belief in a personal God, who in some sense transcends the world. Pantheists usually deny the existence of a personal God—a minded being having the properties of a person, such as having intentional states. As an alternative to, and denial of, theism and atheism, pantheism denies that God is a completely transcendent being distinct from the natural world. The dichotomy between immanence and transcendence (that is, between a god that is part of this world and a god that is outside of it) has been a principal source of philosophical and religious concern in Western and non-Western traditions, and all major traditions have at times turned to pantheism as a way of resolving difficulties with the theistic notion of a transcendent deity.

A. H. Armstrong says that the term *pantheistic* is a "large, vague term of theological abuse" (1976, p. 187), primarily, it seems, because it is deemed as an expression of atheism. With some exceptions, pantheism is nontheistic, but it is not atheistic. It is a form of nontheistic monotheism, or even nonpersonal theism. The primary reason for equating pantheism with atheism is the assumption that belief in God must be belief in a personal God. In his nonpantheistic phase, Samuel Taylor Coleridge claimed, "Every thing God, and no God, are identical positions" (McFarland 1969, p. 228). H. P. Owen wrote, "If God (theos) is identical with the Universe (to pan) it is merely another name for the Universe. It is therefore bereft of any distinctive meaning; so that pantheism is equivalent to atheism" (1971, pp. 69–70). Similarly, Arthur Schopenhauer (1951, p. 40) said that "to call the world God is not to explain it; it is only to enrich our language with a superfluous synonym for the word 'world.'" If what Schopenhauer, Coleridge, and Owen want to show is that believing in a pantheistic God is a confused way of believing in something that can adequately be described apart from any notion of deity, they are mistaken.

PANTHEISM, ETHICS, ECOLOGY

Pantheists, like theists, tend to be moral realists. They believe that some kinds of actions are objectively right and others wrong, and that what is right or wrong is independent of what any person thinks is right or wrong. With the exception of religious ethics, moral realism has not been a widely accepted philosophical position since about the 1970s.

Not accidentally, pantheism is often taken to be a view inherently sympathetic to ecological concerns. There is a tendency to picture pantheists outdoors and in pastoral settings. This tendency has roots in the Stoics' veneration of nature, and in the much later nature mysticism and perhaps the pantheism of some nineteenth-century poets, such as William Wordsworth and Whitman. This notion was fostered in the twentieth century by possible pantheists such as John Muir, Jeffers, Lawrence, and Gary Snyder, who explicitly identify with and extol nature, and claim that people's close association and identification with nature and the natural is necessary to well-being. Belief in a divine unity and some kind of identification with that unity are seen as the basis for an ethical framework and way of life that extends beyond the human to nonhuman and nonliving things. The divine unity is, after all, all-inclusive.

Consider some examples of alleged connections between pantheism, ethics, and ecology. Armstrong wrote,

> Plotinus may give us a lead to a better understanding of the world and may help us to adjust our attitudes and evaluations in a way which may help us to deal with some of the most pressing problems of our time, and especially to do something towards closing the gap between man and non-human nature which has been widening through the Christian and rationalist centuries with, as we are now beginning to see, disastrous results. (1976, p. 188)

Armstrong denies that Plotinus was a pantheist. But he does claim that there is in Plotinus a metaphysical basis for an environmental ethic in which there are significant pantheistic elements. He suggests how aspects of Plotinus's thought can change our attitudes and evaluations concerning nonhuman nature. Grace Jantzen (1984, pp. 156–157) makes a claim similar to that of Armstrong's in her proposal of a model of the world as God's body. Armstrong's view concerning Plotinus and Jantzen's view concerning the implications of her model for ethics and ecology are often taken to be true of pantheism in general. For religiously inclined nontheists, pantheism is supposed to have the resources capable of (in Armstrong's words about Plotinus) "closing the gap between man and nonhuman nature which has been widening."

Whatever critics allege the shortfalls of pantheism to be, there is a prominent, if not prevalent, view that its implications would be a good thing for ecology and for aspects of ethics dealing with the nonhuman, as well as the human. The work of Spinoza is most prominently cited in this context (Naess 1980; Mathews 1990). Genevieve Lloyd (1980), for example, attempts to extract from Spinoza a ground for environmental ethics, arguing that this can be done without assigning rights to nonhuman natural entities and nature as a whole on the basis of his system.

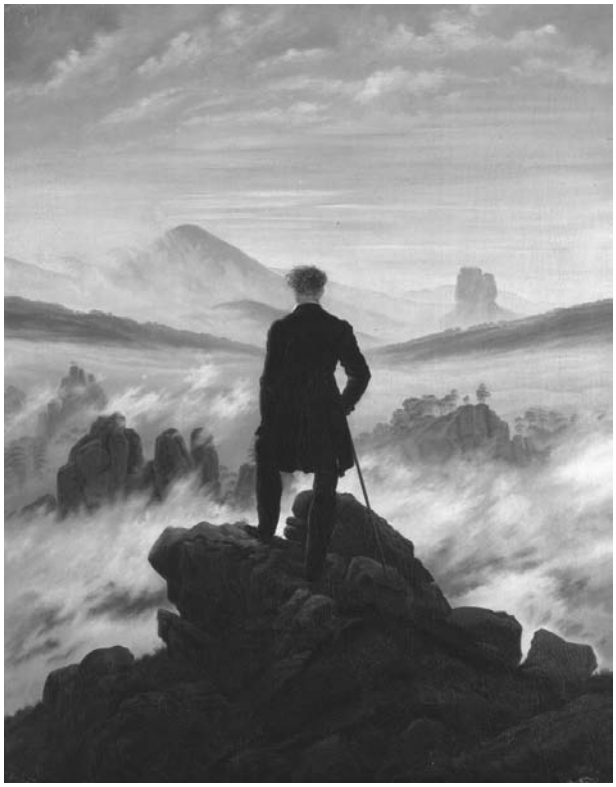
Although Spinoza is the best-known pantheist, looking in his metaphysics for a foundation for environmental ethics is, as Lloyd points out, not without its difficulties. After all, Spinoza rejected animal rights, and despite his view that man is part of nature, environmental ethics is in "apparent tension" with "his treatment of morality as circumscribed by what is good for human beings . . . [and his view] that other species can be ruthlessly exploited for human ends" (Lloyd 1980, p. 294).

Whether or not Spinoza provides a suitable metaphysical basis for an environmental ethic depends, in part, on whether his metaphysics and ethics are plausible. For that reason alone, one might be suspicious of grounding an environmental ethic on Spinoza's philosophy. But Spinoza's particular system aside, it is often supposed that pantheism can offer a more suitable basis for an environmental ethic, and perhaps for ethics generally, than the Judeo-Christian tradition and some nonreligious alternatives, such as utilitarianism, contractarianism, and Kantian views. It is unlikely, however, that the committed theist or utilitarian would, or can, agree that pantheism, if true, offers a better basis for an environmental ethic than their own ethical theories—for metaethical reasons. The meaning of key ethical terms and the conditions governing their use in normative ethical theories are described in terms of normative principles characteristic of a particular system. Utilitarians, for example, would not allow that a pantheist's ethical reasoning provides a sound basis for moral deliberation unless utility, defined in terms of happiness or some other greatest good, were the pantheist's supreme normative principle, which it is not.

Harold W. Wood Jr., a founder of the Universal Pantheist Society, claims that pantheism provides the foundation for an environmental ethic not offered by the Judeo-Christian tradition. He wrote, "Instead of a 'conquer the Earth' mentality, pantheism teaches that respect and reverence for the Earth demands continuing attempts to understand ecosystems. Therefore, among religious viewpoints, pantheism is uniquely qualified to support a foundation for environmental ethics" (1985, p. 157). He talks about interacting with "God-as-nature." With the important exception of Spinoza, pantheists generally do not equate God with nature, but rather believe that nature is a divine unity.

The idea of unifying principles is also present in nature mysticism, as manifest in the work of Wordsworth and some other Romantics. Nature mysticism (as found in the poetry of Wordsworth, Jeffers, and Snyder) has in common with more philosophically robust versions of pantheism the idea that unity is rooted in nature, and this common feature explains why nature mysticism and philosophical pantheism are often conflated with one another. They are distinguishable, however, for nature mysticism need not attribute divinity to nature.

As noted, a pantheistic environmental ethic cannot self-consistently be anthropocentric. Arne Naess (1980) pointed out that Spinoza's anthropocentrism was inconsistent with his pantheism. The pantheist's ethics—environmental ethic and ethics more generally—is metaphysically grounded in the divine unity, the unifying principle that accounts for our commonality with other living and nonliving things and the grounds for extending our notion of moral community to those other living and nonliving things. Everything that is part of the divine unity (as everything is) can be thought of as also part of



Caspar David Friedrich,* Wanderer above a Sea of Fog, *Ca. 1817. *The pantheistic tradition views nature as divine, and asserts that anything divine should not be trifled with or exploited. Moreover, pantheists believe in an all-inclusive God who is "everything and everywhere;" this allows the religion to be an obvious source of environmental ethic. Friedrich's painting of the Wanderer depicts the artist's interest in nature, and alludes to the idea that morality involves oneness with nature.* **BILDARCHIV PREUSSISCHER KULTURBESITZ / ART RESOURCE, NY.**

the moral community. Aldo Leopold wrote, "The land ethic simply enlarges the boundaries of the community to include soils, waters, plants, and animals, or collectively, the land. . . . A thing is right when it tends to preserve the integrity, stability, and beauty of the biotic community. It is wrong when it tends otherwise" (1949, pp. 219, 240). Looking to pantheism as a metaphysical justification of, for example, Leopold's "land ethic" is not unreasonable—or at least no more unreasonable than pantheism itself is.

Philosophically minded ecologists and others who argue, on the basis of pantheistic metaphysics, that our notion of moral community must be enlarged to include nonhuman and even nonliving entities, also claim that practical consequences are involved. The issue is not merely one of providing a rational basis for an environmental ethic. The metaphysically minded ecologist or pantheist claims that the desired results can be obtained only by changing our concept of what constitutes the moral community.

The pantheist, like the theist or atheist, takes reality as determining ethical requirements. Since unity is predicated for some evaluative consideration, value is a focal point and principal concern for pantheism. The pantheist's ethical discourse is related in complex ways to the nature of the divine unity. The pantheist tries to discern and live in accordance with the unity and the kind of values intrinsically associated with it. This is clearly seen in Daoism. To act correctly, one acts in accordance with the Way (*dao*), which is the unifying principle. The *Daodejing*, like most other primary scriptural sources, is at one and the same time an ethical treatise on how to live and a metaphysical treatise about the nature of reality. The Indian doctrine of karma can also be interpreted pantheistically: Action that accords or defies the all-pervasive principle of retribution is by its very nature associated with value and promotes the good.

ETHICS, THE ENVIRONMENT, AND IMMORTALITY

Living an ethical life for the pantheist means, in part, living a life in accordance with ultimate reality. In attempting to conform to ultimate reality, the pantheist is no different from the theist, Daoist, Confucian, Buddhist, or atheistic existentialist. Pantheists strive to live in accord with reality as the divine unity of which they are a part. The nature of the unity is the metaphysical basis for a regulative ideal of how one should live. One achieves well-being and happiness only to the extent that one pursues and achieves the ideal. Living in accordance with the unity is to live in accord with one's nature, with the nature of other things, and with conditions in the world generally.

The notion of an ethical and valuable life, of pursuing an ideal and realizing the good life, is linked to the idea that living involves a *telos* or goal. Thus, pantheistic ethics can be seen as partly teleological, even Aristotelian. Pantheistic ethics may also be related to the theistic notion of salvation. Jeffers, for example, writes,

> I believe that the universe is one being, all its parts are different expressions of the same energy, and they are all in communication with each other, influencing each other, therefore parts of one organic whole. . . . The parts change and pass, or die, people and races and rocks and stars; none of them seems to me important in itself, but only the whole. This whole is in all its parts so beautiful, and is felt by me to be so intensely in earnest, that I am compelled to love it, and to think of it as divine. . . . This whole alone is worthy of the deeper sort of love; and . . . there is peace, freedom, I might say a kind of salvation, in turning one's affections outward toward this

> one God, rather than inwards on one's self, or on humanity. (Quoted in Sessions 1977, p. 512)

Consider further this celebrated passage from Emerson's *Nature*:

> In the woods is perpetual youth. Within these plantations a decorum and sanctity reign, a perennial festival is dressed, and the guest sees not how he should tire of them in a thousand years. In the woods we return to reason and faith. There I feel that nothing can befall me in life—no disgrace, no calamity (leaving me my eyes) which Nature cannot repair. Standing on the bare ground—my head bathed by the blithe air, and uplifted into infinite space—all mean egoism vanishes. I become a transparent eye-ball; I am nothing. I see all. The currents of the Universal Being circulate through me; I am part or particle of God. (1971 [1836], p. 10)

Pantheism, like Aristotelianism and theism, has its own notion of the *telos* of life and its own concepts of the good life.

SEE ALSO *Daoism; Emerson, Ralph Waldo; Jeffers, Robinson; Land Ethic; Leopold, Aldo; Muir, John; Naess, Arne; Paganism; Process Philosophy; Snyder, Gary; Spinoza, Baruch; Teleology.*

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Michael P. Levine

PASSMORE, JOHN ARTHUR
1914–2000

John Passmore, an Australian philosopher, was the author of the first philosophical monograph on environmental ethics, *Man's Responsibility for Nature* (1980; first edition, 1974). Although Passmore's anthropocentric approach was widely rejected in favor of nonanthropocentric alternatives in the decades immediately following the appearance of his book, Passmore was enormously influential in persuading philosophers that environmental issues merited serious attention.

Unlike his professional colleagues in the 1960s and 1970s, who ignored environmentalists' charges that the anthropocentrism of Western traditions of metaphysics, morality, and science made these traditions incapable of criticizing or condemning large-scale environmental destruction, Passmore took these charges seriously. In *Man's Responsibility for Nature*, he evaluates arguments for these charges and for the solutions critics were

proposing: a radical revision of Western metaphysical, moral, and scientific theories. Passmore argued that while the dominant metaphysical traditions of Western thought are guilty as charged, Western moral and scientific traditions are not. Divested of the metaphysical baggage that has distorted them, these latter two branches of the Western tradition, despite their anthropocentrism, provide sufficient resources to condemn our environmentally destructive practices. He presented his argument in three parts.

In part 1 of *Man's Responsibility for Nature* Passmore considered and largely endorsed the charge that the Christianizing of Western metaphysics encouraged Westerners to see human beings as possessing a value and destiny fundamentally divorced from that of the natural world and to view the latter's value and purpose as limited to its utility in helping us to fulfill divine injunctions to multiply on and subdue Earth. This conception of our status in relation to nature, Passmore agreed, licenses our adoption of environmentally destructive practices. But although this view of our relation to nature has long been dominant, he argued, it has always had rivals. Even within Christianity, we find minority traditions holding that our role is to act as nature's steward, preserving its fruitfulness for the future, and/or to cooperate with nature in the ongoing creation of the world.

In part 2 he considered and rejected the charges that Western moral and scientific traditions lack the means to condemn environmentally destructive practices and thus should be replaced by nonanthropocentric alternatives. Passmore's strategy was to adopt the anthropocentric outlook typical of Western moral and liberal political theories and then apply it to current controversies about human exploitation of nature to show that it neither blinds us to the problematic character of human exploitation of nature nor denies us grounds for criticizing destructive exploitation as harmful, unjust, selfish, and/or wrong. From an anthropocentric perspective, he argued, any environmental practice is problematic whose consequences are undesirable in themselves without also being unavoidable byproducts of those human practices genuinely essential to desirable social life. Using this anthropocentric definition, Passmore argued that he is no less able than nonanthropocentrists to recognize that industrial pollution, depletion of nonrenewable resources, extermination of wild species and wilderness areas, and unrestricted human reproduction are all problematic. In each case, Passmore argued, the responsible practices have consequences that are undesirable while being largely nonessential for desirable social life. Hence, our standing moral and social traditions can and rationally must condemn the greed, insensitivity, and shortsightedness that motivates these practices, as well as the callousness and injustice inherent in imposing their avoidable consequences upon their unwilling victims, present and future.

Unless the dominant metaphysical conception of humanity's relation to nature can be displaced by conceptions more in keeping with the minority traditions of stewardship and/or cooperative partnership with nature, the forces of greed, shortsightedness, and insensitivity cannot readily be overcome by appeals to morality and justice alone, Passmore felt. He argued that Western scientific reasoning is playing an important role in helping to bring about this change in perspective. Science has challenged the old belief that Earth's resources exceed our ability to consume them, forcing upon us the realization that they may not sustain future generations if loving stewardship is not practiced. Furthermore, as scientific understanding of ecological complexity increases, it becomes increasingly evident that bending nature to our will is an impossibility. Ongoing creativity in art, science, morality, and culture will become impossible unless we learn to partner with nature to develop more sustainable practices. Passmore concluded that enlightened anthropocentrism, coupled with conceptions of humanity as stewards of nature and cooperative partners with nature, possesses the necessary resources to condemn our current destructive practices and demand their reform—if only we can find the will to act accordingly.

SEE ALSO *Christianity; Stewardship.*

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PATENTING LIFE

The extension of patents to living matter has raised a host of political, economic, ethical, and practical concerns. New science and new institutions offer expanded

opportunities for individuals and organizations to claim ownership and control of components of life or entire living organisms. This entry examines the historical context for ownership of living matter, the modern structure of ownership, the current status of ownership and control, and an array of issues triggered by expanded private ownership of life.

THE HISTORICAL CONTEXT FOR OWNERSHIP OF LIFE

The modern debate about ownership of life is embedded in the history of the science and the institutions designed to advance and use that science. Before recorded time, most people lived as hunters and gatherers, gathering plants and hunting animals for their immediate use but not really controlling or nurturing those organisms. As peoples settled down and began to identify and improve, adopt and adapt, a range of plants and animals as foods, they exerted ownership by asserting individual or communal possession of breeding stock or by controlling knowledge about its characteristics (Diamond 1997).

The concept of intellectual property rights—the right to exclusive ownership and exploitation of useful inventions—originally came in the form of trade secrets. In some cases these secrets involved know-how that could be passed along to others and repeatedly used to make or improve goods or services (e.g., bread making or brewing). In other cases, innovations were embedded in a living reproducible organism, but only the products of those organisms (e.g., grafted fruit trees) were widely exploited. This de facto form of intellectual-property protection was relatively inefficient, however, because the owner had to make often expensive and wasteful efforts to keep the intellectual property secret.

MODERN PROPERTY-PROTECTION MECHANISMS

Explicit, legally sanctioned property rights for technologies, products, processes, or business practices are relatively new. Our modern patent system is firmly rooted in Enlightenment England. The evolving common-law system in England first accepted and confirmed that individuals have the right to the "fruits of their labor" (Locke 1950 [1689]) and then developed a patent system that ultimately protected "inventions" of new and useful products, processes, and technologies.

Patents are essentially a bargain between society and inventors. Inventors get an exclusive period of twenty years to exploit their inventions in exchange for full disclosure of their methods. To patent an invention, the technology, process, product, or business practice must be "novel, useful and non-obvious." This precludes patents on mere discoveries (e.g., an unimproved plant from nature), concepts not reduced to practice, and previously known ideas and products. Patent rights are granted only in the country of application, and rights must be enforced by the inventor. There are no automatic exemptions for others to use patented material for further advances, so researchers and those seeking to commercialize follow-on inventions need to negotiate with related patent holders. Once the patent has expired, the protected knowledge enters the public domain.

Living matter was excluded from early patent systems because the state of science and technology was at a level where new plant varieties or animal breeds could not meet the tests of being novel, useful, and nonobvious. Modern science began to break down the divide between living and nonliving inventions. While modern biology is usually dated from the 1860s, with the emergence of Charles Darwin's theory of evolution (1859) and Gregor Mendel's laws of inherence (1866), it took another generation before these concepts were reduced to practice and systematically applied to breeding plants and animals.

The legal system began to adapt in 1930, when the United States allowed patents on asexually propagated plants, such as fruit trees produced by grafting. Then in the 1940s a number of European countries created property protection, called plant breeders' rights, for sexually reproducing plant varieties. Plant breeders' rights provide developers of new, stable, and uniform plant varieties an eighteen-year right to control the sale of propagating material and to levy royalties for use by others. As with patents, these rules are nationally based; there are no automatic international rights. Plant breeders' rights are cost-effective but offer less protection than patents, as farmers may save seed for replanting and researchers are allowed to use existing varieties to develop new varieties.

The biotechnology era may be dated from 1953, with the discovery by James Watson and Francis Crick of the double-helix structure of deoxyribonucleic acid (DNA), but it practically began in 1973 when Herbert Boyer and Stanley Cohen invented a method of cloning genetically engineered molecules in foreign cells—what has become known as the "cut and paste" method.

The legal system converged with the new science in 1980, when the U.S. Supreme Court granted a utility patent for claims related to a human-engineered microorganism, on the basis of a definition of the organism as a new composition of matter (*Diamond v. Chakrabarty*, 447 U.S. 303, 206 *USPQ* 193). This decision was followed in 1985 by a utility patent for a genetically modified plant, and in 1988 for a genetically modified animal (*Ex parte Hibberd*, 227 *USPQ* 443 [Bd. Pat. App. & Inter.]).

Since the 1980s these developments in the United States have been replicated around the world. In some

cases governments legislated or courts ruled in ways that adjusted national rules to conform to the U.S. system. Meanwhile, international negotiations knit together groups of national systems through treaties. Finally, in 1995 the World Trade Organization Agreement and its associated Trade Related to Intellectual Property (TRIPs) Agreement extended intellectual-property rights internationally, requiring all 150 member countries to provide inventors the option of either patent protection or, in the case of living organisms, some form of protection, such as plant breeders' rights. As of 2006, all member states of the World Trade Organization, including developing countries, are required to provide protection.

CONTEMPORARY OWNERSHIP OF LIFE

As a result of the evolution of science and the complementary development of property-rights systems, there are now thousands of ownership claims to living matter and the tools and structures needed to make use of that living matter. One way to examine the scope of ownership is to take a slice through the information, knowledge, tools, and processes used to manipulate living matter.

In 2008 more than 1,500 organisms, ranging from unicellular yeast to the human genome, are being or have been sequenced. While there was a great flurry of patenting activity of some gene sequences in the 1990s, as of 2008 most genomic information is freely and publicly available in databases. About the only people with effective property protection in this domain are the owners of the machines and inputs used in the sequencing process.

There are also a variety of public and private gene banks, where living plants (mostly seeds), microbes, and animal and human tissues (e.g., blood and cell lines) are preserved. While much of this genetic material is in the public domain (e.g., the more than 600,000 seed accessions of the eleven gene banks of the Consultative Group on International Agricultural Research), there is increasing private interest in genetic material, especially human tissues (e.g., in Iceland and Estonia, where a mix of public and private interests have been developing population gene banks) (Sheremeta and Knoppers 2007).

While the conventional tools of plant and animal breeding have now all entered the public domain, the tools of biotechnology are so recently patented that most remain closely held by firms, universities, hospitals, or public research labs. Some large multinational companies have a bundle of complementary technologies that enable them to operate freely, but most firms and public research programs need to negotiate licenses from other patent holders to assemble the rights to undertake research or to commercialize the resulting products of that research.

Downstream in the products of biotechnology, two somewhat different systems have emerged. Plants and animals can be protected by plant breeders' rights or animal-pedigree rules. While there are no conclusive data, one can probably safely say that virtually all commercially developed plant varieties and animal pedigrees are protected by one or more property mechanisms. Meanwhile, patents have been used in a variety of ways to protect the products of biotechnology. In the plant and animal world, most countries of the Organization for Economic Cooperation and Development offer protection to inventors who insert proprietary genes in plants, and in the United States and the European Union, inventors can claim patents on an entire multicellular organism that is genetically modified. Although Canada, among others, has declined to extend patents to multicellular organisms, the Supreme Court of Canada, in its 2004 review of *Monsanto v. Schmeiser*, ruled that while patents are not permitted on whole plants, the presence of the Roundup Ready gene in every cell of the plant provides the right to exert control over an entire plant (Phillips 2007a). So the rule of thumb for farmers wanting to use commercially developed genetically modified plants and animals is that they should conclude licenses with the owners.

Patenting human genetics is different. Although most countries allow patents on genes and in some cases organs, no country will allow patents on entire humans. Such an extension of rights is deemed by all to offend the *ordre public*. Nevertheless, patenting has proceeded apace. A recent study by Kyle Jensen and Fiona Murray (2005) concluded that 4,270 human genes (in 4,382 claims), nearly 20 percent of all known human genes, have been claimed in U.S. patents. Nearly two-thirds (63%) of these patents are assigned to private firms, with the rest assigned to individual researchers, hospitals, research labs, and universities.

CONTROVERSIES

There has been vociferous debate about the most appropriate systems to deal with intellectual advances—those ideas, recipes, formulas, and processes that generate increases in economic productivity and social well-being. Some controversies involve the ethics of what we are doing, while others relate to the ethics of the outcomes we are generating (for a survey of the economic issues, see Phillips and Stovin 2000).

The Morality of Ownership of Life Many are unhappy with the scope of what is patentable. There is virtually unanimous agreement that it is immoral to patent whole humans, and no systems allow such patents, but there is a wide range of views about what other potential living matter should be excluded or have restricted protection.

Many of the cases related to living matter (e.g., *Moore v. Regents of the University of California* 793 P.2d 479, Cal. 1990) have touched on this issue, but frequently the issue has been related more to who should own the invention rather than whether a patent should be issued.

Nevertheless, many environmental groups, developmental nongovernmental organizations, church groups, and farmer advocates have called for patents to be removed from all higher life forms, including animals and plants, arguing that patenting living organisms is either immoral, inequitable, or inefficient. Also, developmental nongovernmental organizations and indigenous communities have called for much tighter control on patenting of indigenous knowledge and genetic resources and seek broad exemptions from patent enforcement for indigenous farmers and for humanitarian purposes.

Because moral issues are hard to legislate, governments have generally set up systems to allow individuals or groups to raise specific concerns. The TRIPS Agreement permits an *ordre public* provision to address noneconomic values in the patent system. On a case-by-case basis, patents can be refused should the commercial exploitation of the invention violate public order. European Directive 98/44 on the Legal Protection of Biotechnological Inventions (European Commission 1998), for example, states that processes that use human embryos for commercial purposes and processes that clone human beings violate the *ordre public*. In practice, this provision is usually invoked by a third party in an opposition procedure after the patent has been granted. Some systems provide an opportunity to challenge patents while they are being evaluated. Australia, the European Patent Office, France, Germany, India, and Japan currently have opposition processes, and a recent U.S. report has recommended establishing an opposition procedure in the U.S. patent system.

Intellectual-Property Rights and the Freedom to Operate The creation of private intellectual-property rights for biotechnological innovations in the past thirty years has opened the system to substantial private involvement, and this has raised the concern that intellectual property rights make research and commercialization more complex, costly, and inequitable.

One of the most pressing issues for many scientists and companies is the freedom to operate in a world of overlapping and interwoven claims to intellectual property. One often cited example is golden rice, which was developed by public-sector scientists in Switzerland for public-good purposes. When they realized that seventy patented technologies owned by thirty-two different entities had been used, they decided that they did not have the capacity to acquire freedom to operate without assistance, and ultimately decided to assign the product to a large multinational company to commercialize it (Kryder et al. 2000). A big part of the problem is that markets for intellectual property are just beginning to emerge. It is still expensive and time-consuming to search for patent owners or their agents; negotiations for licensing are often protracted; and enforcing rights through contracts or the courts can be prohibitively expensive.

There is rising concern that patents constrain research activity. There is clear evidence in the plant biotechnology industry that since the extension of property rights, many multinational firms have entered and as of 2008 a few dominate some crops. Even though smaller ventures may be able to do research, no start-up firms have successfully commercialized any new genetically modified crops. Meanwhile, in the field of human health, Mildred K. Cho et al. (2003) surveyed clinical laboratory directors in the United States and found that 53 percent had decided not to develop some new clinical genetic tests because of patent concerns.

Patents are also having an effect in product markets. Percy Schmeiser's unsuccessful challenge of Monsanto's patent on Roundup Ready canola was at one level a question of freedom to operate—in this case Schmeiser attempted to assert a farmer's privilege to seed. The Canadian courts ruled that Monsanto has both the right to patent their invention and the authority to commercialize it under their own rules (a contemporary case in the United States, *Monsanto v. McFarling*, delivered similar results). A slightly different argument was made by a group of organic farmers in Saskatchewan, Canada, in an unsuccessful class-action suit (*Hoffman and Beaudoin v. Monsanto and Bayer*). The organic producers argued that the presence of openly pollinated genetically modified canola released by the defendants made it impossible for organic-canola producers to assure foreign buyers of their organic status, and this led to losses in the European Union. The trial courts, upheld at the appellate level, ruled that there was no basis for a class-action suit because there was too much diversity in the farming population. Any claims would have to proceed through other means. This case left unclear whether firms commercializing genetically modified crops are liable for any economic damage they cause other producers (e.g., by commingling in fields or the supply chain).

There is no doubt, however, that firms producing genetically modified crops are liable for health and safety risks. In 2000 Aventis CropScience ended up recalling StarLink hybrid feed corn, with the insecticidal Bt gene, which was not approved by the U.S. Food and Drug Administration for human consumption. In 2000 the feed corn, after two years of use as a commercial feed, was found

Altered Tomatoes. *A German biologist examines a genetically transformed tomato plant. The transgenic plant has a safety lock, which means that the release of its altered genes, for example, through pollen, is not possible.* **AP IMAGES.**

commingled with food corn in the U.S. and other food systems. The company spent an estimated $100 million to remove the variety from the market, paid penalties to the regulators, and settled a class-action suit on behalf of farmers with a $110 million settlement (Phillips 2007b).

Patents and Traditional Knowledge Although only a small part of the agricultural revolution in Europe in eighteenth and nineteenth centuries can be traced to species and varieties of plants from other ecosystems, the major advances in the twentieth century are directly attributable to the collections of landraces and germplasm assembled from around the world. With the availability of the modern tools of biotechnology, there has been a renewed interest in examining genetic resources—regardless of whether they are located in situ in traditional settings or ex situ in modern seed banks—to identify and adapt any useful genes.

The debate about the source and use of traditional varieties of crops (and even human genetic traits) has shown up in two venues. First, a number of groups have disputed and formally challenged patents issued in the United States and the European Union for purportedly new varieties that are actually traditional cultivars from developing countries. High-profile cases include the Mexican yellow bean (a U.S. patent by Pod-Ners for Enola was challenged in U.S. courts by the International Centre for Tropical Agriculture), Indian turmeric (a patent for its wound-healing properties issued in the United States was challenged and subsequently canceled), the Indian neem tree (a series of patents for industrial and pharmacological properties assigned to W. R. Grace and Company issued in the United States and the European Union were challenged and struck down in Europe), and basmati rice (a patent in 1997 by RiceTec Inc. was challenged in the United States and subsequently amended). These and other proven or alleged acts of biopiracy have increased debate about the concept of invention, the definition of prior art, and the ethics of using traditional knowledge and genetic resources in patents.

Second, there is extensive international debate about, and effort directed toward, protecting traditional knowledge and indigenous genetic resources through legal agreements. Efforts are underway at the International Labor Organization, the United Nations (via various declarations on rights of indigenous peoples), the development banks, and the Convention on Biological Diversity. The International Undertaking on Plant Genetic Resources for Food and Agriculture (1983) and the International Treaty on Plant Genetic Resources (2001), which establish genetic materials as the common heritage of humankind, have led to further negotiations under the aegis of the TRIPS Agreement (article 27.3b), the Doha Declaration (article 17), the Convention on Biological Diversity (article 8j), and the World Intellectual Property Organization. Nevertheless, the issue remains unresolved and a point of contention among indigenous communities and governments around the world (Phillips and Onwuekwe 2007).

CONCLUSION

At one level, the debate about ownership of living matter is not new. A variety of strategies for protecting inventions related to living organisms—including trade secrets, private contracts, and commercial strategies—predate patents. What is new is that patents have created a new mind-set about the opportunities and threats of global development using living matter.

Some believe that patents on living matter are absolutely essential for scientific and commercial development. Without patents, they argue, development would slow or cease on many projects related to food, health, and the environment. They argue that patents offer an open, transparent, and relatively economically efficient means of encouraging investment and commercialization. Moreover, patents facilitate our broader governing system by creating clearly defined assets and sets of owners, which provide the basis for financing, marketing, regulatory assessment, safety monitoring, and enforcement. All key regulatory processes formally or informally rely on the ownership assigned through patents. Without any owner, there might not be any concerted effort at development.

Others see patents on life as a dangerous development. They see patents as contributing to winner-take-all races among large multinational corporations and developed countries that seek to dominate nature. The fear is that by and by patents on living matter will distort our

economic system, deliver inequitable economic effects, generate undesirable social outcomes, and ultimately exacerbate many of the problems we wish to resolve.

At root, the issue of ownership and control is a long-standing and fundamental division in cultures and societies. The debate over their role in biotechnology and nature is just one in a long line of ownership controversies.

SEE ALSO *Convention on Biodiversity; Darwin, Charles; Evolution; Genetically Modified Organisms and Biotechnology; Seed Banks; Shiva, Vandana; Transgenic Animals.*

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Peter W. B. Phillips

PESTICIDES

Although it has no biological validity, the term *pest* is assigned to any organism that is doing something that someone finds unpleasant. The word *pesticide* comes from the Latin *pest*, "a plague," and *caedere,* "to kill." Pesticides are chemicals, cultured organisms, or their products that are used to disrupt an organism's physiology long enough to kill it or severely reduce its growth. There are at least twenty-one groups of pesticides, each defined by the organism or organisms they control. The most familiar are insecticides (insects), herbicides (plants), fungicides (diseases), and rodenticides (rodents). Other groups include algicides (algae), avicides (birds) nematicides (nematodes), piscicides (fish), and silvicides (trees and woody plants).

Agricultural applications account for 83 percent of all the pesticides used in the United States. Industry, commerce, and government use 13 percent, and home and garden users are responsible for only 3 percent. Herbicides account for 58 percent of all the pesticides used, insecticides 28 percent, fungicides 8 percent, and all others 7 percent (U.S. Environmental Protection Agency 2001). Agricultural uses generally are regarded as essential to continued production of abundant food. Many believe that improved pesticide technology will eliminate the problems pesticides cause and enhance the sustainability of agriculture, but that claim is debatable. Pests and pesticides have been scientific issues for many years. Only recently have they become subjects of philosophical inquiry.

PESTICIDE REGISTRATION

Most nation-states have some sort of pesticide registration. In some developing countries procedural and data requirements are few to nonexistent, primarily because of fiscal constraints but also because of lack of awareness of the importance of registration. The laws are not well implemented in some countries. Pesticide regulators have the goals of providing protection from adverse effects and gaining the benefits of pesticides. Those objectives are achieved through registration and control of the pesticide label, which allows control over use, performance claims, use directions and precautions, packaging, and advertising. Registration protects the interest of the public and the rights of the manufacturer by ensuring proper use and environmental and human protection.

In many developed countries pesticides have been subject to some kind of governmental regulation for decades. The public is aware of potential problems with pesticides and fearful because of the mistakes that have occurred. Nearly everyone knows something negative about DDT (banned in 1971 in the United States; all use ended in 1973), and many are aware of problems caused by the use of Agent Orange during the Vietnam

Crop Duster, Hebron, Maryland. *A farmer sprays chemicals on a field of snap beans. The beans had been showing signs of white mold due to heavy rainfall. The use of pesticides in agriculture has been heavily debated, with the main issue being production (of crops and goods) versus protection (of humans and the environment).* **AP IMAGES.**

War. The public does not know about the complex and continually reviewed procedures necessary for the registration of a pesticide before it is used. Registration is not a matter simply of recording ownership and paying a nominal fee. It mandates compliance thorough a regulatory process that demands proof of safety but usually not proof of efficacy.

The U.S. system is among the most complex and successful; however, it is not perfect, and there are many complaints from persons who argue that protection is not sufficient and also from manufacturers who find the process slow, expensive, and unnecessarily cautious. The United Kingdom (UK) used to have a voluntary approval process in which a consensus was reached among the manufacturer, the government, and users about appropriate regulation. It was abandoned in the mid-1980s, and the UK and the European Union now regulate advertising, storage, application, and crop use. Many nations follow the standards put forth by the United Nations Food and Agriculture Organization Codex Committee on Pesticide Residues, which establishes maximum residue limits for pesticides in food and guides countries on safety regulations for the use, storage, and analysis of pesticides. Egypt reduced pesticide use 90 percent from 1971 to 2002. No herbicides are permitted on crops grown for export.

FEDERAL INSECTICIDE, FUNGICIDE, AND RODENTICIDE ACT

Pesticide development after World War II created the need for stronger laws. The U.S. Department of Agriculture (USDA), supported by the pesticide industry, developed the 1947 Federal Insecticide, Fungicide, and Rodenticide Act (FIFRA). No other federal law controls pesticides and their labeling. The FIFRA added two new ideas to pesticide regulation. The first was that all pesticides intended for shipment in interstate commerce must be registered with the secretary of agriculture before shipment. The second was that the USDA had control over all precautionary statements on a pesticide label and was empowered to review the public presentation of safety procedures. Manufacturers have the burden of proof.

These provisions stopped the shipment of untested or improperly labeled products in interstate commerce. Withholding registration effectively stopped unapproved

uses. The USDA could withhold registration until data were provided to prove that a pesticide could achieve the degree of pest control claimed and did not cause human harm. The act protected users from physical injury and economic loss and protected the public from injury (previously only purchasers were protected). Manufacturers had to prove effectiveness, and pesticides were defined and limited to economic poisons, which the act defines as "any substance or mixture of substances intended for preventing, destroying, repelling, or mitigating any insects, rodents, fungi, weeds, and other forms of plant or animal life or viruses except viruses on or in living man or animals."

THE PESTICIDE USE DEBATE

Public debate about pesticide use began with publication of Rachel Carson's *Silent Spring* (1962), which was followed by *The Pesticide Conspiracy* (Van den Bosch 1978), which was less widely read but had notable effects. There have been many books and papers published since that time, but none has had Carson's influence.

The debate about pesticides is similar to other debates about agricultural technologies (e.g., biotechnology). Thomas DeGregori expresses the enduring scientific perception of the problem when he states that "public discourse is being driven by emotional language" (DeGregori 2002, p. 125). Norman Borlaug argues that scientific progress "must not be hobbled by excessively restrictive regulations" (Borlaug 2001, p. 28). If the needs of the 8.3 billion people who are likely to be alive in 2025 are to be met, Borlaug claims, conventional technology and biotechnology will be essential. He also claims that "extremists in the environmental movement, largely from the rich nations or the privileged strata of society in poor nations, seem to be doing everything they can to stop scientific progress in its tracks" (p. 29). Borlaug acknowledges the debt of agriculture to the environmental movement, whose efforts have led to "legislation to improve air and water quality, protect wildlife, control the disposal of toxic wastes, protect soil, and reduce loss of biodiversity" (p. 29). However, antitechnology extremists have gone too far and their policies will have "grievous consequences for the environment and humanity." Borlaug's claim is ironic in that those in the environmental movement continue to pursue improvement of the things for which he thanks them.

The 1947 FIFRA was a truth-in-packaging law that emphasized the value of production over protection. The ensuing DDT debate and other pesticide problems (e.g., the dependence of production on pesticides, pesticide resistance, the lack of sustainability of the agricultural production system) have shifted regulation and public discussion away from the initial emphasis on production toward the protection concerns of the environmental movement.

According to the scientistic view of science, "science can determine a fact, that these facts represent objective reality, and that values or beliefs play no role in determination of facts" (Barker and Peters 1993, p. 5). Scientism sees science as objective and value-free and states that it is not the scientist's task to create or change social, economic, or political policy. Scientism is a caricature of the actual nature of science, which is socially embedded, value-driven, theory-laden, and dynamic, so that today's scientific "truth" is tomorrow's falsehood. Scientists attempt to understand and explain the natural world, and technology applies scientific findings to the world. In general, science has been regarded by the public as good and technology has been judged to be good or bad depending on how it is used (Boulter 1997). However, science and its underlying values have moved from being viewed as an unalloyed public benefit to being regarded with suspicion, if not distrust. Scientists used to be seen as being guided by wholesome curiosity and a search for the elusive truth. Now the public is wary. Science, like all human activities, is influenced by social, economic, and political pressures. It is equally well known that some bad consequences that scientists said were unlikely actually have occurred. For example, there are pesticides in some drinking water supplies and food, and nitrates pollute water. Yet there is little debate in the agricultural community about how such things come to be. Within the agricultural community these situations are regarded as unfortunate technological accidents, not moral failures.

Public and scientific debates about pesticides frequently are based on scientific facts—often selected facts—but the disputants nearly always disagree about the story (Charles 2001). All stories are in some sense true, especially when one knows the preconceptions of the storyteller. The dispute is over the goodness of the characters (their virtue or lack of virtue), the plot (why is this happening?), the editing (what facts count?), and how it all will end (Charles 2001). What one hears or reads in these conflicting stories is often not a reasoned debate of the issues. It is a presentation and defense of one of the polar views: Pesticides are good and are required to feed the expanding human population versus pesticides are bad (for a variety of reasons, especially the unpredictability of future effects) and will not help feed people. Pesticides, many argue, are unpredictable, threatening, and a product of the type of human folly that leads people to believe that they can and should control the environment.

PERCEPTION OF RISK

Science can measure risk and determine the probability of the occurrence of a defined risk. Safety, in contrast, is a normative personal or political judgment. Judgment of

safety is not and should not become a scientific decision. Science creates the data on which many judgments and decisions are based, but scientists, through the scientific process, cannot determine individual actions or public policy on the basis of their data. Something may be described as unsafe because it is found through observation to increase the risk of undesirable consequences. For example, a pesticide can have high human toxicity or be an environmental hazard. Scientists can measure the risk (the likelihood) of human or environmental effects. Farmers may decide not to use a pesticide, insurance companies may charge high premiums if it is used, and legislative bodies may pass laws requiring special use precautions. Scientists may agree with those actions, but science does not create them.

People perceive risk in different ways depending on where they live, how rich or poor they are, their level of education, their friends, the scientific evidence they are aware of, what they read, and so on. Perception of risk may differ from the facts as determined by scientific study. But what degree of risk is acceptable and to whom? The answer may be determined legislatively, or it may be determined by one's perception of the risk. Many people are much more likely to accept a very risky activity (e.g., mountain climbing, hang gliding) if they assume the risk voluntarily, the likely effects are perceived to be delayed, the risk is a known common hazard, there are no alternatives available, and the consequences are thought to be reversible. When the opposite situation prevails, risks are accepted less readily. There are 2,000 to 3,000 cases of pesticide poisoning in the United States each year but only about 30 deaths. There are several thousand cases of pesticide poisoning and many more deaths in developing countries each year. In the United States pesticides are regarded as more risky and dangerous than the data show they really are. This is the case because they are seen as uncontrolled, involuntary risks with irreversible, severe, rapid consequences. There is uncertainty about long-term negative effects on human health or the environment. Pesticides are perceived as things that are likely to be misused and are regarded as dreaded, uncommon hazards.

There should be debate about whether pesticides can be hazardous to humans or the environment. They are toxic to people and will poison and may kill if they are not used properly. Many prescription pharmaceuticals, household cleaning agents, aspirin, automotive fuel, and other common products also are dangerous if they are not used properly. Their inherent toxicity does not change with use, but the possibility of danger increases with improper use. Neither stupidity nor ignorance increases the inherent toxicity of anything, but both increase risk.

SEE ALSO *Agricultural Ethics; Agriculture; Carson, Rachel; Environmental Law; Environmental Policy; Food Safety; Genetically Modified Organisms and Biotechnology; Risk Assessment; U.S. Environmental Protection Agency; U.S. Food and Drug Administration.*

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Robert L. Zimdahl

PHENOMENOLOGY

Feelings have a central place in ethics. Although their importance or centrality varies across major schools of thoughts, how we feel about various kinds of activities and behaviors forms at least part of what an ethical theory will seek to explain. Environmental ethics focuses special attention on the activities and behaviors that affect the natural environment. And so it focuses attention as well on the feelings we have regarding these behaviors, and on the constituent parts of that environment, including, among other things, plants, animals, species, ecosystems, and human beings. Phenomenology studies the nature of our first person experiences, which include our moral feelings toward the environment and our behaviors with respect to it. And so a discussion of phenomenology is appropriate in any comprehensive examination of environmental ethics.

THE PHENOMENOLOGICAL METHOD

Phenomenology is the study of conscious experience, *as* experienced. As such, it is intrinsically a first-person endeavor, an examination of the nature of conscious experience, rather than a third person characterization of the objective features of experience.

Etymologically, *phenomenology* is the study of phenomena, or of how things appear. Implicit in this is the distinction between how things appear and how they are. Consequently, phenomenology is concerned with how things appear to subjects of experience rather than with how they are independently of such experiences. This focus upon our experiences of objects in abstraction from questions concerning their existence apart from experience is what is sometimes referred to as phenomenological reduction.

From the standpoint of the natural sciences, we can, for example, study the neurobiology of the perceptual states of organisms, and the causal interactions between such organisms and their environments. We can study the behavior, linguistic and otherwise, of sentient animals, or examine the influence of social and cultural practices on human beliefs and desires. In each case, we are examining experience from a third person point of view: We are concerned with the objective properties necessary and/or sufficient for something to be a conscious experience, or for some entity to undergo a conscious experience. Phenomenology, on the other hand, studies what it is like to have a conscious experience. Its concern is the nature of experience as it is lived, that is, as it is experienced by a subject of experience, described from the first-person point of view.

It might seem that phenomenology is an entirely personal, indeed, individualistic undertaking. As I write this sentence, I can feel the firmness of the chair beneath my body, I have a visual sensation of the computer screen in front of me, I feel a throbbing pain in one of my toes, and I am fighting the urge to get up and smoke a cigarette. No doubt, the current experiences of the reader are considerably different. If phenomenology were nothing but the cataloging of such individual experiences, it would amount to little more than what Immanuel Kant (1925 [1781], p. 21) called a ''random groping,'' that is, a mere sampling of empirical descriptions without attention to any underlying theoretical framework.

However, phenomenology seeks more than such a cataloging of individual experiences. It is an attempt to describe and explain immanent structures within all conscious experiences as such. This is at once it most controversial feature, and, if successful, its greatest theoretical strength. It is controversial in that it apparently involves an inductive generalization from one case to all (typical) cases. That is, the phenomenologist looks at his or her own individual conscious experiences and proceeds, on this basis, to make general statements about the nature of all experiences as such.

The phenomenologist thinks that if others engage in serious and unprejudiced reflection, they will discover their own experience to be similar.This is essential to phenomenological method: Claims to have uncovered or described some universal aspect of or immanent structure within experience are always subject to empirical disconfirmation by any other conscious subject of experience. It is as though the claims of the phenomenologist are always followed by an implicit ''Right?'' or ''Don't you agree?'' Their purported universality presupposes the tacit agreement of the reader or listener. Conversely, as purportedly universal claims, they are open to disconfirmation by the existence of even a single individual who, ''upon serious and unprejudiced reflection,'' observes his or her own experience to be otherwise. (Although Martin Heidegger, a leading phenomenologist, prefaced his own claims by the caveat ''approximately and for the most part.'')

THE PHENOMENOLOGICAL TRADITION

The phenomenological movement in philosophy has its most explicit roots in the early twentieth century works of Edmund Husserl. This tradition continues through the works of Martin Heidegger (1962 [1926]), Maurice Merleau-Ponty (1962 [1945]), Jean-Paul Sartre (1956 [1943]) and others, and remains prevalent today in the work of contemporary Continental philosophers. It is typical for those working within this tradition to view phenomenology as a foundational discipline within philosophy. Phenomenology, that is, is understood as the proper starting point for dealing with fundamental philosophical problems, rather than beginning from within epistemological, metaphysical, or ethical frameworks.

Husserl's first major work dealing with phenomenological themes, *Logical Investigations* (1970 [1900–1901]) shows the influence of both Franz Brentano (1995 [1874]) and Bernard Bolzano (1973 [1837]), among others. From Brentano, Husserl inherited an interest in descriptive psychology. Rather than focusing on the causal relations of mental states, descriptive psychology seeks to describe and classify them. Bolzano's work on logic emphasized the distinction between subjective and objective ideas or mental representations. While subjective ideas are, in Kantian terms, ''mere modifications'' of the subject (Kant 1925 [1781], p. 182), objective representations point to something that has an existence apart from individual subjects of experience. The combination of these two influences can be seen in Husserl's interest in the structural or immanent features found in all

conscious states (or, more narrowly, within certain kinds of conscious experiences) as such.

Following Brentano, Husserl believed that the most fundamental structural feature of conscious states was their intentionality, that is, the fact that they are of or about something, that they are directed toward an object (or state of affairs). That is, if I am seeing, there is something that I see. If I remember, there is something I remember. If I hope, there is something for which I hope. For Brentano (1995 [1874], p. 88), intentionality is in fact the mark of the mental, involving an "intentionally in-existing" object. For Husserl, the ontological status of this intended object apparently varies between his earlier and later works. In *Logical Investigations*, it seems that the intentionality of experience is best viewed as a structural feature of consciousness, and that the intended object, if there is one, is typically an existent object in the natural world. In his later works, beginning with *Ideas* (1969 [1913]), intentionality consists in a relation to a kind of mental object, leading to the charge that Husserl moved from a realist position in his earlier works to an idealist one later on. The ontological status of such phenomena or objects *as* intended remains a controversial one both within and apart from the phenomenological tradition.

THE ROLE OF PHENOMENOLOGY IN ENVIRONMENTAL ETHICS

Phenomenology is concerned with the universal or immanent structural features of our consciousness of objects, while environmental ethics is concerned, among other things, with the moral status of (human and) nonhuman aspects of the natural world. A typical claim of environmental ethicists is that at least some nonhuman parts of the environment have intrinsic or inherent value, that is, that they have a kind of value that is in some important way independent of their relations to human beings and their various desires and needs. But this claim appears to run counter to the prevalent view that all values are relative to valuers, and that the only valuers are conscious beings, typically human beings or other sentient animals. And so the claim that natural entities have intrinsic or inherent value apparently runs afoul of the belief that values, of necessity, can be values only for human (or other sentient) beings. While environmental ethicists such as Holmes Rolston (*Philosophy Gone Wild*, 1986) seek to deny that the value of natural entities need be dependent upon human valuers, philosophers such as J. Baird Callicott (*In Defense of the Land Ethic*, 1989), while stressing that values need not be human-centered, concede that the source of all value must lie "in the breasts" of human or other valuing subjects.

This constitutes a core issue for environmental ethics, as it probes to the very foundations of such an ethics. But it is here that phenomenological methodology may have something to contribute. Phenomenology looks at the nature of conscious experience of objects, including, of course, our experiences of objects in the natural environment. The claim that such objects have some kind of value (whether intrinsic or otherwise) often stems from our experiences of those objects. For many it seems clear that we experience natural objects as having value, and so the role of phenomenology is in examining those experiences.

A key question is whether we experience the values of natural entities as residing in them, independently of our individual wants and needs, or whether we experience those values as in some way projected by us upon those objects. Does the value of these entities "lie in the eye of the beholder" as does (it is often said) the beauty of works of art, or does it lie in the objects themselves, as an objective or natural property, such as its size, shape, and weight?

A phenomenological approach to this question requires investigating the nature of our subjective conscious awareness of such objects. Is the value that we associate with such objects a contingent, idiosyncratic, feature of our individual experiences, or is it a necessary and universal feature of conscious experiences as such? Answering such a question goes beyond the scope of this discussion, but the role of phenomenology in such an inquiry is evident. We must look to our first-person experiences of such entities. Do we experience natural value as something we contribute to natural objects, or as something we discover in them? And if the latter, what is the necessary structure of consciousness in virtue of which such attributions of value can be understood as objectively valid and not merely as subjective fancies? These are phenomenological questions regarding the very nature of our first person subjective awareness of natural objects, and our answers to them have profound and pervasive implications for environmental ethics.

Debates in ethics, environmental and otherwise, are often settled by an appeal to our moral intuitions, that is, to our shared individual feelings about certain kinds of entities and behaviors. As the study of the immanent structure of such subjective experiences, phenomenological method has a critical role to play in our understanding of any ethics of the environment.

SEE ALSO *Deep Ecology; Environmental Philosophy: V. Contemporary Philosophy; Environmental Philosophy: VI. Postmodern Philosophy.*

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Kent Baldner

PINCHOT, GIFFORD
1865–1946

Gifford Pinchot was born in Simsbury, Connecticut, on August 11, 1865. A major figure in the history of conservation in the United States, Pinchot played a key role in shaping environmental consciousness during the late nineteenth and early twentieth centuries. As the first chief of the U.S. Forest Service (1905–1910) he helped define the mission and policies as well as the organizational structure and institutional culture of that agency. He was the driving force behind the Progressive conservation agenda of President Theodore Roosevelt and the leading spokesperson for the Progressives' utilitarian philosophy of conservation. Pinchot died on October 4, 1946, in New York City.

The oldest son in a wealthy and influential family, Pinchot decided at an early age to become a professional forester. After his graduation from Yale University in 1889, he studied forestry with the leading foresters of France, Germany, and Switzerland. In Europe he learned forest management methods that emphasized long-term planning, efficiency, and profitability; those principles later would be the hallmarks of his conservation philosophy.

Upon returning home, Pinchot proclaimed himself the first scientifically trained American forester and embarked on a long public career that blended passion for forestry with political ambitions and ideals. As a member of the National Forest Commission (1896) and a special forest agent with the Department of Interior (1897), Pinchot played an important role in the expansion of the federal forest reserve system under President Grover Cleveland. In 1898 he became chief of the U.S. Division of Forestry. Seven years later, when the Division of Forestry became the U.S. Forest Service, he was named its first chief. Between 1901 and 1908 Pinchot was a key member of Roosevelt's "Tennis Cabinet" and helped launch many of the president's conservation initiatives.

Gifford Pinchot. *Pinchot is often referred to as the "father of the Forest Service," being named chief of the U.S. Forest Service and contributing to the development of the agency's mission, policies, and structure.* **NPS PHOTO.**

Throughout his career Pinchot was at the center of political controversies. The most famous was his long battle with his former friend and hiking companion John Muir over the flooding of the Hetch Hetchy Valley in Yosemite National Park. In 1909 Pinchot and Secretary of Interior Richard Ballinger engaged in a highly publicized battle over allegedly fraudulent Alaskan land claims. That controversy led to Pinchot's dismissal as chief of the Forest Service in 1910 and ultimately contributed to the splintering of the Republican Party in 1912.

Among his many accomplishments Pinchot helped establish the Society of American Foresters and, with the financial support of his father, played an instrumental role in founding the Yale Forest School. He was a leading figure in the rise of the Progressive Party in the 1910s and eventually served two terms as the Republican governor of Pennsylvania (1922–1926 and 1930–1934).

Throughout his career Pinchot advocated conservation policies that promoted "the use of natural resources for the greatest good of the greatest number for the longest time." Although Pinchot credited his fellow Progressive W. J. McGee with formulating that phrase, Pinchot was its most visible and zealous proponent. Echoing Jeremy Bentham's (1748–1832) utilitarian maxim ("greatest happiness of the greatest number"), Pinchot and his

Progressive colleagues added a temporal element ("for the longest time") to emphasize the role of conservation in ensuring the continued availability of natural resources for the benefit and use of future generations.

In addition to its debt to utilitarianism, Pinchot's conservation philosophy was influenced by George Perkins Marsh's 1864 book *Man and Nature; or Physical Geography as Modified by Human Action*. For Pinchot, Marsh's account of past civilizations whose declines could be linked directly to the destruction of their forests and watersheds served as a warning to a rapidly growing nation bent on the unrestrained exploitation of its rich but limited supply of natural resources. Of equal concern to Pinchot was the inequitable distribution of the social and economic benefits derived from that unregulated assault on the public domain.

Pinchot summarized his philosophy of conservation in terms of three guiding principles: (1) the wise use of natural resources for the benefit of people currently alive; (2) the prevention of waste and the preservation of resources for the benefit of future generations; and (3) the development and preservation of natural resources for the benefit of the many, not the profit of the few. For Pinchot, conservation was an all-encompassing idea that could address national environmental and social ills while delivering equality, freedom, and lasting peace. To be effective, however, he believed that conservation policies needed to be based on sound science and required strong regulatory efforts by the federal government and in particular a powerful executive branch.

Occasionally Pinchot's ideas about conservation put him at odds with preservationists such as John Muir, who called for the protection of certain areas from all forms of development. More often, however, Pinchot's conservation ethic found its strongest opposition among those who demanded unregulated access to natural resources for private gain, often at the expense of land health and public welfare.

SEE ALSO *Conservation; Hetch Hetchy; Muir, John; Roosevelt, Theodore; U.S. Forest Service; Utilitarianism.*

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Scott Friskics

PLUMWOOD, VAL
1939–2008

Val Plumwood created and articulated a critical ecofeminist version of ethics and political philosophy and importantly lived as a philosopher sage with and within the natural world about which she wrote. She was born Val Morrell on August 11, 1939, into a poor family that ran a poultry farm near Sydney, Australia. She studied philosophy at the University of Sydney in the 1960s. In the 1970s she was a prominent member of a group of philosophers at the Australian National University that set in motion the first wave of Australian environmental philosophy. This group argued that environmental problems stemmed not merely from faulty policies, practices, and technologies but also from underlying human attitudes toward the natural world that were built into European and North American thought. These thinkers were especially critical of the anthropocentric idea that only humans matter morally and that people have no obligation to protect nonhuman nature for its own sake.

With her second husband, the philosopher Richard Routley, Plumwood coauthored a number of important early treatises, including several articles arguing that human chauvinism (exceptionalism) was detrimental to environmental ethics (Routley and Routley 1979). The Routleys divorced in 1981, and Val became the sole inhabitant of a stone house she had built with Richard in a temperate rain forest in southern Australia. Through her experiences in living in this rural environment she acquired a deep knowledge of nature that became legendary. She changed her name to Val Plumwood, after Plumwood Mountain—the location of her home—which in turn was named after the plumwood tree.

Plumwood was an independent scholar and took irregular teaching positions at a number of places, including Macquarie University, the University of Sydney, Murdoch University, the University of Tasmania, North Carolina State University, the University of California at Berkeley, and the University of Montana. The Australian National University awarded Plumwood a Ph.D. in 1991. She was also an important environmental activist and in the 1970s and 1980s played a key role in an environmental campaign to save rain forests in eastern Australia. She was attacked by a crocodile while she was canoeing alone through Kakuda National Park (Australia) in 1985. After three "death rolls" in the water, she escaped the crocodile's jaws with horrific injuries and

crawled for hours through tropical swamps before she was rescued. She wrote about the experience of being prey, which ironically reaffirmed her vegetarianism (Plumwood 1999).

Much of Plumwood's environmental philosophy focused on analyzing, critiquing, and providing alternatives to the dualisms that she believed lie at the heart of the domination of women, nature, and others. In her view the division between mind and matter that supposedly sets humans apart from nature became codified into an opposition between reason and nature in the European and North American tradition. This polarity, in turn, informed many categories of thought and created an ideology of dualisms that deemed "nature" to be inferior to "reason." Plumwood contended that this dualistic ideology was used to legitimize the subjugation of many social groups, including women, people of color, the working class, the poor, colonized peoples, indigenous peoples, and nonhuman nature. This led to the central ecofeminist insight that struggles for social justice and environmentalism are inseparable.

In 1990 Janna Thompson ventured a critique of Plumwood's outlook in her article "A Refutation of Environmental Ethics." She argued that that there were no foundations beyond sentience for environmental ethics; in response Plumwood (1991) argued that many entities beyond sentient animals—such as rocks, mountains, and ecosystems—possess teleological properties that are worthy of respect and that any adequate environmental philosophy must incorporate an ethic that challenges the purely instrumental human treatment of nature.

In her first book, *Feminism and the Mastery of Nature* (1993), Plumwood develops a feminist critique of dualisms and instrumentalism to argue that the master form of European culture's rationality has been unable to acknowledge its dependence on nature, women, and other dominated groups of people that it constructed as inferior. This "rational" distortion, she argues, has shaped the basic categories of European and North American thought and has threatened the survival of people and nonhuman nature. In "Wilderness Skepticism and Wilderness Dualism" Plumwood (1998) teases out the androcentrism, anthropocentrism, and Eurocentism that she believed to be embedded in the idea of wilderness; she further analyzes the roles dualisms have played in constructing the traditional concept of wilderness as a nonhuman nature that is opposed to human culture.

Plumwood steered her ecofeminism through both environmental ethics and political philosophy, developing what she called a critical-feminist-socialist ecology. At the time of her death, her work was directed toward death as a philosophical theme, especially in her unpublished article "Tasteless: Towards a Food-Based Approach to Death" (2007).

SEE ALSO *Animal Ethics; Anthropocentrism; Ecological Feminism; Environmental Activism; Sylvan, Richard; Vegetarianism.*

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Mark Woods

POLLEN FLOW

The possibility of the movement of genes from engineered crops to wild relatives has been one of the primary concerns associated with the release of genetically modified crops. Such gene flow could result in the evolution of increased competitive ability in wild relatives, making them more noxious weeds (Ellstrand 2003a, Hancock 2003, Snow et al. 2003).

FREQUENCY OF CROP/WILD HYBRIDIZATIONS

Although the early consensus was that hybridization between crops and their wild relatives occurred infrequently, later research showed that crop/wild hybridizations are relatively common. The reproductive barriers between wild and domesticated taxa are so minimal that they are often considered subspecies, and breeders can

readily transfer genes between them. A number of parameters, such as breeding system, flowering time, hybrid viability, and isolation distance can affect the rate of gene transfer, but if compatible relatives are within the area where pollen is dispersed, genes will eventually escape. Evidence for crop introgressions into wild populations of native relatives has been provided for many crops (Ellstrand et al. 1999).

Concerns about the deployment of genetically engineered crops have now shifted to the issue of whether transgenes will persist in native environments and have negative consequences. It has been generally assumed that crop/weed hybrids would be poorly adapted in nature and that transgenes would not, therefore, spread and persist; a few experiments have now shown, however, that the initial hybrids between crops and their native relatives do occasionally have fitness equal or superior to the wild antecedents and that genes from crops often persist for long periods in natural populations (Ellstrand 2001).

THE EFFECT OF TRANSGENES ON NATIVE POPULATIONS

The impact of transgene escape into wild populations will be strongly associated with the plant characteristic that the gene affects and the invasiveness of its wild progenitors (Hancock 2003). Transgenes that have a neutral effect on fitness, such as the marker genes used to recognize transgenic plants during experimental development, might spread randomly in natural populations but would have no subsequent impact on native fitness. Genes with detrimental effects on growth and development, such as male sterility or reduced woodiness in trees, would most likely be selected against in the natural environment and would not spread beyond a narrow area adjacent to commercial plantings. The transgenes associated with pest resistance would have variable effects, depending on the invasiveness of the recipient species and the level of natural control. If a wild species is an agronomic weed, the escape of a herbicide-resistance gene could make it a more noxious pest. Virus- fungal- and pest-resistant genes could increase the fitness of wild populations and make them better competitors if damage from the pest is controlling the size of natural populations. Those transgenes with direct positive effects on fitness, such as those broadening environmental tolerances, could result in dramatic adaptive shifts and have a major impact on the fitness of native populations, depending on the invasiveness of the species.

It has been suggested that the escape of transgenes into native populations could have a negative impact on levels of genetic diversity (Rissler and Mellon 1996). The addition of the transgene itself would, however, actually increase genetic diversity slightly, and any subsequent loss in genetic diversity would occur only at those loci tightly linked to a selectively beneficial transgene. The genes that are adjacent to such a transgene would be ''dragged'' along, possibly replacing any native diversity at these loci. The relative impact on native diversity would still be small, because the loci tightly linked to the transgene would make up only a small fraction of the species genome.

Another concern that has been expressed is that transgenes will have unexpected secondary genetic effects in natural populations. There could be ''epistatic effects,'' where the transgenes interact uniquely with those of the native species, or ''pleiotropic effects,'' where the transgenes influence more than the target trait. Although these possibilities can never be completely excluded, it is unlikely that the transgenes that have been selected for deployment will have dramatically different effects in the wild than they would in a cultivated background. The crops were originally derived from the wild species, and the transgenes have faced numerous evaluations, from the initial transformations to the final field screens, before release. Genes have been moved from native species to crop species by conventional breeders without any unexpected ramifications.

ENVIRONMENTAL IMPACT OF TRANSGENIC CROPS

Concerns have been raised about the environmental impact of crops engineered to produce pharmaceutical compounds, the so-called ''pharma'' or ''industrial'' crops (Ellstrand 2003b). The transgenes producing these products might escape into native populations via pollen flow and present a risk to humans and other animals that might consume them if the compounds are toxic. They also could reduce the fitness of native populations if they had a significant negative effect of competitive ability. It would seem prudent to regulate the release of these engineered industrial crops, as with other transgenic crops, taking into account the likelihood that someone or something could be harmed by them. If they do produce compounds that are potentially toxic or have a significant effect on reproductive fitness, their ability to reproduce needs to be severely restricted through mechanical means, or they need to be engineered into a crop that does not have any proximal native relatives. Although several methods of engineering sterility have been proposed or developed, none is ready for deployment (Chapman and Burke 2006).

One additional concern that is commonly expressed is that the introduction of transgenic crops could contaminate organically grown crops, in which purity from transgenes is a requirement. Relatively short isolation

A Bumble Bee Foraging for Pollen. *One of the major concerns with using genetically modified crops is the possible effects on native plants through hybridization. Some believe that transgenes could have a negative effect on genetic diversity. Other concerns include the contamination of native populations from "pharma crops," via pollen flow.* **ELIZABETH SELLERS/NBII.GOV.**

distances can be used to prevent all but a small percentage of transgene contamination into nontransgenic crops, but at present there are no restrictions on where genetically engineered (GE) crops are grown in relation to non-GE ones.

CONCLUSION

In summary, transgenes will escape into natural populations through pollen flow if compatible relatives are in proximity. Decisions on the risk of transgenic crops to native relatives should be based on three questions about risks: (1) Is a compatible relative present in the areas of deployment? (2) Is the native relative highly invasive? (3) Will the engineered trait significantly affect the invasiveness of the native relative? The degree of risk associated with the unrestricted release of potential GE crops depends on the answers to these three questions.

SEE ALSO *Agriculture; Genetically Modified Organisms and Biotechnology.*

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Jim Hancock

POLLUTION

Pollution refers to energy or substances that contaminate the environment, causing harm to humans or other living organisms. It can also refer to the act or process of releasing these pollutants. Major examples include air pollution, water pollution, and soil contamination caused by the release of toxic chemicals, particulates, or radioactive substances. Less well-known examples include noise pollution (noise that is loud enough to be physically harmful or annoying), thermal pollution (changes in water temperature that affect aquatic life), and light pollution (light from cities that interferes with animal life or astronomical observations). These examples illustrate that a substance can be harmless or even beneficial when present in small quantities while becoming harmful at higher concentrations. Because the status of these substances as pollutants depends on their quantity, there is room for debate about whether to label them as pollutants whenever they rise above "natural" levels or only if they cause harm to particular organisms or biological systems. Efforts to alleviate pollution played a major role in the growth of the environmental movement during the middle of the twentieth century, and the contribution of pollution to global climate change is one of the most important contemporary environmental concerns.

HISTORY

Humans have released pollution since prehistoric times. For example, early efforts at metal grinding and mining resulted in a variety of harmful emissions, culminating in widespread lead pollution during the Roman Empire. Nevertheless, the Industrial Revolution of the 1700s and 1800s produced air and water contamination on an unprecedented scale. These concerns became especially prominent within the environmental movement during the mid-twentieth century. London, which had suffered from smog for centuries, experienced a severe episode of air pollution in 1952 that killed thousands of people in a few days. Rachel Carson's classic book *Silent Spring*, published in 1962, questioned the wisdom of releasing large quantities of pesticides into the environment and

especially challenged the widespread spraying of DDT. A famous 1969 fire on the Cuyahoga River in northeastern Ohio stimulated concerns about water pollution. Public outcry regarding these environmental problems led to the creation of the U.S. Environmental Protection Agency (EPA) in 1970 and the passage of several important laws, including clean air acts in a number of countries, the U.S. Clean Water Act of 1972, and the U.S. Toxic Substances Control Act of 1976.

A number of the most famous environmental and public-health disasters of recent years were connected to pollution. In Japan the discovery of Minamata disease in the 1950s (a severe human neurological syndrome caused by mercury contamination in seafood) highlighted the hazards of heavy metal pollution in wastewater. One of the most catastrophic industrial accidents of modern times occurred in Bhopal, India, in 1984. Toxic methyl isocyanate (MIC) gas was accidentally released from a Union Carbide pesticide plant, killing up to 5,000 people within days and causing serious health problems in some 100,000 people in the ensuing decades. During the 1970s the Love Canal chemical waste landfill (near Niagara Falls, New York) became a symbol of the dangers of old toxic-disposal sites. The many serious illnesses suffered by residents of a neighborhood built over the site prompted the EPA to remove the citizens from their homes and reimburse them. The case galvanized support for the U.S. Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) of 1980, often called Superfund. It established fees, paid by the petroleum and chemical industries, to help pay for the cleanup of heavily contaminated waste sites for which responsible parties could not easily be identified.

EXXON VALDEZ

The oil tanker *Exxon Valdez* ran aground on March 24, 1989, in Prince William Sound, Alaska. This incident illustrates the wide range of impacts on humans and the environment from pollution-related environmental disasters. The tanker spilled more than 10 million gallons of crude oil, damaging 1,000 miles of Alaskan coastline and killing thousands of seabirds, sea otters, fish eggs, and other organisms. Millions of dollars were lost because of decreased fishing and tourism, contributing to the bankruptcy of the Chugach Native American group. The spill spurred economists to improve their techniques of contingent-valuation analysis, a set of approaches used to measure how much the public values particular environmental areas and how much of that value is lost by contamination. In the case of Prince William Sound, the public assessed the lost environmental value at several billion dollars.

ETHICAL AND PHILOSOPHICAL SIGNIFICANCE

Pollution raises a number of important ethical and philosophical questions. Although it was central to the environmental movements of the mid-twentieth century, many philosophers have questioned whether it provides the most appropriate motivation for environmental concerns. For example, Deep Ecologists such as Arne Naess have criticized those who focus solely on pollution and resource degradation as "shallow" environmentalists, concerned primarily about the needs of wealthy humans in the developed world. Nevertheless, a strong case can be made that those concerned about nonhuman organisms, developing countries, and underprivileged groups should also be worried about pollution. In the 1996 book *Our Stolen Future*, which Vice President Al Gore likened to *Silent Spring*, Theo Colborn and her coauthors argued that low-dose exposure to a variety of industrial chemicals was much more harmful to wildlife and humans than previously thought. They claimed that many of these toxins are endocrine disruptors, interfering with the delicate hormonal system of animals and causing species losses, damaged eggs, skewed sex ratios, disturbed mating practices, and abnormal development.

Kristin Shrader-Frechette argued in her book *Environmental Justice* (2002) that pollution is also taking a disproportionate toll on vulnerable groups: children, minorities, and poor citizens of developing countries. Many particularly hazardous pesticides that have been banned in wealthy countries are still produced there and then exported abroad, where they are often used improperly. Another concern is that, as environmental regulations have increased in Europe and North America, polluting industries (along with old, high-emission factory equipment) are moving to developing countries such as China, where they are producing serious threats to human health. Harmful electronic wastes (from computers, cell phones, and other electronic equipment) have also been exported to developing countries, where they are often recycled by poor workers under extremely toxic conditions. The Basel Convention, which entered into force in 1992, is an international treaty designed to reduce and regulate the flow of hazardous waste between countries. In response to critics who argued that the original treaty was inadequate, a Basel Ban Amendment (which prohibits the transfer of hazardous waste from a number of developed countries to developing countries)

Water Pollution in China, 2005. *A woman collects plastic bottles near a river in China's Jiangxi Province. The riverwater is polluted with a reddish dye discharged from a small paper factory nearby.* **AP IMAGES.**

was proposed in 1995 and has been ratified by a number of countries, as well as the European Union.

An important ethical question is how to determine acceptable levels of pollution. Many analysts argue that market forces should play an important role in these decisions. In a particularly striking example, Lawrence Summers, the former chief economist of the World Bank (and former president of Harvard University) signed an internal World Bank memo in 1991 that was later leaked to the *Economist* magazine ("Let Them Eat Pollution" 1992). The memo argued that developed countries ought to export more pollution to developing countries. The rationale was that the economic costs of pollution-related deaths or injuries are lower in developing countries because wages are so much lower. A more moderate and perhaps more justifiable appeal to market forces for regulating pollution involves setting a "cap" on the allowable emission levels of a particular pollutant and then allowing a group of industries to "trade" rights to emit the substance under the cap.

A common objection to many of these economic approaches is that they focus primarily on overall efficiency and not on maintaining a fair distribution of health risks among members of the population. Numerous ethicists argue that people have rights not to suffer significant risks of harm or death from pollution, no matter what the economic benefits to others might be. This position raises difficult problems of its own, however, because of the need to decide what level of risk is acceptable; critics frequently argue that it is impossible to eliminate all pollution-related risks. One solution is to claim that there is some threshold of risk that is so small (sometimes called *de minimis*) that it can be ethically ignored. Others worry that the aggregation of many *de minimis* risks could still pose significant ethical concerns.

Another important philosophical issue is how to balance the perspectives of experts and citizens when making societal decisions about pollution. The psychologist Paul Slovic has found, for example, that ordinary citizens appear to incorporate a wide variety of considerations (e.g., voluntariness, dread, and fairness) into their risk assessments, whereas experts focus more narrowly on the probability of a particular harm. Some

ACID RAIN

Sulfur and nitrogen compounds released from power plants, factories, and motor vehicles can react in the atmosphere to form acidic precipitation. This acid rain harms insects, aquatic organisms, forests, soils, and possibly human health. Acid rain has the potential to produce adverse effects that are very distant from the source of the pollution, much like the effects of chlorofluorocarbons on the ozone layer, the damage caused by fertilizer and pesticide runoff into waterways, and the global warming caused by greenhouse gases. These long-distance forms of pollution raise a number of difficult ethical and social issues:

- They frequently require regulatory cooperation across state and national boundaries.
- They create significant challenges for scientists who seek to identify precise cause-effect relationships between pollutants and harms.
- They make it more difficult to assign ethical responsibility to polluters, because small releases by many individuals can aggregate into large-scale effects.
- The agents who gain economic benefits by causing the pollution are frequently not the same individuals who suffer ill effects from it.

commentators argue that these differences justify respect for the risk perception of nonexperts, but critics such as Cass Sunstein argue that citizens' perceptions usually involve poor assessments of risk probabilities. Another concern about deferring to experts is that, in situations of scientific uncertainty, ordinary citizens sometimes have local expertise that rivals the understanding of scientists. The sociologist Brian Wynne argues, for example, that analysts made serious mistakes when evaluating risks from radioactive contamination of British sheep following the Chernobyl nuclear accident of 1986. Notably, they failed to account for details of sheep behavior and soil type that were well known to farmers. In her book *Taking Action, Saving Lives* (2008), Shrader-Frechette emphasizes another reason to doubt many expert analyses: Polluting industries fund questionable studies designed to obtain results that further their interests. In order to mitigate the effects of financial conflicts of interest on scientific research, she calls for independent sources to fund more studies on the environmental and public health effects of pollution.

PERSISTING ISSUES

The contribution of pollution to climate change is perhaps the most profound environmental issue of the twenty-first century. Emissions of greenhouse gases such as carbon dioxide are warming Earth's atmosphere, producing a wide range of deleterious effects that could include increased flooding in some areas, drought in other places, increased spread of some diseases, and major species extinctions. Some less certain but particularly serious potential consequences include a massive rise in sea levels (especially if ice sheets on Greenland or West Antarctica melt) and alteration of the Gulf Stream that warms Europe. Developing international cooperation on policies to mitigate climate change is one of the major challenges facing world leaders.

As nations attempt to lower their emissions of carbon dioxide in response to climate change, they are debating another crucial issue: pollution risks from nuclear power plants. Although these plants do not directly emit greenhouse gases, they have the potential to release large amounts of radioactive material, either through reactor accidents or through improper waste disposal. The possibility of accidents has become more worrisome as countries with poor industrial safety records begin to pursue nuclear power. In the United States, the plan to locate a repository for high-level radioactive waste at Yucca Mountain, Nevada, has become a focal point for nuclear concerns. Experts from the U.S. Department of Energy and the EPA have claimed that the site would be safe for thousands of years, but critics have questioned the validity of these estimates. The case has stirred renewed citizen and activist scrutiny of "official," "expert" analysis: Critics again are questioning claims to objectivity and seeking to uncover any hidden conflicts of interests. Such issues illustrate the importance of an informed and vigilant citizenry that can deliberate intelligently about the difficult ethical issues raised by pollution.

SEE ALSO *Deep Ecology; Energy; Environmental Law; Environmental Philosophy: V. Contemporary Philosophy; Global Climate Change; Pesticides; U.S. Environmental Protection Agency.*

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Kevin C. Elliott

POLYNESIA

The Polynesian islands form a triangle in the Pacific Ocean from Aotearoa (New Zealand) at the southwestern corner, to Rapa Nui (Easter Island) at the southeastern corner, to the Hawai'ian archipelago at the northern apex. Lying within the triangle are Samoa, Tonga, the Cook Islands, the Society Islands (including Tahiti), the Marquesas, and many more islands. Genetic analysis indicates that the Polynesians are descended from both the indigenous Taiwanese and the peoples of Melanesia, north and east of Australia. Those peoples began expanding farther eastward into the pelagic Pacific around 3,000 years ago. By the fourth century CE, the Polynesians had reached Rapa Nui, and by the fifth, Hawai'i.

HUMAN SETTLEMENT IN POLYNESIA

Aotearoa was peopled by the Polynesians last, only about 1,000 years before the present time. Genetic analysis and radiocarbon dating of chicken bones found in Chile indicate that they reached South America (3,600 miles from Rapa Nui) a century before the Spanish arrived. Sweet potatoes, native to South America, appeared on mid–South Pacific islands as early as the eleventh century. These facts suggest that the Polynesians were trading with South American Indians for half a millennium before Europeans crossed the Atlantic. The navigational skills required for locating, settling, and traveling between tiny bits of land in the largest ocean indicate great sensitivity to the environmental interface of land, sea, air, sky, and the behavior of other animals—in regard to winds, currents, stars, and birds—by means of all five senses.

COSMOLOGY AND CULTURE

Polynesia is united by dialects of a common language and variations of a common material, social, and cognitive culture. Its cosmology is among the most distinctive features of Polynesian cognitive culture and is especially germane to environmental ethics. Although there are many popular and local Polynesian origin myths, a more abstract and esoteric evolutionary epic is extant in both Hawai'i and Aotearoa—the northernmost and southernmost enclaves of Polynesia, respectively—suggesting a common ancestor in the Society Islands, which can be thought of as the cultural motherlands of eastern Polynesia.

An especially detailed expression of that epic is given in the *Kumulipo*, a Hawai'ian genealogical chant composed for Kalani-nui-ia-mamao, a Big Island chief, in the seventeenth century (Johnson 1981). This chief's genealogy is traced all the way back to the coral polyp, and the progression forward from there is quite similar to that of modern biology, moving from coelenterates (corals), to annelids and nematodes (segmented and unsegmented worms), to echinoderms (starfishes and sea urchins), to mollusks (shellfish), and on to marine and terrestrial vertebrates. The biological knowledge recorded in the *Kumulipo* was greater than that which existed in Europe when James Cook made contact with the Polynesians in the eighteenth century.

Of course, missing from the *Kumulipo* is Charles Darwin's major nineteenth-century scientific achievement: the concept of natural selection. From a scientific point of view, the explanation of the proliferation and increased complexity of species by natural selection is the crux of the modern theory of evolution. However, from an environmental-ethical point of view, whether evolution is blindly driven by natural selection or bootstrapped by reproductive *mana* (spirit power) is irrelevant. What is ethically important is the sense of relationship, of kinship, between human and nonhuman life implied in an evolutionary understanding of origins.

SOCIETIES AND SOCIAL ORDER

In most of Polynesia—Aotearoa being the exception—the islands are relatively small and the resource base is limited. Except for birds, some of them flightless and very vulnerable, there were virtually no native wild animals to hunt, although the Polynesians did introduce pigs. In addition to pork, they subsisted mainly by fishing the surrounding waters and cultivating enclosed fishponds and growing taro, the staple of their diet, and a few other domesticated food plants that they imported.

As island populations grew, highly organized and stratified societies developed to maximize the yield of the limited resource base. The volcanic island homes of the Polynesians were divided into wedge-shaped watersheds—bounded on two sides by lava ridges and on the third by the sea—steeply descending from the mountainous interior to the coastal lowlands. Commoners worked the land and sea. Their activities were overseen by stewards (*konohiki*) coordinated by aristocratic administrators (*ali'i*) who were governed by high chiefs (*ali'i nui*), all ruled by a paramount chief (*moi*) who might reign over a whole island. War between neighboring paramount chiefs was common as they struggled to expand their territories to aggrandize themselves but also to relieve population pressure and perhaps keep growing populations in check.

Polynesian social order was maintained by an elaborate system of taboos (the word is of Polynesian origin) or *kapus,* especially the *'aikapu,* or sacred eating, according to which men and women eat apart from one another and certain foods are forbidden to women. Food flowed up that social food chain from the bottom to the top. Polynesian social organization thus mirrored the natural ecological organization of Polynesian lands, for in ecology, energy flows through ecosystems from the bottom of the trophic pyramid to the top, from autotrophic plants, to herbivores, to omnivores, to carnivores. The analogue in Polynesian thought to energy in ecological thought is *mana*, of which the paramount chief, at the apex of the social food chain, has the most. In their conception of their social order, as in the scientific conception of the ecological order, Polynesians included the land as the base of their society. In the Hawai'ian dialect they call themselves *kama-aina*, "children of the land." Love of the land, *aloha aina*, is a pervasive sentiment, and *malama aina*, serving or caring for the land, is a cardinal duty. When the social order and the ecological order are in perfect harmony, everything is *pono* in paradise.

Aotearoa is different from the rest of Polynesia, consisting of two relatively large islands and lying in temperate, not tropical, latitudes, with richer and more diverse terrestrial and marine natural resources. The Maori social order is less vertically organized into gentry and common people and more laterally organized into tribes and clans, with each of the *hapu* established by its own voyaging canoe that came to Aotearoa from a legendary Polynesian motherland. Thus, there was less pressure on the Maori to cultivate the land intensively and efficiently or to develop a highly organized and stratified society. Hence, individuals experienced a greater sense of identity with their tribe, clan, and extended family.

LAND OWNERSHIP

In the modern West, land usually is owned by individuals. This concept of individual ownership is based on a theory crafted and defended by the English philosopher John Locke (1632–1704), who argued that when an individual "mixes" labor with an uncultivated piece of land—clearing it of rank vegetation and planting it with crops—its natural productivity greatly increases. Thus, the industrious individual has a right to "enclose" it and exclude others, to make private property of it. When land becomes private property, it may be "alienated": transferred, bequeathed, divested, bought, and sold. One may husband the land—manage it sustainably—and pass it on to one's offspring in its full productive capacity. Alternatively, one may overwork, mine, or strip the land, thus drawing from it not a living but a windfall profit to invest in another enterprise: One may sell or abandon it, move away, and leave the land in a ruined condition.

In the Maori concept of land ownership, by contrast, the tribe, not the individual, owns the land. Unlike an individual, whose lifetime is finite, a tribal community endures if not forever, at least indefinitely. Moreover, Maori tribal identity is merged with a particular landscape, and an individual's identity is merged with that of the tribe. Thus, for the Maori dislocation from ancestral lands constitutes a loss of tribal and therefore personal identity. Correlatively, from a traditional Maori point of view, sustainable development is the only kind of development that makes sense. The Treaty of Waitangi, signed by a number of Maori tribal chiefs in 1840, effectively established New Zealand as a British colony and guaranteed the Maori certain rights in perpetuity, including land rights. It was largely ignored until 1975, when the Waitangi Tribunal was established to adjudicate Maori claims under the treaty, including those regarding Maori cultural associations with various sites.

ENVIRONMENTAL ETHICS

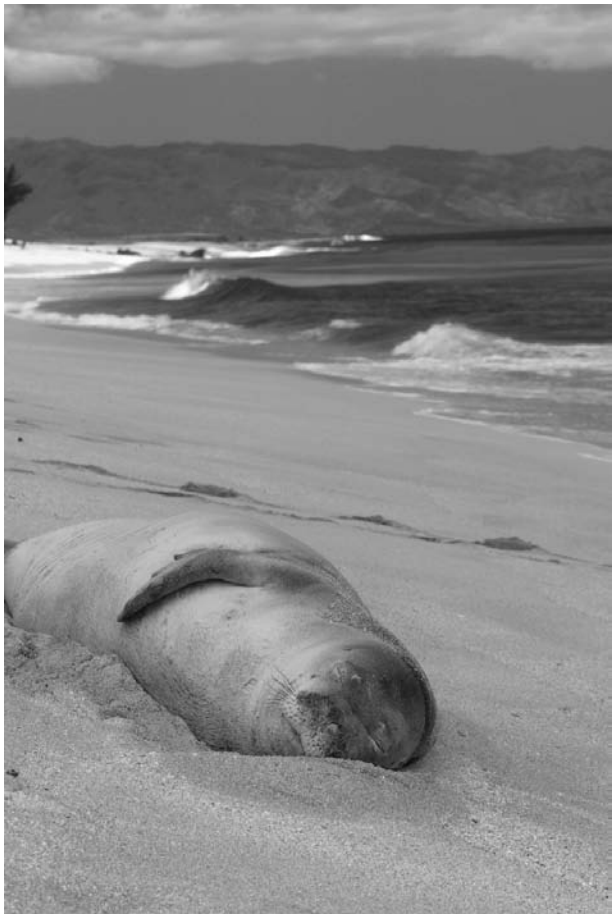
Ethics often is rendered paradoxical by disparities between attitudes, values, and beliefs, on the one hand, and actions, practices, and behavior, on the other hand. For example, how is it conceivable that militant crusades, brutal inquisitions, and genocidal pogroms went on in the name of Christianity, which professes ethical precepts such as turning the other cheek, walking the extra mile,

and loving one's enemy? Environmental ethics is no exception. For all the environmental sensitivity of the Polynesians evident in their navigational skills and for all their evolutionary kinship with and knowledge of the local biota, and despite the fact that many of their social organizations mirrored the ecological organizations of their island habitats and the fact that in some Polynesian societies personal and tribal identity were melded and vested in their homelands, Polynesian environmental behavior has not been beyond reproach.

The Hawaiian royalty wore robes made from the red and yellow feathers of two species of honeycreeper; it took thousands of those small birds to make one cloak. The flightless birds that had enjoyed freedom from mammalian predators were devastated by Polynesian hunters, their dogs and pigs, and the rats that had stowed away on their voyaging canoes. The moa of Aotearoa is only the most infamous example. Hundreds of species of birds went extinct during the interval between the arrival of the Polynesians and the arrival of Europeans from Aotearoa to Hawai'i to Rapa Nui. Lowland forests were cleared for the cultivation of crops, and the composition of upland forests changed radically as a result of anthropogenic causes that are still under investigation.

If the extinction of the Moa and the other flightless birds on Aotearoa is the most notorious instance of the hundreds of avifauna extinctions wrought by the Polynesians, the deforestation of Rapa Nui is the most notorious instance of the ecological devastation they perpetrated. The major reason its Polynesian inhabitants cut down the trees of Rapa Nui was to move their distinctive giant stone busts from the place where they were quarried and carved to the places where they were erected. Ironically, although these were the images of the beings that the islanders propitiated to sustain them, they turned out to be the instruments of their destruction. Without forests to hold the soil, it rapidly eroded. Birds had no place to roost and nest. The people had no wood to make boats, and so they could not go to sea to fish. They literally destroyed the Rapa Nui ecosystem and thus destroyed themselves.

Global climate change will continue to pose a particular challenge to Pacific island peoples, including the Polynesians, during the remainder of the twenty-first century and beyond. The predicted rise in sea level will swamp some low-lying atolls. On all the islands, even those with high mountains, coastal areas will be affected. Island peoples are more vulnerable to the increased frequency and intensity of cyclones, fueled by higher ocean temperatures, than are those who live on large land masses where they can seek refuge in the interior. Rising ocean temperatures may have significant impacts on the marine biota and thus on marine resources. Thus, a discussion of Polynesia and environmental ethics would be incomplete without mention of the concept of environmental justice and the duties owed by those most responsible for global climate change to those affected most adversely by it.



Endangered Hawaiian Monk Seal. *Lifeguards kept beachgoers away from this Monk Seal, on the endangered animals list, who spent two days lounging on the North Shore of Oahu in 2007. The species has shown a rapid decline in population since the rapid spread and development of humans throughout the Hawaiian islands.* **PHIL MISLINSKI/GETTY IMAGES.**

SEE ALSO *Asian Philosophy; Environmental Justice; Extinction; Global Climate Change; Land Ethic; Sustainability.*

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J. Baird Callicott

POPULATION

In the year 1 C.E. there were approximately 200 million people on Earth—less than the population of the contemporary United States alone. It took nearly two thousand years for the global population to increase sixfold: In 1850 the world population was an estimated 1.26 billion. The next increase of nearly sixfold has taken only 150 years, less than one-tenth the time of the previous sixfold jump: As of 2008 the world human population was 6.5 billion. This rapidly increasing growth rate of population, with attendant steep increases in consumption of natural resources, threatens the well-being of Earth's current and future inhabitants.

Environmental philosophers hold differing views on how humans affect the environment. Many questions and controversies have arisen in relation to the issue of population: Are resources disappearing? How do consumption patterns of a rising population change the human impact on the planet? Is there an optimal size of the human population? To what extent do humans have duties to other humans, other species, and future generations? Do ever-increasing rates of population growth augur more hunger, environmental degradation, and poverty? How do cultural and religious attitudes about gender, birth control, reproduction, and the institution of motherhood affect the size of families? How do gender, race, and class affect reproductive choices? How can population growth be restrained?

MALTHUS'S GLOOMY ARITHMETIC

Until the early nineteenth century little thought was given to human population growth except as evidence of the success of the human enterprise on Earth. That view changed with the initial publication, in 1796, of *An Essay on the Principle of Population* by the English political economist Thomas Malthus (1766–1834). Malthus argued that population increases geometrically or exponentially (1, 2, 4, 8, 16, 32, and so on), whereas agricultural productivity can increase only arithmetically (1, 2, 3, 4, 5, 6, and so on), leading to an inevitable strain on resources. For example, a farm couple might own and cultivate a hectare of land and from its yield feed themselves and four children; if those four children each had four children of their own, then in the next generation the same hectare of land must feed sixteen people; then, at the same rate of fertility, there would be sixty-four mouths to feed in the following generation and then 256 in the one following that.

On Malthus's calculation the ingenuity of the farm family might allow it to double the productivity of its hectare of land during the lifetime of the first generation, but any further doubling in productivity would be difficult. For example, suppose that the first-generation farm family produces 100 bushels of corn on its hectare of land, which would be adequate for six people. The next generation manages to produce 200 bushels on the same hectare, which must be divided not among twelve but among sixteen people. With great effort the subsequent generation might eke out an additional 100 bushels of corn from the same hectare for a total of 300, but that would have to be divided among sixty-four people. The share per person of food resources would therefore have gone, in the course of only three generations, from 6:100 to 16:200 to 64:300. At the same rate of fertility, in yet the next generation 256 people must share 400 bushels of corn if, by the most ingenious means, the original hectare can be made to produce as much—in which case the person to food ratio will be 256:400. At this point the hectare of land has reached its maximum possible productivity; hence the person-to-food ratio will shrink in the following generation to 1,024:400.

At this point several scenarios are imaginable: (1) starvation reduces family numbers to the "carrying capacity" of its hectare of land; (2) uncultivated wild land is appropriated and made to produce corn; (3) cultivated land belonging to another family is taken by force. Of course, an enlightened farm family might have foreseen the consequences of its own fertility and consciously limited its fertility rate to two—the replacement rate—by one means or another. But there are only two means of achieving a steady-state population: reduced fertility or increased mortality.

The "population problem," first articulated by Malthus, is captured only iconographically in the parable of the farm family and their single hectare of land. In the real world the human population consumes and depends on resources other than corn—indeed, on resources other than food. The fertility rate of the actual global human population varies from decade to decade, having peaked in the 1980s; as of 2008 it was running only a few tenths of 1 percent above the replacement rate of approximately 2.1. As the fertility rate exceeds the replacement rate, the population grows by an annual percentage. Even a seemingly small rate of increase of only 1.3 percent would result in a doubling of the population in just fifty-three years. The fertility rate and the rate of population increase is not

uniform throughout the world. In some regions fertility rates and rates of population increase are negative and in others positive; a region's population growth or decline is also affected by emigration and immigration.

JULIAN SIMON VS. THE EHRLICHS ON POPULATION GROWTH

Malthus's concerns echo loudly in the debate between the late Julian Simon and Paul and Anne Ehrlich on natural resources and the size of the human population. According to Julian Simon (1981), natural resources are not limited; he argues that when one resource—such as petroleum—is depleted, its price rises, stimulating research and the development of substitutes such as biofuels. Simon thus encourages unbridled consumption of current natural resources, which generates wealth, which in turn may be invested in the development of new technologies to meet the increasing demands of a growing human population. He rejects research calling into question the patterns of consumption and trading practices of the wealthy nations of the global north. He thus contends that economic incentives working in free markets will result in less pollution and a better environment. In sum Simon believes resources will expand as a result of human ingenuity, and the environment will be shaped to fit human needs. He encourages the creation of artificial substitutes for things in nature and argues that our survival capacities will increase from generation to generation, despite (or because of) changes such as reduction in the number of species in the world.

Simon questions the reasoning behind negative views about population growth. For Simon human intelligence is the ultimate resource. He rejects policies that pressure people to have fewer children and instead argues that population growth offers positive benefits, despite short-term costs. According to Simon human talents and capabilities offer endless possibilities that can translate into innovative solutions to challenges such as pollution abatement and resources availability.

In Simon's view population growth will not lead to more famine and desertification. The world eats better now than it ever has before, even in poor countries, according to Simon. He argues that when more food is needed, as both more land is brought under cultivation and advancing agricultural technology increases production per hectare, more food will be available. In addition, even as population increases, the number of farmers decreases while the amount of land per farmer is rising, and he views this as economically more efficient. In Simon's view environmental degradation, habitat loss, and species loss are problems only if economic losses also occur.

In contrast to Simon's view, the Ehrlichs (1998) contend that humans pose a dangerous threat to the environment. According to the Ehrlichs the growth of human population and consumption is responsible for the earth's increasingly degraded environment and global insecurity. They believe that effective remediation is possible, but only if there is a halt and then a reversal of human population growth. They question the optimistic representations of the future of economic growth because such projections, in their view, do not include the significant environmental costs of pollution, environmental health risks, and faltering ecosystems. They question the ability of current market mechanisms to allocate resources properly and doubt that technological advances will be able to address the problems of depleted natural resources and environmental degradation. They do not believe that curbing the use of natural resources should be left to the market. Although some economic studies have focused almost exclusively on the negative economic effects of reducing the use of fossil fuels such as oil, the Ehrlichs argue that there are many possible benefits to reducing per capita energy consumption—especially improving the health of both human and nonhuman beings.

The Ehrlichs also distinguish between biological wealth, or natural capital, and economic wealth and capital. They argue that human consumption and pollution deplete biological wealth and threaten entire ecosystems; they note that there are no artificial substitutes for some natural resources such as air, land, and water, which are subject to unprecedented deterioration. Acid rain, water pollution, toxic waste, climate change, deforestation, and loss of biodiversity are a few of the many environmental problems that the Ehrlichs attribute to the unsustainable scale of human population and patterns of consumption. They point to anthropogenic climate change as a potential cause of biodiversity loss and argue that extinctions of species will in turn cause more serious disruptions of ecosystems such as forest destruction in Eastern Europe by acidic air pollution, the desiccation of the Aral Sea in the former Soviet Union, and desertification in the Sahel region of Africa.

The Ehrlichs believe that limiting the human population size and reducing consumption are preconditions of a sustainable future. In their view eating is one of humanity's most ecologically destructive activities. They call attention to the problems associated with increasing the production of food, including use of synthetic agricultural fertilizers, irrigation, and chemical pesticides in green-revolution technology, which has been touted as the key to boosting food production to keep pace with population growth. They cite substitutions of synthetic pesticides for natural pest control, inorganic fertilizers for natural ones, and chlorination for natural water purification as examples of unsatisfactory attempts to create artificial alternatives to ecosystem services. They argue

that humanity's struggle both to feed the poor and to overfeed the rich is one of the principal causes of environmental degradation. They also note that human population growth and proportionately increasing pressures on food production result in the urban sprawl that devours agricultural land, which in turn spurs the conversion of forests and other natural plant communities into cropland for food production. Thus the task of saving the remaining forests is made harder because of the demands of a growing human population and its need for more food and wood products.

"TRAGEDY OF THE COMMONS," FAMINE, AND FUTURE GENERATIONS

Garrett Hardin (1974) critically examines the once-popular metaphor of the earth as a spaceship that we all live on and must share equally. Hardin prefers the metaphor of a lifeboat. Each wealthy nation can be conceived of as a lifeboat, full of rich people with low fertility rates, whereas the rapidly reproducing people of poor countries are swimming in water, begging for admission to a lifeboat. He argues that we need to recognize the limited carrying capacity of any lifeboat. Sharing in accordance with the spaceship ethic will soon swamp lifeboats and everyone will drown.

According to Hardin spaceship ethics is problematic because it leads to the "tragedy of the commons." Using the example of pastureland, Hardin argues that an owner adequately cares for his privately owned pasture because overshooting its carrying capacity will lead to a deterioration of the health of his herd and, therefore, economic losses. A farmer would recognize and restrain himself within the carrying capacity of his privately owned pasture. If, however, a pasture becomes a commons open to all, it is less likely, Hardin argues, that each individual will refrain from overshooting the carrying capacity. If one person increases his herd by one, the health of all the animals grazing on the commons will suffer, including his own; the value of adding an additional animal will benefit him alone, whereas the cost of doing so will be shared by all.

In Hardin's view common ruin is inevitable if there is no "mutual coercion mutually agreed upon"—regulations, in a word—and he points to air and water as examples of resources that are polluted because they are treated as an unregulated commons. The economic benefits of a polluting industry flow to its owners, whereas the costs of pollution are borne by all. Hardin argues that a free good is likely to become an overused or wrongly used good. He calls into question relief for nations in need by a world food bank, which he regards as a commons in disguise that will eventually bring ruin upon all who share in the commons, according to Hardin. Despite its good intentions, he believes such a system of sharing would encourage the population-growth differential between rich and poor countries. Because poor countries have faster rates of population growth than wealthy countries, this trend, he argues, would only increase with a global system of sharing. He contends that with increasing population growth some nations threaten to exceed—or have already exceeded—their carrying capacity. Hardin argues that when assistance is offered from abroad in order to save poor people plagued by famine, this well-intentioned humanitarianism backfires by diminishing the quality of life for those who remain and for future generations. He calls for those in the lifeboat to consider their commitment to future generations as well as to themselves.

William Aiken (1980) calls into question Hardin's judgment that it is a nation that has a carrying capacity. Aiken argues that the biological notion of carrying capacity is not applicable to the concept of a nation. Nor, in his view, is the natural environment, artificially carved up into nations, a boat that will necessarily "sink" when extra people are added. Aiken suggests that the concept of carrying capacity is ambiguous. Because technology leads to continual increases in the human carrying capacity of the environment, there is no way to determine that capacity precisely. Surely, he argues, there is an absolute limit to the number of people Earth can accommodate, but what that limit is or whether we are beyond it, closely approaching it, or still far from it is not known. Aiken also notes that Hardin focuses on mortality and ignores alternative fertility-focused methods of reducing population such as birth control.

CONSUMPTION PATTERNS AND POPULATION

Humans do not all consume the same amount of resources and generate the same amount of waste. Resource consumption and waste generation vary significantly between developed and developing nations. Only one-fifth of the planet's population lives in industrialized north, but it consumes more than two-thirds of the world's resources. The rest of the world shares what remains. The United States has less than 5 percent of the world's population and uses approximately 25 percent of the world's resources. In *Women and the Environment* (1993) Annabel Rodda notes, for example, that in the industrialized nations the average person is likely to consume more than 200 pounds of paper and 900 pounds of steel per year, compared to approximately 17 and 94 pounds, respectively, consumed by the average Third World resident. The industrialized nations use significantly more energy than the rest of the world; Julie Sze (1997) notes that the average citizen in the United

Total, Urban and Rural Populations by Major Area, Selected Periods, 1950–2050

Major Area	Population (millions)					Average Annual Rate of Change (percentage)			
	1950	1975	2007	2025	2050	1950–1975	1975–2007	2007–2025	2025–2050
Total population									
Africa	224	416	965	1394	1998	2.48	2.63	2.04	1.44
Asia	1411	2394	4030	4779	5266	2.12	1.63	0.95	0.39
Europe	548	676	731	715	664	0.84	0.24	–0.12	–0.30
Latin America and the Caribbean	168	325	572	688	769	2.65	1.77	1.02	0.45
Northern America	172	243	339	393	445	1.40	1.03	0.82	0.50
Oceania	13	21	34	41	49	2.03	1.49	1.05	0.65
Urban population									
Africa	33	107	373	658	1234	4 .76	3.90	3.15	2.52
Asia	237	574	1645	2440	3486	3.54	3.29	2.19	1.43
Europe	281	444	528	545	557	1.84	0.54	0.18	0.08
Latin America and the Caribbean	69	198	448	575	683	4.21	2.55	1.38	0.69
Northern America	110	180	275	337	401	1.98	1.33	1.11	0.70
Oceania	8	15	24	30	37	2.60	1.44	1.17	0.89
Rural population									
Africa	192	309	592	736	764	1.92	2.03	1.21	0.15
Asia	1174	1820	2384	2339	1780	1.75	0.84	–0.11	–1.09
Europe	267	232	204	170	107	–0.57	–0.41	–1.00	–1.84
Latin America and the Caribbean	98	126	124	113	87	1.01	–0.06	–0.50	–1.08
Northern America	62	64	63	56	44	0.11	–0.02	–0.65	–1.00
Oceania	5	6	10	12	11	0.88	1.60	0.78	–0.04

SOURCE: Table 1.3 from United Nations Department of Economic and Social Affairs/Population Division. *World Urbanization Prospects: The 2007 Revision,* February 2008.

Table 1. CENGAGE LEARNING, GALE.

States uses energy at the rate of 3 Japanese, 6 Mexicans, 12 Chinese, 33 Indians, 147 Bangladeshis, or 422 Ethiopians. The environmental footprint of First World residents is much deeper than that of the typical citizen of the Third World.

WASTE

Residents of the industrialized nations generate more waste than people living in the rest of the world. For example, the average person in the United States produces almost 2,000 pounds of solid waste per year. Americans and Europeans are consumers of high-tech consumer electronics such as computers, cell phones, and televisions, which now constitutes the fastest-growing part of municipal waste in the United States and Europe. According to a 2001 Environmental Protection Agency report, this discarded electronics waste generated approximately 70 percent of the heavy metals and 40 percent of the lead now found in landfills in the United States.

Citizens of wealthy nations are largely responsible for toxic dumping, the destruction of biodiversity, and soil and water depletion. Often race is the main factor in the location of hazardous-waste disposal sites in the United States. This inequitable burden also occurs on a global scale. Developed countries produce large amounts of waste that are often transported to poor nations and can cause environmental degradation. Despite international regulations, approximately 80 percent of the electronic waste generated in a year in the United States is being exported to poorer countries such as China, Pakistan, and India, and to countries in West Africa. Large

containers of computer parts are shipped to less-wealthy nations and workers in these countries crack open and melt computer parts over open flames to retrieve metals. The toxic chemicals, vapors, and particles released in this process include lead, polyvinyl chloride (PVC), and polycyclic aromatic hydrocarbons (PAHs), all of which are persistent toxics. According to Elizabeth Grossman (2006), samples taken in Guiyu, China, in 2005 found levels of copper, lead, tin, and cadmium 400 to 600 times higher than what would be considered normal and safe. These samples also found polychlorinated biphenils (PCBs), PAHs, brominated flame retardants, nonphenols, phthalates, and triphenyl phosphates. As a result of this exported e-waste, the air and water in this region have been severely polluted.

POVERTY ECONOMICS AND POPULATION

Affluent, developed countries have lower fertility rates and thus lower rates of population growth than poor, developing counties. Jack Hollander (2003) believes that poverty is the root of population growth—indeed, of all environmental problems; he asserts that only a free and affluent society can achieve zero population growth and environmental protection. Hollander therefore argues, in contrast to the Ehrlichs, that population growth is not a serious long-term global problem. He points out that the Ehrlichs' predictions of massive famines have not been borne out. Instead of focusing directly on limiting population growth—by, for example, withholding food aid or promoting contraception—he recommends economic development, technological progress, and unregulated capitalism to eliminate poverty and thus to slow and ultimately halt population growth.

Hollander also believes that eliminating poverty will improve environmental quality. He thinks that for the 80 percent of the world's people who are not affluent, life's basic necessities take on a higher priority than environmental quality. He maintains that when people have economic and educational opportunities, the human population will stabilize and efficient agriculture will reduce or eliminate hunger and the demand for more land for food production. He contends that economically secure people demand environmental protection.

The Ehrlichs insist, in opposition to Hollander, that a rich person contributes much more to the damaging of Earth's life-support systems than does one living in poverty. Restricting the size of human population, not increasing affluence, should be the first priority for healing the planet, in their view. The Ehrlichs call attention to the energy trap. More energy is required to give all human beings an affluent lifestyle; although developing and deploying these energy sources would be very difficult and costly; using that much energy would create an even larger threat to ecosystems. The Ehrlichs therefore emphasize two key imperatives: reducing consumption and waste generation by the rich and limiting the population growth of all humans, rich or poor.

GENDER, RACE, CLASS, AND POPULATION

Gender, race, and class have been prominent issues in debates about human population. Some argue that gender, race, and class are often not adequately addressed in Ehrlich-style population-restraint perspectives. Recommendations of a reduction of population growth can be seen as racist and classist in condemning the rapid growth that occurs mostly in areas outside of the ambit of the developed countries. Such critics argue that the Ehrlichs' arguments fail to address the reasons for rapid growth in the third world.

Vandana Shiva (1989) argues that there is a link between the destruction of nature and the oppression of women. She argues that agriculture has shifted into two sectors: the cash-mediated masculine sector and the subsistence-oriented feminine sector. As a result the cash economy draws men away from the land, increases women's workload in producing subsistence, and disrupts ecosystems because of the green revolution's focus on growing irrigation-dependent cash crops through the use of synthetic chemicals. Shiva asserts that, as more land is diverted to cash crops and degraded by green-revolution technologies, women have less access to land and other resources but increased burdens in food production for family subsistence. As a result of the environmental degradation caused by industrial agriculture, Shiva notes that women must walk longer distances for water, fodder, and fuel.

Val Plumwood (1991) argues that numerous studies have shown that, in the Third World, ecologically insensitive, high-technology agriculture and forestry strengthen the control of the elites over natural resources and aggravate social inequalities, including men's control over women. Ecofeminists such as Shiva and Plumwood argue that the key to stanching population growth in developing countries is not withholding food aid and promoting contraception or increasing affluence and consumption: They believe that the solution lies in ensuring women's economic and reproductive autonomy. When women are empowered with education, economic means, and reproductive choices, they are more likely to be able to choose to have fewer children because their status may not be as dependent on bearing many children. In addition, they may not feel the need to increase the economic workforce of children as a means of making ends meet. Fewer births may benefit these women in several ways including their health and their efficiency in managing natural resources.

The ecological feminist Chris Cuomo stresses the importance of considering categories such as gender, race, class, and sexuality in an analysis of the complex issues involved in population growth (1994). She points out that some approaches to population control lack a critical analysis of the many social factors underlying gender oppression. She notes that these social factors—including the institution of motherhood and attitudes about sexuality and women's bodies—which contribute to the growth of human population, are ignored in many biology-based theories about "carrying capacity" and "standard of living." She calls attention to the inadequacy of viewing humans as a homogenous species and thus failing to recognize the impact of gender, race, and class on population growth. Cuomo asks, "Why do women bear many children, even in areas or communities where high population density impacts on individual lives very directly, through overcrowding, shortages of food and other necessities, poor health and hygiene, and the obvious destruction of local land and species?" (1994, p. 95).

Cuomo argues that sexism, the institution of motherhood, racism, classism, cultural factors, sexuality, and health issues fuel population growth. The ecofeminist approach acknowledges and examines in detail the need for the disempowerment of women in various ways: in terms of control over their own bodies, their roles in culture, and their sexuality, and their identities as they relate to the environment in which they live. According to this view, women's systematic oppression in patriarchal societies directly relates to the degradation of the natural environment.

Ecofeminist writers have linked women's oppression and the feminization of poverty to human population growth. Ronnie Zoe Hawkins (1992) notes that, although women often seek to limit family sizes, they are sometimes denied access to the means for doing so. Cultural beliefs and values in a patriarchal society often pressure women into bearing many children, even at the expense of their own health. Forms of birth control and abortion may be prohibited by religious or cultural views or both. In addition, women may be alienated from their own bodily functions and processes.

The roots of population growth are thus seen to lie in the poverty and patriarchy that form institutionalized barriers to women's freedom of reproductive choice. For example, many Third World cultures discourage the open discussion of birth control, and contraceptive devices are not readily accessible. In many cultures male babies are seen as more valuable than females; the overwhelming majority of abortions in countries such as China and India are performed to prevent the birth of females, resulting in de facto gendercide. Although this practice may limit population growth because there will be fewer mothers to bear children, feminist critics have pointed with alarm to its grave ethical implications.

Of all the roles traditionally assigned to women, motherhood is the one that is most common across cultures. The ideal of a good mother as a woman constantly bound to her children, physically and emotionally, willing to sacrifice herself and put the children's welfare before anyone else's, including her own, is a demanding ideal, but its perceived nobility offers insight into the reasons that some women continue to reproduce in circumstances where high population lowers their standard of living. Another explanation turns on the economic value of children as part of a family workforce in poor agrarian communities. Third World women often participate more than men in the food system. Women in Africa produce more than 70 percent of Africa's food. Andy Smith (1997) argues that it is often in the economic interest of Third World women to have more children in order to raise more export crops and earn more money.

Smith argues that population-control measures are needed most urgently among the prosperous citizens of the United States because of their rapid rate of consumption of resources. Sze (1997) notes that Third World immigrants and refugees of color with high fertility rates threaten to outbreed the low-fertility white populations of industrialized countries. Sze argues that white fears of "Third World-ification" by Latinos and Asians assume that the world's people of color are to blame for environmental degradation caused by overpopulation.

Some further argue that methods of population control have been threats to the reproductive health among women of color. For example, Smith and Lori Gruen call attention to the history of forced sterilization of women of color and the history of U.S. contraceptive companies marketing dangerous drugs such as Depo-Provera to other countries.

CONCLUSION

While gender, race, and class issues are crucial for consideration in analyses of human population size and growth, it is important that such studies do not use women, particularly women of color, as scapegoats. Reproductive choice is a human rights issue as well as an environmental issue. Policies geared toward the empowerment of all women in their reproductive choices are necessary in order to move toward a more sustainable human population and a healthy planet for all.

SEE ALSO *Anthropocentrism; Biodiversity; Consumption; Deserts and Desertification; Ecological Feminism; Economics, Ecological; Environmental Citizenship; Environmental Policy; Forests; Future Generations; Habitat Loss; Hunger; Intergenerational Justice; Plumwood, Val; Shiva, Vandana; Species; Tragedy of*

the Commons; U.S. Environmental Protection Agency; Waste Management.

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Cecilia Herles

POSTCOLONIAL ENVIRONMENTAL ETHICS

The term *postcolonial environmental ethics* refers to the view that any globally relevant environmental ethic must recognize the legacy of Euro-American resource extraction from subordinate states over the last five centuries. The term *postcolonial* draws attention to the fact that the contemporary period has followed the demise of Euro-American colonial empires that lasted from the late 1400s through the 1960s and that people in the West still are affected by neocolonial attitudes toward nature and the human categories (indigenous/women) that are conceptually connected with nature. At the core of these attitudes is Eurocentric diffusionism (Blaut 1993), the idea that Euro-American cultures have dominated world resources over the last five centuries because of their innate cultural economic superiority over dominated cultures in Africa, Asia, and the Americas; that is, colonial resource extraction is ethically justified. The utilitarian philosopher John Stuart Mill embodied this attitude when he described British colonies as "hardly to be looked upon as countries, . . . but more properly as outlying agricultural or manufacturing establishments belonging to a larger community. . . . The West Indies . . .are the place where England finds it convenient to carry on the production of sugar, coffee, and a few other tropical commodities" (Mill 1965 [1848], p. 693).

Postcolonial environmental philosophers typically critique contemporary economic and cultural globalization for its neocolonial policies. Postcolonial environmental ethics today works constructively toward an environmental ethic that will replace the Euro-American hierarchy with a more diverse, horizontal, historically infused view of environmental problems that integrates environmental and social justice. It therefore brings forward sources of understanding that often are marginalized, such as understanding based on gender, race, caste, and class. Instead of separating people from nature—imagining nature as a pristine sanctuary separate from human beings—it works to undercut conceptual and practical dualisms such as nature versus culture, feminine

versus masculine, emotion versus reason, and the Orient versus the West.

HISTORICAL BACKGROUND

In the wake of Christopher Columbus's claim to have discovered the Western Hemisphere, Pope Alexander VI issued the papal bull *Inter Caeteras,* granting the world east of the Canary Islands to Portugal. Ferdinand and Isabella of Spain were granted the lands to the west so "that in our times especially the Catholic faith and the Christian religion be exalted and be everywhere increased and spread, that the health of souls be cared for and that barbarous nations be overthrown and brought to the faith itself" (Alexander VI 1917 [1493]). In 1498 the Portuguese sailor Vasco da Gama established the eastern water route to the same territory that Columbus coveted by rounding the Cape of Good Hope and landing at Calicut in southwestern India. Thus, Europe, whether looking east or west, had staked its claim to the non-European world as its colony. The reason was primarily environmental, for as Madhav Gadgil and Ramachandra Guha wrote, "Colonialism's most tangible outcome (one whose effects persist to this day) related to its global control of resources" (1992, p. 116). The 24 acres of land available to support each European in 1491 increased to 120 "ghost acres" per European inhabitant with the advent of colonialism (Gadgil and Guha 1992).

As the historian J. M. Blaut has recounted, in the years from 1561 to 1580, 85 percent of the silver in the world came from the Americas. Potosí, a silver-mining city in the Andes, had a population in the 1570s of 120,000 people, more than Paris, Rome, or Madrid. Sugar exports from Brazil in 1600 were double the value of all English exports to the entire world in that period. Blaut estimated that more than a million people were working for the European economy in the Western Hemisphere at the close of the sixteenth century (Blaut 1993).

European economic, cultural, and military dominance over the last five centuries has been due largely to smallpox, not innate European superiority. Although the numbers are disputed, most historians believe that the Western Hemisphere was more populous than Europe in 1491, with perhaps 112 million people, roughly 95 percent of whom died within 130 years of European contact (Mann 2006). The American wilderness that explorers such as René-Robert de La Salle encountered in his voyage up the Mississippi in 1681, "a solitude unrelieved by the faintest trace of man" (Mann 2006, p. 360), was in fact an artificial wilderness created by genocide and disease. John Winthrop, the first governor of the Massachusetts Bay Colony, observed in 1634, "For the natives, they are neere all dead of small Poxe, so as the Lord hathe cleared our title to what we possess" (quoted in Crosby 1986, p. 208).

POSTCOLONIAL ENVIRONMENTAL THEORY

Postcolonialism has influenced many disciplines in the humanities, but it often has remained human-centered. Postcolonial environmental ethics therefore issues a challenge to understand colonialism and its contemporary legacy in terms of the ways in which colonial exploitation of resources is intertwined with the exploitation of people who are understood as being connected to nature. Thus, women, indigenous peoples, and people of color occupy ambiguous spaces when they are constructed in colonial narratives as intermediaries between nature and culture.

Postcolonial environmental ethics is pluralist because its proponents recognize that resistance and solutions grow out of local conditions. A model is the Self Employed Women's Association (SEWA), a trade union founded in 1972 by Elaben Bhatt because in India most women (94 percent) work outside the wage labor economy, finding employment in the informal sector. Their contributions to the economy and to environmental stewardship usually go unrecognized. SEWA embraces Gandhian principles of *satya* (truth), *ahimsā* (nonviolence), *sarvadharma* (integrating all faiths, all people), and *khadi* (propagation of local employment and self-reliance). The association includes a Forest Worker's Campaign because many poor women sustain themselves and their families through the collection of forest produce. The workers raise and sell saplings as well as produce from their nurseries. SEWA contends that the government forest department undercuts women's activities and has launched a campaign to "Feminise Our Forests."

Informed by SEWA's emphasis on local self-reliance (*khadi*), postcolonial environmental ethics often opposes attempts by the so-called First World to develop the Third World as another chapter in what historian Ranajit Guha (1989) termed the "idiom of improvement." The economist William Easterly (2006) compared the West's post–World War II attempt at Third World development with Rudyard Kipling's urgent plea to the United States to colonize the Philippines:

> Take up the White Man's burden—
> Send forth the best ye breed—
> Go bind your sons to exile
> To serve your captives' need

Authors such as Vandana Shiva (2001) and Deane Curtin (1999, 2005) have questioned the attempts of U.S. Agency for International Development (USAID), the World Bank, the International Monetary Fund, and the World Trade Organization to extend the ownership society to the genetics of seeds, medicines, and the human genome. These efforts threaten the security of dispossessed peoples, who need dependable access to nature

for health, safe food and water, and fundamental human dignity.

SEE ALSO *Christianity; Ecological Feminism; Environmental Pluralism; Globalization; India and South Asia; Shiva, Vandana.*

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Deane Curtin

POVERTY

SEE *Environmental Justice.*

POWELL, JOHN WESLEY
1834–1902

John Wesley Powell is best known as the one-armed explorer of the Colorado River, but his later work as an advocate of land reform earned him consideration as North America's first great bioregional thinker. As a leading intellectual of his time, he also made lasting contributions to geology, linguistics, and anthropology. Born on March 24, 1834, in Mount Morris, New York, Powell grew up on a succession of family farms in Ohio, Illinois, and Wisconsin.

An ardent abolitionist, he enlisted in the U.S. Army at the outbreak of the Civil War, ultimately attaining the rank of major. Wounded at the Battle of Shiloh in 1862, he suffered amputation of his right arm but eventually returned to active duty and served in the Vicksburg and Nashville campaigns.

Soon after the war he conceived the idea of exploring the largest remaining blank spot on the map of the United States south of Alaska: the canyons of the legendary Colorado River and its tributaries. Powell aimed to map the region, ascertain its character, and assess its usefulness.

On May 24, 1869, at Green River Station, Wyoming Territory, Powell and nine others shoved four wooden dories into fast water and floated out of sight, bound either for history or oblivion. The loss of a boat and its provisions to an early rapid strained group cohesion. Later, in the Grand Canyon, weeks of scant food, brutal heat, arduous labor, and terrifying rapids prompted three men to leave the expedition and attempt to walk to civilization. They died in the attempt. Powell and the remaining five (one other had departed in June) safely reached the Virgin River in Nevada Territory on August 30, after a wilderness journey of some 900 miles.

The success of the expedition led Congress to create the Geographical and Geological Survey of the Rocky Mountain Region, with Powell in charge. In that capacity, through the 1870s, Powell explored and mapped the Colorado Plateau. He also pursued his long-standing interest in Native American ethnography, producing *Introduction to the Study of Indian Language* in 1877. Two years later he became head of the newly created Bureau of Ethnology in the Smithsonian Institution.

Powell produced an even more groundbreaking work in 1878. His *Report on the Lands of the Arid Region of the United States* proposed a thorough overhaul of laws and policies governing settlement of western lands. He based his argument on two ideas, which, he said, the government and its people would ignore at their peril.

The first was that the land had limits. Most of the United States west of the hundredth meridian received fewer than twenty inches of precipitation annually, which

John Wesley Powell, 1873. *Best known for his explorations of the Colorado River, Powell is also remembered for his contributions to geology, linguistics, and anthropology. He is seen here talking to a Paiute Indian during a survey of northern Arizona.* **U.S. GEOLOGICAL SURVEY.**

was inadequate to sustain unirrigated agriculture. The nation's homestead and preemption laws, which were predicated on development of 160-acre farms, were therefore a prescription for failure. Powell's second idea was that the character of institutions governing settlement—systems for water rights and land tenure, for instance—would directly shape society's prospects for wealth, justice, and democracy.

Powell offered an alternative system, which he continued to revise for another dozen years, culminating in three articles published in *Century Magazine* in 1890. The cornerstone of Powell's plan was to redraw the political landscape of the West as a system of what he called "watershed commonwealths," achieving "local self-government by hydrographic basins" (Powell 2001, pp. 306, 308). Citizens in each watershed would use the land as they collectively wished, while the interlocking interests of irrigators, stock raisers, loggers, and others kept abuses to a minimum.

Powell published the articles because he was under attack. Since 1881 he had directed the U.S. Geological Survey, which Congress formed by combining Powell's survey with two others. In 1888, at Powell's urging, Congress authorized the Irrigation Survey within the Geological Survey to identify reservoir sites and other lands necessary for development of irrigation agriculture throughout the West. As a result of events that Powell neither controlled nor advocated, the work of the Irrigation Survey led to a temporary ban on settlement within the public domain in 1889. The resulting furor destroyed much of Powell's public influence, and he resigned from the Geological Survey in 1894.

He continued as director of the now-renamed Bureau of American Ethnology until his death in 1902; among his important contributions to anthropology is *Indian Linguistic Families of North America*. Nevertheless, Powell's legacy is richest as a philosopher of land use. He held a largely utilitarian view of nature and was no environmental saint, but like few others in his time or since, he fathomed the interrelation of society, land, and water and spoke its truth relentlessly.

SEE ALSO *Land Ethic; Utilitarianism.*

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William deBuys

PRAGMATISM

Pragmatism as a school of philosophy is concerned with practical consequences of ideas. Because environmental issues are practical by their very nature, the central doctrines of pragmatism have been of interest to philosophers and others concerned with environmental ethics.

ORIGINS AND BASIC PRECEPTS OF PRAGMATISM

The formalization of pragmatism began in the United States during the 1870s as a reaction to the epistemological foundationalism and mind-body dualism of René Descartes, the doctrine of the transcendental ego and the "thing in itself" advanced by Immanuel Kant, and the sensory atomism of British empiricists such as John Locke. Although the movement had many contributors, including Jane Addams, George Herbert Mead, and F. C. S. Schiller, the most influential among the founding pragmatists were Charles S. Peirce (1839–1914), William James (1842–1910), and John Dewey (1859–1952).

Reduced to its most basic form, pragmatism is a family of theories of meaning, truth, and inquiry. Pragmatists hold that the meaning of a concept lies in its conceivable practical consequences. Peirce treated truth as a limit toward which disciplined scientific inquiry would eventually converge. For James true ideas are those that we can assimilate, validate, corroborate, and verify. Dewey identified truth with warranted assertibility.

What these treatments of truth have in common is a rejection of key elements of traditional correspondence and coherence theories of truth, as well as an emphasis on the active, selective, reconstructive activity of human inquiry. Peirce, James, and Dewey agreed that inquiry begins with a state of doubt or disequilibrium that is genuinely felt (and not just theoretical or feigned); that it proceeds by way of problem formation, hypotheses, and tests; and that, when successful, it results in a new state of belief or equilibrium in which the subjective and objective conditions that occasioned the original doubtful state have both been satisfied. Dewey characterized this as a process of accommodation of an organism to relevant external conditions and alteration by the organism of relevant external conditions. These two processes together he termed "adjustment" (Dewey 1934, p. 12).

PRAGMATISM AND NATURE

In addition to these basic tenets, there are pragmatism's commitment to the continuity between human life and the rest of nature; its rejection of control or mastery over nature in favor of management of undesirable conditions; its doctrine of fallibilism (or the view that absolute certainty regarding existential affairs is unattainable); and its treatment of ethics as contextual and constructive. Although the roots of pragmatism are in the sciences, it is not scientistic: It rejects the idea that the methods and the conclusions of the natural sciences are applicable to all areas of experience, as well as the notion of the natural sciences as value-free. Each of the founding pragmatists accepted some variety of evolution, and each held some variety of naturalism (as opposed to supernaturalism).

Although Peirce, James, and Dewey shared these and other basic ideas, they differed regarding other matters, including issues that are now debated by environmental philosophers. Peirce and James, for example, accepted various forms of panpsychism, or the view that preference or feeling at the very least (Peirce), or perhaps even consciousness (James), pervades the universe. It was Dewey, however, whose published work most directly interfaces with contemporary debates among environmental philosophers.

Dewey, for example, responded to Thomas Huxley's argument that the world comprises two orders: a "cosmic" order of struggle and strife and an "ethical" order of sympathy and cooperation. He rejected the underlying dualism of Huxley's argument, suggesting instead that there is only one nature, that human beings are a part of nature, and that the relation of human beings to the rest of nature is like that of a gardener who artfully utilizes one part of nature in order to manage another part (Dewey 1898). Dewey's concept of the relation of human beings to their environment thus anticipates the work of the pioneering environmentalist Aldo Leopold, for whom management was a key concept.

PRAGMATISM AND THE ENVIRONMENT

Early in the twentieth century, Dewey's critique of idealist and mystic approaches to environmental issues anticipated some issues currently under debate. He understood idealism, for example, to posit ultimate, inherent environmental value or values that transcend mere human valuation. Contemporary versions of this view have been advanced by those such as Holmes Rolston III, who has held that there are inherent values in nature that transcend human experience and that should be the basis of human values.

Dewey understood the mystic position to hold that rational debates about the environment are pointless—that environmental value is romantically or aesthetically felt and thus requires an attitude of direct vision. A contemporary version of this view has been held by those such as Michael Zimmerman, who has argued for a spiritual appreciation of nature that can only be precipitated by a new type of nondualistic awareness.

Dewey criticized both of these positions. Against the idealist he argued that it is not some ultimate or transcendent value beyond our experience that properly informs our decisions, but instead careful deliberation about real alternative courses of action that is based on the best available evidence. Against the mystic he argued that a romantic or aesthetic appreciation of nature might be a good place to begin deliberation, and that aesthetic qualities pervade inquiry about alternative courses of actions, but that inquiry into wider environmental concerns would be blocked if human relations to the rest of nature were to remain purely romantic or aesthetic.

ENVIRONMENTAL PRAGMATISM

The term *pragmatism* as used in the phrase *environmental pragmatism* has been used by Andrew Light and others to denote an approach to environmental philosophy that incorporates some of the central insights of the founding pragmatists in a general sense but that is at the same time broader and more open-ended. In 1996 Light and Eric Katz published a watershed collection of essays titled *Environmental Pragmatism*. Their aim was to vitalize what they regarded as a sluggish and deadlocked discipline by transcending received methodological dogmas. They argued that environmental ethics up to that point had been too dependent on theoretical considerations and that in order to establish its relevance as a discipline it must begin to address areas of practical decision making in which experimental results trump what Dewey termed the vice of "intellectualism"—that is, neglect of

concrete experiences. They issued a call for metatheoretical pluralism that would be open to the "plausibility of divergent ethical theories working together in a single moral enterprise" (Light and Katz 1996, p. 4). Since the publication of that volume, Light has been actively engaged with issues such as environmental justice and ecological restoration.

The work of Bryan G. Norton provides an excellent example of how this new, broader pragmatism can be married to the insights of the classical pragmatists. Norton's distinction between felt and considered preferences, for example, recalls Dewey's distinction between what is merely valued and what has proved to be valuable. Both Norton and Dewey reject what Norton has termed *strong anthropocentrism*, or the view that felt preferences are sufficient guides for action with respect to the environment. Both prefer versions of "weak anthropocentrism," a view that rejects the underlying subject-object dualism of strong anthropocentrism, with its tendency toward the domination of nature. Weak anthropocentrism advances a transactional view of nature according to which the source of environmental value lies within considered preferences that are the result of experimental inquiry, although the locus of such value may be in nonhuman nature.

Although Norton's work is built on strong theoretical foundations, it is also manifestly practical. His experience at the Environmental Protection Agency led him to conclude that the agency suffers from a structural defect that he terms *towering*: He argues that the two towers of scientific analysis and policy decisions fail to connect (Norton 2005, p. 27). His alternative, a pragmatic model that he terms "adaptive management," attempts to build bridges between the two towers by emphasizing the experimental nature of successful inquiry of all types. He argues for a methodological naturalism that "advocates developing self-corrective processes in public discourse, whether scientific or evaluative" (p. 203). Norton's work is thus grounded in experimentalism.

Norton attempts to supplant metaphysical and ideological debates about environmental issues with deliberation based on the development of sets of "indicators." Indicators express but do not represent values. They are "certain processes and changes in the system [that are] important enough to monitor. Once these processes are chosen for monitoring, it will be possible to identify goals that can be stated as desired levels to be achieved and maintained with respect to the chosen indicators" (Norton, p. 453). Norton describes his method as a kind of "disciplinary stew" in which ordinary language and commonsense policy discourse make up the broth, whereas the meat and potatoes is the work of the empirical sciences (p. 461).

Paul B. Thompson's work stands out as an excellent example of the ways in which environmental pragmatism can be applied to the ethics of food biotechnology. Like Norton, Thompson has been strongly influenced by the work of the founding pragmatists; like Dewey, for example, he just brackets traditional metaphysical debates such as those that concern the existence of inherent or intrinsic values in nature. A key feature of his work is his rejection of "rational-choice" decision models in favor of more pragmatic "context" models that take into account both the social institutions that inform and condition decisions about values, and the needs and interests of specific communities at specific times and places. In his view, "people do not frame their lives as a series of objectives for which they are seeking the most effective means," (Thompson 2007, p. 286) but rather, "people apply their own values in selectively adopting or rejecting scientific knowledge claims" (p. 287). For Thompson the task of the environmental philosopher is to function as a kind of liaison between scientific communities and the individuals and communities that are attempting to find ways of applying their values amid changing circumstances.

Rejection of rational-choice models is also a key element in the work of the pragmatist economist Daniel W. Bromley. Bromley rejects the positivist dogma that "correct decisions necessarily follow from the correct methods of discovering the 'truth' about monetary values of nature and nature's many services" (Bromley 2004, p. 85). Applying his alternative pragmatist model, he treats preferences as constructed rather than fixed, stable, and known. He follows Dewey in arguing that warranted assertions about environmental issues are not the result of the identification of "causes" that are external to deliberation. They are, instead, the result of "the incessant working out of . . . what seems the better thing to do in the current setting and circumstances" (p. 86).

Environmental pragmatism in the Netherlands exhibits a rich blend of classical pragmatism at the same time it builds on the type of discourse ethics developed by Jürgen Habermas. In their 2002 proposal for a pragmatic environmental ethics, Jozef Keulartz, Michiel Korthals, Maartje Schermer, and Tsjalling Swierstra embraced the founding pragmatists' antifoundationalism, antidualism, and antiskepticism. They argued that work toward Dewey's goal of a creative democracy will be more oriented to process than to product and that it must develop procedures to ensure that all involved parties have their say in ethical debates. But they also recognized that procedures can become deadlocked and that substantive interventions are sometimes necessary. They therefore embraced activities such as "studying problem translations, sketching possible future scenarios, and developing new moral vocabularies" in order to facilitate participation across

communities of interest (Keulartz et al., 2002 p. 16). They are concerned to demonstrate methods by which environmental ethics can begin to cope with the dynamic character of our technological culture.

SEE ALSO *Environmental Philosophy: V. Contemporary Philosophy; Norton, Bryan; Rolston III, Holmes.*

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Larry A. Hickman

PRECAUTIONARY PRINCIPLE

The basic message of the precautionary principle (PP) is that on some occasions, measures against a possible hazard should be taken even if the available evidence is not sufficient to consider the existence of that hazard as a scientifically established fact. Thus, PP is about acting to prevent harm in situations in which it is uncertain whether there is a threat or, if there is a threat, how serious it is.

PP has been used primarily in environmental contexts but also in regard to risks to human health. The areas in which it has been thought applicable are highly diverse and range from the regulation of chemicals and genetically modified organisms to research into life-extending medical therapies. It generally has been discussed in the context of threats of serious or irreversible harm, that is, threats that cannot be compensated for easily, such as species extinction.

PP refers both to principles that can be applied by decision makers and policy makers in general (PP in the broad sense) and to principles of national or international law (PP in the legal sense). In the broad sense, some commentators have interpreted it as one or another familiar principle from decision theory, such as maximin, a decision rule that states that an agent should choose the action for which the worst possible outcome is the least bad. They typically take the assumedly risk-neutral strategy of maximizing expected utility (MEU) to be the default rule in risk management and regard PP as more risk averse than MEU.

PP in the broad sense is regarded sometimes as a moral principle and sometimes as a principle for decision making that can be justified on moral or prudential grounds. Those who attempt to make a moral argument for PP have, among other things, appealed to some principle of responsibility emanating from the huge scope of human action, as Hans Jonas did in *The Imperative of Responsibility* (1984) before the term *precautionary principle* was coined. Another suggestion refers to a Rawlsian thought experiment, in which agents behind a veil of ignorance choose a PP. John Rawls (1921–2002) was a philosopher who argued for the maximin principle by using a thought experiment in the form of a hypothetical bargaining situation in which agents agree on the basic principles for a just society. To ensure fair bargaining in the thought experiment, the participants are supposed to be behind a "veil of ignorance." This means that each person is ignorant about what his or her own chances in society will be. He or she does not know anything about his or her sex, ethnic origin, skills, personal characteristics, intelligence, and so on. Rawls argued that these bargainers would choose a maximin principle that maximizes the position of the least well-off in society.

Several commentators also treat PP as a principle of common sense, citing proverbs such as "better safe than sorry" and "an ounce of prevention is worth a pound of cure."

It is fruitful to distinguish between precaution and precautionary principles. Someone might take precautions in a particular case without subscribing to any principle of precaution. For a principle to be present, it may be necessary to demand that the agent at a minimum subscribe to a claim such as "precaution should be taken in situations of type T." The fact that the agent believes that precaution should be taken in the particular situation S is not sufficient. In addition, there must at least be a claim such as "precaution should be taken in situation S and in relevantly similar situations," with the meaning of "relevantly similar" somehow specified.

Various versions of PP have been included in several international legal and policy documents. PP has had proponents primarily among environmentalists, and it has been subject to a heated debate, in particular since the mid-1990s.

HISTORY OF THE PRECAUTIONARY PRINCIPLE

The origin of the term *precautionary principle* is not clear. Obviously, examples of precautionary regulatory and policy measures in regard to health and environmental issues appeared long before the term was coined. One example is the British Alkali Act of 1874. A more recent example is the so-called Delaney Clause, a 1958 amendment to the U.S. Federal Food, Drug, and Cosmetic Act, which banned the use of potentially carcinogenic food additives. A common claim in the literature is that PP first emerged in West German environmental law in the 1970s under the name of *Vorsorgeprinzip*. The United Nations *World Charter for Nature* (1982) contained PP-like wording without using the phrase *precautionary principle*. The term was used explicitly in the Ministerial Declaration of the Second International Conference on the Protection of the North Sea (1987).

IMPORTANT USES OF THE PRECAUTIONARY PRINCIPLE

The most prominent and frequently cited version of PP is probably the one found in Principle 15 of the 1992 Rio Declaration (United Nations Conference on Environment and Development 1993):

> In order to protect the environment, the precautionary approach shall be widely applied by States according to their capabilities. Where there are threats of serious or irreversible damage, lack of full scientific certainty shall not be used as a reason for postponing cost-effective measures to prevent environmental degradation.

This version of PP has been included nearly verbatim in many other documents, although the English text of the declaration does not use the term *principle*. However, translations into several other languages use an expression that corresponds to it directly, and the passage cited here commonly is referred to as expressing PP.

PP has had a prominent place in the European Union (EU), at least since its inclusion (without a definition) in the Maastricht Treaty (1992). An important document is the *Communication from the Commission on the Precautionary Principle* of the Commission of the European Communities issued in 2000 and endorsed at the European Council's meeting in Nice in December 2000. The text and reasoning in these documents are reflected in several other EU documents, such as the so-called General Food Law.

Though not in any way binding, the Wingspread Statement on the Precautionary Principle that was adopted by a conference of environmentalists in 1998 has had considerable influence in the PP debate:

> When an activity raises threats of harm to human health or the environment, precautionary measures should be taken even if some cause-and-effect relationships are not fully established scientifically (cited in Raffensperger and Tickner 1999, pp. 354f).

The Wingspread version has been cited by both advocates and critics of PP. Its advocates regard it as an example of a powerful version of PP that would have the ability to change policy in a more precautionary direction, and its critics see it as an example of an extreme, rigid, and stifling principle.

VERSIONS OF THE PRECAUTIONARY PRINCIPLE

Whether one regards PP in the broad sense or the legal sense, there are numerous versions of it. They can be classified in at least three perhaps overlapping groups that regard PPs as (1) rules of choice; (2) epistemic rules or principles; or (3) procedural requirements.

When interpreted as rules of choice, many existing versions of PP have four common elements and a common structure: (1) the threat dimension; (2) the uncertainty dimension; (3) the action dimension; and (4) the prescription dimension. The common structure can be expressed in the following "if" clause containing the four dimensions:

> *If* there is (1) a threat, which is (2) uncertain, *then* (3) some kind of action (4) is mandatory.

The actual phrasing varies among different versions of PP, and the action can refer to abstaining from action as well. Some versions of PP are very strict, whereas others are significantly more permissive. The Wingspread Statement is an example of PP as a rule of choice.

Epistemic versions of PP are rules not for choosing courses of action but for determining what to believe. One example would be to demand that evidence suggesting a causal link between an activity and possible harm should be given greater weight than it would in other circumstances. In this way, some commentators have wanted to apply PP in the appraisal or assessment of risks rather than in the management of risks. One possible version of PP along these lines is the use of precautionary defaults, that is, a cautious or pessimistic assumption that is used in the absence of adequate information in the assessment of risks; that assumption can be replaced when such information is

obtained. Epistemic versions of PP have been discussed primarily in academic contexts.

Procedural versions of PP are not algorithms for choosing particular courses of action but requirements for how such decisions are to be made. For instance, what arguments are to be considered legitimate? On whom does the burden of proof fall? The version of PP from the Rio Declaration belongs to this broad group of PPs. In this category, burden-of-proof requirements have been discussed extensively. Commentators who propose burden-of-proof versions of PP claim that those who wish to carry out a potentially harmful activity should be required to demonstrate that that activity will be safe before it is allowed to proceed rather than demanding that regulatory authorities provide evidence of harm before banning the activity. Thus, for example, genetically modified (GM) foods and the use of hormones as growth promoters in meat production should be presumed to be harmful until the producers can provide evidence that the products are safe. Another procedural version of PP concerns the level of scientific evidence required to trigger precautionary action. Some PP proponents have suggested that comparatively scant scientific evidence should suffice to warrant treatment of something as harmful (pending further information), whereas a lot more evidence should be required for it to be accepted as safe.

THE PRECAUTIONARY PRINCIPLE AND ENVIRONMENTAL RISK MANAGEMENT

There are two primary ways in which PP has been thought to be able to contribute to improved management of environmental risks. The first is the possibility of increased safety. Proponents of PP often contrast their approach with that of traditional cost-benefit analysis. Citing historical examples, they argue that cost-benefit analysis has led to overly large risks being taken. They also have been critical of the idea of safe levels, as expressed in concepts such as assimilative capacity and threshold doses for toxic substances and radiation. (A threshold dose is a level of exposure to, for instance, a toxic substance below which no harmful effects occur.) Researchers may be mistaken about the threshold or about which level is safe or whether there is a safe level at all, and it is better to err on the side of caution. In radiation protection, this is expressed in the acronym ALARA, which recommends that exposure be kept *a*s *l*ow *a*s *r*easonably *a*chievable.

The second application concerns the role of science in policy. Proponents of PP argue that too much faith in scientific evidence has led to the neglect of some risks. Science has limitations, and sometimes policy makers have failed to consider those limitations. For example, in pure science, type I errors (false positives: concluding that there is a phenomenon or an effect when there is none) generally have been regarded as much more problematic than type II errors (false negatives: missing an existing phenomenon or effect). However, from a policy point of view, type II errors such as believing that a highly toxic substance is harmless may be more serious. Burden-of-proof and other procedural versions of PP have been seen as offering possibilities for balancing this situation. In addition, it is hoped that PP, in particular its procedural versions, will offer a way of ensuring public influence and legitimacy. This view has been put forward by those who see risk management as an activity run by experts with too little regard for public concern about environmental matters.

OBJECTIONS TO THE PRECAUTIONARY PRINCIPLE

Obviously, not everyone shares these views, and PP has been subject to criticism. There are at least five main types of objections to it. First, it has been criticized for being ill defined and too vague to be useful in regulation. It is true that there are definitional problems with PP and that there are many different versions of it. However, this criticism is not necessarily devastating because vague principles and concepts abound in regulation; they can be made more precise through explication and practice. Furthermore, some argue that to be operational, political principles such as PP need a certain vagueness or flexibility that allows for different interpretations.

Second, PP has been criticized for forcing decision makers to pay unreasonable attention to extremely unlikely scenarios. In the extreme, it thus may be self-refuting. If PP is understood as prohibiting courses of action that may lead to harm, PP will prohibit every action, including the action of taking precautionary measures, because any action may have unforeseen harmful consequences, and it never can be proved that there are no such consequences. A principle prohibiting every course of action, then, is self-refuting. Some decision theorists have produced a version of this argument in which a formalized version of PP is shown to be incoherent or incompatible with reasonable desiderata.

The third objection is a related but weaker claim. According to this objection, PP is not incoherent but counterproductive. That is, the precautionary measures prescribed by PP would lead to more risk taking, not less. For instance, precautionary measures against pesticides or potentially unsafe GM crops might lead to famine. This is known as risk trade-off. Increased costs induced by regulation might lead to greater risks than the ones against which the regulatory measures were supposed to

safeguard. This argument has been proposed by a number of U.S. commentators who see PP as a disguised form of trade protectionism.

The fourth objection is that PP is a value judgment, not a scientific judgment. This objection is dismissed by proponents of PP because it is a principle for decision making, and such principles are necessarily normative.

The fifth objection is that PP does not take science seriously and marginalizes the role of science in policy making. This objection is relevant, but it may have more to do with differing views on how to treat scientific uncertainty. Several PP proponents emphasize that decisions should be based on science but that more attention should be paid to the handling of scientific uncertainty.

Proponents of PP have responded to these and similar objections by amending or revising their versions of PP. For instance, to meet the charges of incoherence and counterproductivity, it has been suggested that PP should be supplemented with some sort of de minimis principle, which requires that extremely improbable scenarios be disregarded. An example of an attempt at amending PP can be found in the 2000 communication from the Commission of the European Communities, which states that precautionary measures should, among other things, be proportional to the chosen level of protection, nondiscriminatory, consistent with other similar measures, based on an examination of potential costs and benefits of action (and lack of action), subject to review in the light of new scientific evidence, and capable of assigning responsibility for who should produce the scientific evidence needed for a more thorough risk-benefit assessment.

Such proposals aim at making PP more operative. However, their implementation might mean that in the end very little is left of PP.

SEE ALSO *Cost-Benefit Analysis; Economism; Environmental Law; Environmental Policy; Extinction; Food Safety; Genetically Modified Organisms and Biotechnology; Pesticides; Rio Declaration; Risk Assessment.*

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Per Sandin

PRESERVATION

By the late nineteenth century Americans began to think seriously about setting aside areas of land to protect them from commercial development. Proponents of preservation believed that certain places should be shielded from human exploitation and devoted to less intrusive human ends—recreational, aesthetic, and spiritual—or protected simply as a gesture of respect for the landscape itself. Preservation became an early focal point of a set of concerns that later fell under the rubric of environmentalism. Preservation later came to overlap and compete with related philosophies such as conservationism (sometimes called resourcism) and restorationism.

The idea of preservation gives rise to two philosophical questions: First, what does it actually mean to preserve something? Second, what should be preserved? The historical and contemporary debates over preservation center on these questions.

EARLY PRESERVATION: 1800s TO 1960s

Early gestures at environmental preservation focused as much on the preservation of heritage (or the preservation of origins)—whether of the nation or the human species—as they did on preserving particular physical places. The American transcendentalist Henry David Thoreau (1817–1862) worried that the preservation of wildness

Avalanche Peak, at Yellowstone. *Avalanche Peak is a part of the Absaroka Mountain Range, on the eastern border of Yellowstone National Park. The peak is one of the most popular sites for hiking in the park. Although popular for recreational activities, national parks are concerned first and foremost with preservation and conservation. Yellowstone was established in 1872, when the main focus of preservation in the United States was on wilderness areas.* **NPS. PHOTO BY BOB GREENBURG.**

(often misquoted as "wilderness") was necessary to offset the looming development of America; he wrote, "in Wildness is the preservation of the world" (Callicott and Nelson 1998, p. 37). Concerned mainly with protecting the remaining wild places or wilderness areas in the United States, John Muir (1838–1914) was also a leading nineteenth-century preservationist. Muir grounded his preservation efforts in a variety of arguments: heritage ("going to the mountains is going home"), a wide-range of instrumental values (from watershed protection to mental therapy for "tired, nerve-shaken, over-civilized" urbanites), and even deeper intrinsic value ("This Sierra Reserve . . . is worth the most thoughtful care . . . for its own sake") (Callicott and Nelson 1998, pp. 48–62).

Muir's commitment to a specific place—Yosemite's Hetch Hetchy Valley—pitted him against the utilitarian-motivated U.S. Forest Service chief, Gifford Pinchot (1865–1946). Pinchot proposed damming the Tuolumne River to provide cheap water and electricity to the burgeoning human population of San Francisco (a proposal that was considered conservationist at the time), whereas Muir proposed preserving the valley from this human encroachment. This famous philosophical and political battle sharply and dramatically delineated the distinction between conservation and preservation. This distinction still divides the American environmental movement as well as environmental philosophy and serves as the touchstone of American natural resource education today.

From 1919 until his death, the American ecologist, forester and environmentalist Aldo Leopold (1887–1948) wrote extensively on the importance of wilderness preservation. His early writings focused almost exclusively on the recreational value of such areas, whereas his later writings reflected on the value of preservation to science as a criterion of ecological normality and a measure of "land health."

From the late 1800s to the 1960s, preservation efforts focused largely on setting aside large landscapes and ecosystems such as national parks and wilderness areas in the national forests. The desire for preservation appears to be correlated with our success at fulfilling our

Manifest Destiny (the belief that the United States was destined to expand from the Atlantic to the Pacific seaboards) and a growing sense that we had conquered enough, that it was time to set some areas aside for the preservation of our human and national heritage. The preservation of specific places was codified in the U.S. Wilderness Act of 1964, which sought to establish "a National Wilderness Preservation System" (Callicott and Nelson 1998, pp. 120–130). This characterization is echoed in contemporary discussions of preservation. The philosopher G. Stanley Kane, for example, defines *preservation* as "setting aside areas that still remain undisturbed and protecting them against human encroachment," and he defines *restoration* as "bringing degraded areas back to something resembling an unspoiled condition" (Kane 2000, p. 221). Early preservationist philosophy was manifested in the creation of environmental groups such as the Sierra Club in 1892, the Wilderness Society in 1935, and the Nature Conservancy in 1950.

PRESERVATION SINCE THE 1960S

Although philosopher-scientists such as Leopold and Victor Shelford (1877–1968) had urged the preservation of representative ecosystems, their concerns were not translated into public preservation policy, which was motivated by the aesthetic appreciation of monumental scenery (as served by the national park system) and the desire to provide outdoor recreation (as served by the national wilderness preservation system). Beginning in the late 1960s, however, preservationist concern shifted from scenic landscapes suitable for recreation to the preservation of species of plants and animals. As early as 1920, scientists began noticing with alarm the loss of species—what later became known as the loss of biological diversity or biodiversity. The biologist Francis Sumner, for example, wrote in 1920 of the "importance of saving from destruction the greatest possible number of living species of animals and plants, and saving them, so far as possible, in their natural habitats and in their natural relations to one another" (Nelson and Callicott 2008, p. 32). In the 1970s and 1980s, the biologist Edward O. Wilson became the most prominent proponent of the preservation of biodiversity. In 1985 biologists such as Michael Soulé, Reed Noss, and David Ehrenfeld founded the Society for Conservation Biology as a "mission-driven" effort to preserve Earth's biological diversity.

Environmentalists began to see that biodiversity preservation was a more urgent concern than was the preservation of heritage landscapes. The concern for the preservation of biodiversity was codified in 1973 in the U.S. Endangered Species Act (ESA), which implicitly attributes intrinsic value to, and confers legal rights on, species, subspecies, and distinct population segments, protecting them from the "consequence of economic growth and development untempered by adequate concern and conservation" (Endangered Species Act of 1973, Sec. 2(a)(1), p. 3). The ESA is one of the most powerful conservation laws in the world, shaping much of contemporary discourse about preservation; it has, therefore, become the focus of much antienvironmental critique. In fact, environmentalists themselves sometimes criticize the ESA for its overemphasis on various species and its implicit indifference to the fate of entire ecosystems.

Since the 1960s preservationists have come to focus on four main areas of concern:

- species;
- ecosystems, which include biota and abiota (the nonliving parts of an ecoystem) with an emphasis on the preservation of the functions or processes performed or the services provided by the ecosystem (e.g., nitrogen cycle, carbon budget, water filtration);
- community, which emphasizes the preservation of certain end states of biota (e.g., wilderness, grassland, wetland);
- genetic diversity.

Contemporary preservation efforts have been buoyed by scientific advances such as the ability to readily quantify and understand DNA and the realization that in the face of environmental change, it is genetic diversity (i.e., heterozygosity, allelic diversity, inbreeding coefficient, and population subdivision and structure) that promotes a species' or population's chances for survival. For example, in addition to the preservation of species, the ESA, in later amendments, allows for the preservation of distinct population segments (DPS). Although the ESA does not precisely define a DPS, most scientists use the term to refer to a population representing an important component in the evolutionary legacy of the species (U.S. Fish and Wildlife Service 1996). Conservation geneticists, however, have suggested that DPSs become more definite when defined in terms of genetic diversity and future evolutionary potential, or what are sometimes called evolutionarily significant units. There are, however, limits to scientists' understanding of the relationship between population viability and genetic diversity. Moreover, efforts to champion the preservation of species in more precisely quantifiable terms still entail normative decisions—such as what constitutes "significant" in the evolutionarily significant unit.

CRITIQUE OF PRESERVATION

There are significant disagreements among philosophers about the meaning and goals of preservation. What does

it mean to preserve something? Why would you want to preserve something? It might be tempting to think that all these various foci of preservation all really converge on the same thing, that a focus on preserving scenic landscapes would result in preserving biodiversity, and further that the end result of restoration would be the same as that of preservation. There is reason to think, however, that this is simply not true, that different foci would lead to different actions on the ground with different end states. For example, the philosopher Sahotra Sarkar has pointed out that

> biodiversity conservation . . . cannot be identical with wilderness preservation. . . . [They] differ not only with respect to their explicit and implicit long-term objectives, but also with respect to their justifications, their immediate targets and obstacles, and the strategies that are likely to achieve these targets. . . . [Sometimes] the tasks of biodiversity conservation and wilderness preservation converge, but at least as often they do not. (Nelson and Callicott 2008, p. 231)

There is also a growing scientific literature indicating that actions that maximize the conservation of a species are not necessarily those that maximize the preservation of overall biodiversity, much less scenic or recreationally suitable landscapes. For example, scientists have growing doubts about the value of umbrella species—large "charismatic" species with large home ranges, the preservation of which was once assumed to preserve many other smaller, less "popular" species that might also exist in the critical habitat of the umbrella species.

One standard criticism suggests that preservation upholds interests of nature over the interests of humans. This criticism has been pressed most sharply by scholars and activists from the developing world. In 1989 the Indian scholar Ramachandra Guha (Callicott and Nelson 1998) pointed out that certain preservation tendencies (most notably wilderness preservation) have been ethnocentric and therefore not easily transferable to other contexts around the world without grave human consequences. Similarly, the protected-areas scholar David Harmon, echoing the views of the environmentalist Norman Meyers, suggests "that the whole notion of 'setting aside' has in fact done great damage to the conservation movement around the world" given the lack of attention that has been paid to varying ecologies in various parts of the world and the "top-down" fashion in which such environmentalism is perceived (Callicott and Nelson 1998, p. 228).

Defenders of preservation sometimes concede that they are choosing nature over humans. Philip Cafaro and Monish Verma, for example, argue that when human needs "conflict with measures that are necessary to preserve species, we believe they should be met in ways that preserve wild nature" (Rothenberg and Ulvaeus 2001, p. 60). Other preservationists deny the conflict between nature and humans. The wilderness advocate Dave Foreman, for example, suggests that these criticisms of preservation emanate from "Third World jingoism" and "chronic anti-Americanism" and that preservation "need not conflict with the needs and rights of the downtrodden" (Nelson and Callicott 2008, pp. 399–400).

Another more conceptual criticism suggests that preservation either creates or perpetuates a mentality that alienates humans from nature, whereby humans are despoilers of nature, chronic ecological malefactors. In this view the measure of successful preservation, then, is the degree to which human intervention is absent. This conceptual alienation opens up the door for the misanthropy and elitism that we have sometimes seen in the environmental movement The book *Defending the Earth: A Dialogue between Murray Bookchin and Dave Foreman* (Bookchin and Foreman 2001) nicely captures the tension between advocates and opponents of this viewpoint.

Others have taken exception to preservation strategies that attempt to reconcile the dualism between humans and nature; these critics view such strategies as preventing preservation efforts in areas that are moderately or heavily affected by humans. Referring to a concern about the ways in which preservation (in this case, of the Arctic National Wildlife Refuge in Alaska) can divert attention from other, equally important environmental issues (such as the agrarian landscape), the writer Wendell Berry confesses that he "made a sort of vow . . . [to not] support any more efforts of wilderness preservation that were unrelated to efforts to preserve economic landscapes and their human economies. . . . We can[not] preserve either wilderness or wilderness areas if we can't preserve the economic landscapes and the people who use them" (Berry 2008, p. 601). William Cronon likewise laments the need to ignore and even erase the rich legacy of erstwhile human settlement in the Apostle Islands of Wisconsin in order to create a "proper" Apostle Islands wilderness area (Nelson and Callicott 2008).

BEYOND PRESERVATION

Instead of a focus on the preservation of either processes (e.g., evolutionary) or end states (e.g., wilderness areas or biodiversity reserves), some have suggested that the goal should be preservation (or conservation or restoration) of an appropriate human relationship with nature. In this approach preservation implies the implementation of virtues such as humility, respect, attentiveness, and care. On this view the problem of preservation is the problem of figuring out how humans ought to relate to nature. Some have suggested that preservation is much more a

gesture of respect than it is a desire to preserve a state or process. For example, the philosopher Andrew Light writes that the value of restoration lies "in the revitalization of the human relationship with nature" (Kane 2000, p. 95).

SEE ALSO *Biodiversity; Conservation; Endangered Species Act; Environmental Activism; Environmental Aesthetics; Environmental Law; Guha, Ramachandra; Hetch Hetchy; Leopold, Aldo; Muir, John; Nature Conservancy; Pinchot, Gifford; Sierra Club; Society for Conservation Biology; Thoreau, Henry David; Utilitarianism; Wilderness; Wilderness Act of 1964; Wilson, Edward O.*

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PRIVATE PROPERTY

The term *property* is used to refer to entities for which an individual or group has certain rights. Important types of property include real property (land), personal property (other physical possessions), and intellectual property (inventions and intellectual and artistic creations). Private property is defined in contrast to public property: The possessor of private property customarily has exclusive rights to dispense with the property as he or she sees fit, including its use, transfer, and ownership.

NATURAL RIGHTS

To talk about property is to talk about property rights. Theorizing about property rights in the Anglo-American philosophical tradition has its roots in theorizing about natural rights and natural law. To claim a natural right is to assert that some rights are grounded in human nature rather than in legislation or other acts of government. Claims about natural rights and natural law purport to say something about what legal rights should be rather than what they are. Human rights and property rights often are represented as natural rights.

The Dutch thinker Hugo Grotius (2005 [1625]) secularized the idea of natural law. In his treatment natural law theory became a naturalistic inquiry into the question of which social arrangements were most conducive to the betterment of humankind. Grotius argued that there would be laws of nature, as dictated by the requirements of human nature, even if there were no deity. According to the Grotius scholar Stephen Buckle (1993), property rights are a social creation generated and defined by agreement but still are natural rights in a crucial way insofar as they are inevitable in human social life.

John Locke followed in the footsteps of Grotius. That made his work enormously influential among secular philosophers even though Locke was a theist. Locke (1960 [1690]) argued that God gave the world to humankind in common for the betterment of humankind and therefore intended that people should have the right to do what they need to do to put the earth to work. Individual persons own their own selves. Persons are God's property, but in relation to other humans, the individual alone holds the right to decide how his or her body is to be put to work.

This right to choose how to put people's bodies to work would be useless in that original state and God would be leaving humankind to starve unless people also were at liberty to make a living by laboring on otherwise unowned objects in the world. People normally are not at liberty to seize what already belongs to someone else, but when a resource is not owned, a person can come to own it by mixing his or her labor with it in a way that makes it more useful. Thus, people acquire a crop by virtue of being the ones who planted and harvested it and acquire the land underneath the crop by virtue of being the ones who made that land more productive than it had been in its unappropriated wild condition.

Working within the Lockean tradition, William Blackstone characterized property as the "sole and

despotic dominion which one man claims and exercises over the external things of the world, in total exclusion of the right of any other individual in the universe'' (1765–1769). In practice, though, property rights in the Anglo-American tradition are and always have been hedged with restrictions. The dominion to which Blackstone referred is limited by easements, covenants, nuisance laws, zoning laws, regulatory statutes, and, more generally, the public interest.

THREE KINDS OF RULES

In normal cases property is protected by a property rule that states that no one may use it without the owner's permission. In other circumstances one might say property is protected by a liability rule that states that no one may use it without compensating the owner. In a third kind of case one might say property is protected by an inalienability rule that states that no one may use it even with the owner's permission (Calabresi and Melamed 1972).

The fundamental rationale for liability rules is that sometimes it costs too much or is impossible to get consent to use someone's property and sometimes the contemplated use is compellingly important. For example, people have no right to use their cars to run over a neighbor's fence. Yet every time one pulls out of a driveway, there is some risk that that person's plans will go awry and he or she will accidentally damage someone's property. Whereas a property rule would require people to get advance permission from every property owner against whom they run the risk of committing accidental trespass, a liability rule requires instead that they compensate the owner of a fence after the fact if they accidentally damage it. The analogous rationale for an inalienability rule is that there are forms of property so fundamental that people would cease to be persons in the fullest sense if they were to, for example, sell them. A person may, for example, regard his or her kidney or vote as his or her property yet deny that this confers right to sell such things. In this respect the person would be treating his or her right as inalienable.

Spur Industries, Inc. v. Del E. Webb Development Co. 494 P.2d 701 (Ariz. 1972) is a case that was settled almost simultaneously with the publication of Guido Calabresi and A. Douglas Melamed's article. In this case the judge, who had not read the article, ruled in favor of the housing developer Del Webb, granting an injunction against the feedlot operator Spur Industries while holding that Del Webb had to compensate Spur. The judge reasoned that Spur's property claim was valid but that because the feedlot was a public nuisance, Spur could be forced to move, with compensation paid by Del Webb because Del Webb's housing development brought the public to the nuisance. Thus, Spur's property right in effect was protected by a liability rule rather than a property rule. The takings clause of the Fifth Amendment to the U.S. Constitution can be interpreted as specifying that in cases of compelling public interest property titles are protected by a liability rule rather than a property rule.

PROPERTY RIGHTS AS RIGHTS TO EXCLUDE

In 1913 Wesley Hohfeld distinguished between rights and liberties. One is at liberty to use something just in case one's using that thing is not prohibited. One has a right to a thing just in case one's using it is not prohibited, plus one has the additional liberty of being able to prohibit others from using that thing. That is, the difference between a mere liberty and a full-blooded property right is that with a property right there is an owner who holds a right to exclude other would-be users.

In the contemporary era, though, the term *property rights* generally is understood to refer to a bundle of rights that could include the rights to sell, lend, bequeath, use as collateral, or even destroy. (John Lewis [1888] generally is regarded as the first person to use the ''bundle of sticks'' metaphor.) The fact remains, though, that at the heart of any property right is a right to say no: a right to exclude nonowners. In other words, a more or less Blackstonian right to exclude is not just one among many sticks in a property bundle. Rather, property is a tree, and whereas other sticks are branches, the right to exclude is the trunk. One conceptual reason for saying this is that without the right to say no, the other rights are reduced to mere liberties rather than genuine rights. For example, one can be the owner of a bicycle in a meaningful sense even if for some reason one has no right to lend it to anyone else. By contrast, if one has no right to deny another permission to lend it to anyone else, one is not the owner of the bicycle in any normal sense. Thus, there is a conceptual reason why, among the various sticks that make up the bundle of rights people call property, the right to exclude is the most essential.

In addition to this conceptual reason, there is a practical reason why the right to exclude is the core of a property right. The evolution of property law is driven by an ongoing search for ways to enable people to avoid commons tragedies. Commonly held resources are subject to indiscriminate overuse. If a productive asset is held in common, there is an additional risk that no one will be willing to bear the cost of investing in making the resource more productive. In practice, communal regimes also lead to indiscriminate dumping of wastes that range from piles of unwashed dishes to substances that lead to ecological disasters that threaten whole

Private Beach in Malibu, California. *Many theorists believe that the right to exclude nonowners is at the core of any property right. While this American homeowner boasts such rights to private property, other nations have an eminent domain clause that stipulates that coastlines are the property of the state, and therefore no property owner can prohibit access to the sea. Private property as it is commonly understood is defined in contrast to public property, and grants its possessor exclusive rights to dispense with the property as he or she sees fit.* **AP IMAGES.**

continents. When people's activities impose a cost on innocent bystanders, economists describe those costs as external costs or externalities. There also can be external benefits, or positive externalities, as in a case where one person notices that a second person has developed an innovative new technique for plowing land and copies that technique. The first person is reaping some of the benefit of the second person's research without having paid for it. Property in patents is one tool for "internalizing" the benefits of research and development.

Centuries before the analytical tools of game theory, ecology, and contemporary economics were available, Locke noted that the option of fencing the commons and creating private property enables people to make land more productive than land is when left in the wild. The reason for this is that the right to exclude empowers owners to capture the positive benefits of productivity and at the same time internalize the negative impact of overuse. The right to exclude is for practical purposes the essence of property in general, not only private property. A national park service must be able to exercise a right to exclude cattle ranchers to do its job of protecting national parks. An Israeli kibbutz must be able to exercise a right to exclude nonmembers to be able to feed its members.

FORMS OF PROPERTY

Commonly held property is not necessarily an ecological disaster. For example, the open-field agricultural practices of medieval times gave peasants exclusive cropping rights to scattered thin strips of arable land in each of the village fields (Ostrom 1990). The strips were private only during the growing season, after which the land reverted to the commons for the grazing season. The custom of "stinting" allowed the villagers to own livestock only in proportion to the relative size of their land holdings in the growing season. Governance by custom enabled communal owners to avoid commons tragedies. David Schmidtz and Elizabeth Willott (2003) described a modern case of successful communal management.

Private property is not necessarily an ecological success. Privately managed parcels also are subject to indiscriminate dumping of wastes and various other uses that ignore spillover effects on neighbors. One advantage of private property is that owners can buy out one another and reshuffle their holdings in a way that minimizes the extent to which their activities bother one another. However, this does not always work out well, and the reshuffling itself can be wasteful because there are transaction costs. Such costs include all the expenses incurred in concluding a transaction: commissions, time and money spent on transportation to and from the market, equipment and space rentals, time waiting in line, and so on.

A plausible social goal would be to have a system of property that minimizes the sum of transaction costs and the cost of externalities. For example, a public freeway may minimize transaction cost if the alternative is a private toll road, but the toll road may invest revenues in road repairs, minimizing the external cost of damage to the road caused by thousands of other drivers. There often is a trade-off. Harold Demsetz (1967), Robert Ellickson (1993), and Carol Rose (1986) considered which mix of private and public property best meets this goal. Especially when there are far-flung externalities among people who do not know one another, there is no easy way to determine which mix of private and public property is best. The difficulties in detecting such externalities, tracing them to their source, and holding people accountable for them are difficulties in any kind of property regime.

Privatization exists in different degrees and can take different forms. Simply parceling out land or sea is not always sufficient to stabilize possession of resources that make land or sea valuable in the first place. Suppose, for example, that fish are a fugitive resource, that is, a resource known to migrate from one parcel to another. In that case owners have an incentive to grab as many fish as they can whenever a school passes through their territory. Thus, simply dividing fishing grounds into parcels may not help fishers avoid collectively exceeding sustainable yields. It depends on the extent to which the sought-after fish migrate from one parcel to another and on conventions that are evolving continuously to help neighbors deal with the inadequacy of their fences or other

ways of marking off territory. Thus, not all forms of privatization are equally good at internalizing externalities. Communal management generally does not work, but privatization per se is not a panacea.

SEE ALSO *Economics, Environmental; Environmental Politics; Land Ethic; Natural Law Theory; Tragedy of the Commons.*

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David Schmidtz

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PROCESS PHILOSOPHY

Process philosophy names a range of philosophical theories. The term *process* implies rejection of substances as inherently or ontologically primary. It normally identifies philosophies that assert the independent existence of nature and the location of human beings within it. These philosophies encourage people to take seriously the course of natural events, and, indeed, the rise of evolutionary thinking was one key source of process philosophies. However, in the twentieth century, developments in physics took on primary importance, and evolutionary thought fell into the background.

ALFRED NORTH WHITEHEAD

In the twenty-first century, process philosophy refers chiefly to that of Alfred North Whitehead (1861–1947) and those influenced by him, and it is on this broadly Whiteheadian tradition that this entry will focus. Whitehead was a mathematician, logician, and theoretical physicist who devoted extensive attention to relativity theory. He arrived at his philosophical views partly through reflection about physical fields and partly by the analysis of his own experience. He thought that all the indivisible entities that constitute the world are something for themselves as well as for others. They are all momentary experiences consisting largely of unconscious feeling and emotion. This view can be called *panexperientialism*. This term is better than the more common *panpsychism* because the latter suggests consciousness and even high-grade experience, whereas in panexperientialism consciousness is limited to fairly complex animals. Whitehead's point is that to be at all is to be something in and of itself and not simply an object in the experience of others.

Humans as subjects are aware that some feeling states are preferable to others. They can thus form some judgments from their own experience that are applicable to what occurs elsewhere. In Whitehead's magnum opus, *Process and Reality* (1929), intensity serves as the measure of the value of an experience. In *Adventures of Ideas* (1933) he developed a much more complex theory of value in which "strength of beauty" plays the central role.

Whitehead believed that human experience, like processes in the physical world, consists of a sequence of distinct indivisible momentary experiences rather than a continuous flow. The later experiences inherit from the earlier ones by including them, or, alternatively, the earlier experiences flow into the later ones. This relation is called a *feeling* or a *prehension*. The ultimate locus of subjectivity, and therefore of value, is the individual experience.

Examination of an individual, momentary experience clarifies the implications for ethics. A moment of human experience inherits extensively from predecessor

moments. For adult human beings, this is the most important relation. However, each momentary experience inherits from other sources as well, most obviously from neuronal events. These mediate both new sense data and new bodily feelings. The new occasion is an integration of what it inherits from its personal past and the new stimuli from the body.

There is not first an occasion of experience that then inherits from the past and the body. The new occasion comes into being through the synthesizing of these relations. Thus relations are prior to the entity that is synthesizing them, although the priority is not temporal, because the relations and their synthesis all come into being at once.

Whereas in substance thought relations are external, in this process vision they are internal. In substance thought, relations among substances are chiefly spatial, and their changes do not affect the nature of the substances. For process thought, relations to past occasions are internal to the one that is becoming. A human experience is largely constituted by its relations, both to other persons and to the rest of the world.

Whitehead himself may have come to this radically relational vision more from field theory than from introspection. A physical field is constituted by a multiplicity of local events. But one can conceive of the events equally well as what the field is at a locus. It does not consist of entities that could exist elsewhere. What exists elsewhere is, by virtue of its location, a different entity. Whitehead concluded that every indivisible event is what it is largely as a fresh integration of features of its given world, one unique to each occasion.

Since, in such a model, the ethical concern is to increase value, the question is how occasions achieve more or less value. The greater value is achieved by the inclusion and integration of more of what the world offers. Diversity in these offerings makes possible greater value in the integration. But since diverse elements taken by themselves are often incompatible, simple occasions are forced to exclude most of them. More complex occasions are able to convert what would otherwise be mutually exclusive into a contrast in which the diversity is retained and the whole is richer for having both the different elements and the new values acquired through contrasting them.

Whitehead thus emphasized the importance of the environment. However, each occasion also transcends what it inherits from its world. It achieves value through some flash of novelty that introduces fresh contrast. This is the basis of the vibratory character of primitive physical entities as well as of the creative elements introduced by life. What novelty is possible is determined by what is given. The novelty itself is an expression of the creativity of the universe and is derived from the eternal order of potentiality, which Whitehead called the primordial nature of God. Thus the individual creatures that make up the environment both call forth respect for themselves by their intrinsic value and also contribute to the value of human experience in two ways: first, by the intensity or richness of their own individual experience and, second, by their diversity, which provides for their perceivers the possibility of rich contrasts.

CHARLES HARTSHORNE

Charles Hartshorne (1897–2000) has been the most influential philosopher in the development and promulgation of Whitehead's philosophy. He combined his philosophical pursuits with an interest in birds, and was himself deeply concerned about such ecological matters as the loss of habitat for other species. Hartshorne was a metaphysician and philosopher of religion. He focused attention on what Whitehead treated rather briefly as the consequent nature of God.

Both Whitehead and Hartshorne believed that what happens fleetingly in the world is cumulatively real in God. Without this retention of value in the divine life, the transitoriness of all things would undercut the importance of what happens in the world. Because what we do to ourselves and to our fellow creatures we do also to God, this process tradition undergirds ethics with religious faith. Hartshorne called it *panentheism*. His ethical goal was contribution to the divine life; so he called his ethics *contributionist*.

RESPONSES TO THE ENVIRONMENTAL CRISIS

Process thinkers were prepared by their philosophical understanding to respond to the environmental crisis. Although few engaged in explicit formulation of environmental ethics, much of their writing has been permeated by environmental concerns. Noteworthy examples are Ian G. Barbour, a physicist, and David Ray Griffin, a philosopher of religion.

John B. Cobb, a theologian, drew together the implications of process philosophy for environmental ethics, and in 1972 he published *Is It Too Late? A Theology of Ecology* (revised in 1955). Meanwhile, Charles Birch, a Whiteheadian biologist specializing in ecology, was trying to get the World Council of Churches (WCC) to respond to the new concern. This effort succeeded in 1975 at the Nairobi meeting. The WCC changed the earlier call for "just and participatory societies" to ones that are "just, participatory and *sustainable*." Birch gave the plenary address hailing and explaining this move. Subsequently, Birch and Cobb teamed up to write *The Liberation of Life* (1981), in which they argue for an ecological view of living things to replace the materialist one still dominant in the sciences.

Whitehead's philosophy supports concern both for ecosystems and for individual animals. The WCC concerned itself only with the former. The Whiteheadian philosopher of religion Jay McDaniel joined Birch in organizing a WCC meeting at Annecy, France, in 1988, with an emphasis on individual animals. The report produced by this meeting had little influence in the WCC, but it led to the publication of *Liberating Life* (McDaniel 1990). McDaniel also led in the American Academy of Religion in dealing theologically with animals. Additionally, he has written extensively on ecological spirituality.

Since 1972 Cobb has worked with the Whiteheadian economist Herman Daly contributing an essay to his *Toward a Steady-State Economy*, published in 1973.

In 1994 they jointly authored *For the Common Good*, proposing that economics be rethought on different assumptions. Daly has been a leader in ecological economics.

A number of religious thinkers, influenced by process philosophy, have been prominent in ecofeminism. These include Karen Baker-Fletcher, Rita Nakashima Brock, Carol Christ, Nancy R. Howell, Carol Johnston, Catherine Keller, Sandra Lubarsky, Sallie McFague, Mary Elizabeth Moore, Rebecca Parker, and Marjorie Suchocki.

CRITIQUES

Some of these ecofeminists, other ecofeminists, ecologically concerned Buddhists, and Deep Ecologists criticize Whiteheadian philosophy for advocating a "hierarchy of values" that judges some creatures to be of greater intrinsic value than others. They hold that this is too closely connected with anthropocentric and/or hierarchical thinking, locating human beings at the top, and evaluating others according to their proximity to humans. Defenders of Whitehead's gradation of values respond that practical decisions based on such judgments are inescapable and that Whitehead's criteria for judging the amount of value are not crudely anthropocentric. Although whales resemble humans less than do monkeys, the occasions of whale experience are probably richer. There may be very different creatures elsewhere in the universe with higher grades of value. God's experience, as process thinkers imagine it, is incomparably richer.

Clare Palmer offers the most thorough criticism of Whitehead as environmental ethicist. She considers the judgment that other beings resemble humans in having subjectivity to be "dominating" or "colonizing." She argues that the generalization from human experience suppresses the difference of the other. One response is that the usual ways of describing their otherness deprive them of intrinsic value altogether, whereas Whitehead attributes intrinsic value to all.

Palmer shows that a variety of ethical approaches can find a foothold in Whitehead's philosophy, but she concludes that it is finally consequentialist. Consequentialists fail to attend to relations to the past, such as promises that have been made. Whitehead certainly encouraged the increase of value, but occasions aim at value not only in their future but also in the present. Because each occasion is composed largely of relations to the past, such relations as promise keeping are not be ignored. Cobb dealt with technical ethical questions of this sort in his contribution to Daly's *Toward a Steady-State Economy*.

Palmer finds some of Whitehead's language about nonhuman animals demeaning. Although Whitehead's basic emphasis was to reduce the difference between human beings and other species, she is right that he took human superiority for granted. She also notes rightly that Whitehead thought of civilization as pure gain. He did not appreciate the quality of life in hunting and gathering societies or their arguably superior environmental record. Overall it is true that, even though Whitehead does not emphasize evolutionary and historical progress, he did take many of the humanist assumptions of his time for granted. To follow his philosophy does not require repetition of all his judgments.

Lisa Sideris has followed the theologian James Gustavson in formulating norms for evaluating environmental ethical positions. She judges, surprisingly, that process thought fails to emphasize affective judgments. Although Whitehead used reason extensively in his arguments and considered the emergence of rationality as a great gain, his ultimate appeal was to intuition. Emotion is the primary reality and is involved in every judgment.

Sideris argues for a radically theocentric ethics and judges that process ethics is too anthropocentric. On the one hand, she objects to the view that God aims at the increase of value in the world and that faith in God contributes to well-being. On the other, she objects that whereas process thinkers oppose the sacrifice of animals for minor human gains, they would sacrifice other creatures to meet urgent human needs. This is true. Process thinkers oppose the fragmentation of thought and do not want an environmental ethics that threatens deep concern for the well-being of every human, and especially for the poor and oppressed. Their goal is a single ethic that integrates concern for the biosphere, animal suffering, and human flourishing. They give less attention to refining ethical formulations than to promoting broader changes in attitude and in spirituality. In particular, they think the theoretical changes most urgently needed are in such fields as agriculture and economics.

SEE ALSO *Animal Ethics; Ecological Feminism; Economics, Ecological; Ecotheology; Environmental Philosophy: V. Contemporary Philosophy; Pantheism.*

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John B. Cobb Jr.

Q

QUEER THEORY

Queer theory, which emerged as an academic area of study in the early 1990s, is an interdisciplinary body of scholarship that attempts to understand the way power works as a productive and normalizing force that shapes personal identity, human experience, knowledge, policy making, and political movements. For example, queer theorists question the norms of gendered embodiment that make a person recognizable as a man or a woman and their relationship to sexual norms such as heterosexuality and monogamy. Though influenced by feminist theory and gay and lesbian studies, queer theory builds on the philosopher Michel Foucault's (1926–1984) insight that power is productive rather than being only restrictive and that identity and resistance are effects of societal practices that normalize certain types of behavior and bodies compared with others. As a force of normalization, power takes on the appearance of being natural and inevitable while inducing conformity in the individual. Queer theorists have used Foucault's insights about power to interrogate understandings of gender identity and desire.

The term *queer* often is used as an umbrella designation to refer to lesbian, gay, bisexual, and transgender people; however, within the context of queer theory the term is best understood as a verb. In other words, queer theory aims to queer—to question and defamiliarize—the identities, concepts, knowledge, and experiences that shape lives, values, societies, policies, and academic inquiry. Central to queer theory is a critique of heteronormativity, which is understood both as the institutionalized assumption that heterosexuality and conventional modes of being in a relationship such as marriage and monogamy are normal and natural and as the pressure and obligation to conform to those modes as a condition for respect, legitimacy, recognition, and citizenship.

Queer environmental philosophy seeks to theorize the role of assumed norms of identity, experience, and embodiment that inform the deployment of terms such as *nature*, *the natural*, *sustainability*, *future generations*, and *the common good*. These are key terms which underlie environmental philosophy, policy, and activism, but queer environmentalism recognizes and critiques their heteronormative bias. Queer environmentalism also makes visible and critiques connections between the disavowal of that which is understood to be queer and environmental destruction. There are many areas of overlap between queer environmental philosophy and ecological feminism. In order to understand the commonalities between queer environmental philosophy and ecological feminism, as well as their differences, one must first understand some of the ways in which feminism has influenced queer theory.

QUEER THEORY AND FEMINISM

Queer theory is influenced by and shares the feminist critique of the sex-gender system of oppression and compulsory heterosexuality, both of which rely on the presumed naturalness and inevitability of the connection between biological sex, gender, and desire/sexuality. Both feminism and queer theory expose the social and cultural nature of the sex-gender system and its long-standing role in rationalizing the oppression of women and sexual minorities.

Despite some feminist disagreement with the critique of identity found in queer theory, that critique

has roots in feminist interrogation of the concept of woman as well as Foucault's understanding of power and subjection. Foucault understood subjection both as the subjection of the individual to dominating force and the production of the individual as a subject. Building on that concept, queer theory characterizes all identity categories as effects of power and not as pure sites of resistance to power, and its critique of identity includes a critique of the subjects around which feminism and lesbian and gay studies have been organized: woman and lesbian and gay. In 1990 the philosopher Judith Butler used Simone de Beauvoir's famous question, "What is a woman?" as a point of departure and asked how the subject of feminism (woman) is "produced and restrained" by the power structures through which women's liberation is sought (Butler 1990, p. 2). Gender, Butler argued, is performative, the materialization of historical and cultural norms that make gender and sex visible, real, and meaningful (Butler 1990, 1993, 2004). Butler's performative theory of gender was a major contribution to feminist theory and was foundational for queer theory.

ECOLOGICAL FEMINISM AND QUEER ENVIRONMENTALISM

There also are areas of overlap between ecological feminism and queer environmentalism. For example, both are critical of gender and nature essentialism and value dualisms. Essentialism is the view that all the members of a group (e.g., women) share unchanging characteristics, an essence that is necessary for membership in that group. Queer environmentalists and ecological feminists contend that essentialist definitions do not portray gendered reality or the relationship between humans and nature accurately. Both queer environmentalism and ecological feminism have been influenced by Donna Haraway's (1991) concept of the cyborg, calling into question distinctions between human beings, nature, and technology. Chris Cuomo distinguished between ecofeminism and ecological feminism, arguing that much of ecofeminism is premised on universal, essentialist conceptions of woman, woman's connection to nature, and feminine virtues that ignore how white, wealthy women in the North benefit from globalized exploitation of the earth, poor people, and people of color (Cuomo 1992).

In the 1990 essay "The Power and Promise of Ecological Feminism" Karen J. Warren argued that a critique of value dualisms is an important contribution of ecofeminism. Value dualisms are opposites that categorize dominant conceptions of reality: man/woman, human/animal, culture/nature, mind/body, reason/emotion, and white/black, for example. These opposites are value dualisms because in each pair the second term is subordinated to the first and the meanings attached to the first term define cultural norms. In value dualisms the terms in each pair are "seen as exclusive (rather than inclusive) and oppositional (rather than complementary)," and characteristics associated with the first term are considered to be better than those associated with the second (Warren 2000, p. 46). In an attempt to bridge the gap between ecofeminism and queer theory, Greta Gaard proposed a queer ecofeminism that challenges the oppression of the erotic, an oppression shaped by "reason/erotic" and "heterosexual/queer" dualisms that define Western culture and are integral to the oppression of queers, women, indigenous people, and nature (Gaard 1997, pp. 118–119).

Queer environmentalism differs from ecological feminism in the centrality of Foucault's concept of power and Butler's performative theory of gender to its analysis of environmental problems. For instance, oppression is the predominant concept of power that fuels the ecological feminist critique of interlocking systems of oppression (e.g., racism, sexism, speciesism, classism, oppression of the earth) that support violence against all oppressed humans, nonhuman animals, and nature. Although queer theorists do not deny the existence of oppression, they consider analyses of power centered on oppression to be incomplete. When power is understood as primarily oppressive, the world is divided into those who have power (those who exercise power) and those who do not (those over whom power is exercised), and resistance becomes a matter of making visible power imbalances that characterize oppression, explaining their injustice, and seeking liberation for the oppressed. However, queer theorists in general and queer environmentalists in particular are interested in the ways in which power operates in the myriad coincidences of knowledge and power that generate norms, condition subjectivity, and increase the institutionalized management of individuals.

QUEER CRITIQUES OF ENVIRONMENTALISM

Queer analyses of environmental problems focus on the ways in which the discourse of environmentalism produces subjects that ultimately legitimate rather than undermine globalized capitalism and its role in environmental destruction. Catriona Sandilands argued that environmentalism is a "normalizing discourse" that assumes that there are limits inherent in nature (Sandilands 1999, p. 80). Consequently, both radical and mainstream environmentalism tend to focus on "self denial" as the hallmark of the environmentally responsible citizen who is implicitly juxtaposed against people and governments in the "Third World" that have failed to exercise appropriate self-discipline (Sandilands 1999, pp. 80–81). Even though many, including ecofeminists, critique specific forms of population control, Sandilands contended that

most environmentalists have not challenged population/fertility management as a goal (Sandilands 2004).

Éric Darrier (1999) also crtiqued environmental discourse, focusing specifically on the function of the concept of nature in environmental philosophy and policy. Like Sandilands, he was critical of the values and practices people are obliged to adopt in the name of "the common good," "sustainable development," or "the proper functioning of the 'ecosystem'" (Darrier 1999, p. 217). Darrier proposed a "green aesthetics of existence" rather than a green ethics of existence, a practice he defined as critically self-reflective regarding the assumed truths of nature that are used to justify environmental policies and encourage the adoption of particular values or modes of being (Darrier 1999).

Some theorists, such as Alison Kafer and Eli Clare, have examined connections between queerness, disability, and nature. Kafer argued that many environmentalist narratives about experiences with nature, including ecofeminist narratives, assume able-bodiedness (Kafer 2005). That disregard of disability, Kafer contended, contributes to conflicts between environmentalists and advocates of disability rights over issues such as the accessibility of public lands and parks. According to Kafer, many environmentalists assume that making trails and canoe launches accessible, for example, will exceed limits that are inherent in nature, as if making trails more accessible would "insert the all-too-human into the 'wilderness'" (Kafer 2005, p. 139). For Kafer the absence of the disabled body in environmentalism ultimately assumes and naturalizes a human/nature dualism that many environmentalists want to critique. As an alternative, she proposed Clare's 1999 narratives of hiking as important sources of insight into the ways in which ideas of nature can be shaped by queerness and disability. For Kafer and Clare, queering nature involves understanding that nature and disability are not mutually exclusive, that there is nothing "unnatural" about disability.

Queer environmentalism calls into question the normalization of the concepts of the human, nature, future generations, and population that inform even discourses mobilized on behalf of environmental protection. It proposes persistent questioning of the ways even well-intentioned environmental philosophy and policy can promote the exploitative interests of globalized capitalism.

SEE ALSO *Ecological Feminism; Ethics of Care.*

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Kim Q. Hall

R

REGAN, TOM
1938–

Tom Regan, best known as the philosophical father of the animal-rights movement, was born on November 28, 1938, in Pittsburgh, Pennsylvania. Regan taught for over thirty years at North Carolina State University, receiving emeritus status upon retirement. Major honors include multiple teaching awards, research awards, the William Quarles Holladay Medal, the Gandhi Award, and the Joseph Wood Krutch Medal. His work has focused on animal rights and on the philosophy of G. E. Moore. His major publications include *The Case for Animal Rights* (1983) and *Bloomsbury's Prophet: The Moral Philosophy of G. E. Moore* (1987). Both of these books were nominated for the Pulitzer Prize and the National Book Award. He also authored *All That Dwell Therein: Essays on Animal Rights and Environmental Ethics* (1982), edited *Animal Sacrifices: Religious Perspectives on the Use of Animals in Science* (1986), and authored *Defending Animal Rights* (2001). Of his many articles, two are major contributions to environmental ethics: "The Nature and Possibility of an Environmental Ethic" (1981) and "Does Environmental Philosophy Rest on a Mistake?" (1992). He founded the Tom Regan Animal Rights Archive at North Carolina State University. Tom and Nancy Regan also created the Culture and Animals Foundation to promote animal rights through art.

In his 1981 classic essay "The Nature and Possibility of an Environmental Ethic," Regan argued that a genuine environmental ethic is an ethic *of* the environment, not merely an ethic *for the use of* the environment. The latter sort of ethic regards the environment and the entities inhabiting it as valuable only inasmuch as they benefit humans (are *instrumentally* valuable). An ethic of the environment, by contrast, must hold (1) that nonhuman beings are valuable in and of themselves (are *inherently* or *intrinsically* valuable), and (2) that both conscious and nonconscious beings are inherently valuable. Regan then shows that arguments against the possibility of an environmental ethic rest on unjustified moral claims. Next, Regan exposes the failure of arguments attempting to establish that an environmental ethic is unnecessary for environmental protection. Finally, Regan sketches what it would mean for a being to be inherently valuable/good: Its value is independent of conscious beings, is an objective property arising from its other properties, and appropriately inspires respectful admiration and preservation. Regan concludes his prolegomena to any future environmental ethics by posing two unanswered questions: What property makes a being inherently good? How can we know which beings are inherently good?

In his seminal work *The Case for Animal Rights* (1983), Regan suggests some answers. Here Regan lays out a meticulous case for the inherent value of all "subjects-of-lives." Subjects-of-lives are experiencing, goal-directed beings with welfares. Clear cases of subjects-of-lives, Regan holds, are mammals over one year old. Such beings are rights bearers, having valid claims against moral agents. How can we know this? Regan claims that only rights theory containing the subject-of-a-life moral principle meets the criteria for a satisfactory ethical theory: consistency, scope, precision, conformity with reflective rational intuitions, and simplicity/parsimony.

It would be wrong to conclude that Regan, with the subject-of-a-life proposal, has ruled out an environmental

ethic. He explicitly leaves open its possibility by stating that being the subject-of-a-life is sufficient, but not claimed to be necessary, for inherent value. He thus grants that nonconscious beings might be inherently valuable, although he says it is "radically unclear" how this could be so (1983, p. 246). Nevertheless, Regan holds that his rights view is compatible with an environmental ethic according inherent value to individuals. An example is Paul Taylor's individualistic ethic, defended in *Respect for Nature* (1986). Regan's framework is incompatible with a holistic environmental ethic, however; such an ethic accords inherent value solely to wholes such as species and ecosystems, attributing merely instrumental value to individuals.

In 1992 Regan published another key contribution to environmental ethics, "Does Environmental Ethics Rest on a Mistake?" Here Regan argues that the emerging paradigm for an environmental ethic is fatally flawed. According to the paradigm, natural entities are due respect from moral agents because of the noninstrumental value of these entities, with different and greater intrinsic value attributed to wild beings than to domestic beings. Regan proceeds to argue that no theory of intrinsic value can meet all these requirements for an environmental ethic. A theory according intrinsic value to beings will accord them either equal intrinsic value or different intrinsic value. The first type of theory (e.g., Taylor's biocentric egalitarianism) cannot accord more intrinsic value to wild beings than to domestic beings. The second type of theory would establish a hierarchy of intrinsically valuable beings, with lower-ranking entities being sacrificed for the sake of higher-ranking ones. Such a theory cannot ground respect for natural entities, which merely occupy positions in a hierarchy. Moreover, such a theory is indistinguishable in practice from one positing a hierarchy of instrumentally valuable beings, with a top level of intrinsic value (e.g., an ecosystem, for the sake of which individuals can be culled). This second type of theory is more parsimonious than theories that attach intrinsic value hierarchically, although it too provides no grounds for respecting natural entities.

If Regan is correct, an individualistic environmental ethic, already challenged to justify its criterion of intrinsic value, must abandon the claim that wild and domestic beings have different degrees of intrinsic value. Individualists and holists rejecting Regan's approach must show that he is mistaken here.

Regan's animal-rights philosophy has received its share of criticisms from environmental ethicists. Both J. Baird Callicott (1989) and Mark Sagoff (1984) have argued that the animal-rights view would commit moral agents to protecting all rights bearers, even prey. They hold that this would have disastrous implications for the environment. A different objection has been raised by ecofeminists such as Josephine Donovan (1993). According to this criticism, moral-rights theory is based on a patriarchal worldview that enshrines reason and individualism while denigrating emotion and community, lying also at the foundations of Callicott's approach to environmental ethics. Instead of making rights and justice paramount in ethics, ecofeminists urge that care, partiality, and nature should be at the center.

Regan has replied to these and other critics in *Defending Animal Rights* (2001). He argues that moral agents do not have the general obligation to assist prey (p. 19). Nonhuman predators do not violate prey rights, since these predators are not moral agents. Moreover, there is no duty to assist prey animals against their innocent attackers, because in general they can fend for themselves. Against the ecofeminist critique, Regan argues that it is based on misrepresentation, undefended claims, false dilemmas, and the same biases embodied by patriarchal views (pp. 54–64).

Whether one thinks Regan has succeeded or failed in his criticisms of major environmental ethical theories and in his defenses of animal-rights philosophy, he has made ground-breaking contributions to the view that moral worth is not confined to humanity.

SEE ALSO *Animal Ethics; Callicott, J. Baird; Ecological Feminism; Intrinsic and Instrumental Value; Taylor, Paul.*

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Evelyn B. Pluhar

REGIONALISM

A *region* is a portion of the earth's surface unified by a high degree of internal functional integration and formal consistency. For instance, the corn belt of the United States, which stretches from Ohio to Iowa, functions much like a vast machine, with components such as cornfields, farmhouses, county roads, feedlots, and meat-packing plants. The recurrence of these components in the landscape gives the region a uniform—some might say monotonous—appearance, smell, and sound. Because there is a perceptible consistency in the region's landscape and in the manners, customs, and culture of its people, regions are usually recognized by ordinary people, and their names are part of vernacular geography.

Regional is an adjective attached to forms (artifacts, institutions, beliefs) that are characteristic of, but not necessarily unique to, a region. We speak of a regional landscape, cuisine, dialect, architecture, or costume. In traditional human societies (folk cultures), almost all cultural traits were regional because interaction with people outside the region was limited and most artifacts and practices were adapted to the needs and opportunities of the local environment. Regional distinctiveness has been greatly reduced by modern communication and transportation technology, which increases long-distance interaction and permits functional integration on the continental and global scales.

Regionalism is self-conscious attachment to, and preservation of, regional forms. The members of a folk culture are not regionalists, and their reproduction of regional forms is not regionalism, because they reproduce regional forms out of habit and necessity. These are the only forms they know, or the forms best suited to their physical environment. Regionalism is, on the other hand, a disposition to prefer regional forms (of speech, dress, food, and architecture), when other and perhaps more cost-effective alternatives are available, simply because they are regional.

For example, in Texas, cowboy boots and cowboy hats were, originally, folk forms of dress that emerged from precedents available in the Anglo-Hispanic borderlands to meet the needs of men who spent much of their lives in the sun, with their feet in stirrups. They wore these articles because almost every other man they had ever seen wore them and because they were tools well adapted to cattle ranching in a hot climate. Today most men and women who wear cowboy boots and hats are, in contrast, self-consciously identifying themselves with the region. They are saying, "I'm from Texas and I'm proud of it!" Regional idioms, accents, foods, and the like may all become expressions of regionalism once they are used, self-consciously, as symbols of identity, pride, or defiance. Regional folk culture becomes vernacular regionalism when, and to the extent that, it is elective and expressive rather than habitual and necessary.

In addition to the vernacular regionalism of ordinary people, there is an intellectual regionalism of artists and scholars who write regional literature and history, or restore, preserve, and develop regional folkways, crafts, arts, and architecture. Intellectual regionalism is sometimes antiquarian and curatorial, an exercise in preserving the memory of a regional culture that is lifeless, however beautifully embalmed. More often, intellectual regionalists aspire to keep regional culture alive with new and creative work within the regional tradition. Their understanding of tradition has much more to do with the ideas of the poet and critic T. S. Eliot or the philosopher Alasdair MacIntyre than with Morris dancing, quilting bees, or Civil War reenactment. The best-known example of American intellectual regionalism is the work the writers, known as the Fugitives or Agrarians; centered at Vanderbilt University in the 1930s; they worked to restore pride in the southern way of life.

Vernacular and intellectual regionalism is frequently explained as a reactionary movement on the part of people who fear spatial homogenization and the universal rationality of enlightened modernity. This interpretation reveals more about the prejudices and plans of the interpreter than it does about the motives of regionalists. Its defects are the assumptions that an international style (of everything) is inevitable, that dislike and fear of modernity is irrational, and that regionalism is, at best, equivalent to throwing the covers over one's head at the sound of the bogeyman coming up the stairs. More portentously, critics of regionalism like to suggest, with very little evidence, that it is the gateway to xenophobia and fascism. Regionalism does, indeed, dispute the universal pretensions of enlightened modernity; at least in its intellectual form, however, it does so in an enlightened manner. Far from indulging in fanciful nostalgia, regionalism criticizes and challenges the core assumptions of modernity. Regionalists are not typically cowards who have thrown the covers over their head; they are, more often than not, men and women with the courage to look modernity in the eye and ask it some very hard questions.

SEE ALSO *Globalization; North America; Space/Place.*

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Jonathan M. Smith

RESOURCE MANAGEMENT

Resource management refers to decision making about how to conserve, allocate and use the goods and services available to satisfy people's value demands. Such decision making is fundamental to people's interactions with one another and with the environment, as depicted in Harold Lasswell's model of the human social process: "participants → seeking to maximize values (gratifying outcomes) → utilize institutions → affecting resources" (Lasswell 1971, p. 18). The term *resource management* often is used to refer specifically to decision making about the goods and services available from the natural world, or natural-resource management. This includes decisions about allocating the benefits and costs of resource use among current members of society and between current and future generations. To some people resource management is simply a matter of good planning: carefully making use of available resources to provide social utility while ensuring that there is enough left to meet future needs. That conception, however, masks important ethical and philosophical debates about which approach to management is most appropriate, what the goals of management should be, and whether it is even acceptable to characterize aspects of nature as resources to be managed.

RESOURCES

A basic utilitarian definition of a resource might be "something that can be used by humans." Anthropocentric thinking of that type dominates Western models of natural resource management, although there have been dissenting voices through the years, such as George Perkins Marsh, Henry David Thoreau, John Muir, and Aldo Leopold. Critics of anthropocentrism object to the implication that the value of the nonhuman world lies solely in its ability to satisfy human desires. They point to the many failures of attempts to control or dominate nature and argue that treating the natural world as a collection of resources that can be manipulated and used to achieve human ends is misguided and arrogant.

Alternatives to anthropocentric resource management draw on a variety of philosophical traditions that posit a more equal relationship between humans and the natural world, including the worldviews of some aboriginal societies, in which humans are considered part of nature and there is an emphasis on respect for the nonhuman world; the land ethic of Aldo Leopold, in which humans are members of a broader community of the land and "a thing is right when it tends to preserve the integrity, stability, and beauty" of that community (Leopold 1949, pp. 224–225); the "democracy of all God's creatures" promoted by Saint Francis of Assisi (White 1967, p. 1206); and the more recent human-nature egalitarianism of deep ecology. In those alternative conceptions treating elements of nature as resources to be managed or assigning value to nature solely on the basis of instrumental considerations makes little sense.

Whether or not nature has intrinsic value, humans do make use of and derive benefits from the natural world. In addition, as the claims of the critics of anthropocentrism demonstrate, human values and attitudes toward nature are multidimensional, ranging from an emphasis on use and dominion to aesthetic appreciation and moral concern about natural rights. When resources are defined more broadly to include anything that provides value, resource management can encompass decisions about providing the full spectrum of those values, including protecting wilderness areas for moral reasons as well as managing other areas for recreation or consumptive use. Furthermore, it is not just elements of the natural world that are at stake; cultural, heritage, spiritual, and other human resources often are included in modern understandings of resource management, and managing human behavior can be as important as managing nature.

The physical characteristics of resources also have implications for management because those characteristics dictate the ways in which particular resources can be used or allocated to provide value. Some resources provide materials or inputs for human activities, whereas others have the capacity to assimilate and process wastes or outputs. Some resources are bought and sold in markets and have readily identifiable prices that provide an indication of their value to humans. Others, known as nonmarket resources, do not have easily determined monetary values, making it more difficult to assess their importance relative to goods and services that are

exchanged in the market. Some resources, such as forests and fisheries, are renewable because when they are harvested at an appropriate rate, they can regenerate and provide a continuing supply in the future. In this sense renewable resources form a stock that can be maintained while a flow of benefits is withdrawn. Other resources, such as oil and gas, metals, and most other minerals, are nonrenewable because they cannot be regenerated within human time scales once they are consumed or converted.

Two other key characteristics of resources for management are subtractability, which indicates whether use by one person reduces the capacity of the resource to provide goods or services to others, and excludability, which indicates how difficult it is for users or managers to exclude additional users. When resources are subtractable and nonexcludable (common pool resources), they are likely to be overused unless rules or other institutional structures limit access and exploitation.

APPROACHES TO RESOURCE MANAGEMENT

Approaches to resource management have varied with the scarcity and physical characteristics of resources and have evolved with changes in values, knowledge, and technology. For example, when the American West first was occupied by settlers of European descent, resources seemed highly abundant and the principal management concerns were to allocate those resources in a fair manner and ensure that they were used to encourage settlement and economic development. Accordingly, the Western system of water rights was built on principles of "first in time, first in right," and "use it or lose it," which determine priority among users and help ensure that water is put to use but pay little attention to conservation or the effects of extraction on other users or other components of the system. Similarly, land was allocated for free to those who would homestead and farm, grazing of cattle and sheep was permitted on public lands without charge, and mining and timber rights were granted to encourage the exploitation of those resources.

With the closing of the frontier in the second half of the nineteenth century the supply of free land dwindled, and this, together with evidence of the damage caused by overuse—such as the effects of sheep ranching in the Yosemite area, the impacts of extensive land clearing and logging throughout the West, and the crashes of prominent wildlife populations—fostered the development of two main competing streams of conservation-oriented thinking about resource management. The preservationist philosophy championed by John Muir called for setting aside entire regions of the landscape to protect wilderness values, provide sanctuaries for wildlife species, and preserve examples of wild nature. Preservationists pushed for the protection of Yosemite and other national parks, and this philosophy continues to inform the management of protected areas in both terrestrial and marine environments. In contrast, the progressive conservation of Gifford Pinchot advocated scientifically informed use of resources to maximize the benefits for all: "Conservation means the greatest good to the greatest number for the longest time" (Pinchot 1947, p. 325). This utilitarian philosophy, which often is applied to the management of a single resource, informed sustained yield management policies for forests and fisheries and has become ingrained in many resource management agencies.

Management for a single use does not deal with the interactions of the different demands that humans make on their environment or the effects that utilizing one resource may have on other aspects of the environment and other people's values. In response to increasing pressures and conflicts among demands such as recreation, water supply, ranching, agriculture, and forestry, the concepts of multiple-use and integrated resource management evolved.

Under a multiple-use approach resources are managed to provide multiple benefits for a variety of users, with the overall objective of maximizing human utility. The overlap between multiple use and sustained yield is evident in legislation such as the Multiple Use Sustained Yield Act of 1960, which requires management of U.S. national forests for a sustained yield of products and services, including uses such as range, outdoor recreation, timber, and wildlife. Although multiple-use management involves a degree of integration, the idea of integrated resource management has been extended and interpreted much more broadly to mean coordinated management of social, ecological, and economic systems toward goals such as sustainable development and sustainability.

Approaches to resource management that are explicitly systems-oriented became more prevalent near the end of the twentieth century. For example, in the early 1990s many federal and state land management agencies embraced ecosystem management. The principles of ecosystem management may include managing ecological systems holistically to maintain their integrity, taking account of the disturbance regimes in which those systems evolved, managing adaptively to accommodate and learn from change, and involving the public and incorporating social considerations in management. Ecosystem-based management is a close relative of ecosystem management, which emphasizes management on the basis of ecosystems rather than management of ecosystems. Another important application of systems-oriented thinking to resource management is found in the work of C. S. Holling and his collaborators on panarchy theory, which considers the adaptive cycles and interactions of multiple economic, social, and ecological systems operating at different

temporal and spatial scales and encourages management to "maintain ecological resilience as well as the social flexibility needed to cope, innovate, and adapt" (Holling 2001, p. 404). As with other contemporary models of resource management, systems-based approaches often encourage public participation and the use of traditional ecological knowledge in decision making.

GOALS OF MANAGEMENT

Underlying this diversity of management approaches is an equally diverse array of goals toward which resource management can be directed. Among the more prominent goals are the following:

- Maximizing the extraction and use of a single resource in the short term;
- Maximizing the yield of a single resource that is sustainable over the longer term;
- Maximizing the sustainable benefits of multiple resources at the same time;
- Preserving natural landscapes or systems;
- Reducing harmful pollution or achieving an economically optimal level of pollution;
- Internalizing the positive and negative externalities caused by human activities;
- Protecting human health;
- Preserving charismatic or otherwise highly valued species;
- Preserving biodiversity;
- Maintaining ecosystem health or land health;
- Maintaining ecological integrity or ecosystem integrity;
- Maintaining the resilience and adaptive capacity of systems;
- Maintaining ecosystem functions;
- Keeping systems within their historical range of variability;
- Sustainable development;
- Sustainability.

Since the report of the World Commission on Environment and Development in 1987, the goals of resource management often have been tied to the concept of sustainable development—or sustainability—of social, economic, and ecological systems. Definitions of sustainability vary, however, from sustaining the combined stocks of natural and human-created capital, to sustaining the stock of natural capital separately, to managing within safe minimum standards, which may entail precautionary management to avoid crossing thresholds and causing irreversible change.

Throughout history humans have sought to manage resources, in some cases more successfully than others. Different approaches to resource management reflect different understandings of the appropriate relationship between humans and the natural world. Whether people attempt to manage resources actively toward particular goals or manage their own behavior to allow natural systems to operate without extensive human influence, experience suggests that failure to respect the limits on the capacity of natural systems or to recognize and adapt to changes in that capacity over time can be disastrous.

SEE ALSO *Biodiversity; Conservation; Deep Ecology; Economics, Ecological; Economics, Environmental; Environmental Policy; Land Ethic; Limits to Growth; Muir, John; Preservation; Sustainability.*

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RIO DECLARATION

The United Nations Conference on Environment and Development (UNCED), the Earth Summit, held in Rio do Janeiro in June 1992, produced a short document titled *Rio Declaration on Environment and Development*. This document was to be named the *Earth Charter*, but developing nations objected that such a name focused too much on the earth and nature, and not enough on people and development, so the title was changed. It was renamed the *Rio Declaration* for the lack of any consensus about a title with more explicit reference to its contents. The declaration states twenty-seven principles, most given in a sentence or two, while a few form short paragraphs. Although it was only six pages long, there were lengthy arguments during the proceedings over nuances of phrasing. Toward the close of the conference a document was produced, and this has since been signed by almost every nation. The United States signed, with some protests about possible misinterpretations of the language of the declaration.

Even before the conference started, developing nations had already made it clear that they did not want an earth charter. In the discussion, a First World country delegate suggested an earth charter, a short creed, that "should be framed and put in the room of every child of the world." The retort from a Third World delegate: "Not every child has a room, maybe not even a bed!" Representatives of developing nations argued that direct concern for nature was an elitist luxury of First World nations, an inhumane overlooking of human poverty. "Ecologists care more about plants and animals than about people," complained Gilberto Mestrinho, governor of the Brazilian state of Amazonas. Or concern for saving the Earth was insincere, critics objected, unless accompanied by large donations from the wealthy nations to those in developing nations being asked to preserve nature.

"Human beings are at the centre of concerns for sustainable development," so the *Rio Declaration* begins in principle 1. It goes on to say that people are entitled to "a healthy and productive life in harmony with nature." Alternative language, which was rejected, read, "Human beings are entitled to live in a sound environment, in dignity and in harmony with nature for which they bear the responsibility for protection and enhancement." Principle 4 reads, "In order to achieve sustainable development, environmental protection shall constitute an integral part of the development process and cannot be considered in isolation from it." Development is clearly the dominating motif, with environmental conservation subsidiary to it.

Principle 7 reads, "States shall cooperate in a spirit of global partnership to conserve, protect and restore the health and integrity of the Earth's ecosystem. In view of the different contributions to global environmental degradation, States have common but differentiated responsibilities. The developed countries acknowledge the responsibility that they bear in the international pursuit of sustainable development in view of the pressures their societies place on the global environment and of the technologies and financial resources they command."

Environmental ethics with any direct concern for animals, plants, species, or ecosystems was essentially stripped from the draft language for the declaration. Its ethics was much more subdued than had been anticipated, because the rich-poor controversy became so unexpectedly intense. "Changes in life styles of the rich to those that are less polluting and wasteful is essential to reaching sustainable development." So proposed the developing nations in a draft text that the developed nations rejected. The objection was not so much to eliminating waste and pollution as to the suggestion that poverty in the South (the developing nations) was the fault of overconsumption in the North (the wealthy nations).

There were widespread complaints that world population growth was insufficiently addressed in the *Rio Declaration*, as well as overall at the Earth Summit, due to ideological and religious objections. The motivations suppressing attention to population control were as often implicit as explicit: that population reduction is an effort to reduce the number of non-Western (or non-Northern) people in the world, or that population control is an easier route than sharing unequally distributed resources, or that population control violates human rights or national sovereignty, or that the large populations of the poor really consume less than the limited but extravagantly consuming populations of the wealthy nations. The *Rio Declaration* mildly says, "States should . . . promote appropriate demographic policies" (principle 8). Developing nations were much more anxious to thrust blame on the developed countries for their overconsumption.

The *Rio Declaration* contrasts, tellingly, with a much earlier UN document called the *World Charter for Nature*. This charter begins, "Every form of life is unique, warranting respect regardless of its worth to man" (United Nations General Assembly 1982). A total of 112 nations endorsed this charter, though the United States vigorously opposed it. This statement was largely aspirational; few took it to require any serious changes in policy. In contrast, the *Rio Declaration*, coupled with the massive *Agenda*

21, which accompanied it, was expected to produce changes in behavior. The diplomatic negotiations formulating the document became a kind of morality play of developed nations versus developing nations, North versus South, rich versus poor, development versus conservation.

Disappointment in the *Rio Declaration* led original advocates of an *Earth Charter* to continue their efforts, and such efforts continued during the decade following the United Nations Conference on Environment and Development. A version was completed in March 2000 at The Hague, Netherlands, and efforts to gain subscribers continue. Thousands of organizations have endorsed it, including the United Nations Educational, Scientific, and Cultural Organization (UNESCO), but not yet the United Nations General Assembly. The first principle of the *Earth Charter*, ''Respect Earth and life in all its diversity,'' states, ''Recognize that all beings are interdependent and every form of life has value regardless of its worth to human beings.'' The latter phrasing recalls that of the *World Charter for Nature* and was inserted with an eye to the adoption of the *Earth Charter* by the United Nations General Assembly.

The *Rio Declaration* contains some key themes that are working their way into law: the principle that the polluter pays, responsibility for spillover damage from one country to another, intergenerational equity, public participation, a precautionary approach, environmental-impact assessments, differential responsibilities, healthy environments. Despite its shortcomings, the *Rio Declaration* serves a useful purpose as a negotiated multinational instrument that can serve as an icon for environmentally responsible development.

SEE ALSO *Convention on Biodiversity; Earth Charter; Earth Summit; Ecology: III. Ecosystems; Population; United Nations Educational, Scientific and Cultural Organization.*

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Holmes Rolston III

RISK ASSESSMENT

In an uncertain world most important choices involve a risk of losing something of value. Risk assessment is a process of discovering the possible adverse effects of decisions and figuring out what to do about them. People try to identify and measure the likelihood of adverse effects, put a value on them, and compare them with the costs and benefits of alternatives. This is an important part of any process of rational decision making.

TYPES OF RISK ASSESSMENT

The relative importance of a decision (and the importance of the risks involved), including the expected costs and benefits of accepting, reducing, or eliminating risk, can determine whether the appropriate way to assess risk is through a quick and intuitive judgment or through a more formal and often more technical and costly process. A rational person might do a quick and intuitive risk assessment to help decide when to buy new tires for a car; the same person is likely to take more care, think more formally, and get more information and advice before deciding whether to undergo a risky medical procedure to diagnose or treat a possible cancer. Businesses assess risk before deciding whether to invest in a new venture, and governments perform risk assessments to decide whether to introduce a new program or regulation. In any risk assessment the aim is to decide whether it is most reasonable to introduce or create a risk in exchange for a benefit, try to eliminate or reduce the cause or mitigate the effects of an identified risk, or accept a risk or adapt to the bad consequences if they occur.

RISK ASSESSMENT IN PUBLIC POLICY

Although risk assessment is something individuals and businesses do more or less explicitly or formally every day, the term has acquired a special sense in the context of its use in justifying and explaining decisions that involve public policy. Risk assessment has been part of government activities for as long as governments have been concerned about threats to public and environmental health from disease, pollution, war, and technologies. However, risk assessment for public policies developed as a formal discipline in the 1960s, a period when there was broad support in the United States and other industrially developed countries for regulations aimed at protecting humans and their environments.

Between 1965 and 1980 the U.S. Congress enacted more than thirty major laws aimed at protecting health and the environment that established or strengthened at least a dozen regulatory agencies. Those laws set the agenda and the process for most environmental regulations for several decades. Explicit attention to the

complicated nature of environmental risks led to the growth and influence of research into risk assessment as some advocacy groups lobbied for stricter regulations and others responded to newly promulgated regulations by arguing that they went too far and cost too much. All that activity prompted scientists and engineers to continue to develop formal methods of risk assessment that could improve the quality and acceptability of complex regulatory decisions. In the process the methods and use of formalized risk assessments themselves became subjects of ethical and political concern.

One reason for these controversies in environmental policy making is that different parties to the debates have different political agendas and also may have fundamentally different attitudes toward human responsibilities to nature. Risk assessments tend to disaggregate the problems people face and present them as far as possible in terms of their effects on human health and welfare. The advocates of risk assessment often encourage people to monetize or quantify the components of problems to make the various factors comparable and then aggregate those components into an overall evaluation of the alternative prospects. Some people regard this process as exemplifying the idea of rational decision making, whereas others regard it as being designed to blind people to some of the most important concerns and thus distorting important values.

HOW SAFE IS SAFE ENOUGH?

One of the stimulants to developing risk assessment techniques was the controversy over the safety of nuclear power plants in the United States in the 1970s and 1980s. Nuclear power was turning out to be an expensive and at best marginally profitable source of electricity, and the newly established Nuclear Regulatory Commission, responding to concerns about the safety of large reactors, considered promulgating new regulations that would have added to the costs of producing electricity. Some risk assessors and nuclear engineers began to argue that reactors were already safe enough and that further safety measures were unnecessary and too costly to be justified. Those assessors admitted that any nuclear reactor presents an inevitable small risk of a serious accident but argued that the level of risk was socially acceptable. Their conclusion was based on studies that examined the levels of risk the public accepted in other areas of life and how much the public seemed to be willing to pay to reduce a risk to life, health, or the environment. Critics of the status quo argued that because the consequences of a major nuclear accident were potentially so catastrophic, the probability of an accident must be reduced to very close to zero for that technology to be socially acceptable.

As this controversy developed, the question for risk assessment became: How safe is safe enough? The proponents of nuclear power wanted to look at risk in a general

ECOLOGICAL RISK ASSESSMENT

The Preamble to the National Environmental Protection Act establishes a U.S. "national policy which will encourage productive and enjoyable harmony between man and his environment . . . [and] promote efforts which will prevent or eliminate damage to the environment and biosphere and stimulate the health and welfare of man . . . " The U.S. Environmental Protection Agency (EPA) was established in 1970 to oversee the enforcement of this and other environmental laws. In the first two decades of its existence, however, the EPA focused almost exclusively on protecting human health and welfare from nature while ignoring the need to protect ecosystems from the impact of human activity. This tendency was exacerbated by the rising influence of human health-based risk assessments in guiding EPA policies. In an attempt to correct this imbalance, the EPA around 1990 developed Ecological Risk Assessment (ERA) guidelines, initially for use in its Superfund program.

The aim of ERA is to evaluate potential adverse effects that human activities have on the living organisms that make up an ecosystem. An ERA is supposed to identify stressors that will produce an adverse effect on an ecosystem. A stressor is any physical, chemical, or biological agent that can induce changes in organisms. Stressors may be physical (e.g., dams, construction, etc.), chemical (e.g., pesticides, effluents, etc.), or biological (e.g., introduced species or pathogens). Adverse effects are those that are considered potentially harmful to the healthy functioning of an ecosystem.

ERAs so far have had only limited impacts on environmental policies. Part of the reason is that ecosystems are complex and often harder to understand than human health effects. There is more disagreement about what is good or bad for an ecosystem and about which ecological entities are most important to protect.

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and uniform way and see the problem as determining a general value of a probabilistic increment of the risk of death, illness, or environmental loss. The critics insisted that some risks are different from others and that it is necessary to consider the qualities of the different risks involved as well as the measure of a probability-weighted outcome to determine what is socially acceptable.

HOW PEOPLE JUDGE RISK

The question is partly empirical. It involves issues that are economic as well as issues that are psychological and may involve other cultural factors as well. Research that examined how people thought about this question had several important findings. First, most people find it very difficult to think clearly and consistently about risk and probability. People find it especially hard to compare different risks directly in a coherent way. It is easy to be confused, especially when experts disagree, about the significance of low levels of exposure to harmful substances. For these and other reasons, some experts on risk question the value of using economic data on consumer willingness to pay to reduce some increment of risk through the use of optional safety features in, for example, automobiles or preventive medicines, to support conclusions about social preferences for generally acceptable trade-offs among risks, costs, and benefits. To interpret consumer behavior as revealing a preference for trading off risks, costs, and benefits, it is necessary to assume that consumers are aware of the risks involved, are factoring that knowledge into their economic choices, and are behaving consistently. Research on the psychology of choice casts doubt on those assumptions.

Psychologists and anthropologists have shown that people are influenced by features of a risk other than the magnitude of harm and the probability that it will occur when they judge whether particular risks are acceptable. Social scientists have identified a number of factors that may explain, for example, why many people find the risks posed by nuclear power plants unacceptable but show little concern about technologies or products that pose a much greater likelihood of death or harm. These findings and the debates they generate suggest that any answer to the question "How safe is safe enough?" requires answering more basic questions about whether the goal of risk assessment in public policy should be primarily to protect public health and the environment or instead to determine what will satisfy public values. Risk assessment thus becomes entangled with moral and political issues.

RISK ASSESSMENT AND RISK EVALUATION

As the role and methods of risk assessment came to be seen as more complex and controversial, several expert studies sponsored by the independent National Academy of Sciences (NAS) tried to offer guidance. The main advice in those studies was to separate the scientific aspects of risk assessment, which the NAS sometimes referred to as risk estimation, from the more inherently controversial and value-laden activity of risk evaluation. The idea was that risk assessment should be able to provide useful advice that is free from the moral and political considerations that are part of making important decisions about public policy. The hope behind those recommendations was that experts in risk assessment might focus on the objective and measurable components of risk while the subjective and value dimensions could enter at a later stage of evaluation or political deliberation.

As some of the experts who helped write those NAS reports were aware, however, it is not easy to make risk estimation value-free. A risk assessment must begin by identifying which risks to study and what to count as a risk, an exercise that often requires making value judgments. Suppose, for example, that one is interested in reducing occupational risk and learns that exposure to a certain chemical acts synergistically with tobacco smoke to produce cancer rates in workers exposed to both that are higher than the aggregate of the two independent risks. One must decide whether this risk should be included in an assessment of occupational risk or whether it is acceptable to ignore it in a study because it is a risk to smokers who make a personal lifestyle choice and thus is not a risk to workers in general. Any choice one makes here involves an ethical judgment.

A second class of issues that cause problems in separating the scientific from the value-laden determinants of risk assessment has to do with how to treat different kinds of uncertainty. In the absence of direct epidemiological evidence of the risk of low levels of exposure to many carcinogenic substances, for example, risk assessors must rely on studies conducted on animals that involve exposure to high levels of the substances involved. Experts disagree about the proper way to extrapolate from high risk to animals to low risk to humans. The NAS studies recommended dealing with those uncertainties by reporting results as ranges rather than single numbers or point estimates of risk. This solution is not always available, however, and it does not get to the problem of determining how conservative or precautionary one should be in selecting a number or describing a range. This is another way in which simply identifying and estimating risk involves making value judgments.

The problems involved in understanding and communicating about uncertainties are among the most difficult issues that risk assessment must confront, especially in areas involving important environmental risks. This is the case because uncertainty can be of different kinds and can

be relevant in different ways. Some of these issues are well illustrated in risk assessments of global climate change. In 1988 the United Nations organized the Intergovernmental Panel on Climate Change (IPCC), a group of thousands of leading scientists around the world, and as stated in the "Principles Governing IPCC Work," assigned it the task of reporting on "the scientific basis of risk of human-induced climate change, its potential impacts and options for adaptation and mitigation" (1998, p.1).

UNCERTAINTY

The IPCC published four reports that reflected the consensus of the world scientific community on those questions. Each report indicated that there is much uncertainty about human-induced climate change, but the nature of that uncertainty has changed dramatically during the two decades of IPCC reporting. In its First Assessment Report, published in 1990, the IPCC reported that global climate change could be observed but that there was no way to determine with certainty whether human activities were contributing significantly to it. By 1995 the IPCC scientists could agree that "the balance of evidence suggests a discernable human influence on global climate," but that language still supports uncertainty about the amount of the human contribution. In its fourth report, published in 2007, this uncertainty was removed. The IPCC concluded that the evidence now showed that "[m]ost of the observed increase in globally averaged temperature is very likely due to the observed increase in anthropogenic greenhouse gas concentrations."

This is as close as scientists ever get to stating that a conclusion is certain in a complex world, but in light of the conservative language, the degree of certainty (which the report explains means greater than 95 percent confidence) can be appreciated only by comparing this statement with the earlier IPCC conclusions. Moreover, many other uncertainties—about more localized changes and about which areas and populations will be hurt the most and which may even benefit from climate change—are left untouched or even increased by research that virtually eliminates uncertainty about what is happening on a global scale. These remaining and shifting uncertainties create many problems for risk evaluation.

One issue illustrated by those uncertainties involves the way the distribution of risk can interact with both the perspective taken in a risk assessment and the sometimes different perspectives on determining what does and should matter most to people. Consider a situation in which an average individual in an exposed population has a $1/n$ chance annually of suffering an adverse consequence. This level of individual risk can be distributed across a population in different ways. To take two possibilities, $1/n$ individuals in the population will with certainty suffer the consequence each year but the identities of those individuals cannot be known in advance; alternatively, there is a $1/n$ chance that the entire population will suffer the consequence in any specific year. Those risks can seem identical from an individual's perspective, but from the perspective of the population as a whole the two ways of realizing the risk can be quite different. The former possibility involves no risk at all, but the latter might involve a catastrophic risk. It is clearly an important ethical consideration to determine whether and how risk to the group is to be balanced against risk to an average individual within the group or to a particular group among a larger population. Attempts to balance the risks as seen from more than one perspective also can require changing the level of risk exposure to the individual or the group.

ETHICAL ISSUES

It is not possible to eliminate the possibility of adverse consequences from activities that are deemed socially desirable. Many of the ethical issues surrounding risk assessment can be seen as asking how people should measure and respond to those risks, but at least one concern raises a different sort of question. Some people are bothered by the assumptions of most risk assessments that all values are comparable and can be measured on a single scale. This concern is especially significant when the chosen scale is money and the determinant of value is an aggregation of individuals' willingness to pay for things or changes in human welfare. In these assessments the value of human life and health and the value of natural treasures and healthy ecosystems are treated as commodities or goods with a price. The worry of some critics of this approach to thinking about complicated questions of policy and social values is not whether ethical judgments must be made in the process of risk assessment but whether ethical issues are involved even in considering some possibilities as appropriate subjects of formal risk assessment.

SEE ALSO *Cost-Benefit Analysis; Economics, Environmental; Environmental Law; Environmental Policy; Global Climate Change; Intergovernmental Panel on Climate Change; Nuclear Power; Pollution; Precautionary Principle.*

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Douglas MacLean

RIVERS

Rivers are the blue ribbons of the earth. Over geological time they have shaped the lay of the land through erosion, flooding, and meandering—carving sinuous paths from headwaters in the mountains to estuaries at the mouth. They are the perfect mediators between aquatic and terrestrial ecosystems, providing habitat for land and water species alike. Carrying and depositing sediments, they form intricate complex landscapes with fertile floodplains at the center of their basins. The basin or watershed comprises the entire catchment area that drains surface water into a river, which carries it to the ocean. Connecting land, air, and ocean, rivers play a crucial role in the hydrological cycle: Evaporated from the ocean and transported through the atmosphere, water returns to land as snow or rain and, seeping through soil into streams, it ends up in a river, again on its journey back to the ocean.

Every river has a distinctive flow pattern, determined by the size of its basin and features such as topography, geology, climate, and vegetation. The flow is a crucial driver for the health of the river system, determining the conditions for animal and plant life. Over the course of the year, rivers might have very different flow signatures, depending on snow melt and seasonally variable rain. The Mekong River, for example, carries fifty times more water in the summer monsoon period than in its long dry season. Although it is the seventh-longest river in Asia, the twelfth-longest in the world (4,180 km), and the tenth-largest by *annual average* volume, it has the highest flow variability and, when swollen by summer rains, it turns out to be the third largest by volume, surpassed only by the Amazon and Brahmaputra.

The Amazon is by far the largest river: It delivers more freshwater to the ocean than any other river, 20 percent of the global river discharge. Its drainage area, the Amazon Basin, is enormous: 6.5 million square kilometers, almost 40 percent of South America. Its annual average discharge is 219,000 cubic meters per second. In comparison, the Nile, with its 6,695 kilometers, is the longest river (300 kilometers longer than the Amazon's 6,387 kilometers), but it discharges on average a mere 2,830 cubic meters per second. During certain periods of the year, no water at all reaches the mouth of the Nile at the Mediterranean Sea, revealing the most recent and influential driver of river flows nowadays: humanity. During some seasons all the Nile's water is taken for irrigation.

RIVERS IN CULTURE

Throughout recorded history humans have shaped rivers for irrigation, navigation, and flood protection. The ancient Sumerian culture and, later, the Assyrian civilization (2400 B.C.E.) flourished in the Fertile Crescent, an area whose astounding fecundity was due to its main river systems, the Tigris and Euphrates. These peoples constructed elaborate irrigation and flood-control projects that led to the emergence of cities and sophisticated tax-based economic and legal systems. Like most irrigation-based societies, their civilizations collapsed because of soil depletion, salinization, and a high vulnerability to invasion. By the time the Greek historian Herodotus (c. 484–c.425 B.C.E.) visited the area—parts of present-day Turkey, Syria, Iran, and Iraq—the Persians had established their rule. "Rivers . . . they revere," he wrote about the Persians. And he continued, "They will neither urinate nor spit nor wash their hands in them, nor let anyone else do so" (Herodotus, Book 1, Chapter 138, Section 2).

The only irrigation-based ancient civilization that proved to be sustainable was that of the Egyptians. Their secret lay in the fact that their method of irrigation was basin-based—that is, it made use of the natural rise and fall of the Nile's seasonal fluctuations and hydrology. The river's yearly flooding rejuvenated the land not only with water but also with a new layer of soil—a rich layer of sediments. This annual flood-deposition cycle continued until the Aswan High Dam disrupted the natural flow pattern of the Nile in the twentieth century. A famous bas-relief from 3100 B.C.E.—showing one of the ancient kings ceremonially holding a hoe for cutting an irrigation ditch—testifies to the existence and importance of irrigation waterworks going at least back to that time. For at least 5,000 years the peoples of Egypt maintained an irrigation-based culture.

The flooding of the Nile precipitated the development of mathematics: The world's first numerical system was invented in order to apportion the land after floods and sediment depositions had obliterated boundaries (*geometry* literally means "land measurement") and to determine planting and harvesting schedules. Herodotus rightfully called Egypt "the gift of the Nile." Many Egyptians worshiped Hapi, the god of the Nile; although he was the father of all gods, he was depicted with breasts, a symbol of his capacity to nurture with life-giving fluids.

Rivers are revered in many traditions. Along African rivers one finds small offerings like a bowl of fruit or a bundle of flowers; rivers are of vital importance in Africa, the world's most arid continent. For Hindus in India, rivers are goddesses. The doorways of early Hindu temples were decorated with images of the two main rivers: Ganga rode on a crocodile and Yamuna on a tortoise. "Mother Ganga"—known internationally by its Anglicized name, Ganges—is still the most sacred river in India. Her generative and purifying powers are invoked in various initiation rites and bestow longevity on the one who drinks of her waters. Pilgrims visit her banks for daily ritual bathing, which heals the weak and sickly and washes away sins. People give the bodies of the dead to the river or spread their ashes over her, and she carries them in a last transition to the land of their ancestors.

In many cultures rivers represent the capacity for transformation. The most definitive transition is the one between life and death, symbolized in Greek mythology by the rivers Styx and the Lethe. Indeed, the latter washes away human memories so one can begin anew the afterlife. At the dawn of Greek philosophy, Heraclitus used the image of a river to symbolize the ever-changing flux of nature. In many traditions time is represented as a river. In various literary texts we also find river symbolism. In Dante's *Inferno* ice—not fire—is at the center of hell, and frozen stasis is its most severe punishment. Small rivulets—trickles thawed out of ice—symbolize the narrow path to renewal and hope.

Rivers have been anchors of civilization and bones of contention (the word *rival* is cognate with *rivulet*). They cover great distances and connect a wide diversity of people and places, from high-altitude snowy mountains to lowland deltas. They are rich ecological and cultural corridors. Many cities have arisen at the bank of a river or at a confluence of two rivers. Such rivers have shaped a valley and at a strategic site a city arose: the bottleneck, the valve, of flows of sediments and trade material, in and out of the valley—hence a center of commerce.

In the early 1500s Leonardo da Vinci and Niccolò Machiavelli furtively conspired to mastermind a diversion of the Arno River from the city of Pisa. It would have deprived the city of water, thereby giving victory to Florence after a ten-year war. The plan, if successful, would have turned Florence into a world power with access to a seaport. For various reasons the plan fell apart, inspiring Machiavelli to compare fortune to a river—something that is unpredictable, violent, and irresistible. Even though that scheme to divert the Arno did not come to fruition, the underlying paradigm of the control of fortune through a powerful combination of economic, engineering, and strategic forces was a precursor of modern river management.

RIVERS IN THE MODERN ERA

In early modern times rivers were relegated to the industrial and mercantile back regions of town and turned into functional arteries for transport, for harbors, and for other economic purposes. Or they were exiled underground; or turned into open sewers, carrying diseases; or dried, paved over, and turned into roads to make space for traffic.

Since the Industrial Revolution most of Europe's rivers have been treated as cheap waste transportation to the sea. Heavily polluted, they have harmed human health and degraded the quality of coastal and marine waters. The biodiversity of thousands of kilometers of waterways was affected. The same happened in the United States, culminating in a famous incident in 1969: A thick layer of oily industrial pollutants on the Cuyahoga River in Cleveland, Ohio, caught fire from the sparks of a passing train. Even the revered Ganges and Yamuna rivers turn into open sewers after they pass through Delhi and Varnassi, respectively. Each enters a city alive and leaves nearly dead, soiled by sewage and other waste, anaerobic with a zero dissolved-oxygen level as gaseous sludge rises from the bottom and floats to the surface.

Along the Mississippi River farming and logging on a massive scale had caused immense erosion by the early twentieth century. Vast amounts of topsoil were washed

down the river into the Gulf of Mexico, a trend that had a disastrous impact on impoverished farmers. The Tennessee River is a major tributary of the Mississippi. The Tennessee Valley Authority (TVA) was created in 1933 as a federally owned corporation to provide the residents of the Tennessee River watershed, one of the areas most severely affected by the Great Depression, with a regional development plan based on modernizing the area's economy and society. The complex plan for flood control and electricity generation involved the creation of twenty-nine dams and 1,050 kilometers of navigation channels. It is today the largest public power company in the United States.

Dam building has been promoted as the prime technological approach to riverine development. It was at the heart of President Franklin Roosevelt's program of New Deal public works, which, during the Depression years of the 1930s, provided jobs for masses of unemployed Americans. FDR, however, was only carrying on in the tradition begun by his elder distant cousin and predecessor, President Theodore Roosevelt, who had initiated the twentieth-century American modernization paradigm in 1901: "Great storage works are necessary to equalize the flow of streams and to save the flood waters," he proclaimed (Postel and Richter 2003, p.1). In the same spirit of progress, Prime Minister Nehru of India honored dams in the 1940s as "the Temples of Modern India"; India went on to build some 3,600 dams.

The twentieth century saw an unprecedented impact on rivers, mainly through dam building, leaving a legacy of approximately 800,000 dams worldwide, of which 48,000 are 15 meters or higher, with almost half of these large dams built in China. The collective weight of the harnessed water and trapped sediments in the reservoirs has caused a measurable change in the angle of the earth's axis and the speed of its orbital movement. One-fourth of the global sediment ends up in reservoirs behind dams instead of nourishing floodplains and estuaries. Silt's color accounts for the names of the Yellow River and the Colorado River (Colorado is Spanish for "colored"), but dams have robbed them of the significance of their names: As released from the major dams on these great rivers, the water is as clear as glass. Some of the smaller reservoirs behind dams have silted up to form marshy plains.

Dams provide almost 20 percent of the world's electricity supply. The massive dam at Itaipu (built from 1975–1991), for example, on the mighty Parana River between Brazil and Paraguay, provides Sao Paolo (a city of 11 million people) as well as Rio de Janeiro (a city of 6 million) with energy and furnishes 20 percent of Brazil's electricity and 93 percent of Paraguay's. The Itaipu dam shifted the course of the seventh-biggest river in the world. Echoing Nehru in a secular fashion, the American Society of Civil Engineers called the dam one of the seven wonders of the modern world.

Dams come at high costs. They profoundly disrupt long-established ecological, hydrological, and cultural systems. Dams have displaced 40–80 million people, either by forced eviction or because of the loss of their traditional livelihood as a result of dam-induced environmental change. The stagnant waters of the reservoirs breed mosquitoes and are infested with freshwater snails that carry parasites, generating diseases such as Schistosomiasis (also known as *bilharzia*, or snail fever), commonly found in Asia, Africa, and South America. Snail fever, endemic to Egypt, is exacerbated by the Aswan High dam and associated irrigation projects along the Nile.

Dams have triggered protests all around the world. Modern communication technologies—email, blogs, YouTube videos—have facilitated global networks supporting local communities, social movements, and nongovernmental organizations organized to oppose dams. Influential advocacy groups, such as International Rivers, question the conventional or modern "development" model that dams epitomize. Among other things, they research other ways of meeting people's needs for water, energy, and protection from damaging floods. In 1997 the World Commission on Dams (WCD), an independent panel to review large dams, was created, led by the International Union for Conservation of Nature (IUCN), and the World Bank. The Commission initiated a broad-based research process resulting in its 2000 report, *Dams and Development: A New Framework for Decision-Making*, which acknowledges the important benefits of dams for human development but also judges that the price paid—both socially and environmentally—is unacceptable (WCD 2001).

Once widely regarded as a symbol of progressive technology, dam building is now commonly viewed as a threat to the earth's ecosystems. Nevertheless, major dams are still being built and planned. A series of dams are planned for the headwaters of the Ganges River in India. The Tehri Dam, which began to fill in 2004, already affects the flow of the Ganges River from the Himalaya Mountains. Sunderlal Bahuguna, Indian activist and philosopher in the tradition of Mahatma Gandhi, has gone on many hunger strikes to stop the Tehri Dam Project, and was forcibly moved to a government issued home upstream. A leading Indian scientist, G. D. Agarwal, former dean of the Indian Institute of Technology at Kanpur, has decided to go on a fast unto death against the damming of the River Bhagirathi "to oppose the destruction of this ecological marvel and the epitome of Hindu cultural faith" (Agarwal 2008).Where for Nehru the dam was the temple, now the river is the religious center of attention.

At the beginning of the twenty-first century, one in ten of the world's major rivers no longer reached the sea for part of the year because of upstream use of their waters, mainly for irrigation. The Nile, the Yellow, the Indus, the Rio Grande, and the Colorado rivers, along with many others, now end in sand, sometimes hundreds of kilometers before they have a chance to reach their mouths and fertilize their deltas to maintain ecologically rich estuarial ecotones that mix sweet and salt water into one of the most productive kinds of ecosystems on Earth. The number of foreshortened rivers may increase during the twenty-first century. Although irrigation already accounts for 70 to 80 percent of human use of freshwater, more and more countries are pushing their water resources, including rivers, to the limit in order to increase food production.

Many rivers are thus but a shadow of their former selves. The blue lines on the map are often tokens of faded glories. Whereas rivers once symbolized transition, they are now themselves in transition.

RIVERS IN TRANSITION

In German romanticism the Rhine and Danube—with their castles, vineyards, and associated ancient legends—loomed large in the cultural imagination. This popular veneration did not spare the rivers from pollution and other forms of environmental degradation. A renewed environmental consciousness, however, is transforming cultural attitudes toward rivers. Human and ecosystem water needs ought to be balanced, according to the water experts Sandra Postel, director of the Global Water Policy Project, and Brian Richter, director of the Freshwater Initiative of the Nature Conservancy (Postel and Richter 2003). More than 60 percent of the world's 227 largest rivers have been fragmented by infrastructures such as dams and diversions. Rivers are turned on and off instead of flowing by natural rhythms. Their main functions are providing hydroelectric power, irrigation for agriculture, and shipping routes for trade; their traditional ecological functions and services have been systematically undermined. With great efficiency the periodic floods of untamed rivers shaped river channels and redistributed sediment, creating habitats essential to fish and other riverine life. Because floodwaters are no longer getting cleansed by floodplain wetlands, more pollution is reaching inland and coastal seas. Hence in many parts of the world, the harnessing of rivers for economic gain is causing more harm than good.

In 2000 the European Parliament adopted a water-policy framework, the European Community Water Framework Directive (the WFD), an unprecedented attempt to design a regime for managing water quality and instream flow for each watershed, thus creating a basic geographic unit for resource planning. The WFD aims to manage whole watersheds or river basins in a holistic manner (a strategy referred to as integrated water-resources management [IWRM]) at the basin or watershed level in order to integrate land and water—upstream and downstream water, surface water, groundwater, and coastal water. A more transparent and participatory transnational governance alternative has thus replaced a politically fragmented, top-down management approach. In an effort to achieve multiple-stakeholder consensus, hydrological and engineering expertise has been complemented by ecological concerns along with urban, agricultural, industrial, and recreational interests. Because water connects all elements of society, an integrative water ethic becomes essential, one that views local problems of water quality and quantity in transregional and global political contexts.

The major water laws were created in an era of economic control of rivers. The emerging new paradigm is based on the concept of ecological health. This radical shift calls for a dislodging of entrenched laws and policies. Around the globe, in areas as diverse as Australia, South Africa, Europe, and Texas, governments are implementing policies that establish allocation of water for ecosystem support—mainly minimum instream flows to maintain environmental quality and sustainability.

Because rivers are the anchors of cultures, many cities are revitalizing communities and ecosystems by reconnecting them to the rivers that run through them. Rivers are resurfacing in the public imagination as cultural and ecological corridors, creating a cultural rejuvenation. Although some of these projects are driven solely by economic motives, most of them stimulate awareness of the river's ecological, cultural, and economic wealth and inspire public education about local water issues. Some of them explicitly aim for increasing stewardship of the river and engaging communities in river-related projects. New urban river projects—such as river-walk promenades, theaters, cafés, and restaurants along old quays—are beginning to appear in many places. This trend often comes with a gentrification of dilapidated harbor neighborhoods as old warehouses turn into high-priced riverfront housing developments.

For example, the Los Angeles River is about to be unlocked from its concrete ditch and restored by means of a riparian-community-based process meant to create a blue ribbon along housing developments, parks, and walkways, thus revitalizing river and community alike. New Orleans plans "RiverSphere" as a forum for art, science, and technology focused on the Mississippi. In an era of fluvial imagination, river festivals burst forth: there is the Brisbane River Festival in Queensland, Australia; the Hudson River Festival in New York City; London's Thames Festival; and Danube day throughout southeastern Europe. New urban water cultures are emerging that celebrate

The Concrete Channel of the Los Angeles River. *The Los Angeles River was once the primary water source for the Los Angeles basin, but frequent flooding led some to search for a sollution to control the unpredictable river flows. Since the late 1930s, the river has been primarily a flood control channel. Environmentalists and others hope that the river can soon be returned to its more natural state.* **PHOTO BY IRENE KLAVER.**

rivers as part of a deepening appreciation of waterways and growing involvement in river basins. The "One River Mississippi" festival celebrates the river along the Father of Waters (which is what "Mississippi" means in the Cherokee language) at various places, all at the same time.

Also in rural areas river restoration is underway: Remeandering—done by many of the same engineering firms that straightened them fifty years ago—gives floodplains back to the rivers. And there is a movement to learn to live with the floods—riparian restoration and nurturing wetlands to take out pollutants, fertilizers, and pesticides before the water drains back into the river.

With the combined application of interdisciplinary engineering, hydrological expertise, and ecological sensitivity, the twenty-first century promises a renewal of river cultures, perhaps even a respect approaching the ancients' reverence for these great waterways. New management regimes are seeking to work with, not against, the great rivers to enhance their flow and allow them the freedom of flood in a natural cycle of renewal and rejuvenation for humans and the entire manifold of life that flows into and out of these vital arteries the earth.

Rivers are archives. They record deep and shallow time, revealing what happened a million years in the past as well as a moment ago upstream. Rivers are the sinews of the world; without them life unravels

SEE ALSO *Atmosphere; Biodiversity; Carson, Rachel; Dams; Farms; Food; Hinduism; Nongovernmental Organizations; Roosevelt, Theodore; Salmon Restoration; Sustainability; Waste Management.*

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Irene Klaver

ROLSTON, HOLMES, III
1932–

Holmes Rolston III was born in the Shenandoah Valley of Virginia on November 19, 1932. His father was a rural pastor. Rolston grew up with the Blue Ridge Mountains on the horizon; from his earliest years he recalls wandering the woods and swimming the creeks of his native landscape.

Rolston's formal education included a B.A. in physics from Davidson College (1953), a Ph.D. in theology from Edinburgh University (1958), and (after several years' service as a pastor back in Virginia) an M.A. in the philosophy of science from the University of Pittsburgh (1968). At each step Rolston felt dissatisfaction with the reigning concepts of nature and with people's mistreatment of nature itself. He especially disliked the common insistence that nature was value-free. He came to realize the need for an environmental philosophy that could undergird a richer appreciation of life on earth. His forty-year career in the Philosophy Department at Colorado State University, beginning in 1968, was largely devoted to creating such a philosophy.

Rolston's 1975 article, "Is There an Ecological Ethic?" helped to jump-start interest in environmental ethics in academic philosophy. In 1979 he helped to found the first journal in the field, *Environmental Ethics,* and as of 2008 remained an associate editor. During this time he was developing his own nonanthropocentric environmental ethics, first in articles later collected in *Philosophy Gone Wild* (1986) and then in a systematic presentation in the book *Environmental Ethics* (1988).

Rolston is best known for his sustained, ingenious, and uncompromising advocacy of the idea that values inhere objectively in nature. He holds that individual organisms, biological species, and ecosystems may all possess intrinsic values—values based on what they themselves are—in addition to their instrumental values to human beings. These intrinsic values ground duties to treat nature with respect and use it with restraint. Rolston insists that human beings are sometimes morally required to put values discovered in nature above their own preferences or self-interest.

In addition to defending nature's intrinsic values, Rolston attempts to enrich our account of nature's instrumental values to humans (including life-supporting, economic, recreational, aesthetic, scientific, and spiritual values). He also argues for nature's "systemic value": the creative capacities of the earth's ecosystems to generate intrinsic and instrumental values over evolutionary time. Rolston's goal is a comprehensive and accurate account of the way in which nature ought to be valued, one that not only does justice to human beings' uniquely complex and important roles on earth and to the new values brought forth by consciousness, but that also appreciates nonhuman nature for what it is.

Rolston's value arguments are built upon detailed, scientifically informed descriptions and an appreciation of the natural entities in question. They have been so influential that casual observers often define environmental ethics as the position that nature has intrinsic value, or equate environmental ethics with nonanthropocentrism. Strictly speaking, this is false, since one can consistently hold an anthropocentric environmental ethics. Rolston, however, finds such ethical outlooks to be inadequate, either as guides to practice or as complements to a modern scientifically informed worldview.

Rolston has also worked to specify what respect for nature might mean for policy issues such as protected-areas management, endangered species and biodiversity conservation, wilderness preservation, sustainable development, corporate environmental responsibility, and population policy. *Conserving Natural Value* (1994) provides a comprehensive, nuanced account of Rolston's positions on many of these issues. Throughout his writings he places a premium on reining in human consumption in order to preserve wild nature.

In addition to his efforts to formulate an environmental ethics, Rolston has endeavored to overcome the modern split between science and religion. Motivation for this project goes back at least to his time as a pastor to evolution-fearing but nature-loving southern farmers. This work, also widely influential in philosophical circles, led to his invitation to give the Gifford Lectures at the University of Edinburgh in 1997–1998, later published as *Genes, Genesis, and God* (1999). In 2003 he was awarded the John Templeton Prize in Religion, the money from which he used to endow a chair at his alma mater, Davidson College. Rolston has been university distinguished professor at Colorado State University since 1992.

Often referred to as "the father of environmental ethics" and later sometimes as its "grandfather," Rolston lectured on all seven continents. He strongly influenced environmental ethics through his six books, fifty authored chapters, and more than one hundred articles; his many generous efforts to help philosophers, theologians, and scientists further their own work; and his practical conservation efforts at the local, state, federal, and international levels.

SEE ALSO *Biodiversity; Conservation; Consumption; Environmental Philosophy: V. Contemporary Philosophy; Intrinsic and Instrumental Value; Population; Preservation; Sustainable Development; Wilderness.*

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Philip Cafaro

ROMANTIC POETRY, ENGLISH

The Romantic period of the late eighteenth and early nineteenth centuries has historically been seen as a time of a renewed interest in the natural world, and many attitudes, ideas, and landscapes that writers of the period celebrated in their poetry have endured in contemporary environmental thinking. Influenced by such European writers as Jean-Jacques Rousseau, the English poets of the period saw nature as a means of resisting and opposing the artifice and corruption of many aspects of culture. Indeed, one of the signal ideas of the Romantic period is that nature and culture are opposed rather than conforming, as Alexander Pope and other Enlightenment figures had thought. A central motivating idea for the Romantics was that human nature was perfectible in nature and made corrupt only by culture. Thus such early Romantic poets as Charlotte Smith, William Wordsworth, and Samuel Taylor Coleridge wrote lyric poems featuring the poet fleeing various instances of culture (cities, crowds, families) and seeking the isolation of various forms of wilderness.

INDIVIDUAL IMAGINATION AND THE NATURAL WORLD

In this version of the Romantic lyric, the speaker returns to spiritual health by finding in the natural world solace and wholeness. The most influential example of this is Wordsworth's "Lines Composed a Few Miles above Tintern Abbey," a poem that is also a kind of manifesto for how the natural world can make the individual a better person, morally, spiritually, and physically. Many poems by Smith and Coleridge make the same point. Coleridge's pronouncement in "The Eolian Harp" (1796) that the "one Life within us and abroad" is the source of all solace is a succinct encapsulation of a quintessentially Romantic and environmental idea. The key arguments here are that the harmony and beauty of the natural world point to a fundamental reality obscured and even destroyed by much human activity and that nature is imbued with, or is a manifestation of, a powerful spirit, consciousness, or force to which human consciousness may return.

Wordsworth developed these ideas in dozens of poems, including his epic autobiography *The Prelude*, which argues that an early and sustained connection to the natural world is necessary for the development of a healthy and creative imagination. Indeed, literary criticism of the early twenty-first century has heralded Wordsworth as the father of the nascent ecological vision of Romanticism (Bate 1991; Buell 1995), and also as the originator of a key myth of modern environmentalism, or at least one of its deepest and perhaps most unscrutinized ideologies: the idea that the natural world is a source of health and that cities and other forms of human culture produce pollution and disease, both physical and spiritual.

The Romantic poets did not think of themselves as belonging to a school or movement, however, and each had distinctive ideas about the natural world. Indeed, their belief in the sanctity of the individual imagination almost guaranteed much diversity of thought. The emphasis on the individual's encounter with the natural world is also a central feature of much environmental writing by such later figures as Ralph Waldo Emerson and Henry David Thoreau in the mid-nineteenth century, and as Robinson Jeffers, Edward Abbey, Aldo Leopold, and many others in the twentieth. There are two connected ideas here: that nature offers places of solitude in which to discover one's individuality and that the true quality of nature can only be appreciated and understood by the solitary observer.

ANIMAL ETHICS AND THE ROMANTIC PERIOD

Although Coleridge would give up both poetry and his idealization of nature to become a philosophical idealist by the early 1800s, the extraordinary popularity of his *Rime of the Ancient Mariner* has earned him a perhaps outsized influence on environmental thought. This self-consciously mysterious and symbolic poem tells the story of the mariner's apparently random killing of a beautiful and companionable animal and the revenge enacted upon him by both the natural and supernatural worlds. The poem has been read variously as revealing humanity's crimes against nature (and nature's ultimate revenge), as arguing for sympathy and kindness toward animals, and as revealing a deep and hidden moral (or amoral) order in the physical world—all of which ideas resonate with environmental thought.

Concern for the status and well-being of animals is a consistent and important feature of Romantic-period environmental thought. Such early Romantic poets as

Anna Barbauld and Robert Burns wrote popular poems that seem to condemn cruelty to animals, and the young Coleridge's "To a Young Ass," much mocked at the time, asserted solidarity with animals. Though, as a radical and apocalyptic Christian, William Blake generally valued human imagination over the necessarily fallen and corrupt physical world, his poetry brilliantly and consistently sees animals, and human treatment of them, as symbolic of actual sin and potential redemption. The "peasant poet" John Clare is remembered today in part for the careful description of birds and mammals in his poetry, and for his powerful evocation of sympathy for the well-being of animals and the ecosystems that support them. Clare is important too for decrying the privatizing of public grazing lands and for extolling the virtue of careful and sustained observation of animals and landscapes, as opposed to the rare moments of epiphanic insight celebrated by most of the other Romantic poets.

Probably the most committed animal-rights poet and most radical environmental thinker of the Romantic period was Percy Bysshe Shelley, who wrote two tracts on the "necessity" of vegetarianism, in which he developed the radical view of meat eating (and the production and slaughter of livestock) as the "root of all evil." His argument, ultimately about the interconnectedness of things, is that how and what we eat, for instance, affects our physical environment as well as our moral being. Though Shelley's thinking often overreaches, the daring and vigor of his imagining of the relationship between consciousness, culture, and the physical world anticipates much contemporary environmental thinking the most of all the Romantic poets.

Shelley is simultaneously a radical materialist and a radical idealist. Important poems such as "Mont Blanc," "Ode to the West Wind," and *Prometheus Unbound* argue that the laws of the world are ultimately those of nature, which have long been obscured by the corrupting cycles of human development. Shelley seems to have been the only Romantic poet aware of the deep implications of the new science of geology: that the Earth was far older than the Bible stated and also that humankind may be insignificant in the vastness of geologic time. Shelley was invigorated by the thought that if natural forces, rather than human forces, were primary, then human culture (which Shelley saw as producing predominantly violence and pain) was ultimately a veneer and could be replaced, through the forces of nature and healthy human imagining, by the kind of ecological utopia imagined at the end of *Prometheus Unbound*: a place of permanent spring and renewal.

JOHN KEATS AND LORD BYRON

Though John Keats and Lord Byron (George Gordon Byron) have long been seen as important figures of the English Romantic period, their contributions to environmental thinking, relative to the other four central figures, have been less obvious. Both poets were more interested in the nature and value of poetry and in the life of the poet than in the natural world as an end in itself. Though Byron wrote memorably about the natural world in many poems, he did so in the mode of ironic posing as a late Romantic. Yet his descriptions of his love of animals, and the centrality of physical passion to human nature, are central and powerful. He would no doubt be surprised and pleased that his most influential contribution to environmental thinking is his comic nihilistic poem "Darkness" (1816), which imagines a world in which the sun dies, and human morality and then human life are slowly extinguished: "The World was void, / The populous and the powerful was a lump, / Seasonless, herbless, treeless, manless, lifeless— / A lump of death." The poem was probably written in response to the abysmally cold summer of 1816, caused by the massive release of ash by the explosion of the Indonesian volcano Tambora the year before. Now the poem has powerful resonances with nuclear winter and catastrophic climate change.

Keats managed to absorb much of the spirit of the period and to reflect it in some of the most beautiful and powerful verse ever written. His "Ode to Autumn" (1819), one of the most perfect nature poems of the period, revels in the ability of language to reproduce the experience of observing and being content with the natural world. The poem is also tinged with the recognition that the bliss and contentment of a harmonious relationship with nature is threatened by winter and death. Indeed, Keats's awareness of mortality, of the inevitability of change, provides a necessary correction to the Wordsworthian idealization of the natural world as static and harmonious, due primarily to Wordsworth.

Though the Romantic poets produced an astonishing variety of ideas about the natural world, their belief that writing about the natural world could itself be significant and beautiful has had the most profound effect on later writers. Romanticism virtually invented nature writing as we know it today.

SEE ALSO *Abbey, Edward; Animal Ethics; Emerson, Ralph Waldo; Jeffers, Robinson; Landscape Painters and Environmental Photography; Leopold, Aldo; Romanticism; Ruskin, John; Thoreau, Henry David; Wordsworth, William.*

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Onno Oerlemans

ROMANTICISM

There are two main traditions of Romantic literature and philosophy with significant implications for environmental philosophy. The emergence of Romanticism as a dominant school of thought in Germany toward the end of the eighteenth century marked a significant change in conceptions of nature and the natural sciences. British Romanticism developed slightly later, from similar sources, and was predominantly a literary movement. The German Romantics, by contrast, were as concerned with the scientific study and depiction of nature as with its portrayal in art, and indeed considered these two realms of human activity to be inseparable. As a result of the emphasis of German Romanticism on the beauty and freedom of nature, its philosophy and literature played an influential role in the worldwide inception and development of environmental preservation, appreciation, and ethics. British Romanticism too, with its focus on the relationship of humans to nature, fostered new ways of viewing and valuing the natural world.

ORIGIN OF THE CONCEPT OF ROMANTICISM

Although the Romantic period was commonly contrasted with the Neoclassical period that preceded it, the specific sense of the term *Romantic* as it began to be used in the early nineteenth century was conceived in 1800 by Friedrich Schlegel (1772–1829) to evoke a "return to the Romans" (1982 [1800], p. 89) and the Italian medieval romance (1991 [1798–1800], p. 31), both of these as part of a projected urbanity that could embrace a multitude of styles and genres while retaining a universal and progressive significance. The term *Romanticism* also refers to the idea of a *lingua romana*, or a language of (all) the people. Romanticism evolved in reaction to what were conceived to be the negative consequences of Enlightenment thought, especially its association with the industrialization and homogenization of Europe. Despite their reaction against scientific conceptions that envisioned and depicted nature mechanistically, Romantic thinkers were not antiscientific, and indeed they made significant contributions to the philosophy of nature and the natural sciences.

In addition, Romanticism allied itself with progressive political thought, in particular, the ideals of equality and freedom espoused by the French Revolution. The philosophy of Jean-Jacques Rousseau (1712–1778) postulated that humans in the state of nature are neither good nor evil and that it is society that corrupts humans or cultivates good citizens. His educational theory emphasized the role of the study of nature in properly educating citizens. These two aspects of his thought thus provided a link between the study of nature and progressive politics. Rousseau's last published work, *The Reveries of the Solitary Walker* (1782), expressed the need for humans, even in a fully realized civil society, to reconnect with the natural environment to actualize fully their human essence.

PHILOSOPHICAL FOUNDATIONS OF GERMAN ROMANTICISM

Romantic philosophy of nature was deeply influenced by the philosophy of Immanuel Kant (1724–1804) and the literary and scientific studies of Johann Wolfgang von Goethe (1749–1832), both of whom, in different ways, advocated intertwining science and art. In his *Critique of Judgment*, Kant describes a "technic of nature," by which he meant that for scientific explanations to systematize all the discrete laws and regularities arrived at through observation of nature, humans must go beyond empirical cognition and think of nature in an artistic manner. This necessity of conceiving nature as a unified whole is an a priori demand that our faculty of judgment carries within itself, and cannot be justified objectively. Nonetheless, Kant argues, without what he calls the "fiction" of the theoretical construct of the unity of nature, scientists will never rest content with their results. Kant postulated the organism, a self-regulating natural being, as the most satisfying metaphor for describing nature as a totality. This conviction led to the Romantic conception of nature as an organic whole. In addition, Kant's description of the sublime aesthetic judgment contributed to the Romantic fascination with wild landscapes depicted in visual art and poetry.

As a natural scientist, Goethe insisted on a more empirical approach to nature than Kant's articulation of the transcendental conditions for the possibility of making and unifying judgments, although the primal phenomena that Goethe identified in nature attributed spirituality to nature. This attribution inspired the Romantic philosophy of nature, which saw nature as a kind of subject in its own right. Goethe identified what he considered to be the two

great driving forces of nature: polarity, on the one hand, and enhancement or intensification, on the other. Polarity, according to Goethe, is a property of nature insofar as it is thought of as natural, and intensification is a property of nature insofar as it is spiritual. He called polarity "a state of constant attraction and repulsion," and intensification "a state of ever-striving ascent." These two forces affect mind and body equally, and are interdependent for their existence. Goethe argued that phenomena like magnetism and metamorphosis are "originary," in the sense of strictly belonging neither to the realm of matter nor to that of spirit.

LITERARY FORMS OF GERMAN ROMANTICISM

These originary phenomena were named "potencies" by Novalis (the pseudonym of Friedrich Leopold, Freiherr von Hardenberg; 1772–1801), the Romantic poet, novelist, scientist, and mathematician. Novalis called Romanticism a "qualitative potentization" (1965–2005, vol. 2, p. 545), or an elevation to a higher level of potency, by which he meant that when one elevates ordinary experience to the mystical level, the finite to the infinite, the known to the unknown, or the material to the spiritual, one is romanticizing it. The idea behind Romantic thought was that by re-enchanting nature through art, a closer affinity might be created between humans and nature—an affinity that in turn might lead to an increase in knowledge without destruction of nature. The natural world was not to be conceived of as a machine to be harnessed and manipulated for practical purposes, nor as an object upon which one could experiment without compunction, but rather as an organism whose needs and endeavors could oppose or complement, but always affect, those of humans.

The word *organic* was first used around 1799 by the Romantic poet Friedrich Hölderlin (1770–1843) to project onto nature the peculiarly human activities of "self-action," art, and reflection; to attribute to the whole of nature systematic form (1988 [1794–1800], p. 54). While Hölderlin's poetry can be read as a continuation of the Romantic project of re-enchanting nature by creating art to reinstill a sense of beauty, magic, and wonder in nature, he viewed the human desire for a unification with nature as ultimately unfulfillable. Organic nature is nature as appropriated and thus inevitably transformed by humans. Standing in opposition to organic nature is what Hölderlin designated as "aorgic" nature, nature prior to human intervention, a realm of being that precedes the subject/object distinction and that is thus not conceptualizable or knowable (1988 [1794–1800], p. 53). The difference between the aorgic and the organic is akin to the difference between an unlimited striving and a series of constraining forms that bring nature into presence. According to Hölderlin, these two forces are continually in tension with each other, and humans will never know nature as it is in itself, however much they may wish to.

FRIEDRICH SCHELLING

Friedrich Schelling (1775–1854), who made nature the central focus of his systematic thought, was perhaps the best-known German Romantic philosopher. In his philosophy of nature, Schelling combined the Romantic quest to integrate the diverse areas of human inquiry, Kant's critical philosophy and insights into how to overcome the gap between nature and human freedom, Goethe's emphasis on grounding all theoretical philosophy of nature in experience, and the idealist perspective of Johann Gottlieb Fichte (1762–1814), as well as the most radical scientific theories of his day.

Schelling not only insisted, like Kant, that theories of nature must reflect a unified conceptualization of nature, but also expressed complete confidence that nature agrees with the maxims of reflective reason (1988 [1797], p. 41). Schelling set out to show that nature in itself is, in fact, systematic, and that its purposiveness is not simply limited to the form of our cognition. Calling his philosophy of nature a "speculative physics," Schelling argued that nature is in fact the realization of an overarching rationality. What Georg Wilhelm Friedrich Hegel accomplished for the moral world, customs, social life, politics, and history, Schelling first outlined for the physical world of nature. In nature, spirit should recognize itself.

After 1801 Schelling turned away from a Fichtean preoccupation with the centrality of the "I" and of freedom as the highest principle of all philosophy, toward the philosophy of nature. This change of direction arose directly out of his reading and discussion of the chemical theories of Antoine-Laurent Lavoisier, his attendance at the lectures of Karl Friedrich Hindenburg on experimental physics in Leipzig, his reading of Carl Kielmeyer on organic powers and Alexander von Humboldt on electrophysiology, and his research into the theories on biology and medicine of John Brown, as well as his enduring allegiance to Kant's speculative scientific theories on force, life, and matter.

Schelling broke with Fichte on the nature of the absolute ego. For Fichte, nature is nothing more than the pure negative, the illusory "not-I," of the absolute ego. Originally, Schelling emphasized the power of mind or spirit (Fichte's absolute ego) to expand outward, to be determined or restricted only by the negative force of consciousness, or the not-I (rather than the in-itself of Kant, which lay outside of the mind). In contrast to Fichte, Schelling argued that the limitation or restriction came from the absolute ego's striving to know itself, and that the natural world arose through the interaction of

the creative ego and the constrictive formative force. Schelling stated that his philosophy of nature, or speculative physics, regards active nature (*natura naturans*)—as opposed to passive nature (*natura naturata*), which empirical science takes as its object—as a subject in its own right and the proper focus of all theory (2004 [1799], p. 202). Schelling's assertion of an independent philosophy of nature as active put him at the center of German Romanticism.

Although Schelling accorded active nature a kind of freedom, it was a freedom within the bounds of law, in contrast to the theory of vital force of Johann Friedrich Blumenbach (1752–1840), which Schelling believed illegitimately implied the complete self-determination of nature. Following Kant, Schelling asserted that the behavior of nature can be scientifically accounted for only as law-governed, and that such lawful freedom can hold only if we take the organism to be a fundamental concept, not only in biology, but also in chemistry and physics. He thus moved beyond the logical analysis of the a priori conditions for the lawfulness of nature toward the real experience of the organism as a freely self-motivated natural entity.

There seems to be a fundamental correspondence between the systematizing power of the human (and divine) mind and the organization of nature. This structure can be seen in the simplest of organized forms. Schelling set his philosophy apart from pure idealism by insisting that two distinct types of philosophy are equally necessary: a transcendental philosophy that understands nature as the visible organism of our understanding and a philosophy of nature that explains the ideal as arising from and explainable from the real.

Schelling called nature the "original duplicity" in its character as both subject and object, and claimed that the opposite tendencies that pervade nature through magnetism, electricity, and sexuality manifest this duplicity (both mechanically and vitally) in nature's productivity (1867, p. 201). The process of the conflict of forces in this expanded sense can be experienced through the senses both in the realm of the inorganic, through magnetism, electricity, and chemical processes, and in the realm of the organic, through sensibility, irritability, and metamorphosis. Schelling argued that the heart of natural science was the experiment, since in the experiment "nature [is] compelled to act under certain definite conditions, which either do not exist in it at all or else exist only as modified by others" (2004 [1799], pp. 196–197). Only through such acts is it possible to gaze into the internal structure of nature.

In his essay "On Human Freedom," Schelling, following Jakob Boehme (1575–1624), described nature as effecting the self-revelation of the divine itself. God, according to Schelling in this essay, enters freely into a relation of *love* with nature. It is this relation that allows the self-manifestation of the divine, of human freedom, and of ethics. Here Schelling outlines a modified, dynamic Spinozan pantheism in which nature provides the ground for not only human freedom and divine actualization, but also evil. Schelling insists that nature, as God's ground, remains eternally separate from God, but he also accords a kind of freedom to nature because of its origin in the divine (1987 [1809], pp. 251–252). The separation of nature as ground and nature as existence in God, and the dual beginning that springs forth from this difference, also allows for personal existence, love, and human freedom. Such a loving relationship extends not only to the relationship between God and nature and between God and humans, but also and essentially to the relationship between humans and nature, whose intimate interconnectedness can be seen in the analogous structure of organism and system.

BRITISH ROMANTICISM

British Romanticism emerged out of German Romanticism. The poet Samuel Taylor Coleridge (1772–1834) in particular was strongly influenced by the philosophy of Schelling, as well as by Kant and Fichte. Coleridge's poetry and theoretical writings express the belief that a new conception of self in its relation to nature might emerge through consideration of the relation of words as "living powers" to thought and being. William Wordsworth (1770–1850) and Coleridge together initiated a new way of considering and responding to the natural world, often along the themes of journey and return through self-transformation—themes borrowed from the metaphysics of German Idealism. Wordsworth celebrated the spiritual power of raw natural beauty as a resource for self-renewal and education. John Keats (1795–1821) also used poetry to celebrate the beauty of nature and the eternal solace that nature can offer in the midst of human suffering. In contrast, William Blake (*Jerusalem*), Percy Bysshe Shelley ("Ozymandias"), Mary Shelley (*Frankenstein*), and Lord Byron ("Darkness") offered nightmarish visions of the results of human destruction or false manipulation of nature.

INFLUENCES OF GERMAN ROMANTICISM ON ENVIRONMENTAL PHILOSOPHY

The American Transcendentalists Ralph Waldo Emerson (1803–1882) and Henry David Thoreau (1817–1862) were influenced by German Romanticism in their articulation of the fundamental unity and harmony of humankind and nature, and the essential spirituality of all creation. They shared in the post-Kantian acceptance of a tempered convergence of religion and science.

Emerson, following Kant, strove to see in the beauty of nature a reconciliation of the realms of science and freedom, and like Schelling, he accorded a kind of morality to nature. The organism and the organic principle of form were central concepts for Emerson and Thoreau in their reflections on nature and writing. John Muir (1838–1914), the American naturalist, shared the Romantic conviction that there is a divine presence in nature, and he translated his concern for wilderness and appreciation of the sublime in nature into an initiative for nature preserves and the first U.S. national parks.

SEE ALSO *Emerson, Ralph Waldo; Landscape Painters and Environmental Photography; Muir, John; Pantheism; Romantic Poetry, English; Ruskin, John; Spinoza, Baruch; Thoreau, Henry David; Wordsworth, William.*

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Elaine Miller

ROOSEVELT, THEODORE
1858–1919

Born in New York City on October 27, 1858, Theodore Roosevelt was the twenty-sixth president of the United States, a historian, a naturalist, a big-game hunter, and a cofounder of the Boone and Crockett Club. Roosevelt's presidency is noted for its support for the conservation of natural resources. Roosevelt withdrew from development a total of 234 million acres of public lands and set them aside as national monuments and parks, national forests, and federal wildlife refuges. He created or empowered federal agencies to manage that land on an unprecedented level. Roosevelt died on January 16, 1919, in Oyster Bay, New York.

POLITICAL CAREER

Roosevelt's childhood interest in natural history and ornithology led him to consider becoming a zoologist. He published two ornithology books while in college, the

first of his three dozen books on a variety of topics. Instead of becoming a zoologist, he graduated from Harvard and enrolled at Columbia Law School, though he entered politics without getting a law degree. He served in the New York State Assembly from 1882 to 1884. In 1883, he purchased a cattle ranch in what is now North Dakota and worked it on and off for the next five years. The experience taught him about life and the environment in the semi-arid Western frontier region.

In 1887 Roosevelt co-founded the Boone and Crockett Club, a gentleman hunter's club with a strong interest in the preservation of large game animals. It fought for the preservation of Yellowstone Park, contributed to the passage of the Forest Reserve Act in 1891—the basis of the national forest system—and helped found the Bronx Zoo in 1895.

Roosevelt served on the U.S. Civil Service Commission (1889–1895) and the New York City Police Board (1895–1897) and became assistant secretary of the U.S. Navy (1897–1898). When the Spanish-American War began in April 1898, he resigned to form the First United States Volunteer Cavalry regiment, better known as the Rough Riders. He returned a war hero and was elected governor of New York in 1898. In 1900 he was elected vice president of the United States, and in September 1901 he became president after the assassination of William McKinley.

Theodore Rooselvelt with John Muir, 1903. *President Roosevelt and John Muir often camped together at Glacier Point in Yosemite National Park, having lengthy talks about conservation. Although he supported the protection of natural wonders, Roosevelt rejected the impractical idea of of eliminating all development in wild areas.* **THE LIBRARY OF CONGRESS.**

ACHIEVEMENTS AS A CONSERVATIONIST

Besides trustbusting, Roosevelt remains in the American political consciousness for his strong support of the conservation movement. Shortly after becoming president, Roosevelt asked Gifford Pinchot of the Division of Forestry and Frederick Newell of the U.S. Geological Survey to help craft an integrated program for federal management of natural resources. Like them, Roosevelt feared letting private industry continue to exploit public lands without federal regulation and believed that only federal scientific management could save American natural resources and, by extension, democracy from industrial monopolies and their wastefulness.

During his first term in office Congress passed the Newlands Reclamation Act in 1902, bringing nearly three million acres of semiarid land in a dozen states under irrigation and making settlement there feasible. After the 1904 presidential election Roosevelt made conservation a central domestic issue.

Roosevelt supported both preservation and conservation. He favored the preservation and protection of natural oddities and wonders but rejected as impractical the preservationists' idea of eliminating development in all natural or wild areas. He urged Congress to pass the Antiquities (or National Monuments) Act of 1906, which allowed the president to set aside scientifically or historically important areas such as the Grand Canyon for protection. He also established the first federal wildlife refuges and reservations to protect wildlife and its habitats. At the same time Roosevelt promoted utilitarian conservation and planned natural resource development. In 1905 Congress transferred the sixty-three million acres of federal forest reserves to the Department of Agriculture and created the U.S. Forest Service to manage the national forests for timber and watershed protection.

Roosevelt appointed commissions and held conferences to highlight his conservation agenda. In 1907 he appointed the Inland Waterways Commission to examine multiple-purpose development of river basins. His Governors Conference on Conservation in 1908 inspired individual states to establish state forests, forest services, and conservation boards. Roosevelt also expanded conservation to include the health of children, waste in war, and civic beautification. The Country Life Commission, for example, attempted to stop the disintegration of rural life, which some social critics considered of vital

importance for the political survival of the nation. Congress, however, resented the expansion of executive power and cut off funding.

After leaving the presidency in 1909, Roosevelt undertook an African expedition to collect specimens for the Smithsonian Institution. After his defeat in 1912 as a third-party candidate for president, he explored a newly discovered river in Brazil. The trip nearly killed him, but his party mapped the river and collected specimens. In Roosevelt's honor, Brazil renamed the river Rio Roosevelt. His last years were spent writing articles and reviews for various publications. Among his many accomplishments, Roosevelt's conservation work may be his greatest legacy.

SEE ALSO *Conservation; Environmental Law; Pinchot, Gifford; Preservation; U.S. Department of Agriculture; U.S. Forest Service.*

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James G. Lewis

ROUTLEY, RICHARD

SEE *Sylvan, Richard.*

RUSKIN, JOHN
1819–1900

The Victorian art and social critic John Ruskin was born in London on February 8, 1819. Among his primary concerns was the accurate description of nature. His 1834 essay in *Loudon's Magazine* discussed, as an example, the causes of the color of the Rhine. That commitment to exactness and curiosity about nature, articulated explicitly or implicitly within the terms of natural theology, defined his thought throughout his life. In the first half of his career, Ruskin's principal intellectual preoccupations were with the moral testimony of art, particularly art representing nature. Ruskin understood the best art as art that, first, respected the empirical truths of nature through accurate representation and, second, embodied a great artist's interpretation of the moral truths of nature. To see the natural world properly, in this respect, was an act of love and a way of understanding ethical teaching. The five volumes of Ruskin's *Modern Painters* (1843–1860) offered a detailed account of the English painter J. M. W. Turner as an ideal artist, faithful in the representation, and wise in the interpretation, of nature. They proposed as a general conviction that to "see clearly is poetry, prophecy, and religion,—all in one" (vol. 5, p. 333).

Ruskin's close observation of nature contributed to his exceptional drawings and watercolors. In the early 1850s he supported, with equivocation, the principles of the Pre-Raphaelite Brotherhood to represent the natural world faithfully. His concern with the representations of art gradually expanded into a preoccupation with the condition of the world in which artists worked. *Unto This Last* (1860) marked, at least as Ruskin saw it, his formal turn to economics and politics. Inseparable from his political arguments were new questions about the meaning of nature and how industrial modernity treated it. Although Ruskin had rejected his evangelical Christianity in 1858, only for the briefest moments thereafter did he lose faith in the divinely inspired meaning of the natural world. In the 1860s, looking for new ways to discuss what human beings could learn from the natural world, he explored mythological readings of nature, including Greek myth in *The Queen of the Air* (1869). Ruskin's late scientific textbooks—*Love's Meinie* (1873–1881), *Deucalion* (1875–1883), and *Proserpina* (1875–1886)—endeavored to draw the best wisdom from such mythological approaches to nature.

Politically, Ruskin in the 1870s paid attention to rural communities and the contamination of the natural world, which he regarded as a betrayal of humanity's God-given duty of care. The public letters of *Fors Clavigera* (1871–1884) developed plans for an alternative agrarian community—the Guild of St. George—that privileged hand labor over mechanical labor, and that, in its statement of principles, required a basic commitment to respect life and beauty: "I will not kill nor hurt any living creature needlessly, nor destroy any beautiful thing, but will strive to save and comfort all gentle life, and guard and perfect all natural beauty, upon the earth" (vol. 28, p. 419). In his last years, Ruskin's impatience

with industrial pollution prompted frequent statements admonishing the nation and recurrent private lament. In 1878 he entered into an angry argument with the Corporation of Manchester, which was trying to turn the lake of Thirlmere into a reservoir. Elsewhere he mourned the loss of humbler natural sites that he had personally valued (see the elegy for Croxted Lane in *Fiction—Fair and Foul*, pt. 1 [1880]). Most dramatically, in his public lectures *The Storm-Cloud of the Nineteenth Century* (1884), he argued that a "plague wind" was infecting England (vol. 34, p. 31). That wind, he said, suggested an approaching environmental calamity born of divine displeasure. From many years of observation, Ruskin adduced evidence for the palsied behavior of nature: "blanched Sun,—blighted grass,—blinded man" (vol. 34, p. 40). He concluded that natural disorder confirmed moral gloom. His lectures, the most extreme development of Ruskin's reading of nature's lessons for human beings, offered prototypes of early-twenty-first-century rhetoric of environmental apocalypse.

Ruskin's legacy in environmental matters was significant in his own century. Alongside William Morris, he influenced the development of the arts and crafts movement, with its favoring of traditional industries and nonmechanical labor. His initiation of the Guild of St. George lay behind later back-to-the-land movements and socialist utopias (see, for instance, the work of Edward Carpenter). The development of the Garden City initiative, late Victorian campaigns for clean air, and the foundation of the National Trust owe inspiration to Ruskin's writings, which continue to be cited as protoenvironmentalist and prescient in its strong commitment to the organic harmony of living things.

SEE ALSO *Environmental Aesthetics; Environmental Art; Environmental Philosophy: IV. Nineteenth-Century Philosophy; Romanticism; Wordsworth, William.*

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Francis O'Gorman

RUSSIA AND EASTERN EUROPE

Environmental ethics in the Commonwealth of Independent States and East European countries was initially formed under the strong influence of Russian science, Russian culture, and, up to the early 1990s, Marxist ideology. For a variety of geographical, historical, and political reasons, Russia was the dominant intellectual center in Eurasia. Even after the 1990s, East European countries and the Commonwealth of Independent States remained under the influence of Russian high culture, which depends not only on the spread of the Russian language and the popularity of Russian literature and philosophy but also on the unprecedented development of theoretical and scientific thought in the Soviet Union in the twentieth century. Scientific schools, emanating from the Soviet Academy of Sciences or the leading universities of Russia, still function more or less successfully in all of these countries.

Russian scientists—among them Vladimir I. Vernadskii, Nikita N. Moiseev, Vladimir N. Sukachev, Nikolai V. Timofeev-Resovskii, and Alexander L. Yanshin—made fundamental contributions to the development of ecology in the twentieth century. Because of this strong tradition, the Soviet scholarly community was receptive to the ideas of environmental ethics developed by Albert Schweitzer and the Italian industrialist and economist Aurelio Peccei.

PHILOSOPHICAL UNDERSTANDING OF HUMAN INTERACTIONS WITH NATURE

During the Soviet period, ecological literature that analyzed the state of the environment paid special attention to the role of sociopolitical factors, which were considered primary for understanding and resolving emerging ecological problems. The view was that only in the capitalist world do ecological catastrophes arise.

Under socialism, the ecological relation between humans and nature was explored from the vantage point of dialectical materialism. According to this concept, the interaction between humans and nature is a natural historical process, the concrete contents and movement of which depend on the level of development of productive forces and on the class that controls the means of production. In other words, the relation between humans and nature is not constant and natural, but is determined by social factors. Humans are related to nature through practical activity and material production. This relation is one not of abstract observation of nature, but of interaction through labor and practical activity.

Under presocialist socioeconomic institutions, there is spontaneous interaction between society and the natural environment. Under socialism, however, society has transitioned from spontaneous interaction with nature to guiding nature and being responsible for its future course. The view was that real guidance of the interactions between society and nature is possible only with public ownership of the means of production, sociopolitical unity, and humane social relationships.

Initially, on the basis of these philosophical and methodological considerations, the Soviet socioecological literature even attempted to claim that there was no ecological crisis under socialism, since socialism engaged in planned, predictable development of the economy. Yet socialism needed more theoretical development, particularly for working out the practical, legal, socioeconomic mechanisms for harmonizing the interaction of society and nature. Unfortunately, this need was not fully understood and put into practice by the authorities of the Soviet Union and other socialist countries. Thus, under socialism, these counties were unable to resolve the contradictions inhering in interactions between nature and society, contradictions that increased with technological progress.

ENVIRONMENTAL PROBLEMS AND DISASTERS

The high concentration of industry in cities during the Soviet period degraded the environment around them and spawned a variety of health problems. No less than 10 percent of Russian cities have high levels of soil, air, and water pollution. Almost every city with a population of over 1 million people has ecological problems. Many of these and other environmental problems, as cataloged by William Carter and David Turnock (1993), are a legacy of the Soviet era. Areas of environmental degradation include the region around the Aral Sea (in Kazakhstan, Uzbekistan, and Tukmenistan), the former Semipalatinsk nuclear test site in Northern Kazakhstan, and the industrial zones of Donbass in Ukraine and of the Kola Peninsula and the South Urals in Russia.

During the period of glasnost in the 1980s, new nongovernmental organizations began engaging the state on environmental issues, but the collapse of the Soviet Union and other communist states and the economic crises that ensued effectively terminated these discussions. Since the early 1990s, clear improvement in the environmental situation has not occurred. This failure was a result in part of the transition to market economies, in which protection of the environment had low priority. While more progress was made in the relatively richer East European countries, several problems require urgent attention. These include uncontrolled management of dangerous waste, unreliable treatment of waste water, deterioration of air quality in highly populous urban and industrial areas, and contamination and damage to the soil by pesticides and overcultivation. In addition, multinational oil corporations have motivated Kazakhstan, Uzbekistan, and Azerbaijan to allow large-scale drilling in the shallow waters of the Caspian Sea, at the risk of destroying vulnerable ecosystems.

By far the worst environmental damage resulted from the accident at the Chernobyl nuclear power plant on April 26, 1986, when a breakdown of the fourth reactor resulted in the release of a large amount of radioactivity into the environment. The explosion released thirty to forty times the combined fallout from the atomic bombing of Hiroshima and Nagasaki. Belarus (the European part of the Russian Federation) and Ukraine suffered the most, with Belarus receiving about 60 percent of the fallout. A year after the disaster, the radiation across most of the European territory of the Soviet Union primarily involved long-lived cesium isotopes. In areas closer to the disaster, strontium-90, various isotopes of plutonium, and several other highly radioactive elements continue to pose hazards. By 2005, 56 direct deaths had occurred, and the expectation is that there will eventually be as many as 4,000 cancer deaths among the 600,000 most exposed and as many more among the 6 million people living nearby. Ten-year forecasts of the continuing pollution of European territories have been made. Most of the pollution will largely disappear between 2006 and 2016, but in the Bryansk region pollution will remain until 2092.

ADDRESSING ENVIRONMENTAL PROBLEMS

As of 2008, several groups are seeking to address these environmental problems. For example, the Regional Environmental Center for Central and Eastern Europe, which publishes the quarterly magazine *Green Horizon*, seeks to assist in solving environmental problems in this region by providing information on the environment, promoting public participation, and encouraging cooperation among environmental stakeholders.

Western countries eventually overcame their neglect of the environment. Several characteristics of nonsocialist societies played a role in that process. These characteristics include transparency, public availability of environmental information, the emergence of mass environmental movements, and advocacy by ecologically oriented political parties leading to the adoption of environmental laws. As a result, under constitutional states, environmental problems started to be resolved more effectively than under socialism because needed laws were rapidly adopted and enforced.

A NEW ENVIRONMENTAL ETHIC

Socioecological literature of the Soviet period included serious theoretical works arguing that contradictions in the interrelations between society and nature are inevitable quite apart from the socioeconomic structure of society. This argument was based on an analysis of how the system of society and nature functions under the laws of nature, particularly the conservation laws of physics and chemistry, which preclude the destruction of matter and energy. This literature concluded that contradictions are inevitable for such systems because a society cannot develop without using natural resources and producing

Brown Bear, Kamchatka, Russia. *The brown bear (*Ursus arctos*), shown here crossing a stream in the Valley of the Geysers, Kronotsky Zapovednik Reserve, is found in many parts of the world, but the species is most populous in Russia. Over the last century, habitat encroachment and hunting by humans has dramatically reduced the number of brown bears globally; in most populations they are considered endangered or threatened. Conservation efforts are fighting to increase the numbers of brown bears in Russia and elsewhere.* **IGOR SHPILENOK/NATUREPL.COM.**

waste and this reliance sooner or later leads to specific ecological collisions. In coming to these conclusions, the scientific literature, unlike the ideological literature, did not idealize Eastern socialist economies and did not bow before the received notion that the presocialist societies of the West would inevitably break down.

Environmental ethics in the Soviet philosophical literature was logically divided along the following perspectives toward nature: theoretical, practical, aesthetic, and ethical (Tugarinov 1978). The practical attitude toward nature focuses on processes that produce goods and services and enable humans to live. Through these processes, the human forces at work in society are revealed. These practical and material economic arrangements determine, in accord with dialectical materialism, the theoretical and ideological structures of society, including society's attitude toward nature

The aesthetic attitude toward nature can be seen in the human need to observe the beauty of natural phenomena and various landscapes, and to engage in artistic reflection on observable forms, such as space and light. Natural elements enrich figurative artistic exploration of reality. In turn, the aesthetic attitude toward nature contributes to the formation in mass consciousness of the idea of an empathetic approach toward nature.

In the second half of the twentieth century, the importance of an ethical attitude toward nature grew significantly. Inculcating a love of nature and the need to preserve plant and animal species and their habitats became one of the most important tasks of moral education. The point was not to resurrect animistic feelings, but to understand that the surrounding flora and fauna are necessary for humans (for both their physical existence and spiritual enrichment) and that some limits on the transformation of nature are needed even under conditions of socialism. Ethical indifference toward nature was to be replaced with a clear understanding that destruction of nature is immoral and intolerable. More and more people understand that nature is a support for

human life, a source of beauty, and the ground of an ultimate good. It thus became commonplace to include in the sphere of moral relationships some aspects of the relationship between humans and nature, along with traditional considerations of person-person and person-society relationships.

In the past, the specific content of these different human attitudes toward nature were considered to depend significantly on the socioeconomic structure of society and on the various social relations and value configurations that emerged in a given historical situation. Yet since the 1990s, through social connections, the surrounding environment has obtained universal significance for people, satisfying their different needs—from simple physical ones to spiritual ones. In Russia, East European countries, and the Commonwealth of Independent States, environmental ethics is now understood to depend on the formation of an environmental consciousness and an environmental culture, based on continuous environmental education and ecological enlightenment.

SUSTAINABLE DEVELOPMENT

Undoubtedly, the concept of sustainable development adopted by the 1992 U.N. Conference on Environment and Development (Rio de Janeiro) provided a new impulse for environmental ethics to go in that direction. In Russia, the concept of sustainable development reflects the increase of social, economic, and ecological problems on our planet, on the one hand, and also our overall level of scientific understanding of nature and society, on the other. The concept of sustainable development seems to be the point of convergence of several philosophical and sociological teachings and several theories in the natural sciences and mathematics.

Simply put, humankind has to transition to sustainable development for the survival of humanity and preservation of the biosphere—the thin sphere of life enveloping the geosphere. Needed is a transformation of all spheres of human activity in the direction of diminishing pressure on the biosphere. Without doubt, sustainable development should be characterized by economic effectiveness and social justice, as well as a general reduction of anthropogenic pressure on the biosphere.

The Russian approach to understanding ecological problems and sustainable development is connected with Vladimir I. Vernadskii's teachings about the biosphere and noosphere. The concept of a noosphere, a sphere of mind, reflects a belief in the power of reason and its unlimited creative capabilities. The notion was developed by the French scientists Edward Leroi and Pierre Teilhard de Chardin, as well as by Vernadskii, though their several ideas about the noosphere are significantly different from one another. According to Vernadskii, the epoch of the noosphere will be characterized by the following basic traits:

- Humankind settles the whole planet; connections between various peoples and countries intensify.
- The geological role of human activity prevails over natural geological processes taking place in the biosphere.
- The borders of the biosphere expand; humankind enters outer space.
- New sources of energy are found.
- People of all races and religions are discovered to be equal.
- The role of the masses in solving the problems of domestic and foreign policy grows.
- Wars are excluded from social life.
- The welfare of working people grows; a real opportunity emerges for the elimination of hunger, poverty, and disease.
- The original planetary biosphere is reasonably transformed to satisfy all the material and spiritual needs of a growing global population.
- Scientific thought and inquiry are liberated from the pressures of religion and politics, and state and society create conditions favorable to the realization of this intellectual freedom.

The philosophical connections between Vernadskii's vision and the later concept of sustainable development are striking. For instance, the concept of sustainable development means, among other things, a movement of humankind into the sphere of reason, where society and nature harmoniously interact with each other.

Since around 2005, there has been a generalization of the concept of sustainable development. Under this generalization, sustainable development is understood not simply as ecologically secure development, but also as stability in the social and political spheres of social life, based on respect for human rights, democratic principles, the rule of law, and norms of international law. Such sustainable development unites the environmental, economic, and sociopolitical domains into a single unified system. Moreover, it connects reason and morality. Historically, the achievements of reason, torn asunder from moral elements, have sometimes acquired a malevolent and antihuman character. To limit rational but inhumane social development, spiritual values and norms of morality are needed.

Transition to sustainable development means changing both the substance and form of the material and spiritual culture of civilization. This transition cannot be

achieved by means of conventional thinking or traditional ideas and values. It requires working out new scientific and philosophical approaches to complex problems, corresponding not only to postmodern reality but also to the prospects for civilization in the third millennium.

Realizing sustainable development that affirms the intrinsic value of nature and ethical attitudes toward it is of utmost importance. Former strategies, oriented only to economic development, need to be replaced with a strategy of integrating the human economy into the natural economy and patterning the design of artificial systems of energy production and agriculture on the model of ecosystems, in accord with the concept of sustainable development. The modern way of life, with values formed in the previous half millennium, needs to undergo radical changes in order to meet the challenges of the new millennium.

In Soviet and post-Soviet cultural literature, the ecology of the biosphere is basically treated as the new means of reconciling humans and nature on the basis of knowledge about and understanding of nature. By knowing the modalities, depth, and scale of interaction between humans and nature, biospheric ecology can play a significant role in the formation of environmental thinking, reorienting all spheres of human life toward solving environmental problems. The main paradigm of the Russian environmental outlook and the main thrust of biospheric ecology is understanding that people do not exist on the earth simply for themselves, that they also perform specific ecological functions. The most important characteristic of Eastern European environmental ethics is a rejection of naive anthropocentrism and a transition toward a system of beliefs built on biospheric centrism. Such an environmental ethics is the conceptual basis of a new biosphere-centered culture. By concentrating attention on the problems of the biosphere, biospheric environmental ethics creates the preconditions for actions oriented toward preserving and developing the well-being of humans and nature.

Like most environmental ethics, Eastern European environmental ethics cares about the natural conditions of existence of future generations. Orientation toward the future, which presupposes also caring about the present, distinguishes environmental ethics from traditional ethics.

Sustainable development can be understood as development that satisfies the needs of the present without endangering the ability of future generations to satisfy their own needs. This orientation can be considered the main ethical regulator of interaction between people and the natural environment. In place of anthropocentrism, there emerges a new approach to reality based on biospheric centrism. The biospheric approach introduces a fundamentally new perspective into the moral experience of humankind, hitherto based on a traditional dichotomy of good and evil. Vernadskii (1988) claims that ethics can be approached scientifically if it proceeds from knowledge of the biosphere. Environmental ethics demands that we act responsibly toward future generations when making decisions affecting the environment.

Post-Soviet environmental literature suggests that sustainable development is possible, not under conditions of socialism, but only under a biosphere-centered culture that reproduces through sustainable development. Hence, the notions of biosphere-centered culture and sustainable development reflect different aspects of the same process: harmonizing the relations between society and nature.

GLOBALIZATION

The post-Soviet environmental literature since around 2005 increasingly focuses on issues of globalization. As Vernadskii predicted, humankind lives in an era of the formation of a new world outlook, the basic content of which is, to a large extent, global. The complex, multifaceted process of globalization is defined by a number of factors, including integrative trends in the economic and political spheres, synthesis of the natural sciences and humanities to present an integrated picture of reality, and development of information and communication technologies so as to change not only the human way of life and perspective on the world but also human consciousness. The emerging danger posed by global climate change requires reconsidering the entire system of our basic social values (such as ethical norms, attitudes toward nature, and the character of production to satisfy human needs and wants).

In relation to controlling the processes of globalization for sustainable development, the premises and conditions of the formation of global consciousness become extremely topical. The contents of global consciousness should be determined less through broadening traditional perceptions and thought than through forming fundamentally new perspectives based on emerging ideas for global integration.

In each era, humankind, relying on the current level of knowledge in various fields, regulated to varying degrees its relations with the natural environment. At the beginning of the twenty-first century, however, we face the greatest challenge of our time, perhaps of all time: harmonizing the development of the socioeconomic sphere and the biosphere. The task is to realize an environmentally sound revolution in human lifestyles, to environmentalize the human way of living.

EDUCATION

Meeting this challenge is unthinkable without a corresponding transformation of social consciousness, without each individual understanding the meaning of the coming

changes. For this reason, the problems of education come to the foreground. Needed is a global change of orientation in educational systems toward the theory and practice of sustainable development. This transformation requires a search for forms and means of embedding environmental knowledge and imperatives into different levels of education.

In Russia, East European countries, and the Commonwealth of Independent States, a commonly accepted ideal is the need to deploy a multilevel system of environmental education that embraces all elements of preschool, primary, secondary, and higher education, as well as executive courses, retraining, and popularization of scientific knowledge. Such an education should be the main thrust for developing environmental consciousness and forming environmental responsibility. An environmental education is a precondition for the emergence of an environmental culture and for society's transition to sustainable development.

In Russia, environmental education should be a top priority in that country because one can especially feel a strong dependence on the material and spiritual forces of nature. Russia is not only the biggest country in the world and the richest country in terms of energy resources; it is also the coldest country, where permafrost covers more than half of its territory and an extreme natural environment dominates. Fortunately, in Russia the birthrate has been dropping catastrophically in recent years, thus relieving human pressure on the biosphere.

Education for sustainable development is integrative and multifaceted. It is directed toward solving a number of interrelated problems and thus cannot be reduced to ecological education alone. It must define strategic goals and develop the spiritual, intellectual, scientific, and technological means for achieving them. As is evident, education for sustainable development should ascend to the level of an integrated environmental education.

SEE ALSO *Anthropocentrism; Chernobyl; Conservation; Future Generations; Intrinsic and Instrumental Value; Schweitzer, Albert; Space/Place; Sustainable Development.*

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S

SALMON RESTORATION

As anadromous fish dependent on the oceans for feeding and fresh water for spawning, salmon are vulnerable to a wide range of human activities. Pacific salmon were indigenous to the north Pacific in coastal regions and rivers from Japan, through Russia, and across the Pacific from Alaska south to California. Atlantic Salmon on the eastern coast of North America were indigenous from Long Island through the Atlantic Provinces of Canada to Greenland, Iceland, Scandinavia, the British Isles, western Russia and south in Europe as far as Portugal. In both the Atlantic and Pacific these geographic ranges are as of 2008 significantly reduced. Historically and ecologically, the long and precipitous decline of wild salmon stocks in the United States is traceable to a constellation of factors, the most important of which are habitat destruction and over-harvesting.

Both of these factors prevail in direct proportion to increased human population density along the coastal waterways and inland river basins where salmon migrated and spawned. On the East Coast of the United States, primarily Maine, the situation of Atlantic salmon is so dire that restoration of the species is highly dubious. According to the National Oceanic and Atmospheric Administration (NOAA) Fisheries and the U.S. Fish and Wildlife Service, "The number of wild Atlantic salmon in Maine rivers is at an all-time low, placing them in danger of extinction" (NOAA Fisheries 2007, p. 1).

On the West Coast of the United States, the status of salmon—which includes Chinook (King), Coho (Sliver), Sockeye, Chum, and Pink varieties—is much more variegated, depending on the region. Salmon stocks in Alaska, for example, are usually more stable and healthy, whereas salmon stocks in California are seriously threatened or endangered. A classic example of the complex and often contentious nature of salmon recovery is the early 2000s effort to restore salmon in the Columbia River Basin, which, according to some estimates, once had the largest number of returning salmon of any river in North America—between 10 and 15 million.

Salmon restoration as a formal strategic attempt to recover salmon on the West Coast began in earnest during the 1990s, when a number of wild seasonal spawning runs of salmon, identified as evolutionarily significant units (ESUs), were rapidly listed as either threatened or endangered under the federal Endangered Species Act (1973). An important tipping point was a report issued in 1991 by Nehlsen, Williams, and Lichatowich called "Pacific Salmon at the Crossroads: Stocks at Risk from California, Oregon, Idaho, and Washington." Their research showed that of 214 wild runs of salmon, steelhead, and sea-run cutthroat trout, 101 were in extreme risk of extinction, 58 at moderate risk, and 54 of concern. They identified 106 runs that had already become extinct. It was with this background that the National Marine Fisheries Service (later known as NOAA Fisheries) was mandated by the Endangered Species Act to develop salmon and steelhead recovery (or restoration) plans.

Salmon restoration encompasses a dizzying array of stakeholder groups that can add up to a bureaucratic and policy conundrum (Lackey, Lach, and Duncan 2006; Kolmes and Butkus 2006). Although it would be unwieldy to list all those involved, a short list includes the following: federal agencies, state governments, regional and municipal governments, Native American tribes, commercial and

sport fishing associations, the hydroelectric power industry, the Northwest Power and Conservation Council, several environmentally oriented NGOs in favor of salmon recovery, and a number of industry and agriculture (e.g., irrigation) NGOs who favor the status quo. The primary entity responsible for creating salmon restoration plans and mediating the conflicts among various parties is NOAA Fisheries. The recovery process, however, is not beyond political maneuvering at the very highest levels of the federal government.

The contentious nature of salmon recovery was highlighted by the 2002 struggle in the Klamath River Basin, where competition over water between farmers and fishers (commercial and tribal) took a toll not only on community good will but also a significant number of adult salmon. In September 2002, nearly 34,000 adult salmon returning to spawn were killed when low water in the Klamath River created lethally warm conditions, causing the fish to succumb to fungal infection. The scenario in the Klamath Basin is an example of the clash of social values over salmon restoration and a notable case study in environmental ethics. It is also an example of how the abandonment of good science and the mismanagement of water resources in the Klamath River led to a conflict that nearly erupted into violence.

NOAA restoration plans have incorporated a vision of salmon recovery (reducing the risk of extinction for any population to 5% over the next hundred years) that is considered by some to be a narrow interpretation of the term *recovery*. Focused on preventing extinction and achieving the delisting of salmon as an endangered species, NOAA's approach to salmon restoration appears incongruous with the more generous vision of what "broad-sense recovery" means to most people. The shifting biological opinions and restoration plans produced by NOAA, struck down one after another by federal courts as inadequate, have raised questions about the capacity of NOAA Fisheries to carry out reliable salmon restoration planning. The attempt of NOAA Fisheries to count industrially produced hatchery fish, known to be genetically deficient and lacking the local evolutionary adaptations vital to population viability, has intensified the conflict between NOAA Fisheries on the one hand and environmental groups and locally based salmon-restoration efforts on the other (Meyers et al. 2004). In the view of some environmental activists, NOAA Fisheries has taken a view of salmon-recovery planning metrics that focuses excessively on fish population numbers to the exclusion of habitat issues or fish characteristics. Seeking to count hatchery fish to achieve stability of fish numbers, it has eschewed critical habitat requirements—and the attendant political implications for human land-use practices—that are essential for long-term salmon survival.

The issue of salmon restoration can also be addressed from the environmental-ethical perspective expressed in this question: Do human beings have a moral obligation to prevent the extinction of salmon and to commit time, money, and energy to the effort to restore the species? The answer to this question depends in large part on how one values salmon and salmon restoration. At one extreme there are those who do not value salmon at all and see salmon restoration as a major hindrance to the economic values of the industrial economy. In the middle—where the majority of people in the Northwest reside, based on opinion polls—are those who are in favor of salmon restoration and hold a variety of human values for salmon, including aesthetic, recreational, nutritional, culinary, cultural, scientific and spiritual At the other end of the spectrum are those, such as tribal peoples, who, for cultural and religious purposes, see salmon as sacred and others who believe salmon have intrinsic value apart from their utility to humans.

An interesting layer of analysis was added to the ethical assessment of salmon when, in 2001, the Roman Catholic bishops within the Columbia River Basin issued a pastoral letter entitled "The Columbia River Watershed: Caring for Creation and the Common Good." This international document surveyed the problems of the basin and provided a theological-ethical foundation for ecological and social responsibility. Grounding this idea in the concept of biblical stewardship and concern for the common good, the bishops of the region sought to create an ethical framework for action by offering ten ethical norms called "Considerations for Community Caretaking." On one of these principles, "Conserve and Protect Species of Wildlife," a critical norm for salmon restoration, the bishops state:

> The presence and health of wildlife is in many ways a sign of the health of our ecosystems, of the well-being of the people and communities dependent on the ecosystems for their livelihood, and our respect for God's creatures and creation. The presence and health of salmon and other species in the Columbia-Snake system, in particular, is a sign of the health of the entire region.

The ethical imperative to restore wild salmon is directly linked—scientifically, philosophically, and theologically—to the value of a species' life other than our own and to the generative, creative evolutionary process that produced it. The primary issue is that anthropogenic extinction inevitably curtails the evolutionary process that produces life. In the view of Holmes Rolston III, "Every extinction is an incremental decay in this stopping of the flow of life, no small thing. Every extinction is a kind of superkilling. It kills forms (species), beyond individuals. It kills 'essences' beyond 'existences,' the 'soul' as well as

the 'body'" (1988, p. 144). Accordingly, the ethical duty to preserve and restore a species is, in Rolston's words, "a categorical imperative to living categories." In other words, the obligation to recover salmon from extinction is a moral duty without exception.

Prospects for the restoration of Atlantic salmon on the East Coast of the United States are bleak. Pacific salmon, however, have better prospects because of population density and the extent of commercial development in their historic breeding range. There are runs in California (e.g., the longstanding decline of the Sacramento River winter run of Chinook) where restoration is probably not realistic. The Sacramento River spring Chinook run suffered a dramatic population crash in 2008. Other runs of Pacific salmon, from Oregon to Alaska, can be restored or preserved in healthy condition if human activities detrimental to salmon survival are sharply curtailed to enhance water quality and reduce habitat alterations, riparian deforestation, genetic dilution of previously adaptive populations caused by hatcheries, and overfishing. If human beings in salmon-bearing areas are willing to embrace and implement an ethic of sustainability—a balance between the needs of humans and the legitimate ecosystem needs of wild salmon—then there are good prospects for restoration in areas where the habitat remains viable.

SEE ALSO *Ecological Restoration; Endangered Species Act; Hunting and Fishing: I. Overview; Hunting and Fishing: V. Commercial Fishing; Stewardship.*

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SARO-WIWA, KEN
1941–1995

Kenule Beeson Saro-Wiwa, best known as Ken Saro-Wiwa, was born in Bori, an Ogoni village, on October 10, 1941. The Ogoni are an indigenous community of about 500,000 in the oil-rich Niger Delta of southeast Nigeria. He attended Government College, Umuahia, and later the University of Ibadan in western Nigeria. Saro-Wiwa became the community's spokesman in its battle against the environmental devastation caused by the long-time oil exploration and extraction activities of foreign oil companies, especially Shell.

Saro-Wiwa was a graduate assistant in English at Ibadan when a national political crisis broke out in 1966 in the form of a spate of coups d'état that pitted eastern and northern Nigerians against each other. As an easterner, Saro-Wiwa was obliged to leave Ibadan. He took up another assistantship at the University of Nigeria, Nsukka. When civil war erupted in 1967 and the Igbo declared the Republic of Biafra, he returned to his Ogoni homeland. There he taught secondary school, became a businessman, and campaigned for a federal Nigeria. In September 1967 he joined the University of Lagos as a teaching assistant.

In November 1967, at the age of twenty-six, Saro-Wiwa was appointed administrator for Bonny Island in Rivers State. After six months at that job, he returned to Lagos but soon went back to Rivers as commissioner, holding various portfolios for six years.

From 1973 until his death, Saro-Wiwa gradually moved from private life into the eye of a public storm. An Ogoni nationalist, Saro-Wiwa explained his outlook in his

prison diary: "My worry about the Ogoni has been an article of faith, conceived of in primary school, nurtured through secondary school, actualized in the Nigerian civil war in 1967–70 and during my tenure as member of the Rivers State Executive Council, 1968–73" (1996, p. 75). From his youth onward, Saro-Wiwa had witnessed his people's plight as an oil-rich but exploited minority. He became committed as a leader of their struggle for survival against the exploitation of their natural resources and the destruction of their environment, with all the economic benefits accruing to the foreign oil companies. In 1977 he failed in his attempt to win election as a member of the Constituent Assembly that had been mandated by the Babangida military regime to fashion a new constitution that, in Saro-Wiwa's opinion, established an even stronger central government that further marginalized the minorities.

His writing output, both creative and critical, expanded as he became more and more engrossed in the Ogoni struggle. Among his over twenty books are: *Sozaboy* (1985); *Songs in a Time of War* (1985); *Prisoners of Jebs* (1988), and *Genocide in Nigeria* (1992). Penguin published his detention diary, *A Month and a Day*, in 1995. The Ogoni's oil, discovered in the 1950s, fast became a curse: Incidents of oil spillage, consistent gas flaring, and ecological devastation became the daily travails of the Ogoni fishing community. Saro-Wiwa believed in the political and economic autonomy of every nationality in the Nigerian federation, particularly the minorities such as the Ogoni, which were powerless in an overcentralized system controlled by the three major ethnic groups (Fulani-Hausa, Igbo, and Yoruba). It is therefore significant that Saro-Wiwa collaborated with other Ogoni leaders in 1990 to found the Movement for the Survival of the Ogoni People (MOSOP) that would soon become a major platform for his nationalist and environmental activities. As he traveled internationally to promote the movement and became popular and controversial, he drew the ire of both Ogoni elders and the military government.

Accusations of violence were rejected by Saro-Wiwa and his followers. He always preached nonviolence and claimed the late Martin Luther King Jr. as his model of activism even though King fought for inclusion and integration whereas Saro-Wiwa was an avowed separatist who sought "to establish a government of Ogoni people by Ogoni for Ogoni people in Ogoni within a confederal Nigeria" (Saro-Wiwa 1996, p. 111).

The Royal Dutch/Shell oil company was the main target of Ogoni protest; these protests led to the company's decision to abandon exploration and exploitation in the area. Significantly, the Nigerian government maintained that Shell was "a partner in progress" despite the environmental degradation caused by oil spillage and gas flaring, conditions that adversely affected the health of nearby residents. The Ogoni composed a song that featured the lyric, "The flames of Shell are hell, we bask beneath their light." The international community's failure to respond to issues alien to their economic interests did not help the Ogoni cause. For instance, the United States, Nigeria's main oil client, did nothing to interfere with Shell's oil extraction. Although Shell got away with a slap on the wrist, with official warnings and token fines, for its destructive actions in Nigeria, similar actions in Europe and North America were being heavily punished.

Protester in South Africa Recalls Ken Saro-Wiwa's Struggle for Justice. *Protesters in Johannesburg call for democracy in Nigeria, the native country of Ogoni activist Saro-Wiwa. Saro-Wiwa spoke out against human rights and environmental abuses inflicted on his people, most notably by Shell Oil Company. Saro-Wiwa was executed by the Nigerian military in 1995, along with eight other activists.* **AP IMAGES.**

On January 4, 1993, Saro-Wiwa organized Ogoni Day, announcing a bill of rights calling for the autonomy of the Ogoni people within a Nigerian confederation. Authored by Saro-Wiwa, the bill had been signed in 1990 by representatives of five of the six Ogoni kingdoms. In partial response the military began a "pacification" of the Ogoni that consisted of the repression or elimination of any dissidents. When four reactionary Ogoni leaders were murdered in May 21, 1994, the government fingered Saro-Wiwa as the hidden hand behind the act. He was arrested, with eight other associates, on May 22, 1994.

Despite the indifference of the United States government, Saro-Wiwa had many supporters among European

and North American intellectuals and activists. The British author William Boyd advised him to contact Amnesty International and Greenpeace. Interaction with these organizations influenced him into drafting an addendum to the bill of rights titled "An Appeal to the International Community" and the establishment of the Ethnic Minority Rights Organization of Africa in 1993. Saro-Wiwa met with many nongovernmental organizations and filmmakers such as Kay Bishop who made the Ogoni documentary *The Heat of the Moment* (1992). Despite these gestures of support, on October 21, 1995, a special tribunal condemned Saro-Wiwa and his comrades to death by hanging. Notwithstanding calls from home and abroad for leniency, all were hanged on November 10, 1995.

Saro-Wiwa was nominated for the 1995 Nobel Peace Prize. In that year he won the Right Livelihood Award, known as the Alternative Nobel Prize. His exclusivist stance perhaps diminished the success of the Ogoni struggle. Perhaps Saro-Wiwa would have achieved more if he had championed the environmentalist and anti-exploitation cause on behalf of all or several Niger Delta groups. Nonetheless, his commitment to Ogoni rights and sovereignty as a minority, and to the well-being of the environment, still serves as a benchmark for activism in Nigeria. Since his execution, other groups, such as Movement for the Emancipation of the Niger Delta, have sprung up. Regarding the protection of the environment, one is tempted to believe that Saro-Wiwa's concern was more in terms of the particularity of the Ogoni, and less of the generality of nature's ecological well-being. Outside the Ogoni struggle, he would probably not have taken much interest in the environment.

SEE ALSO *Africa, Sub-Saharan; Environmental Activism.*

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Femi Ojo-Ade

SCANDINAVIA

This entry contains the following:

I. DENMARK AND SWEDEN

Scandinavia is a region of Northern Europe defined by geography, history, and language as including the countries of the Scandinavian Peninsula—Norway and Sweden—as well as Denmark. Some authorities advocate the inclusion of Finland because of economic and cultural connections, and Iceland and the Faroe Islands because their populations speak Northern European tongues closely related to Swedish and Norwegian. The region is often associated with nature-friendly attitudes and strong traditions of nature management, outdoor life, and environmental education. Danish and Swedish environmentalism share an ecological worldview, a critical view of technology, and a call for participatory democracy in environmental policy making.

Danish environmentalism, which encompasses a cosmological dimension, has emerged from a political culture of participatory democracy and a decentralized, small-scale economy. It speaks to civil society and encourages personal commitment to environmental goals. Swedish environmentalism is influenced by a centralized state administration emphasizing systemic solutions to environmental and developmental challenges.

Environmental controversies and debates in Denmark and Sweden have focused on genetically modified organisms (GMOs), animal welfare, the use and storage of pesticides and herbicides in the chemical and transport industry, the building of a fixed link across the Öresund (the strait that separates the Danish island Zealand from the southern Swedish province of Scania), the radioactive fallout from the nuclear accident in Chernobyl in 1985, and the question of environmentally friendly energy and nuclear power.

THE NUCLEAR ENERGY CONTROVERSY

Strong movements of opposition to nuclear energy have arisen in both Denmark and Sweden, but they took different forms in each country because of the countries' differing political cultures. Swedish antinuclear environmentalism has been mostly assimilated into previously existing governmental and nongovernmental institutions, although it has generated some new organizations. In 1980 the national nuclear-energy referendum resulted in the two more positive lines defeating the anti-nuclear line. Three months after the referendum the Swedish Parliament decided to phase out all nuclear reactors before the end of 2010. Many radical antinuclear activists considered this measure a setback because of its extended time frame. The antinuclear movement was scattered, and the issue was rapidly further institutionalized with the formation of the Swedish Green Party in 1981.

In Denmark the antinuclear movement engaged in critical debates with the political establishment, critical scientists, and journalists. As a result of these joint discussions, in the 1980s the Danish government repudiated nuclear energy, a decision made in a context of a small-scale, decentralized economy that aimed to develop alternative energy sources through increased research, local developments, and commercial incentives. The differences between Danish and Swedish environmentalism can be traced to the two countries' contrasting traditions of environmental law, policy making, environmental research, and environmental ethics and philosophy.

THE LEGAL AND POLICY DIMENSIONS OF SWEDISH AND DANISH ENVIRONMENTALISM

Allemansrätten (the right of public access) is a unique Scandinavan and Swedish regulation that protects the public's right to move freely in nature. This right also includes a responsibility not to destroy and disturb the environment. This is an example of how Swedish representative democracy, with its top-down institutionalized culture of environmental politics, governs public access to land.

In Denmark the culture of participatory democracy has engendered dialogues between the political establishment and the environmental movement. One important result of these dialogues has been the establishment of consensus conferencing that seeks to include the public in decisions concerning the environment and development issues. In 1986 one of the world's most rigorous precautionary laws on genetically modified organisms was passed as a result of this public-consultation procedure. In the late 1990s NGOs and the public argued that the issue of commercialization of GMO crops implied that precautionary principles should include ethics and value judgments. On the other hand, the experts and the industry continued to treat risk in a scientific and physical sense. Thus the issue of commercialization of GMO crops challenged this consensus.

In Sweden, because of the rapid incorporation of environmentalism into parliament (such as the Centre Party), administration (such as the Environmental Protection Board [1967]), and nongovernmental organizations (such as the Swedish Society for Nature Conservation) in the 1960s and 1970s, Swedish environmental policy making is largely the result of parliamentary work in which staff members from NGOs often serve as expert consultants. This process has resulted in predominantly large-scale solutions to environmental problems, including the incorporation of environmental concerns into the existing economic and corporate culture.

In Denmark, as previously noted, environmentalism has not been as easily channeled into official governmental bodies. Instead, the country's heritage of citizen participation and cooperation has played a vital role in creating alternative ways of enhancing public environmental awareness. The grass-roots movement NOAH, founded in 1969, refers to "the first environmental activist who fought for the species" (Jamison et al. 1990, p. 120). NOAH has played a significant role in discussions about alternative technologies. NOAH was formed by environmental activist students who dramatically revolted against NOA (a natural history society at the University of Copenhagen) at a NOA annual seminar in 1969.

Educational institutions have played an important role in the development of environmental awareness in both Sweden and Denmark. As far back as 1940, Elisabeth Tamm (1880–1958) and Elin Wägner (1882–1949) argued for the importance of integrating environmental and development concerns with education and women's emancipation—an argument that predates concepts such as sustainable development and education for sustainable development by thirty to fifty years.

The Swedish school system has long been responsible for instilling social values and instigating social change. The guidelines and regulations put forward by the United Nations Educational, Scientific and Cultural Organization's (UNESCO) Decade of Education for Sustainable Development (DESD) are, for example, implemented at all levels of the Swedish educational system, emphasizing critical reflection, pluralism, and democracy.

The People's High Schools have promoted the development of environmental activism and ecological awareness in the rural population of Denmark. The minister, poet, and educator N. F. S Gruntwig (1783–1872) is considered to be the father of these schools, which became arenas for alternative-technology workshops and

the promotion of alternative ecological lifestyles in the 1970s and 1980s. Like the Danish People's High Schools of the 1980s, the Swedish implementation of the United Nations' Education for Sustainable Development (ESD) since 2000 has gone beyond traditional pedagogy to teach values and critical reflection

ENVIRONMENTAL RESEARCH AND PHILOSOPHY

The largest and most ambitious environmental research program in the humanities in Scandinavia, Man and Nature (Menneske og nature) (1992–1997), was based in Denmark at Odense University. In Sweden the best-known program is Roads to Sustainable Development (1996–2002) (Vägar till uthållig utveckling-beteenden, organisationer, strukturer).

The Swedish and Danish natural environments have influenced both countries' environmental research and philosophy. The lack of wildlife in mainland Denmark, the fact that Denmark is densely populated, and Denmark's history of decentralized and small-scale economy has inspired experimental and pragmatic environmental research and philosophy. This pragmatic take on nonhuman nature includes the view of nonhuman nature as a workshop. This view, in contrast to the Swedish theoretical view, was typical of Tycho Brahe (1546–1601) and Hans Christian Ørsted (1777–1851), who combined romantic and utilitarian views of nonhuman nature in his research.

In Sweden the heritage of Carl Linnaeus's (1707–1778) theoretical classifications approach to nonhuman nature, along with the need to understand and manage large areas of wilderness, has given birth to an almost imperialistic relationship to nonhuman nature. Nevertheless, empirical studies of Swedes' views of nonhuman nature reveal strongly nonanthropocentric, biocentric, and ecocentric attitudes.

SEE ALSO *Alternative Technology; Environmental Education; Environmental Policy; Genetically Modified Organisms and Biotechnology; Naess, Arne; Nongovernmental Organizations; Nuclear Power; Sustainable Development.*

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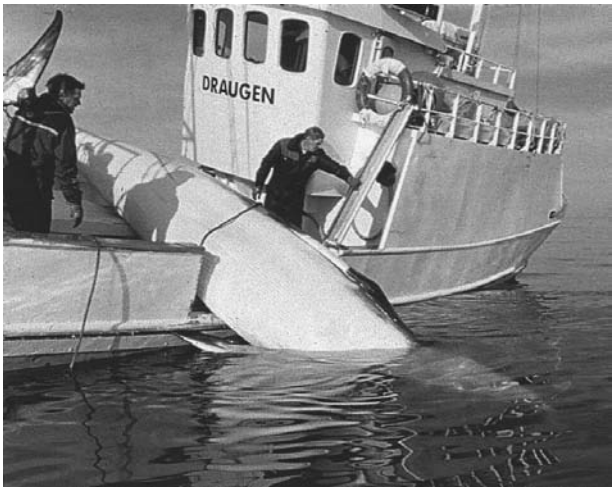
David Kronlid

II. NORWAY

In Scandinavia the ideas of ecophilosophy, ecosophy, and ecopolitics have been a staple of debates on issues related to environmental ethics. Norway has been a hotbed of these ecologically informed philosophies, which offer unique perspectives on living in harmony with the environment. Key Norwegian thinkers include the coauthor of *The Limits to Growth* (1972), Jørgen Randers; the founder of Deep Ecology, Arne Naess; the chair of the World Commission on Environment and Development, Gro Harlem Brundtland; the politician and diplomat Rolf Edberg (1912–1997); and the peace researcher Johan Galtung.

The development of environmental ethics and philosophy gained real momentum in Scandinavia only after the 1960s. It was environmental concerns that arose abroad that triggered Norwegians into action and reflection. Rachel Carson's famous warning against pesticides in *Silent Spring* (1962) was immediately translated into key Scandinavian languages, and it inspired many people to adopt an ecological perspective. Equally important were the environmental writings of Lynn Townsend White Jr. (1907–1987) and Jacques Yves Cousteau (1910–1997), and the reflections on the technological



Whalers off the Coast of Norway, 1999. *Whale blubber was once a hot commodity in Norway, used in a wide range of products. Today the price is so low that even hunters believe its not worth the cost of hauling to land. Environmentalists around the world criticize the whaling practice for violating animal rights; Norway defends it as being sustainable.* **AP IMAGES.**

standardization of human life and nature by the Finnish philosopher George Henrik von Wright (1916–2003).

Scholars active in the International Biological Program (IBP; an effort, from 1964 to 1974, to coordinate large-scale ecological and environmental studies) mobilized a series of students and philosophers throughout Scandinavia to rethink the human condition in the natural world. This program, initiated by members of the International Union of Biological Sciences, focused mainly on problems related to food production and management of natural resources in view of a rapidly increasing human population and widespread malnutrition in the world. In Scandinavia the program was active between the mid-1960s and the mid-1970s, and fully in effect between 1967 and 1972. The managerial benefits of ecological research were, at least initially, stressed in all the Scandinavian countries. The managerial perspective gave way to a biocentrism that accorded intrinsic value to the environment as a whole. The ecologists who dominated the program pledged to deliver scientific and philosophical methods that could generate useful knowledge about the consequences of various modes of land use. Most of their research sought to achieve an energy balance between species, as articulated by the American ecologist Eugene P. Odum (1913–2002). This methodology assumed the desirability of a steady-state economy of human beings that would be in balance with steady-state economy of nature.

ECOPOLITICS VS. ANIMAL RIGHTS

The hegemony of the ecological approach may explain why the protection of individual animals failed to capture public attention in Norway. The few vocal defenders of both animal liberation and animal rights have not been successful in translating philosophical points into political or legal achievements. A case in point is the issue of whaling, which is defended by Norwegian politicians, scientists, and environmental philosophers alike from an ecological point of view. The Norwegians have only been hunting mink whale, which, according to Norwegian marine ecologists, are not endangered. Despite criticisms from environmentalists around the world who more often than not focus on animal liberation or rights, Norwegian environmentalists thus tend to defend whaling as sustainable.

Many of the scientists involved in IBP were deeply concerned about environmental problems. For example, the Norwegian ecologist Ivar Mysterud argued that politics should be put on a secure ecological footing, and in 1970 he suggested the term *ecopolitics* to demarcate managerial environmentalism from an approach to politics based on the science of ecology. The term was quickly adopted not only by fellow ecologists but also by many scholars, activists, and students who questioned the practices of technocracy and industrialism. Much of this criticism had, since the mid-1960s, been informed by populist agrarian socialism, which persisted under the new label ecopolitics from 1970 onward.

Ecopolitics aims at developing a steady-state social economy that would mirror the steady-state balance of the economy of nature. One of many students inspired by steady-state reasoning was Nils Christian Stenseth, who later became a key figure in international ecological research. His first article, published at the age of twenty-three, was about ecopolitics. In it he argued that "all biologists should work for a *steady-state society* in place of the *growth society*," and one should limit the human population growth to zero (1972, p. 118). Ecological modeling represented the way forward, for simulation models could determine exactly when and how to achieve a steady state.

Ecologists began to arrange seminars and various outreach activities to engage scholars in the political and social sciences and philosophy. As a result, the environmental debates in Scandinavia were often framed in terms of ecological methodologies and perspectives. In Sweden, for example, the politician and diplomat Rolf Edberg wrote several popular books about the need to take care of the environment. He described the need to achieve a more harmonious relationship to nature through the science of ecology.

Beginning in the late 1960s, there was a growing concern in Sweden about the effect of airborne industrial pollution originating elsewhere in Europe on the nation's forest industry, a topic brought to international attention

at the United Nations Conference on the Human Environment that took place in Stockholm in June 1972. At the heart of the Swedish agenda was not only raising international awareness but also presenting analytical tools that could address environmental issues. One such tool was socioeconomics, an academic field with strong intellectual ties to the socialist-inspired economies of all the Scandinavian countries.

ECOPHILOSOPHY

In Norway many philosophers were impressed with the ecologists, and they would attend their lectures and participate in their seminars. The Norwegian philosopher Sigmund Kvaløy organized a Coworking Group for the Protection of Nature and the Environment inspired by the ecologists. Those with a philosophical bent met in the Ecophilosophy Group, a subsection of this loose association. Kvaløy was granted a four-year Ph.D. scholarship in philosophy starting in 1967, which he used to explore ecological thinking. He had been Arne Naess's student and assistant since 1961. In 1969 he took over Naess's introductory seminar to epistemology, "Nature and Humans," and quickly turned it into a workshop for his group's work in "ecophilosophy" (a word Kvaløy coined).

Kvaløy's students and followers were fond of quoting Karl Marx's famous saying, "The philosophers have only interpreted the world in various ways; the point, however, is to change it." Turning words into action, the Coworking Group became an effective, hard-hitting student association that targeted hydropower developments. Most dramatic was their attempt to save the Mardøla River, which included Norway's highest waterfall, during the summer of 1970. Naess joined the Mardøla demonstration, and he decided afterward to resign his professorship so that he could devote himself fully to the environmental cause.

At the same time Naess started to attend his own "Nature and Humans" seminar, where Kvaløy was now in charge. Apparently, Naess was one of the few who took notes, and in the spring of 1971 he transformed them into a lecture series titled "Ecology and Philosophy." In these talks he introduced, for the first time, his

> ecosophy ... as a type of philosophy that takes its point of departure from an identification with all life in this life-giving environment. It establishes in a way a classless society within the entire biosphere, a democracy in which we can talk about justice not only for humans but also for animals, plants, and minerals. And life will not be conceived as an antagonism unto death but an interaction with surroundings, a life-giving environment. This represents a very strong emphasis on everything hanging together and emphasizes that we are only *fragments*—not even parts. (Naess 1971, p. 54)

ECOSOPHY

The Mardøla experience and the discussions at the "Nature and Humans" seminar radicalized the thinking of Kvaløy, the charismatic leader. After the Mardøla experience he adopted from ecology the idea that a complex ecosystem is more robust than a simple one in the face of environmental changes. Inspired by Herbert Marcuse, he argued that a complex human society would have a better chance of surviving the environmental crisis than one based on the "one-dimensional man" of industrial society.

Many of the ecophilosophers, including Naess and Kvaløy, were active members of the Norwegian Alpine Club, an organization devoted to technical climbing. Among their many activities, they made several visits to the high mountains of Pakistan. It was during a trip in 1964 that Naess first formulated what later became known as the ecosophy formula. He explained his "thriving" in Pakistan's mountains as a mixture of pain and excitement in the following mathematical terms: $T = G^2/(L_S + Å_s)$. In this equation T, *trivsel,* (thriving) equals G^2, *glød*, (excitement squared) divided by L_S, *legemlige smerter*, (bodily pains) plus $Å_S$, *åndelige smerter* (spiritual pains). This formula would later serve as a key explanation of the meaning of self-realization in Naess's "Ecosophy T," with the T standing for "thriving." The "T" could also be short for Tvergastein, the name of Naess's cottage, or also "Tolkning" (interpretation) as this was important to his early philosophy. There is, however, only circumstantial evidence for these readings.

Equally important to his ecosophy was Mohandas Gandhi's (1869–1948) teaching of nonviolence, which came to the forefront of Naess's thinking after his first visit to Pakistan in 1950. Back in Oslo he gave a lecture series about Gandhi's political ethics that resulted in a book he coauthored with the young sociologist Johan Galtung that was published in 1955. In 1960 Naess followed up with a popular version of this work, which was translated as *Gandhi and the Nuclear Age* in 1965. Here he argued that people from the Europe and North America had much to learn from Gandhi given the threat of nuclear Armageddon.

DEEP ECOLOGY

Naess introduced the concept of Deep Ecology in a paper at the World Future Research Conference in Bucharest in early September 1972. The conference was organized by the World Futures Studies Federation. What dominated future studies in 1972 was *The Limits to Growth* report for the Club of Rome written, among others, by the twenty-seven-year-old Norwegian solid-state physicist Jørgen Randers. At the time Randers was entirely unknown. It was therefore a shock to Norwegian environmentalists to see him rise to world fame through a

report that came to dominate environmental debate at the United Nations' conference in Stockholm. Though *The Limits to Growth* predicted that there would be limits to natural resources, it did not predict limits to existing political systems. The MIT group behind the report was, in this respect, part of a larger trend of environmentalists looking for solutions to ecological problems within established social structures.

For Galtung and Naess the time was ripe in Bucharest to hit back at what they saw as a "shallow" technocratic analysis of the environmental situation. Galtung spoke first with his paper "*The Limits to Growth* and Class Politics" (1973), a head-on attack on the lack of social analysis in the report. When it was Naess's turn to mount the rostrum in Bucharest, he, too, took an anti-class posture in presenting "The Shallow and the Deep Ecology Movement" in Norway. Upon returning to Oslo Naess used his notes to compile a summary which he published as "The Shallow and the Deep, Long-Range Ecology Movements" in 1973.

Ironically, the long-range ecology movement Naess spoke of faded upon his return to Oslo, as the Coworking Group for the Protection of Nature and the Environment was infiltrated and taken over by Marxist-Leninists. The group dissolved in 1973 after a period of internal cleansings and futile debates about the value of democracy. Its last unified stand came with the national referendum on membership in the European Community at the end of September 1972. The group was decisively opposed to joining, arguing that "this industrial-serving mega-society seeks to break apart the established *diversity* of sturdy self-governed and heterogeneously, traditional-colored local communities and replace them with a uniform system of government that presupposes uniform social units and a uniform culture: a simplification that increases vulnerability, according to the science of ecology" (Samarbeidsgruppa 1972, p. 91). They made their case: Norway voted against EU membership but could not decide on what to do next. As a result, the ecophilosophers split into socialist and ecological wings. Kvaløy and Naess regretted this leftward turn in the politics of ecology because it undermined the broad science-based environmentalism they sought to mobilize. They subsequently continued with their activities outside the academic realm in various environmental organizations where they, among other things, mobilized people to save the Alta River in the north of Norway.

GRO HARLEM BRUNDTLAND

When the young and politically inexperienced feminist Gro Harlem Brundtland became minister of the environment in 1974, she faced the ecophilosophers in various heated debates and rough conflicts. They used every opportunity to show that the ecological steady-state society was not an herbal-tea party but a revolutionary break with industrial growth. As a medical doctor, she took a strictly anthropocentric stand against them and the ecologists claiming to speak on behalf of nature, arguing in favor of bureaucratic rules and democratic procedures instituted by humans to the benefit of humans and especially the working class she represented as the head of the Labour Party. In offering resistance to her views, both the ecophilosophers and the ecologists forced Brundtland to reflect more deeply on social aspects of environmental affairs, as she later did in *Our Common Future* (1987).

CONCLUSION

Norwegian ecologists' and environmental activists' concerns for the environmental future mobilized a series of students and philosophers to rethink the human condition in the natural world. Their innovative thinking about ecophilosophy, ecosophy, and eco-politics became part of the international debate.

SEE ALSO *Animal Ethics; Deep Ecology; Environmental Policy; Environmental Politics; Limits to Growth; Naess, Arne.*

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Peder Anker

SCHUMACHER, ERNST FRIEDRICH
1911–1977

Ernst Friedrich Schumacher was an economist, policy adviser, and essayist who was born in Bonn, Germany, on August 16, 1911. His most famous work, *Small Is Beautiful* (1973), sold millions of copies and helped spark the "intermediate" or "appropriate technology" movement. Schumacher died in Switzerland on September 4, 1977.

EDUCATION AND EARLY WORK

E. F. Schumacher studied economics from an early age, eventually becoming a Rhodes Scholar, and traveled to England to study at New College, Oxford. Throughout the late 1920s and early 1930s Schumacher's life and work were overshadowed by the struggles in his Germany to cope with a series of economic and political crises that led to the rise of Adolf Hitler and the Nazis. At the outbreak of World War II Schumacher was interned in England as an enemy alien and later was forced to work as an agricultural laborer. That experience fostered his interests in farming, soil management, and Marxist socialism that were to influence his future activities.

At the end of the war Schumacher—now a British citizen—was made a member of the Strategic Bombing Survey, which examined the impacts of bombing on Germany; he later became a member of the British Control Commission in Germany. After his return to England he became the economic adviser to the National Coal Board, where he stayed until his official retirement in 1971. His early interests in the postwar period revolved around reconstructing Germany and the attempt to establish an international financial and trading system (the World Bank and the International Monetary Fund).

In 1955 Schumacher was invited to go to Burma for a short term as an economic adviser, an event that resulted in an essay published in 1955 titled "Economics in a Buddhist Country," later revised as "Buddhist Economics." The essay drew on his experience of a country whose core way of life was completely different from the world he had inhabited. Schumacher was astonished at the happiness of a people living in poverty. In that essay and in later works he ascribed their contentment to a series of approaches to life: (1) minimizing wants; (2) work as a means of enhancing life; and (3) a spiritual understanding of human beings. The enrichment of life was seen as the purpose of economics. In this way Schumacher rediscovered in Burma a buried British tradition (sometimes referred to as the Third Way) of economic socialism that derived from John Ruskin, William Morris, and R. H. Tawney and was instrumental in creating Gandhi's spiritual economics.

PHILOSOPHY AND LATER WORKS

Schumacher's new interest in the problems of developing countries led him to India, where the vast distance between the high-technology future planned by the government with the assistance of international economic advisers and the poverty of the population led him to push for intermediate technologies that would enhance the work people were doing through the application of appropriately considered improvements.

Small Is Beautiful: Economics as If People Mattered (1973) is a series of overlapping essays. "Nuclear Power—Salvation or Damnation" not only attacks the economics of nuclear power but also points out in detail the intransigence of the waste problem. "Development" articulates the emerging problem of rich elites in developing countries as enclaves of westernization in a sea of poverty. "Social and Economic Problems Calling for the Development of Intermediate Technology" puts forward a diagnosis and a work agenda that would be followed by the Intermediate Technology Development Group (ITDG). The most famous chapter, "Buddhist Economics," set out the essentials of ecological economics long before anyone gave it a name: Schumacher makes clear the distinctions between renewable and nonrenewable resources and the folly of living off capital rather than interest. "How to obtain given ends"—the dignity of the human—"with minimum means" is Schumacher's version of what a Buddhist economics should be; as opposed to a system driven by a goal of maximum consumption. *Good Work* (1979) is a complementary series of speeches and short essays published after Schumacher's death that includes an indictment of dependence on oil.

Guide for the Perplexed (1977), which was written after Schumacher's conversion to Catholicism, is an attempt to put forward a more extensive philosophy and theology. It is essentially an updated version of medieval Christianity based primarily on the thought of Saint Thomas Aquinas and argues that contemporary philosophies are "horizontal" (concerned only with the material world), whereas a "vertical" approach is more appropriate to beings who ascend from mere physical life, the mineral, through plants, to consciousness, and then to self-awareness. The book claims that people need an adequate level of response to the problems at each level.

SEE ALSO *Buddhism; Nuclear Power; Ruskin, John; Technology.*

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Peter Timmerman

SCHWEITZER, ALBERT
1875–1965

Albert Schweitzer, theologian, philosopher, concert organist, and physician, was born on January 14, 1875, in Kaisersberg, Alsace-Lorraine. In 1912 Schweitzer left his position as professor of theology at the University of Strasbourg to become a mission doctor at Lambaréné in what later became Gabon.

Schweitzer is best known for his philosophy of reverence for life, which he developed in response to the sense of cultural crisis that was widespread in Europe in the late nineteenth and early twentieth centuries. Schweitzer argued that the failure of ethics to provide an orientation to life rests on trying to base ethics on a worldview that claims that the world itself is structured by and oriented toward ethical values. Rejecting any such metaphysical project, Schweitzer called for an ethics based on a view of life as practical action within the world.

Schweitzer's development of his ethical view of life is a form of life-philosophy (*Lebensphilosophie*), a nineteenth and twentieth century development that put life and will at the center of philosophical thought. His orientation is explicitly existential: How can an individual give positive meaning to life, starting with the will to live as each individual immediately experiences it. Ethics has the task of giving the human will to live a focus that frees it from alienation and pessimism. "Deepened affirmation of world and life consists in this: that we have the will to maintain our own life and every kind of existence that we can in any way influence, and to bring them to their highest value" (Schweitzer 1987 [1923], p. 278).

Schweitzer says that when human beings affirm both their own inner will to live and the will to live in all forms of life, they experience contact with something much deeper: "Reverence for life means to be in the grasp of the infinite, inexplicable, forward-urging will in which all Being is grounded" (Schweitzer 1987 [1923], p. 283). Schweitzer argues that this mystical experience is necessary for a genuinely positive orientation toward life.

The principle of reverence for life has important implications for human relations with animal and plant life (see Schweitzer 1988 [1919]). Our world is "a ghastly drama of the self-estrangement of the will to live. One existence makes its way at the cost of another; one destroys the other. . . . I can do nothing but hold to the fact that the will to live in me manifests itself as will to live that desires to come to harmony with other will to live" (Schweitzer 1987 [1923], p. 312).

Recognizing that injury to life is necessary for sustaining human life, Schweitzer asked how it is possible to lead a concrete life of reverence for life. While causing unnecessary suffering and harm is strictly forbidden, Schweitzer acknowledged that reverence for life has an unavoidably subjective or personal dimension. One person may conclude that reverence for life requires one to be vegetarian; another that eating animal flesh is permissible. Each, in making this subjective decision, may be showing reverence for life, but if one decides to eat meat, one has the objective obligation to ensure that animals live and die without unnecessary suffering. However one decides this question, one always lives at the expense of other life, and to this extent one is always guilty.

While Schweitzer's thought has been influential in animal-welfare movements, it has had less impact on environmental thought. But his insistence on reverence for all life, in whatever form, makes his philosophy a potentially important resource for biocentric thought, and reverence for life is a clear relative of Edward O. Wilson's notion of biophilia.

Schweitzer's philosophy of reverence for life presents two major problems for contemporary thought. First, his mysticism concerning the infinite will to live will be foreign to many people, though the experiential nature of this mysticism will make it accessible to some. He insists that his mysticism is not an abstract worldview, but rather a concrete attitude toward life. One may want to ask, however, whether this mysticism successfully avoids the problems Schweitzer sees in abstract mysticism. Second, Schweitzer's emphasis on the guilt that inevitably results when a moral agent lives in a world in which life lives at the expense of other life may strike some readers as a version of original sin. One may want to ask whether a moral life that lives at the expense of other life is possible without guilt.

SEE ALSO *Animal Ethics; Biocentrism; Biophilia; Intrinsic and Instrumental Value; Life: Respect/Reverence; Wilson, Edward O.*

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J. Claude Evans

SEED BANKS

Seed banks are facilities for conserving seeds, either by continually replanting and harvesting them in the places in which they were bred (in situ) or by placing them in some form of remote storage (ex situ). Seed banks play a key role in crop improvement and in the conservation of biodiversity. There are more than 1,500 government, private-sector, and nongovernment-organization seed banks around the world with more than 6 million accessions—different landraces or varieties—in storage.

Modern agricultural practices have dramatically reduced the number of landraces, or traditional regional varieties that are grown by local farmers. Farmers who continue to plant the varieties of their forebears conserve tremendous the genetic variation that has been created over thousands of years of artificially—as opposed to naturally—selected mutations, natural hybridizations, and chromosomal aberrations. Genetic diversity is also being destroyed by other human activity and global climate change. The Food and Agricultural Organization (FAO) estimates that in 1949 there were 10,000 wheat varieties grown in China. In the 1970s that number had shrunk to 1,000 varieties (1997).

Seed banks also provide a reservoir of genes and cultivars (a variety of plant that originates and persists under cultivation) that can be used by research scientists and farmers. There are instances in which catastrophic events such as wars or hurricanes have destroyed the seed of an important traditional variety and the seed bank material was used to reestablish the cultivar. Following the Rwandan civil war in 1994, several international organizations helped to reintroduce more than 275 bean varieties back to Rwandan farmers, thus helping to restore food security.

Plant breeders are the major users of the genetic material stored in seed banks. Cultivars, landraces, and wild populations stored in the seed banks provide the genes and genetic resources needed by plant breeders to develop new cultivars with increased yield, pest resistance, and other valuable traits. Plant breeders will screen large numbers of accessions from seed banks to identify new genes for biotic and abiotic stresses, including insects, diseases, temperature, and soil. They will also look for other genetic traits, including growth habit, nutrition, color and quality. Wild germ plasm can also be used by plant breeders to improve yield and other important traits of agricultural crops.

Seed banks only store the genetic material, whereas farmers who plant landraces or allow plants to grow in their natural habitat will continue to create new genes and gene combinations. Both biotic and abiotic stresses help to select new genes that will then be available to the plant breeders. Creating new genes through mutation is important as climate change continues to influence plant production. In situ cultivation over thousands of years is what has produced the genetic variation that we have today. The ideal way to store genetic diversity is in situ. This method allows the population to continue to create additional genetic diversity. The Convention on Biological Diversity (CBD) states that ex situ conservation should complement in situ conservation. The CBD (1993) enhanced global awareness of the importance of conserving, using, and sharing the benefits of genetic diversity.

Doomsday Vault, Norway. *The Svalbard Global Seed Vault, known as the "doomsday" vault, was officially opened in February 2008, to protect millions of food crops from climate change, wars, and natural disasters in the remote Arctic location. Several seed banks exist around the world, in order to protect against an accidental loss of genetic diversity.* **AP IMAGES.**

A seed bank (the Svalbard Global Seed Vault) has been built in northern Norway, 696 miles from the North Pole. It will hold more than 3 million samples at minus 18 degrees Celsius. Opened in February 2008, this seed bank will preserve seed from the world's major and minor food crops. It was built by the Norwegian government and will be operated by the Global Crop Diversity Trust.

SEE ALSO *Agriculture; Biodiversity; Convention on Biodiversity; Farms; Food; Global Climate Change.*

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Russell Freed

SELF-AWARENESS

SEE *Consciousness.*

SELF-CONSCIOUSNESS

SEE *Consciousness.*

SHEPARD, PAUL
1925–1996

Paul Howe Shepard was born on July 12, 1925, in Kansas City, Missouri. His life-long fascination with natural history and evolution led to research in many fields of inquiry in the sciences and social sciences. He is credited with synthesizing this far-ranging view into a human ecology that explicated the relationship of humans to the whole of nature.

Shepard acknowledged that his theory was informed by his boyhood experiences, first in collecting and keeping animals as a child, and later in youth, through hunting, fishing, trapping, and falconry. His original view of human ecology was culminated, at the age of fifty-seven, in *Nature and Madness* (1982). In this psychohistory, Shepard explains attenuated development and maturation in humans, examines our puzzling estrangement from nature, and proposes the proper rearing of children close to nature.

Nature and Madness followed years of seeking the origins of nature perception in humans. In 1950, after graduation from the University of Missouri and a brief stint as field representative of the Missouri Wildlife Federation headed by Charles Callison, Shepard entered a Master's Conservation Program at Yale University, co-directed by renowned plant ecologist Paul Sears and evolutionist G. Evelyn Hutchinson. Focusing on the relationship of art to ecological perception in pioneer America, Shepard plunged into the study of the Hudson River School painters of the 1830s and 1840s. He broadened this study in an interdisciplinary doctoral program that culminated in his dissertation, "American Attitudes Towards the Landscape in New England and the West, 1830–1870."

During his graduate studies and his first academic appointment at Knox College, Shepard was a grassroots activist in his summer employment as a seasonal state and national park ranger. At Big Spring State Park in Missouri and at Olympic National Park in Washington, he was a whistleblower, publicizing the illegal logging of old growth forests, which led in both cases to administrative and policy changes. As conservation chairman of the National Garden Clubs of America, he initiated letter-writing campaigns supporting the creation of the Arctic National Wildlife Refuge and opposing the use of pesticides and the building of a dam in Dinosaur National Monument. In his first teaching position at Knox College, he transformed old mine tailings and pits into a biological field station, Green Oaks, restoring one meadow to tall-grass prairie. During this period of his life he was married to Melba Wheatcroft Shepard and they had three children, Kenton, Margaret, and Jane.

Shepard's studies on the influence of landscape aesthetics on nature perception were presented in 1967 in his book, *Man in the Landscape: A Historic View of the Esthetics of Nature*. This book, along with the anthology *The Subversive Science*, co-authored with Daniel McKinley, were important to developing ecologists and used as popular readers for burgeoning environmental studies programs. Published posthumously in 2003, *Where We Belong* is a collection of essays on landscape and place also written by Shepard during this period.

After living in Massachusetts and holding several teaching positions in the East, in 1973 Shepard and his second wife, Ruth Attwood Shepard, moved to California where he was named Professor of Human Ecology and Natural Philosophy at Pitzer College, one of the Claremont Schools.

Years of writing and research on nature perception led Shepard at this time to an unexpected conclusion: Landscape art and literature, rather than drawing us to nature, distance us from it and creates a world of observers rather than participants. It was then that he turned to anthropology. Soon after arriving at Pitzer College, Shepard published his much acclaimed *The Tender Carnivore and the Sacred Game* (1973), a celebration of our primal hunter and gatherer forebears. However, his assertion that domestication turned humans away from a harmonious foraging way of life drew strong criticism.

Enthralled by animals from an early age, Shepard believed that humanity emerged in close association with

animals and cannot be complete without them. He explored this connection in three books. *Thinking Animals: Animals and Human Development* (1978) shows how animals have been and still are integral to human thought and language. *The Sacred Paw* (with Barry Sanders, 1985) establishes the significance of the bear to northern hemisphere peoples in art, mythology, and literature. And in *The Others: How Animals Made Us Human*, published posthumously in 1996, Shepard explores the relationship of humans to animals in diverse cultural contexts throughout history.

Shepard retired from teaching at Pitzer College in 1994. He died at home in Salt Lake City on July 16, 1996, as his last book, *The Only World We've Got*, a reader, was published. In *Coming Home to the Pleistocene* (1998)—edited by his third wife, Florence Krall Shepard, and published posthumously—he summarized and clarified his most important insights into our human ecology and development. He believed that carried deep in our DNA is an integrated person who knows how to live ethically and ecologically on Planet Earth.

SEE ALSO *Environmental Activism; Environmental Aesthetics; Environmental Art; Hudson River School; Hunting and Fishing: II. Recreational Hunting; Space/Place.*

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Florence Shepard

SHIVA, VANDANA
1952–

Vandana Shiva, who was born in Dehra Dun, India, in November 1952, is one of the leading environmental scholars and activists in the world. Originally trained in physics, she completed a doctorate in the philosophy of science in 1978. She is the author and editor of fifteen books and has published more than three hundred articles in addition to lecturing worldwide. In 1982 she established the Research Foundation for Science, Technology and Natural Resource Policy in India, which supports local environmental struggles, promotes biodiversity, and protects indigenous knowledge. Shiva has developed an activist platform for "earth democracy" that is opposed to life-destroying corporate globalization and demands local sovereignty over food systems, water systems, and biodiversity systems.

Shiva's critique of corporate globalization identifies the multiple ways in which Western economic development strategies and technological incursions destroy not just nature but native knowledge and social relations as well. In *The Violence of the Green Revolution* (1989) she identified the destruction caused by first world corporations in their efforts to increase crop productivity and profits. For many, the Green Revolution brings to mind advances in agricultural development that allowed greater food production to feed an ever-increasing human population, particularly after years of catastrophic famines. Shiva's discussions reveal a darker side in which high-yielding seeds brought environmental, economic, and social disasters. Corporations that developed and owned the new technologies turned biologically diverse and sustainable local farms into monoculture plots that were dependent on corporate products and World Bank loans for funds to purchase the products. When a crop failed, there was nowhere to turn, and in communities that had changed their farming practices a bad year meant economic and social collapse. In addition, the toxic pesticides and chemical fertilizers that were necessary for "advanced" methods of farming destroyed native plants and depleted soils.

Building on her earlier criticisms of the development of industrialized agriculture, Shiva is an outspoken critic of genetically modifying foods and patenting life, which she addressed in *Biopiracy: The Plunder of Nature and Knowledge* (1997). When corporations claim ownership of the earth and the living things on it, the value of

nature and those who work with nature is diminished. Bidiversity and sustainability are sacrificed for profit.

As both a writer and an activist, Shiva uses her scholarly analyses to develop ecologically sustainable alternatives. For example, to combat the problems associated with the intervention of corporate agribusiness in Indian farming and the increasing destruction of globalized food production, Shiva formed an organization, Navdanya, whose name means ''nine crops'' that represent India's collective source of food security. Navdanya supports local organic farming, rescues and protects seeds and plants that are threatened with extinction, and defends native knowledge and food security.

Most of the farmers who produce most of the food in the third world are women, and Shiva is aware of the way in which ecological destruction disproportionately affects women. From her early days as part of the Chipko movement, which was made up of Himalayan women dedicated to the protection of the environment, through her critique of ''maldevelopment'' in *Staying Alive: Women, Ecology and Development* (1988), to the formation of an international coalition of women to respond to globalization called Diverse Women for Diversity, Shiva's environmentalism has been linked to the struggles of women.

Shiva has argued that the masculine way of thinking, doing science, and defining progress as controlling wealth and property dehumanizes women as well as men and ultimately will destroy the earth. This destructive force of patriarchy requires harnessing the creative power of women and nature. To accomplish this, those in positions of economic and epistemic power relegate women and nature to the realm of the passive. Once something is made passive or inert, Shiva argues, it can be used and commodified more readily. The health of the planet demands that women's labor and knowledge and the earth itself not be used in these ways, and thus she sees feminism and environmentalism as powerful political partners. This partnership can provide liberation from the life-destroying systems that currently threaten women, particularly third world women, and the planet.

Some have criticized Shiva's stance against global corporate techno-culture as over-simplified. Critics claim that she has underestimated the value of technological advances in saving lives. Shiva's stance is not anti-technology, however. She advocates democratic, community participation in the decisions to use and control technology and raises cautionary concerns about the long-term effects of technological incursions into social relations and our delicate relationship with the Earth. Recently she has issued warnings about the dangers of rushing to replace oil with biofuels, or fuels derived from corn, soya, and other common food crops. She argues that this quick fix solution will negatively impact the lives of poor people who will not be able to afford food.

SEE ALSO *Agriculture; Berry, Wendell; Biodiversity; Borlaug, Norman; Chipko Movement; Ecological Feminism; Environmental Activism; Factory Farms; Farms; Food Safety; Genetically Modified Organisms and Biotechnology; India and South Asia; Jackson, Wes; Patenting Life; Sustainability.*

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Lori Gruen

SHRADER-FRECHETTE, KRISTIN
1944–

Kristin Shrader-Frechette was born on September 14, 1944, in Louisville, Kentucky. She got her B.A. in mathematics from Xavier University, earned a Ph.D. in philosophy from the University of Notre Dame, and held postdoctoral fellowships in biology (community ecology), economics, and hydrogeology. As of 2008 she is O'Neill Family Professor of Philosophy and Concurrent Professor of Biological Sciences at the University of Notre Dame. She is the author of more than 350 articles and 15 books, much of this work focused on ethical and methodological issues that arise in connection with technological risks to humans and the environment, the actual consequences of various technologies, and related governmental regulatory efforts. She also writes on ethical theory and the scientific method.

Shrader-Frechette's work has regularly addressed problems related to nuclear technology. She has written extensively on the proposed permanent nuclear-waste

repository in Yucca Mountain, Nevada. Because of the nature and extent of the scientific uncertainty regarding whether such waste could be safely housed there (or anywhere) for 10,000 years—a number that is, in any case, problematically arbitrary—she claims that the Department of Energy should delay determination of the site's suitability and store waste for a century in numerous regional, monitored, retrievable facilities while the option of permanent interment is further studied. She has criticized federal regulations governing releases of radiation from the site, arguing that the U.S. Environmental Protection Agency's suggested radiation-exposure limits, which are twenty-three times higher for the distant future than for the near future, fail the demand for equal protection, indefensibly entailing that we merit more protection than our descendents in spite of the fact that we, not they, profit from the power for which the waste was generated. Furthermore, she holds that the agency should not assess compliance with these regulations according to mean and median doses of exposure across the affected population, since both of these approaches are capable of sanctioning lethal doses for many people. Instead, compliance should be assessed according to whether any individual faces an exposure dose over a certain amount. She has also written on the siting of uranium-enrichment facilities, the effects and cleanup of low-dose ionizing radiation from above-ground nuclear-weapons testing, and safety regulations in the nuclear-workplace environment.

Shrader-Frechette has consistently defended the use of cost-benefit analysis in environmental-policy decision making, albeit only where such analysis is conceived of and conducted in ways she sees as appropriate. She believes that while its use may be necessary for rational societal decision making, it is not sufficient, since considerations such as who is responsible for creating the risk, who benefits from the risk, whether the risk is involuntarily imposed or voluntarily chosen, what moral and legal rights affected parties have, and so on, can override narrow cost-benefit judgments. She maintains that assessments of policy-related gains and losses must be scientifically well informed—a demand to which economists have traditionally been somewhat insensitive. Such analysis must treat risk assessment as not purely subjective, that is, not as matters purely of value rather than fact. However, she argues, this does not mean that risk assessment or the resultant determination of costs and benefits should be conceived of as a purely scientific process in which only expert analysis counts. Rather, public deliberation is critically important. The appropriateness of lay persons' involvement is based in the stake that we all have in the outcomes of these policy decisions, in the very idea of democracy, and in the fact that scientific judgments are often unavoidably plagued by uncertainty. Thus, Shrader-Frechette makes a much smaller role for technocrats in regulatory decisions than do some others (perhaps most notably Cass Sunstein).

Shrader-Frechette has also produced writings central to the development of the environmental-justice movement and been involved on the ground in environmental-justice efforts around the world. In the Congo, for example, she worked with the World Council of Churches to advise locals on how to avoid having toxic waste shipped to their land from developed countries. And with her students, she helped the predominantly African-American community of Scarboro, Tennessee—one with high numbers of children suffering from respiratory and pulmonary ailments—assess local levels of exposure to pollutants, including beryllium, lead, ionizing radiation, mercury, and polychlorinated biphenyls. She has advised the United Nations, the World Health Organization, numerous foreign governments, as well as the president of the United States, the U.S. Congress, and various federal and state agencies. She was the first female president of several prestigious scholarly associations and societies.

SEE ALSO *China; Cost-Benefit Analysis; Environmental Justice; Environmental Policy; Global Climate Change; Nuclear Power; Pollution; Resource Management; Risk Assessment; Urban Environments; U.S. Environmental Protection Agency.*

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Ty Raterman

SIERRA CLUB

The Sierra Club has influenced environmental thought and policy in the United States for more than one hundred years. The club's original regional focus has gradually enlarged to the point where it now has a global presence, with more than 1 million members. This shift has been accompanied by an evolution of the organization's goals, methods, and overall philosophy. With a history intertwined with that of the National Park

Service, the Sierra Club has a strong tradition of both conservation and recreation.

As its name suggests, the Sierra Club was inspired by the Sierra Nevada mountain range of California. Revered today as a patron saint of not only the Sierra Club, but also of the conservation movement as a whole, John Muir (1838–1914) articulated an early statement of purpose. Even before the organization was founded, Muir, along with the editor Robert Underwood Johnson (1853–1937), lobbied Congress successfully for the creation of Yosemite National Park in 1890. On May 28, 1892, a coalition of prominent San Francisco Bay area residents, including professors from Stanford and the University of California, joined Muir and Johnson in founding the Sierra Club. They wanted to defend and enlarge Yosemite but also sought to formulate larger scientific and recreational goals for California.

The Sierra Club found its voice in Muir, whose writing was published by the organization in its journal, the *Sierra Club Bulletin*. Muir's enthusiasm was infectious, fostering opportunities for others to visit the mountains. By 1901 the Board of Directors approved summer excursions. That first year nearly a hundred people went to Tuolumne Meadows in Yosemite. The numbers of participants in outings grew rapidly, along with membership totals.

In 1914 the Sierra Club organized a final trip to Hetch Hetchy Valley. Considered by many to be Yosemite Valley's equal in beauty, Hetch Hetchy was the subject of a long fight between conservationists and the city of San Francisco, which sought to dam the valley for its municipal water supply. This controversy tested the young Sierra Club and drove a permanent wedge between two groups of conservationists that previously held a shaky truce: on one side were the "preservationists," whom the Sierra Club fully embraced, and on the other were the utilitarians, or "conservationists," headed by the first chief of the United State Forest Service, Gifford Pinchot (1865–1946). Preservationists argued for retaining natural lands with minimal management, while utilitarians believed that wild lands can be productively used for multiple purposes. The Sierra Club failed to preserve the valley: In 1913 Congress approved the damming of Hetch Hetchy.

Following that defeat the Sierra Club won a victory with the passage of the National Park Service Organic Act of 1916, which created this new government agency and appropriated federal funding in its support. Utilitarians such as Forest Service Chief Pinchot thus saw their influence eroded in the national parks. Efforts to develop and make accessible places such as Yosemite were a major focus of the next several decades. Hiking trails were built, and Sierra Club members began pioneering new ways to explore the mountains. Mountaineering and rock climbing techniques opened up previously inaccessible areas. Lightweight hiking and camping gear made these expeditions more enjoyable and popular. The 1920s saw major road-building efforts, and the automobile brought ever-increasing numbers of tourists to the expanding park system.

The recreational successes that the Sierra Club was enjoying began to clash with the group's ecological goals. Development of the most scenic areas in the country was so rapid and overwhelming that the parks were in danger of being destroyed by overuse. As Michael Cohen notes, the organization's statement of purpose was amended in 1951 to read "explore, enjoy, and preserve" instead of "explore, enjoy, and render accessible" (1988, p. 100). Working with other groups such as the Wilderness Society, the Sierra Club was no longer satisfied with national park designations unless they were backed by an ecological vision.

The early 1950s brought many changes and fights to the Sierra Club, both internal and external. David Brower (1912–2000) became the club's first executive director in 1952. His leadership, along with a proposal to dam the Colorado River in 1951 at Echo Park and flood Dinosaur National Monument, spurred the Sierra Club to employ more aggressive tactics. One strategy was full-page newspaper ads to lobby against the proposed dam; these ads brought the Sierra Club to the Supreme Court when their tax-exempt status was threatened. Meanwhile, the organization brought tens of thousands of new visitors to Dinosaur, many of whom experienced the area by rafting the Colorado. The club's tradition of making previously unknown places accessible proved successful in this case: The proposal to dam the river at Echo Park was thwarted in 1956, although construction began for the Glen Canyon Dam. The Sierra Club continued to publish books in support of its mission and branched out into filmmaking. The organization decided to avoid losing its tax-exempt status, however, by not directly lobbying the government.

The Sierra Club now had a national presence yet retained a regional focus through its local chapters. This local presence was enhanced when the club's tax-exempt status was revoked. Fighting against a proposal to dam parts of the Grand Canyon, the Sierra Club took out several full-page advertisements in national publications. Their most famous ad, published in 1966, proclaimed, "Should we also flood the Sistine Chapel so tourists can get nearer the ceiling?" Membership skyrocketed. April 22, 1970, the first Earth Day, sparked a rise in awareness of environmental issues that brought the Sierra Club still more members. However, this wave of members came without Brower, who resigned as executive director in 1969 after several years of clashes with board members.

Sierra Club Ceremony, Johnson City, Tennessee. *Members of a local Sierra Club chapter stage a "funeral" for four ancient beech trees cut down to make way for development in 2005. The organization, with John Muir as its patron saint, has been around since the early twentieth century.* **AP IMAGES.**

Through the 1970s the Sierra Club's platform became more wide-ranging. The group addressed issues such as overpopulation, arguing that birth rates in the United States are too high; the club, however, does not take a position on immigration or issues it sees as disconnected from conservation. Brower, after reconciling with the Sierra Club, led a faction that argued for a public position against immigration in 2000, but the club's moderate elements steered official club policy towards a more compromising stance. Notably, younger conservation and environmental organizations have criticized the Sierra Club as being too willing to compromise and make deals with Washington. These groups argue for grassroots activism and suggest that the Sierra Club has strayed too far from John Muir's originary vision.

Despite criticism, traditional conservation causes remain important to the Sierra Club. For example, it has repeatedly lobbied to keep the Arctic National Wildlife Refuge closed to oil drilling and has worked to create new wilderness areas. Global and urban issues also attracted the Sierra Club as the group passed its centennial in 1992. Climate change and renewable energy became major policy issues, as have clean urban spaces and environmental justice. The Sierra Club has evolved into a comprehensive conservation group that has managed to keep local chapters small and dedicated to excursions. Nevertheless, it maintains a national presence and wields considerable influence in Washington, D.C. These efforts to be local yet global, to protect yet promote, have created a flexible and lasting organization.

SEE ALSO *Conservation; Environmental Activism; Environmental Law; Environmental Policy; Hetch Hetchy; Mountains; Muir, John; Nongovernmental Organizations; Pinchot, Gifford; Preservation; U.S. Forest Service; Utilitarianism; Water; Wilderness.*

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Kyhl Lyndgaard

SINGER, PETER
1946–

Peter Singer was born in Melbourne, Australia, on July 6, 1946. He completed undergraduate studies in law, history, and philosophy at Melbourne University and did graduate work in philosophy at Oxford, where he received a bachelor of philosophy degree in 1971.

His primary appointments have been as a professor of philosophy at Monash University in Australia and a professor of bioethics at the Center for Human Values at Princeton University; he also has held visiting positions at universities around the world. Singer addresses timely and provocative moral issues, has a clear and accessible writing style, and is a socially engaged public intellectual. He is said to be among the most influential philosophers alive (Specter 1999).

PRACTICAL ETHICS

Singer's most important contributions have been in practical ethics. He helped establish the applied ethics movement in which philosophers turned their analytical and argumentative skills toward matters of moral significance and public interest. He has focused primarily on "relevant" issues that "any thinking person must face" (Singer 1993, p. v).

Singer has argued vigorously for challenging, usually unorthodox positions on the treatment of nonhuman animals; the obligations affluent people have to people living in absolute poverty; the ethics of globalization; environmental protection, including measures to reduce climate change; and major issues in bioethics, including

euthanasia and abortion. His works offer a critique of the doctrine of the sanctity of life.

ANIMAL LIBERATION AND ANIMAL RIGHTS

In *Animal Liberation,* first published in 1975, Singer challenged the morality of using nonhuman animals for food and scientific experimentation. He maintained that it is inconsistent to use animals for purposes for which people would not consider using a human being, even an infant or a person whose mental level is similar to that of an animal. He argued that such uses are wrong because they result from an unjustified prejudice against other species, which, adopting a term coined by Richard Ryder, he called *speciesism*.

Singer has defended the "fundamental principle of equality," the demand that equal moral consideration be given to comparable interests regardless of whose interests they are, by arguing that that principle best explains why racism and sexism are wrong. In the human case it generally is agreed that women's and minorities' educational, political, and economic interests are comparable to those of white men, and so their interests should be given equal consideration.

In the case of animals Singer argues that many animals also have interests both in avoiding pain and suffering and in experiencing happiness. *Animal Liberation* uses photographs and vivid descriptions to show how animals' interests are given little or no consideration by agribusiness and research industries. That treatment violates the principle of equality and therefore is wrong.

Animal Liberation sold hundreds of thousands of copies and helped start a worldwide animal protection movement. It has been referred to widely as the Bible of the animal liberation movement. In *Practical Ethics,* first published in 1979, Singer supplemented his equality-based defense of animals with a utilitarian defense, arguing that the overall harms produced by these uses of animals typically outweigh the benefits.

In *Practical Ethics* Singer also discussed the major issues in biomedical ethics. His sanctity of life doctrine holds that all human life, regardless of its subjective quality, is equally valuable and thus deserves equal treatment. Singer has argued for an ethic sensitive to relevant details, for example, whether the individual is conscious, is in pain and suffering, has expressed a preference for how her or his life should end, the medical prognosis, and the family's wishes. He has argued that those factors can make it permissible or even obligatory to let a human being die and even be killed actively. Singer thus argues that abortion, voluntary euthanasia, assisted suicide, and even infanticide can be morally permissible and often are.

POVERTY AND MORAL OBLIGATIONS

Singer has applied the principle of equality and utilitarianism to questions about people's moral obligations toward the billion or more people living in and dying from absolute poverty. He has argued that affluent individuals and nations are morally obligated to provide generous assistance to people in poverty, with an immediate response to famines and natural disasters and, more important, long-term development aid. In his essay "Famine, Affluence, and Morality" (1972) Singer defended his conclusions by referring to a simple case: Someone sees a small child fall into a pond and realizes the child is in danger of drowning. She could save the child, but her clothes would get muddy. Is she morally obligated to save the child? Most people would think that she is. Singer argues that this principle best explains why if one can prevent something very bad from happening at an insignificant cost to oneself, one is obligated to do so. By analogy and by appeal to that principle Singer concludes that people are obligated to help prevent the daily needless deaths of tens of thousands of children: Those deaths are very bad, and people can prevent them at only minor costs to themselves.

In *One World,* first published in 2002, Singer applied the principle of equality to climate change and globalization. Affluent nations enjoy their prosperity at significant costs to the environment: Their development and energy-consumptive lifestyles contribute to climate change that threatens the future of life on the planet. There is a scientific consensus on predictions for increased hurricanes and storms, droughts and floods, tropical diseases, rising sea levels, and disruption in food production resulting from climate change. That change probably will affect poor nations the most because they lack the resources to move people from affected areas, store food, and fight disease.

Singer argues that industrialized nations must reduce their greenhouse gas and carbon emissions in an attempt to curb climate change. The principle of equal consideration of interests requires a new global ethic in which leaders of developed nations consider the effects of their policies on all the people affected by them, not just the people of their own nations. He argues that on a variety of plausible theories of fairness and justice, the refusal of the United States to commit to a plan to address atmospheric change, for example, the Kyoto Protocol, is self-serving and ethically indefensible because the United States has 5 percent of the world's population but produces 30 percent of the climate-changing emissions. Because the developing nations' contributions of greenhouse gases will not equal the built-up contributions of the developed nations until about 2038 and, per capita, for at least a hundred years,

Singer argues that industrialized nations should bear the initial burdens; he proposes a cap and trade program to give developing countries incentives to keep their emissions low.

ENVIRONMENTAL ETHICS

In regard to the environment Singer's ethic is an extension of the dominant Western ethics to include all sentient beings. It attributes no intrinsic value to nonsentient entities such as plants, ecosystems, wilderness, species (apart from individual members of a species), endangered species, and nature generally. Singer argues that if an entity lacks or is incapable of subjective experience, it lacks interests that need to be considered. He rejects developments in environmental ethics, such as holism, Deep Ecology, and the land ethic, that posit intrinsic value beyond conscious beings and their experiences.

Singer has argued that his ethic provides strong environmental protection. Many human beings value natural spaces for recreational, scientific, aesthetic, and spiritual purposes: Destroying wilderness, which is irreplaceable, thwarts those interests. Because future generations of humans probably will have such interests, short-term economic benefits from destroying nature should not outweigh this loss to an indefinite number of future humans.

SEE ALSO *Animal Ethics; Civil Disobedience; Environmental Activism; Environmental Philosophy: V. Contemporary Philosophy; Global Climate Change; Speciesism; Utilitarianism.*

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Nathan Nobis

SNYDER, GARY
1930–

Poet, essayist, teacher, Buddhist practitioner, and community activist, Gary Snyder has lived a colorful and storied life. Many readers became familiar with Snyder through his fictionalized representation in Jack Kerouac's 1958 novel *Dharma Bums*, in which his prowess as an outdoorsman and mountain climber is highlighted. Others are particularly fascinated with Snyder's ten-year immersion in Buddhist philosophy and practice from the late 1950s through the late 1960s, during which he lived in various Zen monasteries in Kyoto, Japan, developing habits and affinities to which he continued to adhere into the twenty-first century. And, of course, most people know Snyder through his many important works of poetry and nonfiction, ranging from *Riprap* (his first book of poetry, published in 1959), to his Pulitzer-prize-winning collection *Turtle Island* (1974), to more recent volumes such as *No Nature: New and Selected Poems* (1992), *Mountains and Rivers Without End* (1995), and *Danger on Peaks* (2005). The most compendious edition of his work is *The Gary Snyder Reader: Prose, Poetry, and Translations, 1952–1998*, which appeared in 1999.

Of particular relevance to environmental ethics and philosophy are Snyder's profound engagement with and articulation of the experience of physical labor, his application of Buddhist ideas to the conceptualization of the human relationship with nature, and his personal involvement with local, regional, and global political issues associated with environmental responsibility. The poems in *Riprap* and such later collections as *Myths & Texts* (1960), *Riprap and Cold Mountain Poems* (1965), and *The Back Country* (1967), among others, vividly evoke the presence of a human speaker immersed in the sensory qualities of outdoor experience. One poem from *Riprap*, titled "Mid-August at Sourdough Mountain Lookout," for instance, recalls the poet's seasonal work as a fire lookout in the North Cascades of Washington State, immersing the speaker in the physical realities of the job ("Down valley a smoke haze /... Swarms of new flies. // Drinking cold snow-water from a tin cup / Looking down for miles / Through high still air"). Philosopher Jack Turner writes bitterly in *The Abstract Wild* (1996) that "Science, including economics, tends to reduce nonhuman life to trash...We need to find another way of describing the world and our experience in it" (p. 65). He points specifically to Snyder's work—using an excerpt from *Mountains and Rivers Without End* as an example—to demonstrate the language of engaged non-abstraction.

Many of Snyder's poems resonate with echoes of his Buddhist training, but perhaps one of the most powerful applications of this philosophical tradition to the poet's artistic vision occurs in "Ripples on the Surface," the final poem in *No Nature*. This poem explores how the human mind knows nature, seeking to read it as a text, to apprehend it as if it were a "performance." He concludes by erasing the distinction between nature and human culture, stating "No nature // Both together, one big

empty house." Despite the frequent immersion in the physical world that occurs in Snyder's poetry, this Buddhist angle presents an opposing viewpoint: The phenomenal world is not the essence of reality and essential Truth cannot be perceived or articulated. This idea directly echoes the *Diamond Sutra*. This sacred text, dating back to ninth-century China, explores the fundamental notion of reality and the importance of nonattachment and is a central text in the Mahayana Buddhist tradition.

Despite his Buddhist skepticism toward the ability of humans to apprehend nature, Snyder took a practical stance in late-twentieth-century debates about the meaning of wilderness in American culture. In the essay "Is Nature Real?" (collected in *The Gary Snyder Reader* [1999]), he both acknowledged the validity of contemporary deconstructions of "wilderness" by scholars such as historian William Cronon ("So we understand the point about wilderness being in one sense a cultural construct, for what isn't?") and sharply criticized the political naiveté of such critiques. He states: "The attacks on nature and wilderness from the ivory towers come at just the right time to bolster global developers, the resurgent timber companies . . . and those who would trash the Endangered Species Act" (p. 388).

Patrick D. Murphy begins his 2000 study, *A Place for Wayfaring: The Poetry and Prose of Gary Snyder*, by recalling that when Snyder was a small child, his family moved to Lake City, Washington, an area that had been devastated by clear-cutting. "The significance of this land having been clear-cut for Snyder's psychological and environmental-ethical development should not be underestimated," Murphy argues (p. 1). The poet himself remarked in *The Practice of the Wild* (1990): "I suspect that I was to some extent instructed by the ghosts of those ancient trees as they hovered near their stumps" (p. 118). Later, Snyder directed his social concerns toward the militaristic ambitions of the U.S. government and its allies, noting in his 2003 essay "Ecology, Literature, and the New World Disorder" in *Back on the Fire* (2007) that "we have entered a period in which global relations are defined by new nationalisms, religious fundamentalism, developed world hubris, stepped-up environmental damage, and everywhere expanding problems of health and poverty" (p. 22). Snyder's poetry, too, reflects his sense of social commitment—commitment, that is, to the larger community of life. In "For All," collected in *Axe Handles* (1983) and later in *No Nature,* he laughingly declares his true loyalty: "I pledge allegiance // I pledge allegiance to the soil / of Turtle Island, / and to the beings who thereon dwell / one ecosystem / in diversity / under the sun / With joyful interpenetration for all." This single brief poem captures the essence of the essays collected in the opening section, titled "Ethics," of his 1995 collection of essays, *A Place in Space: Ethics, Aesthetics, and Watersheds*. The "Watersheds" section of that volume includes several essays that explain in detail what it means to live responsibly in a particular community in a particular place, with a long-term (sustainable) vision of that place; essays such as "Reinhabitation" and "Coming into the Watershed" probe the author's essential concepts of community and bioregional governance.

In his 2006 essay "Writers and the War Against Nature" (collected in *Back on the Fire*), Snyder points to "Song of the Taste" (initially published in *Regarding Wave* in 1969) as his "first truly ecological poem" and an exploration of "the essential qualities of human foods" (p. 68). As he explains in this essay, the poem goes "straight to the question of conflict between the ethics of *ahimsa*, nonviolence, 'respect for all beings,' and the lives of necessity and subsistence of indigenous peoples and Native Americans I had known." People who derive their existence from the bounty of nature, he continues, "can enter into the process with gratitude and care, and no arrogant assumptions of human privilege. This cannot come from 'thinking about' nature; it must come from being *within* nature" (p. 69). From his trim, haiku-like meditations on the physicality of human engagement with nature to his Buddhism-inspired reflections and his political critiques, Gary Snyder's work resonates with the implications of a life lived "within nature" and, at the same time, within community.

SEE ALSO *Buddhism; Environmental Activism; Wilderness.*

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Scott Slovic

SOCIAL CONSTRUCTIVISM

Social constructivism is a group of connected claims about how perspectives, knowledge, and perhaps more concrete objects arise through social processes. Most important for environmental ethics, though, are four similar ideas:

1. First, and most important, social constructivists draw attention to the ways in which scientific knowledge does not simply reflect nature, but instead stems from work done by groups of people to describe nature. That work shapes the knowledge produced; therefore, our ideas have social histories. There is no direct path from nature to our ideas about it.
2. Second, not only is scientific knowledge socially constructed, but so are values and meanings (Macnaghten and Urry 1998). People's understandings of nature and wilderness are deeply shaped by their cultures, by their economic positions, by political struggles over environmental issues, and by more idiosyncratic factors such as personal histories. To one person a forest might be a beautiful and fragile piece of wilderness needing protection. To another it might be a resource waiting to be sustainably exploited. To yet another it might be a forbidding and terrifying source of dangers to be contained. All of these meanings stem from particular cultural, economic, and political contexts. If meanings of particular natural objects are socially constructed, so are general environmental values, especially those for which philosophers argue.
3. Third, more materially, much of physical nature itself is socially constructed because many of the environments and landscapes that we take to be natural have themselves been affected by many generations of human actions (Cronon 1995). Forests in North America once looked like pristine wilderness, but even before Europeans logged and cleared them, Native Americans were managing some of those forests through controlled fires. Many of the places that modern urban dwellers most appreciate as natural refuges from the built world have been profoundly affected by human activity and even deliberately shaped for recreation.
4. Finally, what we might call "strong" social constructivism is the claim that how people understand the world *is* the world. This is the claim that with their knowledge of it people shape the world directly. Although there is a philosophical case to be made for strong social constructivism, it is controversial, and we can set it aside here.

THE CASE FOR THE SOCIAL CONSTRUCTION OF SCIENTIFIC KNOWLEDGE

The case for the social construction of scientific knowledge has been made repeatedly in science and technology studies (STS) (Sismondo 2004), and in postmodern philosophy. There is a common saying that "data do not speak for themselves." This point, which denies that data are a sufficient foundation of knowledge, might illustrate justifications for social constructivism about scientific knowledge. Data need to be interpreted before they can have any meaning. There are no absolute rules for interpretation. Instead there are practices, tools, and innovations, all of which have to be acceptable or justified to expert communities. More deeply, the choice of data to be gathered is determined by the questions posed or the hypotheses to be tested; by the means or lack thereof for acquiring data, such as satellite imaging technology or transportation to a remote site; and by the resources for purchasing equipment, conducting surveys, or paying graduate students.

The widely held view that knowledge cannot be absolutely or even solidly grounded is known as *antifoundationalism.* Antifoundationalism is important not only to STS, but also to postmodern philosophy—and even to much modern philosophy. Postmodernists argue and emphasize that people's access to nature is always mediated because there is no direct way to know nature as it is in itself (Smith 1999). They further argue that there are no stable foundations for any values or institutions; therefore, knowledge and values are constructed.

Science and technology are thoroughly social activities. They are social because scientists are always members of communities, enculturated into those communities and necessarily working within them. Communities, among other things, set standards for inquiry and evaluate knowledge claims; there is no abstract, ideal, and logical scientific method apart from the best practices of scientists. In addition, science is an arena in which rhetorical work is crucial because scientists always have to convince their peers and others (including funding sources) of the value of their ideas and plans. Scientific actors have investments in skills, prestige, knowledge, and specific theories and practices. Thus many different types of ideologies and values are important components of research; even conflicts in a wider

society may be connected to conflicts within science and vice versa.

Thousands of empirical case studies have shown that scientists have choices about how and where to look for data, how to interpret that data, what can count as good models and theories, and how to interpret and use those models and theories. To take only one important and well-studied example: The general circulation models (GCMs) that provide our best evidence of human-induced climate change are extremely complicated computer programs that combine models and data in innovative ways (Demeritt 2001; Edwards 2001). The models, and the ways in which the models are applied and programmed, differ from one GCM to another, although they are often related by descent and by cross-fertilization (models typically share ancestors; when researchers can, they use good ideas that they see in other GCMs). The models are corrected by factors that bring them into line with existing data and expectations; this kind of correction is an art. Even the data are not raw, but corrected and smoothed, to take account of the fact that they are collected differently at irregularly spaced weather stations and satellites. Every aspect of a GCM is shaped by choices; communities of experts decide what the acceptable choices are.

Scientific knowledge is produced when the socially sanctioned expert communities, or important parts of them, are satisfied with claims. For uncontroversial claims, the experts might agree very quickly, accepting the authority of the researchers making those claims or the reasonableness of the claims given other things known. Controversies can arise, however, prompting the examining and challenging of many of the choices and arguments, the competence of researchers, and the reliability of equipment. Such controversies can expose the social construction of scientific knowledge. Eventually, minority views are marginalized and excluded from the debates, and the result is a rough consensus.

OPPOSITION TO SOCIAL CONSTRUCTIVISM

The idea that our knowledge is socially constructed may appear obvious. There is, however, another set of connected claims and perspectives, typically going under the label of *realism,* that opposes the views of social constructivism. For realists, our best scientific knowledge is true to nature. Realists claim that social processes do not significantly shape scientific knowledge but instead faithfully record nature's nature and that the emphasis of social constructivism is therefore misplaced (Crist 2004). On this view, scientific knowledge, the meaning of nature, environmental values, and even "natural" spaces may be shaped socially, but they are also shaped by nature. Not only is science shaped by nature, but it must also be approximately true to nature because it is so successful—at contributing to technology, for example. In other words, scientific knowledge passes the pragmatic test of truth: It works.

A further case against social constructivism is that its emphasis makes environmental politics difficult (Soulé and Lease 1995). A focus on the social processes by which scientific knowledge is made tends to undercut that knowledge because it implies that other social circumstances would have produced different knowledge and because confidence in science is based on its reliance on formulaic methods for uncovering truths of nature. Social constructivism, in this view, cripples the ability of science to serve as a solid foundation for environmental politics. Likewise, somebody who claims that wilderness is valuable for its own sake wants to assert that claim as objectively true, not merely as one culturally bound "story" among many possible "stories." Social constructivism, however—in this case, the social construction of values and meanings—does not allow environmental values to trump other factors in political disputes. Even the third, material, form of social constructivism—the observation that some landscapes normally thought to be natural are shaped by people—poses problems for environmental politics because it raises questions about how much and why we should value those landscapes.

SOCIAL CONSTRUCTIVISM AND ENVIRONMENTAL POLITICS

We might think that at least part of the debate about social constructivism and environmental politics hinges on a theoretical clash between social constructivism and realism. If realism is right, and science and philosophy provide natural and ethical truths that mirror the way things are, then environmental politics can rest securely on those truths. If social constructivism is right, and science and philosophy provide only contingent natural and ethical truths, then environmental politics can rest only insecurely on those truths.

In practice, however, these theoretical debates are not important to environmental politics or even to most environmental arguments—not just because the theoretical debates are far removed from the action but also because practical and down-to-earth versions of social constructivism and realism often play roles in environmental disputes. The practical versions make the theoretical ones less relevant.

Environmental politics often pits experts against one another. On the one hand, experts typically try to present their own views as entirely constrained by nature and rationality so that there is no room for disagreement. On the other hand, those same experts find ways in which

opposing arguments are open to challenge. Scientific knowledge laden with choices is not hidden, a truth seen not only by people working in STS or postmodern philosophy; it is regularly rediscovered in disputes. For example, the authority of studies on climate change through GCMs has been continually challenged, both substantively and as a basis for policy (Demeritt 2001). The result is that political expertise in other domains has often played a larger role in energy policy than has climate science.

Values are even more open to challenge. Therefore, environmental politics (and any other kind of politics) is already a constructivist arena. If the stakes are high enough, the pronouncements of experts do not go unchallenged. It is well established in studies of public controversies that as long as the social and political issues are being actively disputed, so will be the scientific issues. In rough terms, all the issues have to be resolved at once.

If the above argument is right, then for science (and philosophy) to play a larger role in politics, they should become more engaged, not less. Since expertise will be ''deconstructed'' during controversies; knowledge should be constructed with controversy already in mind. The authority of science cannot depend on an incorrect formal picture of itself that is open to periodic debunking. The social-constructivist view brings to the fore the complexity of real-world science and therefore can contribute to its success. Successful science in the public sphere can be the result of the ''coproduction'' of science and politics (Jasanoff 2004); science can more easily solve problems in the public domain if scientific knowledge is carefully adjusted to its public contexts and attuned to knowledge that non-scientists have. Perhaps the third, material, form of social constructivism can give us a hint about how environmental politics can thrive in the absence of foundations. A landscape does not have to be a wilderness to have value—although enough people have to be convinced of its value, even in the absence of pure naturalness, for this claim to carry weight. Similarly, scientific and philosophical claims do not have to be indisputable to gain respect—although their authority hinges at least in part on a sufficient number of people being convinced of their value. Social constructivism, then, tells us we have to live without foundations.

SEE ALSO *Environmental Philosophy: VI. Postmodern Philosophy; Environmental Politics; Forests; Global Climate Change; Wilderness.*

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Sergio Sismondo

SOCIAL CONTRACT THEORY

Social contract theory is generally considered to be one of the most significant contemporary political theories. While early forms of the theory are found in views attributed to Protagoras in the fifth century BCE and expressed in Plato's dialogue *Crito* (c. 350 BCE) and summarized in his *Republic*, as well as by Manegold of Lautenbach (1080), most commentators consider Thomas Hobbes's *Leviathan* (1651) to be the first fully developed statement of social contract theory. For Hobbes, a fictional state of nature illustrated the necessity of political authority. People are equal, in the sense that everyone can be killed by others, and therefore some kind of agreement is necessary in order for people to live together in peace: The social contract is essentially a life preserver. After Hobbes, John Locke, and Jean-Jacques Rousseau were the most prominent proponents of this theory. These thinkers differed from Hobbes in asserting that there are certain irreducible moral notions, based on a natural equality of moral status. Rousseau's *Discourse on Inequality* (1754) affirmed that self-preservation and pity are prior to reason and that the duty not to harm others is based not on rationality but on sentience, the capacity to feel. Thus animals have the natural right not to be mistreated by human beings. Locke, in his *Second Treatise of Government* (1689), saw humankind in the state of nature as inherently social and relatively peaceful, but as prone to conflict over property. Locke's view, in which private ownership of property preceded the social

contract, foreshadowed many conflicts between private property and the public good.

In the twentieth century, John Rawls's *A Theory of Justice* (1971) emerged as the most influential statement of social contract theory. Rawls adopts Immanuel Kant's position that persons are able to reason from a universal point of view. Rawls's premise is that principles of justice are those which rational self-interested persons would agree to in an ideally fair situation, which he termed the "original position." Rawls's original position, unlike the state of nature in some earlier contractarian theories, is not supposed to be an actual historical situation, but rather a fiction that can help us think well about justice. Rawls proposed that those in the original position were behind the "veil of ignorance," meaning that they do not know their gender, race, and socioeconomic position in society, their natural talents or endowments, or their own conceptions of the good.

Rawls argued that those in the original position would agree on two principles of distributive justice. The first principle is that each person is to have a right to the most extensive liberties compatible with the same liberties for all others. The second principle is that social and economic inequalities are to be arranged so that they are to the greatest benefit of the least advantaged and attached to offices and positions open to all under conditions of fair equality of opportunity.

Rawls's theory has evoked opposition, due in part to the exclusion of nonhuman animals and the environment from the sphere of those entitled to justice. Tom Regan argues that Rawls's theory is not impartial, since while at key points Rawls indicates that mentally disabled humans, who are relevantly like animals, are owed duties of justice, he maintains that we have only indirect duties to animals. For Regan, the veil of ignorance should veil knowledge of the eventual species of the contractor. Regan is joined in his view by Paola Cavalieri and Will Kymlicka in "Expanding the Social Contract" (1996). Mark Rowlands in "Contractarianism and Animal Rights" (1997) makes a similar point in claiming that rationality is an undeserved quality, just as are race and economic class. Peter Singer, in the revised *Practical Ethics* (1993), argues that social contract theory should be rejected for the above reasons and also for its exclusion of future generations and of poor nations from the sphere of those to whom justice is owed. J. Baird Callicott maintains that positing reason as the origin of the moral community, even in a hypothetical manner, is contradicted by what is known of the evolutionary development of ethics.

Some commentators have offered revisions that could be incorporated into Rawls's theory. For example, the idea of what constitutes the basic goods to which everyone is entitled could be expanded to include clean air and water. Another proposal is to include behind the veil of ignorance to what generation the contractor will in fact belong.

Other revisions involve the basic premises of Rawls's theory. For example, many feminist thinkers reject, as male-biased, the idea of the original position as made up of rational and self-interested humans. They argue on the contrary that humans are fundamentally social, concerned for others as well as themselves, and mutually dependent. Avner de-Shalit points out in *The Environment: Between Theory and Practice* (2000) that Rawls's theory requires those in the original position to be without identity, including without a place in the world and without moral values that affirm the environment.

Many thinkers reject reciprocity between equals as a necessary component of justice. For these thinkers, rather than being limited to agreements between equals, justice is owed to all individuals who have morally weighty interests that are in need of protection. Mary Midgley, in *Animals and Why They Matter* (1983), argues that in many cases, such as those of the mentally handicapped, animals, plants, and rivers, our duties are noncontractual.

Rawls addresses this issue by stating that we have direct moral duties to animals, but these are duties of compassion and humanity rather than duties of justice. Rawls also states that social contract theory does not comprise all of moral theory. Martha Nussbaum and others object that this strategy of separating justice from compassion tends to trivialize animals, mentally disabled humans, and the environment, due to the heavy emphasis on justice in Western moral theory.

In contrast, some have held that nonhuman animals and the natural world are active communicators who are in fact participants in the contract with humanity. Bernard Rollin (1992) argues that domestication is an implicit social contract humans have made with animals, which is violated by factory farming. Michel Serres, in *The Natural Contract* (1995), acknowledges the earth itself as a partner. He interprets a contract in terms of the relationships, the "cords" between humans and the world. For Serres, we live in a play of energies, as participants in our entire community.

SEE ALSO *Callicott, J. Baird; Environmental Citizenship; Environmental Justice; Environmental Politics; Intergenerational Justice; Regan, Tom; Singer, Peter.*

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Susan J. Armstrong

SOCIAL ECOLOGY

It is difficult to separate Social Ecology from the work of the social theorist Murray Bookchin. Having elaborated its philosophical foundations in a dozen books and many essays, he is considered by many to be the founder of the field. Bookchin drew on history, anthropology, philosophy, political theory, and ecology to formulate a comprehensive analysis of the relationship between humanity and nature, the causes of the ecological crisis, and the pathways humanity could reinstate to create an ecologically sustainable and just world (Bookchin 1982, 1986, 1995, 2003).

DEFINING THE TRADITION

The Social Ecologist John Clark has argued that although Social Ecology is associated closely with Bookchin's work, it is part of a long philosophical tradition (Clark 1998). Clark creatively traced—or, as Andrew Light (1998) described it, creatively invented—the intellectual tradition that preceded Social Ecology. Among its forerunners was the anarchist Petr Kropotkin with his emphasis on the significance of "mutual aid" among animals and humans and model of a human society organized in communities founded on cooperation and free from central government (Kropotkin 1987). The geographer and anarchist Elisée Reclus, a colleague of Kropotkin's, prefigured ideas of Social Ecology in envisioning the reorganization of societies into communities embedded within their ecological and geographic regions (Clark and Martin 2004). The historian and social theorist Lewis Mumford may be regarded as an early Social Ecologist for his analysis of the way mechanization and domination lead to the dissolution of human ties to the natural world (Mumford 1967). Bookchin contributed the most elaborate articulation of Social Ecology: His argument, which continues to stand as the central pillar of Social Ecology, is that the destruction of nature originated in hierarchical and class-structured social domination among humans (Bookchin 1982).

WHAT IS SOCIAL ECOLOGY?

Clark's description of Social Ecology as "the awakening earth community reflecting on itself, uncovering its history, exploring its present predicament, and contemplating its future" highlights its general threads and calls attention to its predilection for theorizing nature and society as a unity (Clark 1998, p. 416). More specifically, key themes and arguments of Social Ecology include the following:

- Viewing nature and society as emerging through an evolutionary unfolding toward increasing diversity, complexity, freedom, and consciousness by means of processes that foundationally involve interconnection, complementarity, and cooperation;
- Understanding the relationship between nature and society as a holistic unity in diversity and seeking to discover why this relationship has gone awry; regarding social conditions and structures as the causes of the detrimental impact of humanity on nature;
- Critiquing institutionalized forms of dominance, both hierarchical and class-based, not only from a social-justice perspective but also for being causally implicated in ecological destruction;
- Privileging social-structural explanations of ecological disruptions over biological and/or psychospiritual explanatory frameworks such as human population growth and human chauvinism;
- Assessing the capitalist market economy as the major force behind intensifying ecological problems;
- Identifying capitalism as an economy, way of life, and thought style that has colonized every aspect of human life and the natural world;
- Agitating for the revolutionary abolition of all forms of domination rather than seeking reformist solutions to social and ecological problems or encouraging individual spiritual transformation;
- Urging the realization of freedom for both people and nature;
- Providing a vision of the ecological society to counter the dominance of the economism (the hegemony of the market economy) that is destroying the biosphere.

Slum District in Manila, Philippines. *A group of children in the district of Baseco in Manila play near their shanty house, which contrasts sharply with the homes being built by Habitat for Humanity aid workers behind them. According to principles of Social Ecology, ecological problems cannot be separated from social inequality and economic exploitation. In a similar vein, Social Ecologists would say that ecological destruction cannot be evaded until hierarchy and class structure are abolished.* **JOEL NITO/AFP/GETTY IMAGES.**

According to Social Ecologists, the human-nature relationship is formed through the structural and conceptual relations that predominate in any society. The drive to dominate nature originated in and is perpetuated by the human domination of humans. Social domination is organized along lines of hierarchy and class stratification: Hierarchy involves the valorization and institutionalization of human differences (gender, race, ethnicity, etc.), and class divisions are based on unequal ownership or control of material wealth and means of production. Both forms of domination underlie the destruction of nature, for it is only when differential status, master-servant relationships, and economic exploitation emerge in the social world that human beings direct related ideas and actions to the world of landscapes, animals, and plants. Ecological problems never have been separate from social inequity and economic exploitation, and the ecological crisis cannot be resolved without a revolutionary restructuring of society on the economic, political, cultural, and value levels.

In making the case for the causal primacy of social structure in the way nature is treated, Social Ecologists echo a long-standing sociological predilection for viewing social patterns as being projected onto nonsocial domains, especially the realms of gods and nature. Within any society all its dimensions are aligned through the structural and ideological mappings that the sociologist Max Weber characterized as manifesting ''elective affinity.'' Thus, societies stratified through systems of domination project a blueprint of stratification onto the natural world, representing it as a domain inferior to humanity. That projection makes nature available for many forms of physical domination: destruction of habitats, conversion of ecosystems, ownership of land,

exploitation of life forms, and experimentation on animals as well as the overarching constitution of the nonhuman world as a realm for instrumental use.

The upshot of this analysis is that ending ecological destruction hinges on abolishing domination in society. This analysis may explain why the contemporary environmental movement, along with the earlier work of Henry David Thoreau and John Muir, has been unable to turn things around. From a social-ecological standpoint, the creation of an ecological society requires nothing less than the emergence of an emancipated humanity that abandons hierarchical valuations and economic inequalities, charting instead a new historical course for both humans and nature into realms of creativity and freedom.

Although the destruction of nature did not originate with industrialism but has roots in the earliest forms of hierarchy (especially patriarchy), Social Ecologists indict the market economy as the major force behind the ecological crisis. Steven Best stated that for Social Ecology "environmental problems emerge from a long history of hierarchical social relations that culminate in a class-ridden, profit-driven, accumulation-oriented capitalist society" (Best 1998, p. 337). In its addiction to limitless growth the market economy, especially "the horror of economistic-technocratic globalism" (Clark 1998, p. 429) that it has turned into, is jeopardizing the integrity of the biosphere as a whole.

From the point of view of Social Ecology, economic expansionism is leading to the colonization of all worlds: natural, social, cultural, and personal. Economism homogenizes and impoverishes the natural world while degrading human relations and experiences into commodities. Economism also has co-opted the Enlightenment concept of progress as social development that unfolds through competition and expansionism rather than through cooperation and balance. Social Ecologists do not regard the negative impact of industrialism as stemming from either technological development or cultural-ideological contrivances such as commodity fetishism that sustain overproduction but instead from an economic system founded on the "the universal reign of limitless buying and selling, indeed, of limitless growth and expansion" (Bookchin 1986, pp. 28–29). This imperative renders capitalism nearly impervious to ethical considerations and unmasks the idea of "greening capitalism" as an oxymoron if not an Orwellian smoke screen (Bookchin 1993).

Diagnosing socioeconomic forms of domination as the source of ecological destruction presents Social Ecology with the task of envisioning an alternative way of life: the ecological society. The future ecological society is portrayed as organized in ecocommunities that will be egalitarian, democratic and participatory, and semiautonomous but interconnected. Such networked communities will live in balance—both knowledge-based and heartfelt—with their ecological regions. In the ecological society people will integrate ethical considerations into their energy choices, forms of land use, and treatment of animals. Economies will be human-scaled. In the creation and exchange of objects craft will be valued over mass production, durability over constant turnover, and simple lifestyles over consumption (Biehl 1998).

The ethos of the ecological society is envisioned as cooperative with respect to people, animals, and the land. Because cooperative relationships are ontologically primary in evolutionary, ecological, and social processes, the ecological society is conceived as a realizable and actionable vision rather than a utopian will-o'-the-wisp. The creation of a social world rooted in the praxis and ethic of mutualism is theorized as restoring the primal and ever-present, even when repressed and marginalized, ground of being (Clark 1998).

THE COSMOLOGICAL FOUNDATIONS OF SOCIAL ECOLOGY

Even as Social Ecology has problematized material relations within economic, political, and sociocultural systems of domination, it has articulated a cosmological context for the emergence of humanity within an evolving universe and biosphere; the rupture between humanity and nature that has culminated in the ecological crisis is scrutinized in the same context. The materialism of Social Ecology is thus a far cry from the materialism of European and American Marxist and anarchist traditions, which shy away from theorizing the universe at large and the Earth in particular as manifestations of a cosmos of intrinsic integrity, beauty, and order. Bookchin in particular elaborated those cosmological foundations for Social Ecology, relying on dialectical naturalism to represent society as an emergent of nature and redeem the human-nature relationship (in its original unity and future potential) as complementary, harmonious, and mutually supportive. The framework of dialectical naturalism allowed him to tap into an established philosophical tradition while signaling his divergence from Hegel's Christian idealism and Marx's anthropocentric materialism.

Bookchin portrayed natural history as grading into social history without sacrificing the distinctive qualities of either domain. Everything that is characteristically or quintessentially human, from the development of science and technology to the creation of cities, the invention of writing, and the composition of music, has been eons in the making (Bookchin 1993). The peculiar qualities of human beings, such as the capacity for reason and self-consciousness, sophisticated language, the aspiration to freedom, and the power to innovate and intervene, have

emerged through and as a form of biological evolution. Social Ecology thus affirms nature and society as a continuum, or a "differentiated unity" (Bookchin 1996): This perspective opposes lifting humanity into a realm above the natural world but also objects to conflating society and nature by discounting the unique features of humanity.

Bookchin coined the terms *first nature* (the natural world) and *second nature* (human society) to underscore their similarity and divergence. The rise of domination within second nature has had dire repercussions for first nature and for society's relationship with it: The schisms and alienation created within society echo a human schism and alienation from the natural world, and the abuses inflicted on people are all easily directed at nonhumans. By overcoming the distortions arising from social domination, a dialectical unfolding can lead humanity and nature into a higher synthesis, a liberated coexistence that Bookchin called free nature (Bender 2003).

In remaining vague about the meaning of free nature, Bookchin skirted an important issue: the substantive contours of the relationship between second nature and first nature in the ecological society. Clark endeavored to correct this by unpacking Bookchin's free nature in connection with the issues of biodiversity and wilderness protection:

> The social-ecological conception of freedom as spontaneous creative order points to the need for a larger sphere of wild nature so that biodiversity can be maintained and evolutionary processes can continue their self-expression, not only in human culture and humanized nature, but also in the natural world substantially free of human influence and control. A Social Ecology therefore implies the necessity not only for wilderness preservation but also for an extensive expansion of wilderness (and relative wilderness) areas where they have been largely destroyed. (Clark 1998, p. 430)

This passage points to the attempt to harmonize free nature with key themes of environmental thought; it also represents an attempt to begin reconciling social-ecological and deep-ecological perspectives.

Human society is born out of the natural world in a biological sense but also in the ancient and originally egalitarian structuring of human relations along kinship lines, a sexual division of labor, and rights and obligations of different age groups (Bookchin 1982). Although all human qualities exist in inchoate form in first nature, second nature has evolved an unparalleled potential aptitude for rationality, self-consciousness, and intentionality. For Bookchin the deepest realization of these abilities requires freedom, but freedom has been stifled by social domination in all its forms: status distinctions, patriarchy, racism, tribalism, economic exploitation, discrimination against minorities, and state oppression. The future of both humanity and the biosphere depends on establishing the freedom within which the highest human qualities can become actualized. Bookchin tends to echo a Nietzschean assessment of human beings as an unrealized but promise-filled species hovering between ape and superman: grown beyond unselfconscious animal but not yet nature rendered self-conscious.

Bookchin attempted to sustain first nature and second nature as a continuum while honoring the qualities that make the human phenomenon unique. By underscoring positive features of humanity such as the celebration of freedom, the cultivation of reason, and the aspiration to self-consciousness, he seems to have had a twofold goal: to preempt a conscious or subterranean response of misanthropy to the ecological damage human beings have wrought and to highlight the human qualities that can be actualized after the relational and mental shackles of domination are undone and the way to the ecological society is opened.

CRITICISMS

The social-ecological preoccupation with human uniqueness has been criticized, especially by Deep Ecologists, as an expression of human chauvinism or anthropocentrism (Bender 2003). Passages in Bookchin's work in which he draws sharp lines between human nature and all other animals invite that critique. To get a theoretically tidy distinction between first nature and second nature, Bookchin tended to oversimplify animal life as one of fixed instincts and genetic programs while exulting humanity as epitomizing the achievements of reasoning, self-consciousness, intentional planning, and behavioral plasticity. However, a dualistic frame of this type is empirically problematic because it ignores advances in behavioral ecology and cognitive ethology that reveal the complexities of animal life and ethically problematic because it underwrites a human-supremacist argument.

The motive behind such dualistic maneuvers is to avoid naturalizing the ecological crisis by anchoring it in biological programs or regarding it as a consequence of Darwinian processes. After hypostatizing the distinction between human beings and animals, Bookchin and other Social Ecologists exorcise terms such as *hierarchy, domination, competition,* and *slavery* from animal relations. When that terminology is applied to the natural world, domination of people and nature (and ultimately human colonization of the biosphere) can appear legitimated as an extension of biological basics. Thus, Bookchin's attempt to distinguish humanity from the rest of the animal kingdom allowed him to pathologize domination as a pure sociocultural phenomenon and at the same time

exonerate first nature from the vices of inequity, exploitation, oppression, and subservience.

Although Bookchin's critics often deplore the sharp line he drew between humans and animals, they rarely give him and other Social Ecologists credit for defending the natural world against its historical and recent constructions as blind, mute, cruel, selfish, competitive, and stingy. Countering the ideological fiction of nature as "demonic and hostile" (Bookchin 1986), Bookchin insisted on an understanding of the natural world as creative, pregnant, fecund, participatory, relational, and wondrous (Bookchin 1986, Clark 1998).

Social Ecology propounds a philosophy of all phenomena as interrelated, jointly enhancing, and mutually forming through symbiotic and cooperative processes. Within that framework the destructiveness of domination is conceived of as fortuitous, a possible historical trajectory but not an essential or necessary characteristic of the world. The cosmology of Social Ecology is thus openly spiritual in offering a vision of the good and goodness as primary forces and in affirming evolutionary emergence in the universe and the biosphere as a creative, awe-inspiring process, though not one conceived as either supernaturally designed or with a predetermined telos. As Clark noted about the implications of this cosmology for a possible future, "the ecological society that is the goal of Social Ecology is found to be rooted in the most basic levels of being" (Clark 1998, p. 421). For Social Ecologists, in a just and ecologically harmonious world, humanity will return to a primordial condition, but this will involve the restoration of the original essence and potential of humankind, not the reinstatement of the Stone Age or the Pleistocene.

THE CLASH BETWEEN SOCIAL ECOLOGY AND DEEP ECOLOGY

Despite Bookchin's theoretical brilliance, decades of activism and writing, and comprehensive formulation of Social Ecology, his divisiveness marred his contribution and damaged the ecological cause. His sectarianism manifested itself in his attack on Deep Ecology during the 1980s and 1990s. The ensuing conflict between Deep Ecology and Social Ecology contributed to polarizing the environmental movement into nature and social justice camps, the very schism that Bookchin was striving to supersede (Best 1998, Light 1998, Clark 2000).

Deep Ecology emerged with the work of the Norwegian ecophilosopher Arne Naess and evolved into the Deep Ecology movement through the contributions of American and Australian environmental thinkers and activists. The underlying cause of ecological destruction and of the alienation of the human species from the biosphere is identified by Deep Ecologists as anthropocentrism: the self-exultation of human beings, whose ostensible superiority and perceived entitlements sanction dominion over nature. In the culture at large anthropocentrism manifests itself as the pervasive and often unquestioned belief that nature is a domain to be used, a domain primarily of instrumental value for people.

In an effort to recover traditions of thought and practice that transcend anthropocentrism, foster biospheric egalitarianism, and celebrate the intrinsic value of nature, Deep Ecologists have formulated a syncretic platform that has integrated elements of Western philosophy, scientific ecology, conservation biology, humanistic psychology, primitive ritual, and Eastern spirituality. Those syntheses are used in an attempt to recover a biocentric sensibility that counters the supremacist tendencies of *Homo sapiens* with a vision of harmonious coexistence with all beings. In the idiom of Aldo Leopold, Deep Ecologists agitate for the day when human beings will be "plain members and citizens" rather than conquerors of the land community.

Bookchin disparaged deep-ecological thought as a random collage of ideas that was deplorable in its theoretical incoherence, mystical inclinations, inattention to social-justice issues, and denial of social domination as the root of ecological exploitation and destruction. He considered Deep Ecological philosophy a hodgepodge of "Taoist moods, Buddhist homilies, and New Age platitudes," with Spinoza, Whitehead, and Heidegger thrown into the mix, that displaces the "vigorous reasoning" and "muscularity of thought" of Western philosophical and political traditions (Bookchin 1996, p. 98ff.). Bookchin's criticisms might have inspired a dialogue between Deep Ecology and Social Ecology, but his invective proved more polarizing than constructive. The tendentious tone that Bookchin set can be seen in a deep-ecological backlash that finds little if anything to learn from his ideas.

In focusing on what repelled him in deep-ecological literature—especially appeals to spiritual transformation, invocations of mystical unity, and antirationalism—Bookchin failed to acknowledge important convergences between Deep Ecology and Social Ecology (Clark 2000). Deep Ecology has always stressed the idea that creating a balanced world will necessitate profound changes at the economic, political, cultural, and ideological levels. Social Ecologists similarly insist that real transformation will not occur without reimagining and revolutionizing all dimensions of society. Concurring with social-ecological analyses, Deep Ecologists have not shied away from criticizing capitalist wasteful production as well as the consumer culture that both is spawned by overproduction and feeds it (Roszak, Gomes, and Kanner 1995). Social Ecology and Deep Ecology share a broad vision of the ecological society, highlighting the desirability of local governance and democratic decision making,

small-scale economies of production and consumption, community spirit, lifestyles that respect cultural and natural diversity, ecological embeddedness, and care of nonhuman species both for the ways they enhance human life and for their intrinsic value.

The legacy of Social Ecology for the environmental movement and the future directions of social-ecological thought are not known. It is unclear whether Social Ecology will thrive as an ecophilosophy in its own right, whether its insights will be absorbed into new syntheses in environmental thought and activism, or whether the term *Social Ecology* will end up being applied only to analyses narrowly focused on social-justice concerns in environmental and ecological contexts. Murray Bookchin died in 2006. In the years before his death his polemics alienated him from many of his contemporaries. However, the key insights of Social Ecology continue to command attention: Social and ecological problems are inseparable, and social domination has long been implicated in the destruction of the biosphere.

SEE ALSO *Animal Ethics; Biocentrism; Bookchin, Murray; Darwin, Charles; Deep Ecology; Ecological Feminism; Ecology: II. Community Ecology; Environmental Justice; Environmental Philosophy: V. Contemporary Philosophy; Land Ethic; Leopold, Aldo; Naess, Arne.*

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SOCIETY FOR CONSERVATION BIOLOGY

The Society for Conservation Biology (SCB), established in 1986, seeks to promote the scientific study of issues pertaining to the loss, maintenance, and restoration of biodiversity. The SCB and its flagship journal, *Conservation Biology,* bring together scientists, scholars, policy makers, and members of nongovernmental organizations who share the goal of protecting and perpetuating the earth's biological diversity. Since its inception the SCB has recognized an essential role for environmental ethics in informing, shaping, and applying the science of conservation biology. Conversely, ideas and insights from conservation biology have contributed to the development of environmental philosophy and ethics.

ORIGINS AND DEVELOPMENT OF CONSERVATION BIOLOGY

The SCB was founded in 1986 in response to the increasingly urgent concern over global threats to biological diversity in the late twentieth century. More broadly, however, the emergence of conservation biology as a new interdisciplinary field reflected long-term trends in conservation science and practice. A concern with biological diversity has deep roots in the worldviews of native cultures around the world; in the scientific tradition of Europe and North America (in the fundamental contributions, for example, of Linnaeus, Charles Darwin, and Alfred Russel Wallace); and in the work of naturalists and protoconservationists of the 1800s (the writings, for example, of Alexander von Humboldt, Henry David Thoreau, and George Perkins Marsh). With the rise of the Progressive-Era conservation movement in the United States in the early 1900s, science became more intimately tied to conservation policy and practice. It

was, however, fragmented into varied disciplines, preecological in content and narrowly utilitarian in application. This scientific content both reflected and reinforced the philosophical split in the early conservation movement between the utilitarian resource-conservation ethic (often associated with forester Gifford Pinchot) and the nature-preservation ethic (often associated with naturalist John Muir).

By the 1930s ecological and evolutionary science had begun to influence various resource-management fields (including agriculture, forestry, wildlife management, range management, and fisheries management), easing this long-standing tension within the conservation movement. Early biogeographers and ecologists such as Henry C. Cowles, Frederic Clements, Henry Gleason, Victor Shelford, Charles Elton, and Ernst Mayr developed basic concepts of community ecology, ecological change, population dynamics, and plant and animal distribution, giving greater emphasis to the role of biological diversity in the structure, composition, and function of biotic communities. Aldo Leopold, applying these concepts to land management and stewardship in the 1930s and 1940s, redefined conservation as "a state of health in the land," which he further described as "the capacity for self-renewal in the soils, waters, plants, and animals that collectively comprise the land" (1991, p. 318). In thus recasting conservation's goals—most explicitly in his influential essay "The Land Ethic," published posthumously in the environmental classic *A Sand County Almanac* (1949)—Leopold wedded conservation science and conservation ethics. Leopold's land ethic implied that conservation was no longer just the purview of professional resource managers charged with the efficient production of goods from the earth, but also of individuals and institutions assuming responsibility for the health of the land. A generation later this coupling of science and ethics in the service of an ecologically robust approach to conservation provided an important cornerstone for the field of conservation biology.

In the decades following World War II, the resource-management professions faced mounting environmental and philosophical challenges in the United States and around the world. An expanding and increasingly globalized economy increased the burdens on natural communities through overexploitation; pollution; the spread of invasive species; the early indications of climate change; and widespread habitat loss, alteration, and fragmentation. These environmental changes engendered ever-lengthening lists of threatened and endangered species (later legally defined and protected) and alarm over the loss of biological diversity at various geographical scales. The world's species-rich tropical forests, for example, became a focal point of global environmental concern by the late 1970s. The traditional resource-management fields, with their inherited disciplinary boundary lines, reductionist tendencies, and commodity-dominated priorities, were ill-equipped to address these systemic challenges.

Conservation biology emerged in response to these trends. It was a part of the same process of intellectual cross-pollination that spawned such fields as environmental ethics, environmental history, ecological economics, landscape ecology, agroecology, and restoration ecology in the late 1970s and 1980s. Conservation biology was the product of a fusion of several overlapping spheres of scientific inquiry: coevolution and population biology (as developed in the 1960s by Peter Raven and Paul Ehrlich, among others); island biogeography (grounded in the landmark research of E. O. Wilson and Robert MacArthur); conservation genetics (especially as synthesized by Otto Frankel and Michael Soulé); and inquiry into the social dimensions of conservation policy and international development (through key contributors such as Thomas Lovejoy, Bruce Wilcox, and Norman Myers).

THE FOUNDING OF THE SCB

Conditions were ripe for the creation of the new field and its namesake professional society. A series of scientific workshops and conferences held between 1978 and 1985 gave the field increasing definition. In 1986 a major forum on the conservation of biodiversity—a neologism adopted in the course of planning the forum—was convened in Washington, D.C., under the auspices of the Smithsonian Institution and the U.S. National Academy of Sciences. Many of the forum's scientific leaders helped to establish the new group. In 1987 the SCB, under its first president Michael Soulé, organized its first annual meeting and published the first issue of *Conservation Biology*.

A close and continuing relationship between environmental ethics and conservation biology was forged in these early years of the SCB. The 1986 forum on biodiversity included not only a wide range of scientists but also environmental ethicists and scholars from other fields. Soulé, the central figure in defining conservation biology and organizing the SCB, credited the influential Norwegian environmental ethicist Arne Naess with shaping his priorities for the field; it was to be a "mission-driven" and "value-laden" field that accepted the moral responsibility of humans to safeguard and sustain the community of life. The bylaws required that one seat on the society's board of directors be reserved for a scholar in the humanities and environmental ethics. The first editor of *Conservation Biology*, David Ehrenfeld, had published his own contribution to environmental philosophy, *The Arrogance of Humanism*, in 1981. Beginning with Ehrenfeld's editorship, the journal regularly

featured articles on environmental ethics alongside its more customary scientific studies.

Even as conservation biology has sought to unify the disparate domains of natural-resource management, it has also significantly influenced the discourse of environmental ethics. It has raised vital issues such as the human role in shaping "natural" ecosystems; the role of biological diversity in conservation strategy; the movement toward more community-based, participatory approaches to conservation decision making; the philosophical rationales and ecological foundations of sustainability; and the role of the conservation biologist as scientist in an explicitly values-driven undertaking.

SEE ALSO *Biodiversity; Conservation; Conservation Biology; Globalization; Land Ethic; Leopold, Aldo; Naess, Arne; Resource Management.*

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Curt Meine

SOCIOBIOLOGY

SEE *Evolutionary Psychology.*

SOILS

Soil is the portion of the earth's surface that consists of a mixture of disintegrated rock and humus, or dead organic matter. Soil science, a branch of agronomy, has categorized thousands of soil types according to their physical and biochemical characteristics. In addition to its mineral substrate and humus tilth, a soil may contain 30,000 species of organisms, with a thimbleful containing billions of bacteria, fungi, algae, protozoa, and nematodes, plus virus particles. The soil microbiologist Selman Waksman received the Nobel Prize for discovering soil actinobacteria that produce lifesaving antibiotics. Soil may be critical in preventing the spread of antibiotic resistance to preserve the medical value of these soil-borne antibiotics.

VALUE AND DEGRADATION

Soil has both intrinsic and instrumental value, but modern agriculture has allowed soil degradation through erosion and contamination of soils and waters with chemicals. Though considered by some medical authorities to be a pathology, eating soil (geophagy or pica) can improve human or animal health by dissolving micronutrients. The clay mineral surfaces adsorb harmful bacteria, viruses, and toxic organic compounds and are eliminated from the body. Soil also performs a variety of ecosystem services. Soil microbes enzymatically digest the complex organic compounds of dead plants, animals, and other microbes, producing simple inorganic ions by mineralization (rotting or composting). Roots absorb those ions, and the carbon dioxide gas released enables photosynthesis. This action constitutes nutrient cycling in all terrestrial ecosystems, the study of which is a major branch of ecosystem ecology. A wide variety of toxic and hazardous organic compounds are bioremediated into harmless or beneficial inorganic substances by soil microbes. The soil biota provides biological resilience to chemical insults if it is not overwhelmed.

The "spirit of the soil" includes several extrascientific concepts. The idea of native soil has inspired patriotism for centuries, which results from the concept of soil as a symbol for the place of a person's birth and, before world trade and transport, the source of a person's nutrition. Centuries ago the apparently spontaneous appearance of mushrooms caused humans to develop the idea of vitalism, by which the soil was said to transmit a vital force from animals, through their manure, to the soil and then into the newly developing plants, once more providing sustenance for animals. The development of soilless hydroponic horticulture—plants are grown in water and supplied by dissolved inorganic fertilizers (nutrients)—developed by Justus von Leibig disproved the idea of vitalism. However, Wendell Berry and others have suggested that soil nevertheless retains a memory of its past management.

Aldo Leopold proposed a land ethic that would promote biological diversity, ranging from the humble earthworm to all other life-forms, with each one having a right to maintain a habitat within the soil. Leopold's early papers, written while he was a U.S. Forest Service

employee in the Southwest, indicate that his land ethic was rooted in concern about the soil erosion caused by the advent of fire suppression and cattle ranching in that region. Farmers holding soil in their hands often have a reverence for the plant and animal productivity developing from soil. The ancient Jewish stewardship environmental ethic emphasizes human responsibility to conserve the soil by periodically resting it because the land or soil belongs to God, not to humans. Thus, humans are caretakers of the earth.

PROBLEMS AND REMEDIES

Contemporary nonsustainable industrialized crop-production practices create serious threats to water quality, in part because they pose serious threats to soil, which modulates the flow of water and purifies it. Those nonsustainable practices also cause soil erosion, which, in addition to the loss of productive, life-sustaining soil, loads streams and reservoirs with sediments and excess nutrients, which also diminish water quality. Phosphates and pesticides move away from fields with the soil into rivers, lakes, and streams, resulting in algal blooms and fish kills or the death of a wider variety of organisms and pose threats to human health. Nitrates and herbicides are moving downward into groundwater through depleted soils, contaminating sources of drinking water.

Because of the loss of soil as a result of the use of modern tillage equipment, soil conservation practices have been a major focus of U.S. public policy. However, growers have ignored these practices in the interest of expediting farming operations and increasing short-term profits. Soil loss of one to five tons per acre per year is considered acceptable, but accelerated soil loss may occur at ten or more times that rate. A sustainable society would ensure that soil is preserved and further soil-related environmental degradation does not continue.

A major controversy surrounds the goal of nutrient replenishment. Although synthetic industrial chemical fertilizers provide the base for modern plant nutrition, more environmentally friendly sources might be reintroduced. Commercial fertilizers require extensive petroleum energy to produce, transport, and apply compared with more sustainable fertilizers, such as animal manures, that are an agricultural by-product that can be produced locally. Also, legumes used in crop rotation provide free low-energy nitrogen not only to themselves but to other plants grown on the same soil. Biodynamic microbial preparations, compost teas (composted material dissolved or suspended in water so that it can be sprayed), and greater use of animal wastes, including human waste, are key ingredients in the recipe for a postindustrial sustainable agriculture. Using more organic materials greatly enhances phosphate (the second most limiting plant nutrient after nitrogen) availability to plants. This is the key to organic agricultural production systems, including long-term sustainable practices to prevent soil and water erosion.

A holistic ecological approach to soil management requires viewing the health of the soil and the conservation of soil as a vital component of human health. Soil fertility promotes regenerative sustainable crop production, the most salient elements of which are biological nitrogen-fixing bacteria functioning inside root nodules of legumes, mycorrhizal fungi living on plant roots that serve as extra root hairs that enhance plant nutrition, and bacteria, fungi, and nematodes serving as natural biological control agents by killing insects and other plant pathogens.

The loss of soil microbial diversity may threaten future generations through loss of soil-based ecosystem services and basic biological processes and through loss of potential lifesaving antibiotics and medicines.

SEE ALSO *Agriculture; Berry, Wendell; Biodiversity; Conservation; Ecosystem Health; Future Generations; Judaism; Land Ethic; Sustainable Agriculture; U.S. Forest Service; Water.*

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SONTOKU, NINOMIYA
1787–1856

Ninomiya Sontoku, also known as Ninomiya Kinjiro, a Japanese farmer-sage, was born in a small village in Odawara Han (the contemporary Kanagawa prefecture, near Tokyo) in the Edo era (1603–1867). As an orphan living in poverty, Sontoku restored his father's house and became a landowner, enlarging his estate through hard work and rational management. He served a samurai family and rescued it from debt, after which he was

sought out to restore ruined villages. He later was appointed a samurai officer and helped the government restore the Nikko area, where he died and was enshrined.

Sontoku's environmental thoughts and practices were based on the premodern ecological worldview that was characteristic of preindustrial Japanese society; it consisted mainly of Shintoism mixed with Japanese Confucianism and Buddhism. Sontoku believed that all humans and nature exist in a circle within which everything exists in fusion and unity (*ichi-en yu-go*). This is reminiscent of the Great Ultimate of Chu Hsi, the synthesizer of Neo-Confucianism in the Sung Dynasty in China, which also took the form of a circle as the monistic origin or ground from which everything was brought forth. The circle that represents the Confucian unification of humans and nature might be considered a symbol of the ecoholistic view.

The circle expresses the unity of all things. Nothing can be outside the circle, and everything is contained within it. The circle also expresses the limits of humans and nature as a whole, in which reside all dualistic principles such as yin and yang, masculine and feminine, light and dark, life and death, good and evil, and rich and poor. A circle also expresses the idea that everything within the circle will change not in the direction of progress but in a cyclical way. This holistic way of thinking leads to the conclusion that a one-sided increase in the welfare of humans or nature will destroy the balance; that is, an increase in the welfare of humans will lead to a decrease in the welfare of nature.

Sontoku's practical solution to the problem of the relationship of human beings to nature lay in the symbiotic coelaboration of both. Human beings owe gratitude (*on*) to heaven and earth (the great father and mother), to their ancestors, parents, and lords, and are obliged to repay the debt. The main virtues Sontuku practiced and recommended were diligent labor (*kin*), frugality (*ken*), and concession (*jo*) in agriculture and economics to increase natural produce by "assisting the transforming and nourishing process of Heaven and Earth" (Tu 1989, p. 86). This is part of Sontoku's teaching of "reward for virtue" (*hotoku*).

Sontoku eventually rescued more than six hundred villages and tens of thousands of people. He not only restored devastated farms but also saved people from mental collapse by helping them be financially and morally independent. To help distressed people, he used large sums of money from his successful projects, leaving none for his own family. The voluntary credit union organized by his followers, the Society for Rewarding Virtue (*Hotoku-sha*), was highly successful, with many branches throughout Japan; it continues to exist. Sontoku's achievements testified to his belief that Confucian morals ('*jen*), politics, and economics rather than Western power politics and self-interested economics can both make people happy and restore nature.

In prewar Japan, Sontoku was a national hero who was cited in elementary school textbooks on moral education called *shushin* ("cultivating oneself") as a model of Confucian and other virtues. All elementary schools had a bronze statue of him on a pedestal near the main entrance in which he carried on his back a bundle of firewood gathered in the mountains, reading a book while walking. Boys and girls were encouraged to work hard and study diligently so that they would become decent citizens and successful people. Thus, his influence was felt not only in agriculture and economics but also in moral education in Confucian virtues. In postwar Japan, he was neglected and his school of thought was almost forgotten. However, his thoughts and practices have been revived by the International Ninomiya Sontoku Association, which was founded in 2003.

SEE ALSO *Confucianism; Japan.*

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SOUTH AMERICA

The cultural and biogeographic identity of South America, as well as the history of its environmental philosophy, is embodied in the Andes Cordillera, the great mountain system that crosses the continent from south to north and is home to the emblematic Andean Condor. According to Tiahuanaco pre-Inca culture, in ancestral times *Viracocha* (one of the most important deities in the Inca pantheon) emerged from Lake Titicaca in the heights of the Andes and created the sun with his light; the rain and water with his tears; the heavens, the stars, the humans and the other living beings that inhabited the region (Kusch 1962). Today, along this Andean backbone, there is a mosaic of altiplanic, rain-forest, wetland, desert, coastal, glacial, steppe, and prairie ecosystems hosting most of the world's plant and animal biodiversity (Mittermeier et al. 2003). The highest mountain peaks in the Americas, as well as the vast Amazonian basin, Pantanal wetlands, Chaco savannas, and Patagonian high latitudes

Gateway of the Sun. *The figure of* Viracocha *in the center of the Sun Gate in Tiahuanaco in the highlands of Bolivia, surrounded by human-condor guardians illustrates how deities, humans, and nature have been and are still united in Amerindians' worldviews and lives.* **© TINA MANLEY/ARCHEOLOGY/ALAMY.**

are still inhabited by endemic biological species, cultures, and languages. Amerindian people have coevolved with each of these unique and diverse landscapes, ecosystems, and biota, developing a plethora of environmental worldviews and practices that have come under consideration by South American environmental philosophers since the 1980s (Rozzi 2001).

ENVIRONMENTAL ISSUES

The principal environmental concern in South America is the threat to this, the world's treasure trove of biodiversity. The drivers of biodiversity destruction and losses of cultural diversity in South America are many (Primack et al. 2006). Global climate change is provoking a rapid retreat of high Andean glaciers. Sine 1970, glaciers in the Andes have lost 20 percent of their volume, with drastic water supply consequences that are affecting mountain communities, agriculture, and ecosystem integrity. Ozone depletion in the Earth's stratosphere has its strongest expression in the Antarctic ozone hole. At the beginning of the 2000s, in this area of the Antarctic stratosphere ozone levels have dropped 33 percent of their pre-1975 values, with a variety of human health and ecological consequences, such as increases in skin cancer, damage to plants, and reduction of plankton populations and photosynthetic capacity. Exotic invasive species represent another major threat to South American biodiversity. Exotic mammals (such as feral goats, European rabbits, or North American beavers and minks) are especially harmful in archipelagoes such as Galapagos, Juan Fernandez, and Cape Horn. Exotic predatory fish, such as trout and salmon, have a high impact on Andean and temperate freshwater ecosystems.

Mining is also a main driver of rapid and intensive changes in freshwater, marine, and terrestrial biological diversity, as well as cultural diversity involving displacement of communities from their ancestral territories, and destruction of their habitats. In addition to direct habitat destruction, mining frequently involves pollution. For example, mercury pollution caused by the amalgamation of gold in tropical regions such as the Amazon affects the health of aquatic invertebrates, fish, and humans downstream from gold-mining activities. Dams and construction of waterways represent a frequent source of social

conflicts and environmental impacts. One of the most debated mega-projects in South America is the Hidrovia, in which the Paraguay-Parana River would be dredged to let large ships carry cargo from Buenos Aires on the Argentinean coast 3000 km north to Bolivia, Paraguay, and Brazil. This project could cause significant drainage of the Pantanal, the world's largest wetland, which is the habitat of endangered jaguars, giant otters, thousands of invertebrates, and tens of Indian tribes. The latter have joined scientists, artists, humanists, and numerous non-governmental organizations (NGOs) in their protest. This type of mega-project often involves serious and rapid environmental degradation, but they have a widespread presence throughout South American geography and post-Columbian history. Currently, extensive monospecific plantations of eucalyptus are replacing native forests in Colombia, southern Brazil, Uruguay, and Chile, and large-scale plantations of genetically modified sugarcane and soybean are replacing vast areas of tropical forests. At the same time, tropical and temperate coastal marine biodiversity of South America is threatened by shrimp and salmon aquaculture, respectively.

As the process of globalization accelerated over the last quarter of the twentieth century, South America's agriculture industrialized—one element of which is an economy of scale—forcing subsistence farmers off their smallholds, for which they had no legal title. As the twenty-first century unfolds, South America not only continues to supply a hungry world with mineral, wood, and food resources, but also an energy-starved world with biofuels—more especially ethanol derived from sugar cane, further exacerbating social dislocation and environmental degradation. In spite of this pressing scenario, South America is still the home of vigorous peasant, indigenous, and diverse rural and urban communities, who value and defend their biological and cultural heritage. Thus South American environmental philosophy has from its start integrated social and often political analysis with environmental concerns. Today, they are frequently involved in conservation, ecological and social justice, and sustainable development initiatives.

SOUTH AMERICAN ENVIRONMENTAL PHILOSOPHY

There are two main sources of South American environmental philosophy (Rozzi 2001). The first is rooted in the ancient ethos and biocultural landscapes of Amerindian people, as well as African American, old peasant, and contemporary rural and urban communities. Since the 1960s these rich biocultural landscapes have been increasingly studied and valued by academics through historical and critical thinking (Mignolo 1995, Escobar 1996), liberation philosophy and theology (Boff 1995), ecofeminism (Parentelli 1996, Gebara 1999), and biocultural conservation (Rozzi 1997, 2001). The second source is the incorporation of international environmental thinking and philosophy in South American universities. This trend was first sparked in the 1970s by the United Nations Environment Programme that focused on sustainable development and interdisciplinary education (PNUMA/UNESCO 1985, Carrizosa 2001, Leff 2002, Porto-Gonçalves 2006). Second, in the 1990s, the spontaneous interest of South American scholars initiated the discussion and translation into Spanish the work of environmental philosophers in Europe, Australia and the United States, thereby introducing Deep Ecology, Social Ecology, ecocentric ethics, and animal liberation into Latin America (Sosa 1990; Bugallo 1995; Kwiatkowska and Issa 1998; Valdés 2004; Rozzi 1997, 2007).

Roots of South American Environmental Philosophy The Argentine philosopher Rodolfo Kusch was a pioneer in understanding the links between regional landscapes and Amerindian cultures in the Andean region. He realized that no genuine philosophy in the Americas can be conceived without incorporating the Amerindian cultures (1962). Kusch's efforts pitted him against the almost determined ignorance of indigenous thought and lives in South American academic philosophy.

In the1960s Kusch began to develop studies in comparative ethno-philosophy while working in northern Argentina at the University of Salta. Kusch was interested in learning how much of the Inca legacy persisted in twentieth-century peasant communities in Bolivia and northwest Argentina. In "Geoculture of the American Man" (1976) Kusch coined the term *geoculture*; thanks to the insights yielded by this concept, South American geography was no longer seen merely through "colonial lenses" as a virgin territory to be conquered and used. Instead, it was understood as a source of cultural meanings. Kusch disclosed the embeddedness of various South American ethos in the environment, "always situated, always grounded" (Gutierrez 2008, p. 2). Kusch's philosophical inquiry was motivated by a need, felt by Latin-American intellectuals since the second half of the nineteenth century, to discover or renew the cultural identity of the Americas (Mignolo 1995). The Andean biocultural geography inspired this search for identity in the southern cone of South America.

Decolonization Research Program and Environmental Philosophy In the 1980s the Argentine-Mexican philosopher Enrique Dussel developed the notion of transmodernity. This notion, combined with Kusch's geocultural approach, inspired another Argentine philosopher, Walter Mignolo, to develop the notions of *border thinking,*

An Indigenous Community in Bolivia. *Indigenous Quechua and Aymara communities in the high Andes have many celebrations and rituals to pay (*pagos*) and thank (*despachos*) the Earth or* Pachamama. *These rituals seek renovation and purification, fostering reciprocity among people, the land, and deities. The picture illustrates a celebration at Sajama National Park in Bolivia.* **PHOTO BY JUERGEN CZERWENKA. COURTESY OF RICARDO ROZZI.**

border epistemology, and *pluritopic hermeneutics* (Mignolo 1995). Dussel's liberation philosophy aims to overcome eurocentric modernity not simply by negating it "but by thinking it from the underside, from the perspective of the excluded other": the colonized indigenous people, poor peasant communities, and urban marginal citizens and workers (1996, p. 14).

At Duke University Mignolo has further developed this project through the Latin American Modernity/Coloniality Research Program (LAMCRP). He affirms "the 'West and the rest,' in Huntington's phrase, provides the model to overcome, as the 'rest' . . . emerges in its diversity" (Mignolo 2000, p. 310). In contradistinction to eurocentric abstract universals, the alternative proposed by Mignolo is a kind of border thinking that "engages the colonialism of Western epistemology from the perspective of epistemic forces that have been turned into subaltern (traditional, folkloric, religious, emotional, etc.) forms of knowledge" (Mignolo 2001, p. 11). He emphasizes the need to permit the expression of "pluriversal" epistemologies and local histories and communities that exist at the borders of globalization (Mignolo 1995).

At the University of North Carolina at Chapel Hill, another LAMCRP researcher, the Colombian philosopher Arturo Escobar, has developed a geopolitical perspective by working closely with African American communities in the Colombian Pacific on projects about globalization, culture, women, environment, and place. In these communities Escobar finds powerful elements of ecological sustainability in the reinterpretation of anthropological practices related to mythical and symbolic traditions and ecosystemic contexts (Noguera 2007). However, growing violence, poverty, and environmental and social degradation in Latin America are replacing these realities. In "Invention of the Third World," Escobar affirms that "it suffices to take a quick look to the biophysical, economic, and cultural landscapes of the Third World to realize that the Development Project is in crisis" (1996, p. 9). Against this background Escobar calls for a postdevelopment era, which emphasizes local economies rather than global markets and consumerist lifestyles.

Liberation Theology and Environmental Philosophy In contrast to Escobar, Leonardo Boff, a Brazilian liberation theologian and leading environmental philosopher, asserts in his landmark book *Ecology and Liberation: A New Paradigm* (1995), that "what is today in crisis is not so much the development model, but the model of society that dominates the world" (p. 31). He proposes a holistic, ecosocial approach to environmental ethics, affirming that "the new model of society has to aim at a reconstruction of the social fabric, starting from the multiform potentialities of human beings and society" (1995, p. 36). At the same time Boff calls for broadening the spectrum of environmental ethics to encompass a notion of environmental justice that would incorporate the interests of poor people. In *Cry of the Earth, Cry of the Poor* (1997), he situates the social and political concerns of liberation theology in broader ecological frameworks: "We need to refine the concept of ecological justice, but without a minimum of social justice it is impossible to make ecological justice fully effective. The one involves the other" (p. 45). Boff's concept of ecological justice demands an overcoming of both anthropocentrism and ethnocentrism; social well-being requires consideration of biological and ecological diversity as much as of social classes, native languages, worldviews, and cultural practices.

Boff demands integration at multiple levels of relations, repeatedly calling for an interior ecology (psychological, spiritual) and a reconnection with the earth as a whole, a *dignitas terrae.* He highlights the importance of revering the masculine and feminine, a position that echoes the philosophy of leading South American ecofeminists and liberation theologians Gladys Parentelli (Uruguay and Venezuela) and Ivone Gebara (Brazil). Based on their work with poor women, Parentelli (1996) and Gebara (1999) have inaugurated a Latin American theology from the "optic" of women, pointing out that poverty is not a gender-neutral category. Frequently, poor women are victims of physical and sexual violence; they also lack control over maternity and often are left to provide the primary economic support for their children. Since the 1980s ecofeminists have created new networks and journals that explore the relationship between the oppression of women, indigenous people, and nature in Latin America. South American ecofeminists have called attention to the daily lives of women in slums, showing the ways that the exclusion of the poor is linked to the destruction of their lands. This approach concurs with the perspective that in Latin America the most negative impacts of environmental degradation affect poor people; they are the main victims, not the agents of most degradation (Rozzi 2001).

Biocultural Conservation and Environmental Philosophy Working with indigenous communities in southern South America, the Chilean ecologist and philosopher Ricardo Rozzi has integrated ecological sciences and environmental philosophy. He has developed epistemological and ethical frameworks that are designed to gain a better understanding of the differences and similarities between contemporary scientific knowledge and indigenous ecological knowledge. His work has two main goals: (1) enhancing communication and respect among different sociocultural actors and (2) promoting biocultural conservation. In South America numerous case studies show that indigenous and other local communities agree with scientists and other scholars that, where biodiversity has been protected, local communities enjoy higher levels of autonomy and social well-being (Primack et al. 2006). This convergence between indigenous and scientific views is also supported by the concept of "environmentalism of the poor" developed in South America by the Spanish ecological economist Juan Martinez Alier (2002). Likewise, Rozzi (2001) has called for a "field environmental philosophy" approach whereby philosophers participate in long-term interdisciplinary biocultural conservation projects that involve "direct encounters" with human and nonhuman beings living in their habitats. This field environmental philosophy approach aims to prevent the imposition of global epistemological and development models and to promote instead the expression of diverse ethos and traditional ecological knowledge by local communities.

ENVIRONMENTAL PHILOSOPHY AND SOUTH AMERICAN ACADEMIA

There are two main sources of the influence that environmental philosophy has come to have in South American academia: (1) UNEP's support for environmental academic programs and (2) the efforts of individual scholars.

United Nations Environment Programme (UNEP) At the beginning of the 1970s, the United Nations launched two important programs that promoted environmental thought in South American universities. In 1970 the United Nations Educational, Scientific, and Cultural Organization (UNESCO) created the Man and Biosphere Programme (MAB), which "proposes an interdisciplinary research agenda and capacity building aiming to improve the relationship of people with their environment globally" (UNESCO 2008). In 1972 UNEP was founded, and it immediately proposed to establish "an international program on interdisciplinary environmental formal and informal education" (PNUMA/UNESCO 1985).

In 1977 UNESCO and UNEP organized the International Conference on Environmental Education in Tbilisi, Russia; the conference issued a call for each continent to establish a regional network devoted to

environmental thought and education. The most successful such undertaking was the Latin American and Caribbean network, which was consolidated in 1985 at the University and Environment Conference held at the Universidad Nacional de Colombia (UNC). Three central concepts emerged from this meeting: (1) The environment includes not only biotic-physical elements but also sociocultural ones; (2) environmental problems are associated with human development; and (3) university education requires interdisciplinary approaches to address the interactions among nature, technology, and society (PNUMA/UNESCO 1985).

The University and Environment Conference triggered the creation of the Institute on Environmental Studies (IDEA) at UNC, which in 1987 gave rise to the *Pensamiento Ambiental* (Environmental Thought) working group. Since the 1990s this group has researched the relationships between environmental ethics, epistemology, and politics, questioning the technocratic character that prevails in public administration and environmental sciences (Noguera 2005). Since 2000 IDEA has collaborated with the Mexican environmental economist Enrique Leff in publishing the *UNEP Series on Environmental Thought,* an essential bibliographic source on South American environmental philosophy.

Among the philosophers from IDEA, Augusto Angel-Maya stands out for having pioneered an influential school of environmental thought in Colombia. He criticizes the rationalist tradition of philosophy that separates humans from nature. Angel-Maya affirms that "Platonism has drowned Western philosophy" (2002, p. 85). Angel-Maya urges philosophers to turn away from Platonic metaphysics by rediscovering the work of the Ionian pre-Socratic philosophers, with their immersion in the multidimensional complexities of immanent, here-and-now reality, a task he believes is best accomplished through interdisciplinary approaches.

Influences of Anglo-Saxon Environmental Philosophy As an academic subdiscipline, environmental ethics emerged during the early 1970s, mainly in U.S., British, and Australian universities (Callicott and da Rocha 1996). Since the 1990s a few South American scholars have begun to translate and discuss Anglo-Saxon environmental philosophers. In Argentina Alicia Bugallo did extensive research in Deep Ecology and published *De Dioses, Pensadores, y Ecologistas* (Of Gods, Thinkers, and Ecologists) (1995). In Uruguay Eduardo Gudynas introduced the work of the American anarchist ecologist Murray Bookchin and created the Latin American Center of Social Ecology in 1989. In Brazil Sonia Felipe has adapted the work of the animal-liberation philosophers Peter Singer and Tom Regan, participating in the journal *Revista Brasileira de Direito Animal* (Brazilian Animal Rights Review). In Chile Ricardo Rozzi has worked on ecological ethics and introduced the work of Baird Callicott and Eugene Hargrove through a collection of articles in the journal *Ambiente y Desarrollo* since 1996. To enhance the dialogue between South American and Anglo-Saxon environmental philosophers, the University of North Texas and Chilean universities have collaborated on a number of programs in environmental philosophy and biocultural conservation, including a series of occasional papers published online by the International Society of Environmental Ethics (Rozzi 2007).

Social Movements and Environmental Philosophy Since 2000 social movements have played an increasingly influential role in South American environmental philosophy. "Another world is possible" is the slogan of the World Social Forum (WSF) first held in Porto Alegre, Brazil, in 2001. The WSF has brought together countless social movements and leading environmental philosophers and scholars, helping to forge an approach to environmental philosophy that builds on the knowledge of indigenous, peasant, and other subaltern or minority groups to envision other ways of coexisting with a multiplicity of human and nonhuman beings. In the words of the "Manifesto for Life: Ethics for Sustainability," "The ethic for building a sustainable society leads to an emancipation process which, as Paulo Freire taught, recognizes that no one frees anyone else and no one frees himself alone; human beings are only freed in communion" (in Reichman 2004, p. 18). This manifesto, prepared by 35 distinguished Latin American scholars, was signed during the Thirteenth Forum of Ministers of the Environment of Latin America held in Rio de Janeiro, Brazil, in October 2001 and ratified by leading South American environmental philosophers at the Symposium on Environmental Ethics and Sustainable Development in Bogota, Colombia, in 2002; it suggests that a future of South American environmental philosophy is oriented toward a dialogue among the multiplicity of human and nonhuman forms of life.

SEE ALSO *Antarctica; Biocultural and Linguistic Diversity; Biodiversity; Caribbean; Dams; Exotic Species; Fish Farming; Forests; Global Climate Change; Invasive Species; Mining: I. Overview; Ozone Depletion; Traditional Ecological Knowledge; United Nations Environment Programme.*

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Ricardo Rozzi

SOUTHEAST ASIA

Southeast Asia forms a major part of the Indomalayan bioregion. Myanmar (Burma), Thailand, peninsular Malaysia, Singapore, Laos, Cambodia, and Vietnam belong to the Asian mainland, and have a biota that is similar to that of the Indian subcontinent. The insular Sabah and Sarawak (Malaysia), Brunei Darussalam, the Philippines, Indonesia, Timor-Leste, and Papua New Guinea make up most of the great Malay Archipelago, linking Indomalaya to the Australian bioregion. Southeast Asia is also usually considered to include the Andaman and Nicobar islands (India), and the Australian islands of Christmas and Cocos (Keeling).

POPULATION AND POLITICS

Geologically complex and biodiversity rich, this region is home to more than 8 percent of the world's human population and has a land area of about 5 million square kilometers (comparable to that of the European Union). With an average of about 125 people per square kilometer, its population density is similar to that of China and Europe, less than half that of India but four times greater than that of the United States. Although the two major divisions (mainland and archipelago) have many biotic and ethnic connections, the differences give rise to a variety of environmental challenges compounded by cultural diversity and a wide range of political systems: a military dictatorship (Myanmar), a communist state (Laos), a socialist republic (Vietnam), democracies (constitutional monarchies in Thailand, Malaysia, Cambodia, and Papua New Guinea; and presidencies in Singapore, Philippines, Indonesia, and Timor-Leste), and a

hereditary kingdom (Brunei). There are also pockets of unassimilated people, such as the Mangyan tribes of Mindoro (Philippines) and the totally separate Sentinelese (Andaman Islands). The recent histories of these states offer remarkable contrasts, ranging from stability to violent struggle (internal and external), including ecocide and even genocide—despite which there is evidence that both people and nature can achieve significant recovery. Most of these countries now belong to the Association of Southeast Asian Nations (ASEAN).

Although all major nations in the region are designated as "developing countries" (in terms of gross national product and population, some have had dramatic growth rates over recent decades), there are wide variations in human wealth and well-being and associated environmental problems. Singapore has attained a European standard of living, whereas in Myanmar, beyond the ruling elite poverty is widespread. Many Javanese are prosperous compared to the rural poor on other Indonesian islands. Although most areas are safe, the islands of the north Celebes Sea (southwestern Philippines) harbor many pirates and dissidents. Social unrest occurs locally, including southern Thailand, Ambon (Indonesia), Kalimantan (transmigrant and Dayak conflicts), Myanmar, and Timor-Leste (when it achieved nationhood in 2002, by some accounts it was the poorest country in the world), and many of these struggles seem likely to continue.

ENVIRONMENTAL CHALLENGES

The region faces many environmental problems. The biodiversity of Neomalaya (Malay Peninsula, Sumatra, and Borneo) has been greatly influenced by sea-level change over the last 2.5 million years, and the projected ocean rise associated with global warming would have a major impact on the densely populated coastal areas of Southeast Asia. Although much of the region has abundant rainfall, access to freshwater is threatened by climate change, agribusiness, and pollution. Loss of Tibetan glacial feed water for the great rivers of Indochina, including the Irrawaddy, the Mekong, and the Red River, will have massive impacts on humans and wildlife alike. Local rainfall patterns are often seasonal, as in central Philippines and Nusa Tenggara (Indonesia), with the effects of climate change difficult to predict. Inshore marine pollution, such as eutrophication caused by conversion of mangroves for aquaculture, is extensive. Since 1975 about half the mangrove of the Irrawaddy Delta has been cut, and the exceptional flooding caused by Cyclone Nargis in 2008 was at least partly due to this rapid and uncontrolled change.

Many areas have been affected by smoke drifting hundreds of kilometers when peat and forest fires burn out of control. In Kalimantan the so-called "El Niño fires" of 1982–83 destroyed more than 3.5 million hectares of degraded forest, and at least 200,000 additional hectares burned in 1998. These huge fires cause serious health problems, especially in megacities (where the smoke combines with vehicle and factory fumes), and economic loss (including reduced crop growth). Controversy surrounds their cause: Developers blame climate change, whereas environmentalists argue that a mixture of local uncontrolled and internationally financed forest clearance is to blame.

If all major regional forests are destroyed, these fires will eventually come to an end. But long before that point is reached, the impacts of forest destruction on local and global climate regimes, nutrient cycles, erosion, and sediment discharge into the sea are likely to be profound. Following deforestation many local soils rapidly become infertile and are abandoned, after which they are often colonized by dense siliceous grasses (notably "lalang," *Imperata cylindrica*) that inhibit natural tree regeneration. Former forest becomes anthropogenic grassland of very limited utility and greatly reduced biodiversity—as evident in the central Philippines.

UNIQUE BIODIVERSITY UNDER THREAT

These issues raise an acute challenge to the region's biodiversity. The impact of wholesale forest destruction will be massive because the region is one of the greatest biodiversity hot spots in the world. Indonesia covers less than 1.5 percent of the Earth's land surface but supports about 17 percent of all species. If there are roughly 15 million species worldwide, then probably some 2.5 million exist in Indonesia alone. Assuming a conservative 10-percent level of endemism, this means that the area is home to 250,000 species found nowhere else. For Southeast Asia as a whole, the number of endemics probably far exceeds 1 million, most of which depend on closed forest. New Guinea has the third-largest rain forest on Earth, but pressures for timber extraction and land conversion mount daily.

Myanmar, Thailand, the Malay Peninsula, and New Guinea are probably the most species-rich areas of Southeast Asia, closely followed by Vietnam and the islands of Borneo and Sumatra. If one considers marine biodiversity, the Malay Archipelago is very likely the richest on Earth, with one-third of the world's coastline and coral reefs. Nowhere is this biodiversity homogeneous—every mountain range, valley system, and shallow sea harbors a unique mix of species and, in many cases, unique endemics as well. This lack of homogeneity is shown most dramatically in the suture zone between the Asian and Australian tectonic plates occupied by the Philippines, Sulawesi, Maluku, and Nusa Tenggara (Indonesia). Biodiversity measured as species richness per unit area is lower here, but many of the species are unique to local areas. The Philippine islands, for example, are divisible (on the co-occurrence of endemic species) into six subregions, four of which make up the Philippines "proper," with many thousands of species of organisms found only there. It seems certain that many of these have

gone extinct since Magellan arrived in 1521, with the rate of disappearance accelerating sharply since 1900. Although it is a single landmass, Sulawesi offers a comparable picture of relatively low richness coupled with high endemism, including endemics restricted to particular parts of the island. To a lesser extent the same is true of northern and central Maluku, where islands such as Buru, Obi, and Seram all have a good number of endemics. The island of New Guinea (politically divided between Indonesia and Papua New Guinea) is another area of exceptional endemism.

This very high rate of change in species composition across habitats and whole regions (beta and gamma diversity, respectively) is a major challenge for conservation, especially given the wholesale conversion of lowlands for cash-crop monocultures and lumber, displacement of subsistence agriculture into montane regions, mechanized and illegal fishing, and capture of mountain water for irrigation. To conserve the region's biodiversity requires, *in extremis*, what has been called a "structural solution"; actions are required that are unique to every local ecosystem coupled with general restraint to prevent wholesale conversion to anthropogenic landscapes (already far progressed in many areas such as the Philippines, which has only 7 percent of its original forest cover left). In the archipelago in particular, because of the vast number of medium and small islands, where there is a strong tendency toward the evolution of local forms and subspecies, the threat to such "evolutionary significant units" is massive. There is every reason to expect that extensive local genetic diversity affects the majority of organisms throughout this, the greatest archipelago on Earth.

Protest Against New Forest Access Regulations. *Indonesian women protest about use of the nation's forests by mining corporations, in Jakarta on March 10, 2008. Driven by global demand for commodities, Indonesia has one of the highest rates of deforestation in the world—but public concerns about the likely consequences are growing.* **BAY ISMOYO/AFP/GETTY IMAGES.**

WHAT CAN BE DONE?

If climate change is driven by fossil fuel use, then, regardless of its own emissions, the region is largely at the mercy of China, India, Europe, and the United States. An equally potent threat to biodiversity is poverty, coupled with rising population, over which nation states have more control; Thailand, for example, has achieved some measure of population restraint through the work of the family-planning activist Mechai Viravaidya. If, however, escape from poverty depends on increased use of fossil fuel, then this policy may be self-defeating.

For many people now living in the central areas of the archipelago, such as Indonesians resettled by World Bank-funded transmigration schemes during the 1980s, primary forests appear hostile and frightening. Education, especially regarding ecological literacy, will be vital if this is to change, but opportunities are limited by persistent poverty. Many rural people now engaged in agriculture and fishing have little local or traditional ecosystem knowledge. Even though there are encouraging developments, such as dissemination of local-language guides about sustainable fisheries, these have yet to overcome the use of blast (explosive) fishing for local food needs and cyanide to collect reef fish for the international aquarium trade—both hideously destructive and all-too-common practices.

For the conservation of biodiversity, international nongovernmental organizations (NGOs) play a growing role in raising awareness and providing funds for action, although organizations such as the Nature Conservancy have been criticized for dependence on multinationals as major donors. There is increasing collaboration between Southeast Asian and international scientists concerning environmental projects, including the Millennium Ecosystem Assessment of 2001–2005.

However important NGOs, academic research, and the business world may be, any shift to a sustainable Human-Earth relationship will depend on the understanding and willingness of the mass of people. Worldviews and social aspirations, coupled with better education and relief from poverty, will largely determine the future environmental impact of *Homo sapiens* on all parts of the Earth. In Southeast

Asia there are many cultural divisions as well as demographic and economic differences, although in one respect the overall picture appears simple: On the mainland the dominant cultural outlook has been shaped by Buddhism, and in the archipelago (including the Malay Peninsula) by Islam. Christianity is a lesser but important influence throughout, with notable Roman Catholic dominance in the northern and central Philippines and in Timor-Leste. The archipelago, now dominated by monotheistic religions, has mostly had a poorer environmental record than the Buddhist-influenced mainland. However, wherever a consumer-orientated middle class has emerged, as in parts of Thailand, increasing materialism is also evident, with concomitant impacts even on areas formerly held sacred.

ENVIRONMENTAL ACTION AND PHILOSOPHY

Cultural differences, coupled with wide variations in political and economic reality, mean that structural solutions to biodiversity loss are not just desirable—they are essential. Environmental action has to deal with differences not only between but also within countries, especially in large and culturally diverse nations such as Indonesia and Vietnam. International NGOs and national and local government agencies that fail to recognize this reality (including wide variations in land tenure) are unlikely to meet with success—and could well do more harm than good.

Against this background the development of environmental philosophy within the region, including courses taught and leading figures, is vitally important as a source of insight and future leadership. Influential figures in the conservation movement include Angel Alcala (Silliman University, Philippines, a key person in marine protection), Maryati Mohamed (director of the Institute for Tropical Biology and Conservation, University of Malaysia Sabah, Kota Kinabalu), and Chris Margules (Australian team leader for Conservation International's Indo-Pacific Region program). Establishment of the ASEAN Center for Biodiversity (University of Philippines, Los Baños), and the Conservation Training and Resource Center (Bogor, Indonesia) are important steps. BirdLife International in Indochina is active in Vietnam, Cambodia, Laos, and Myanmar. There are also valuable national organizations, such as Education for Nature Vietnam; Wildlife Conservation Society of the Philippines (founded in 1992 and later a key meeting ground for government agencies, NGOs, and academics); the Malaysian Nature Society; and the Center for Environment, Technology, and Development Malaysia (founded by the renewable-energy activist Gurmit Singh).

Most of these initiatives are oriented toward technology and action, not philosophy. Few universities in Southeast Asia teach general philosophy, much less environmental values, although ethical issues are addressed within ecological and environmental courses. The International Society for Environmental Ethics does not list a single representative in Southeast Asia. The philosophy course at the National University of Singapore does include one module, taught by Cecilia Lim. International academic collaboration is likely to be critical to foster growth in environmental philosophy in the region, such as the recently established International Network of Environmental Education, led by Fumiaki Taniguchi from Konan University (Kobe, Japan) in partnership with Phranakhon Rajabhat University (Bangkok, Thailand), Peking University (Beijing, China), and University of Malaya (Kuala Lumpur, Malaysia). The Earth Charter Initiative should also play a valuable role. The effectiveness of such initiatives will hinge on sensitivity to cultural differences, a point that has been explored by Hana Panggabean, from the psychology faculty, Atma Jaya Catholic University, Jakarta (Fremerey and Panggabean 2004).

SEE ALSO *Biodiversity; Buddhism; Christianity; Conservation; Earth Charter; Forests; Global Climate Change; Islam; Nongovernmental Organizations; Population; Species; Sustainability.*

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R. I. Vane-Wright

SPACE/PLACE

Humans see things and events not only as they are, but also as signs or symbols that point beyond themselves to other associated things, events, or ideas. These symbols point to meanings that might otherwise be overlooked because they are obscure, intangible, or far removed in time or space. A sign in the park warning of poison ivy points out a hazard to visitors who can read English, but not the shapes of leaves; a war memorial points back to a past event; a steeple points beyond this world to a transcendent hope.

UNDERSTANDING A SENSE OF PLACE

Such symbols are part of a public and a local vocabulary. Every day each person uses symbols in a locality to take and keep his or her physical and spiritual bearings. Understanding this local symbolic vocabulary—and the intangibles to which it points—is the first step toward sensing the locality as a place, toward feeling "in place." We can appreciate this feeling when we travel to foreign localities that are, to us, largely unintelligible, scarcely places at all. The commonalities of human life ensure that no human locality is to any other human wholly unintelligible, but to be deeply uncertain as to the meaning of many of the things and activities by which one is surrounded is to feel "out of place."

EMOTIONS, MEMORY, AND A SENSE OF PLACE

It is, of course, possible to comprehend meanings while feeling toward them intense repugnance, disapproval, or dislike. We have all understood and yet disliked a book. To understand and detest a place is not, perhaps, so common as to understand and detest a book; but there is, commonly enough, what the philosopher Roger Scruton (2007) calls *oikophobia:* antipathy toward one's home place. The oikophobe is of the place and so understands the place (detachment may enhance insight), but he is not altogether in the place. He is also, in his own way, "out of place." This is because sense of place entails empathy, affection, and understanding. The oikophobe is cut off from full understanding of the place just as the teetotaling prohibitionist, notwithstanding degrees in organic chemistry and physiology, is cut off from full understanding of wine. To understand Austria, for instance, one must not only understand the meaning and recognize the manifestations of gemütlichkeit (cordiality, friendliness)—one must also enjoy gemütlichkeit.

This identification with a place is often tacitly present in natives who cannot imagine themselves living anywhere else. But visitors to places with a distinctive ethos and way of life—places like New York City, New Orleans, Santa Fe, or San Francisco—sometimes feel a surge of similar affinity. Some who do will stay. Chronic homesickness afflicts anyone forced to leave a place with which they identify, because a sense of place implies desire to be in that place.

Empathy and affection may rise to the level of love. Indeed, a sense of place is often described in the language of love. Love of a place is the root meaning of *patriotism* (a word that should not be surrendered to jingoists and chauvinists or to the oikophobes who oppose them). People say that they have "fallen in love" with a place. In this, as in any loving relation, there is an interpenetration and mutual involvement that progressively knits the partners together. A husband, for instance, comes to see something of himself in his wife, as she presumably comes to see something of herself in him. The expression "grown together" is, in such cases, more than mere metaphor. Persons with a sense of place are knitted to the place in an analogous fashion. Looking at the place, they are reminded of the life they have lived there; thinking about the life they have lived, they are reminded of that place.

Memory is, therefore, the third component in a sense of place. This is not reminiscence, for sense of place does not mean that the mind is forever asking itself, "Do you remember when?" Memory is, rather, recognition that, for better or for worse (recurring to the language of love and marriage), here and nowhere else is where my life has been and is being lived. It is, in other words, love completed by conscious and demonstrated commitment to the place.

PLACELESSNESS

Understanding, affection, and memory are the three components in a sense of place. Possessing any one of these in even a small degree, one may lay claim to a sense of place, but it is doubtful that a person utterly devoid of any one of them really feels a sense of place. Localities are, for such persons, only more or less satisfactory. They are enigmas that arouse no curiosity—disposable instruments, like a parking place, a motel room, or a seat in an airport waiting area.

The geographer Edward Relph called this attitude *placelessness* (1976). Placelessness is the absence of understanding, affection, or memory. It may arise in placeless individuals who are incapable of developing a sense of place, or in placeless localities that are impossible to understand, love, or remember. Relph argued that placelessness is increasing for both reasons. There are more drifting nomads who cannot put down roots, and more impenetrable localities that do not provide fertile soil for the sinking of roots.

This argument is easily criticized as a mask for xenophobia; it is not at all clear, however, that people

with a secure sense of place are prone to xenophobia. Xenophobia is, if anything, a pathology of persons who resent unsought placelessness and blame foreigners and immigrants for this unsettled condition. This argument has also engendered a postmodern style of architecture that seeks to recover the unique and local, but the rearguard of modernism routinely denounces it as ersatz, eclectic, and kitschy. Perhaps there is something fundamentally phony about much of this superficially idiosyncratic architecture, but one can admit this and still agree with its protest against the placeless "geography of nowhere" imposed by the "international style."

THE ENVIRONMENT AND A SENSE OF PLACE

The connection between sense of place and environmental values and attitudes is complex. Clearly, persons with a sense of place will not wish to see that place destroyed; they can be expected to show more concern for stewardship of the local environment than, say, nomadic managers of global corporations. But the natural environment will be, for such proud locals, only one facet of the place, joined in complicated ways to its economy, society, and culture. The conflicts between logging communities and environmentalists in the Pacific Northwest show that residents with a sense of place may not prize environmental values. Whether understood as scenery or as natural resources, the natural environment is just one of the things these people understand, love, and remember when they experience a sense of place. They will, therefore, often accept environmental costs as tradeoffs for economic, social, or cultural benefits. Environmentalists who would harness the powerful sentiment that we call a sense of place must, therefore, learn to see and describe the ecosystem as part of the larger social and symbolic ecology of the locale. When environmental degradation can be shown to threaten a way of life and the identities of individuals who are part of it, environmentalism and a sense of place are in harmony. When environmentalism appears to threaten an established local way of life, however, environmentalism and sense of place will clash.

Regard for the viability of a place should include concern for the natural environment, as well as the larger social and symbolic ecology. Such concern is, however, sometimes coupled to indifference to the viability of the natural environment in other places. If my drinking water is safe, I may too easily grow indifferent to the quality of drinking water in other places, even when this has been rendered unsafe by my behavior as a consumer. Thus, to some ethicists attaching special value to one's local environment is a vice akin to the vice that other ethicists find in preferential regard for one's neighbors and kin. The answer to both of these challenges is the same: Abstract regard (for humanity or the environment) normally issues in a censorious attitude, whereas concrete regard (for persons and places) more often issues in constructive action.

SHRINKING SPACE AND TIME

For humans and presumably all creatures endowed with sight, the external world appears to consist of objects that occupy space. Philosophers disagree on this point: Some argue that space is itself a feature of the external world, whereas others regard space as a concept whereby the mind imagines something that is, in fact, quite different from space. Space for the second group of philosophers is analogous to color. The external world has no color, just light with different wavelengths bouncing off or being absorbed by objects: but color is the way our mind imagines these wavelengths. Whatever the answer may be to this abstruse question, there can be no doubt that it is highly practical to understand the world as objects arrayed in space. Spatial maneuvers are, after all, our most effective means of manipulating and controlling the external world.

This is why space is one of the first things the human infant learns to understand. At a young age she discovers that she can have much that she desires by reaching out for it, rolling toward it, crawling after it. This primary spatial education continues in the spontaneous play of childhood and the organized sport of adolescence. Children learn the basic nature of space (along with other things) when they run, jump, and fall; when they catch and throw balls; when they frighten their parents with tricks on their bicycles. In adulthood such exercises may continue in the spatial virtuosity of the athlete, acrobat, or dancer but are more commonly transformed into practical geometries such as navigation, engineering, and ballistics.

The mention of those three sciences should make it clear why humans seek spatial understanding. Practical geometries are instruments of power. It is no coincidence that revolutions in navigation and ballistics (as well as cartography and perspectival drawing) accompanied the birth of the modern age. Successful navigation, engineering, drawing, and ballistics demand advanced spatial understanding, but they are also means of shaping space. Navigation and ballistics, for example, shrink space. Engineering has contributed mightily to what nineteenth-century writers, thinking of trains and the telegraph, called the "annihilation of distance." Since the fifteenth century distance annihilating innovations such as highways, airplanes, and microwave transmitters have radically reduced the effective size of the earth.

The geographer Donald G. Janelle (1969) has described this shrinkage as time-space convergence, because the convergence of locations in space was a reduction in transportation

time. Time-space convergence is a pervasive fact of society. People, goods, capital, images, and ideas move through space with astonishing speed, as do pathogens, pollutants, terrorists, and intercontinental ballistic missiles. (Efforts to channel or stem these flows are another class of space-shaping technologies).

Time-space compression has profoundly transformed the global environment: first by bringing together organisms that had evolved separately—with disastrous consequences for some of those organisms (Native American populations were devastated by Old World diseases such as smallpox)—and second by bringing the farthest corners of the earth into the reach of metropolitan markets. Many critics note that the spatially extensive economy also hides from consumers the consequences of their choices, putting resource extraction, polluting factories, and waste out of sight and out of mind. Others have countered that this annihilation of distance also permits the dissemination of images of environmental degradation. Indeed, because such images often depict vivid extremes, consumers may in some instances overestimate environmental degradation.

The greatest effect of time-space compression on consumer perception of the environment is to separate degradation from the intentions of any single human actor, thereby diffusing the sense of responsibility. If someone cuts down a tree and builds a table, she has no doubt that it was she who cut the tree. If a shopper buys a table, it is much harder for her to connect her intention with the felling of any particular tree. Indeed, she never forms the intention to fell a tree—only the intention to buy a table so that she may give a dinner party for twelve. At the other end of the commodity chain, the lumberjack likewise works in a fog of abstractions. He cuts down the tree not necessarily because he wishes to but because he is impelled to do so by the market demand that reaches him through the orders and inducements of his employer. Thus, a tree is cut and no one feels that it is he or she who bears responsibility for the act. Hence environmental consciousness is not everywhere identical to a sense of place, and time-space convergence is sometimes—but not always—harmful to the environment.

SEE ALSO *Globalization; Land Ethic; Native Americans; Regionalism; Stewardship.*

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Jonathan M. Smith

SPECIES

Concern for the protection of endangered and threatened species is central to environmental ethics, and is embodied in public policy. Our moral and legal deliberations about species ought to be grounded in the best current biological and philosophical thinking about species. Unfortunately, there is no single unambiguous definition of *species* in biology, but rather a host of competing species concepts and definitions. Biologists and philosophers disagree about which, if any, is the "correct" species concept, whether we should accept a plurality of species concepts, and even whether *species* are real natural categories. These difficulties are known as "the species problem." This entry discusses various aspects of the species problem and how they impact our moral and legal thinking about species. It argues that there is a sufficiently clear account of the entities our species protection laws aim to protect, and the rationale for protecting them.

PROBLEMS WITH SPECIES

A species concept is an account of the species category. It spells out the special features that distinguish species from other groups of organisms. A species concept indicates where the boundaries are between distinct species and what makes two organisms conspecific. There are many species concepts in the biological literature; four of the most important in current use are discussed below.

The Biological Species Concept: A species is a group of interbreeding natural populations that is reproductively isolated from other such groups (Mayr and Ashlock 1991, p. 26).

The Evolutionary Species Concept: A species is a single lineage of ancestral descendant populations of organisms which maintains its identity from other such lineages and which has its own evolutionary tendencies and historical fate (Wiley 1978, p. 18).

The Ecological Species Concept: A species is a lineage (or a closely related set of lineages) which occupies an adaptive zone [ecological niche] minimally different from

that of any other lineage in its range and which evolves separately from all lineages outside its range (Van Valen 1976, p. 233).

The Phylogenetic Species Concept: A species is a group of organisms, including a common ancestor and all of its descendants (a monophyletic group), that is the smallest diagnosably distinct such group. (See Cracraft 1983; Mishler and Brandon 1987.)

These species concepts give different accounts of what makes a group of organisms a species, and generate different classifications of organisms. For example, the Biological Species Concept (BSC) does not recognize as species groups of organisms that do not interbreed, and consequently does not recognize asexual organisms as forming species. The other three species concepts recognize asexual organisms as species so long as they form ancestor-descendant lineages that meet their other criteria. The Ecological Species Concept and the Evolutionary Species Concept will lump together as a single species populations that do not exchange genetic material due to geographical isolation (unlike the BSC), so long as those populations occupy the same ecological niche, or maintain the same evolutionary tendencies, respectively. The Phylogenetic Species Concept (PSC) is the most fine-grained species concept in that it splits such populations into distinct species, so long as they are diagnosably discernible. The PSC recognizes distinct species wherever a monophyletic group of organisms is recognized as a distinct group for a variety of reasons. Subspecies, distinct forms of species often recognized by geographical or minor character differences, may be regarded as distinct species by the PSC.

Species monism is the view that there is one correct species concept, and a task of biological systematics is to determine which species concept gives the correct account of species and generates a classification that reflects true divisions in nature. Given the ongoing and unresolved dispute concerning the species concept, and the fact that biologists adopt different species concepts in different contexts, an increasingly popular alternative is *species pluralism*. Species pluralists (John Dupré 1993; Marc Ereshefsky 2001; Philip Kitcher 1984) maintain that there is more than one kind of species, and we can accept a number of different species concepts, which need not conflict. Biologists with different concerns may simply be talking about different things. For example, taxonomists employing the PSC generally follow the cladistic approach to taxonomy, which aims to reconstruct evolutionary history, while de-emphasizing the importance of similarities in classification. Those adopting the other species concepts have additional concerns and wish to retain a more intuitive classification. Pluralists have suggested we adopt explicit terminology ("biospecies," "ecospecies," "phylospecies") to make clear which things we are talking about by *species*.

Another area of contention regarding species concerns their ontological status. The traditional Platonic view considered species to be universals—abstract entities distinct from the concrete individual organisms that are their instances. The view that species are universals—eternal, unchanging, abstract entities—is thought to have no place in contemporary evolutionary biology, where species are changing, evolving units that have beginnings and go extinct. According to the class view, a species is a class or set of organisms with certain properties in common. A species concept tells us which qualitative properties (morphological, genetic, etc.) distinguish one species class from another. On one version of the class view, there are properties shared by all and only the members of a species, in virtue of which organisms belong to that species. The other version rejects precise species essences in favor of clusters of features, such that organisms belong to a species if they have a sufficient number of them. Much contemporary thinking about species has de-emphasized qualitative similarities between organisms, and focused instead on populations and the biological relations that unite them into species. This shift has caused many to adopt the species-as-individuals view—that species are concrete, persisting, particular individuals, with organisms as parts rather than members. (See works by Judith Crane 2004, Michael Ghiselin 1974, and David Hull 1978.)

A final aspect of the species problem concerns the reality of species. The difficulties in settling on a species concept and understanding the ontology of species invite this worry. Perhaps species are merely artificial categories drawn up for the sake of convenience. The idea that species gradually evolve into one another suggests that the boundaries between species are quite arbitrary, which is what led Charles Darwin to doubt the reality of species. For species to be real is for there to be an objective fact as to what the different species are, and where the boundaries are between species. Philosophers sometimes talk of "carving nature at the joints," echoing Plato's expression from *The Sophist*. If species are real, there are natural joints to be discovered, and the quest for the correct species concept is the attempt to carve nature at its joints.

CONSERVATION SPECIES

What kind of "species" matter in our efforts to protect endangered species? Consider the U.S. Endangered Species Act of 1973 (ESA). The "Definitions" section contains the following: "The term 'species' includes any subspecies of fish or wildlife or plants, and any distinct population segment of any species of vertebrate fish or wildlife which interbreeds when mature" (Section 3[16]).

The inclusion of "subspecies" and "distinct population segments" shows that the ESA is using a finer-grained

notion of species than the Biological, Ecological, or Evolutionary Species Concepts. Many of the endangered and threatened species listed under the ESA are in fact classified as subspecies in standard classifications. Perhaps the ESA is using the fine-grained Phylogenetic Species Concept (PSC), which treats many "subspecies" as species. However, the PSC's strict adherence to only monophyletic groups as species is clearly not a concern of the ESA. According to the PSC, an ancestral population that buds off a new species but persists without any noticeable change is not considered a species, since it does not include all of its descendants. The ESA's appeal to interbreeding, at least for vertebrate animals, suggests that interbreeding relations would be sufficient to unify such a group of organisms into a species, even if it were not monophyletic. That interbreeding is mentioned only in the case of vertebrate animals suggests that other biological processes, such as ecological forces, could unify a population into a species. The "species" of the ESA are finely divided populations, but the ESA does not specify which biological processes unify populations into species.

Robin Waples (1991) suggests that the protectable populations of the ESA be understood as "evolutionarily significant units" (ESUs). ESUs were introduced to capture the idea of a minimal unit of conservation, which avoids the controversial taxonomic categories of species and subspecies. This would allow ESA species to be more fine-grained than many standard species concepts. However, ESUs are identified by morphological or genetic distinctness from related populations. David Pennock and Walter Dimmick (1997) note that many populations listed under the ESA do not qualify as ESUs. Protected populations of grizzlies and grey wolves are identified by region, and do not differ genetically or morphologically from unprotected populations in other regions.

The fine-grainedness of ESA species appears to flow from the goals of slowing the current rate of extinctions, and preserving ecosystems on which species depend. Section 2(b) reads: "The purposes of this Act are to provide a means whereby the ecosystems upon which endangered species and threatened species depend may be conserved . . ." The emphasis on ecosystems accompanies a concern with regional populations. In some cases regional populations are classified as subspecies. For example, the ESA lists six subspecies of beach mice. The mice occupy similar habitats in the Southeastern United States, are closely related biologically, and are distinguished only by region and minor morphological differences. Where biological classifications do not differentiate populations as subspecies, the ESA may differentiate them nonetheless. Grizzly bears are listed as a single species (*Ursus arctos horribilis*, a subspecies of brown bear), but the ESA distinguishes and treats separately five different regional populations of grizzlies. In March 2007, the Yellowstone grizzly was removed from the threatened list, while the remaining four populations of grizzlies remained protected.

Grizzly Bear Peering Over the Grass, Yellowstone National Park. *The grizzly bear (*ursus arctos horribilis*) is a symbol of the American wilderness; it is the largest species of bear found in North America. Between 1800 and 1975, the number of grizzlies in the United States decreased from around 50,000 to fewer than 1,000. The effort to recover the number of grizzly bears, initiated in 1975, has met with some success.* **NPS.**

The ESA uses a species concept based on the idea of a regional population. How fine-grained is it supposed to be? Where do we stop dividing populations? Consider the ESA definition of "endangered species": "The term 'endangered species' means any species which is in danger of extinction throughout all or a significant portion of its range . . ." (Section 3[6]). The range of a species may be broader than an area occupied by a protected population, as in the case of grizzlies. The range of grizzlies includes Washington, Idaho, Montana, and Wyoming, but grizzlies are endangered in a portion of their range, as indicated by the four out of five regional populations protected under the ESA. But portions of ranges used to divide populations for protection must be "significant." This language is vague, as is often the case with legal language, and allows room for judgment. Clearly the status of the American red squirrel should not be based on the fate of one backyard population. Given the

concern to protect ecosystems, it is plausible that the limit of a "significant" portion of a range is an ecosystem that can be identified and discerned for the purposes of conservation. Thus the following species concept appears to be implicit in the ESA and in our practical thinking about species conservation: *The Conservation Species Concept:* A (conservation) species is a population of organisms (unified by interbreeding relations, occupation of a common ecological niche, or other biological process) that depends on a discernable ecosystem for its survival.

The Conservation Species Concept recognizes as species biologically unified populations that can be discriminated on the basis of protectable ecosystems. It is such populations that species protection laws aim to protect.

Because the Conservation Species Concept is population-based, it suggests a species-as-individuals ontology. Perhaps understanding species as individuals can help to explain the value of species and why they ought to be protected. It has been suggested that species as individuals have interests in addition to any interests of their members, and so deserve moral consideration independently of their value to humans. (See Lawrence Johnson [2003] for an attempt to show this.) But even if species are the same type of entity ontologically as organisms, given the comparative lack of cohesion and other significant differences between species and organisms, trying to establish a meaningful account of species interests still poses a substantial challenge (see Sandler and Crane 2006).

The ESA provides another account of the value of species: "These species of fish, wildlife, and plants are of esthetic, ecological, educational, historical, recreational, and scientific value to the Nation and its people" (Section 2[3]). This account of the value of species is not only human-centered, it is nation-centered, which many environmentalists may find unsatisfactory. It provides a rationale for protecting endangered populations that avoids the difficulties in giving an account of species value independently of human interests. In fact, the ESA explicitly does not recognize as endangered any species of insect that is considered a "pest" (Section 3[6]). If we rely on such an account of species value, there are no true conflicts between human interests and those of endangered species. Such apparent conflicts are between competing human interests.

The question of species realism would appear to have profound implications for efforts to preserve species. If species are not real, but merely convenient categories, are efforts to protect species misguided? No. Even biologists and philosophers who reject the reality of species can accept that populations are real. A population is a group of organisms that is integrated in some biologically interesting way—for example, by interbreeding or ecological forces. The Conservation Species Concept is based on this idea of a population. If we take a pluralist approach to species, we can accept such species concepts as legitimate. Species monists who believe there is one correct scientific concept can allow that conservationists are not talking about biological species, but populations that can be identified by the ecosystems on which those populations depend, and which we have an interest in protecting.

SEE ALSO *Conservation; Defenders of Wildlife; Ecosystem Health; Endangered Species Act; Environmental Law; Speciesism.*

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Judith K. Crane

SPECIESISM

Richard Ryder is credited with coining the term *speciesism* in 1970 (see Ryder 1975, 1989). As Ryder himself observed, "In 1985 the *Oxford English Dictionary* defined speciesism as 'discrimination against or exploitation of certain animal species by human beings, based on an assumption of mankind's superiority.' This definition marked the official acceptance of 'speciesism' into the language" (1998, p. 320). Ryder goes on to refer to the pioneering work of Peter Singer, who has done much to both popularize the concept of speciesism and to present arguments justifying claims that speciesism is a morally odious practice.

The charge of speciesism, as it occurs in debates about the moral status of nonhuman animals, usually applies to people who attempt to justify different treatment of nonhuman animals (or who attribute to such animals different value) using the criterion of species membership. Speciesism has been compared to both racism and sexism. Racists attempt to justify different treatment and different attribution of value using race membership as a criterion, and sexists do the same using gender as a criterion. Opponents of speciesism argue that just as racism and sexism are morally odious as applied to our fellow humans, so, too, is speciesism as applied to our fellow creatures. Opponents of speciesism believe that the moral community—the community of beings that count and have moral worth—needs to be expanded to include both humans and nonhuman animals.

The debate about speciesism has been particularly intense in connection with the use of millions of nonhuman animals in biomedical experiments. As Singer has pointed out:

> The experimenter, then, shows bias in favor of his own species whenever he carries out an experiment on a non-human for a purpose that he would not think justified him in using a human being at an equal or lower level of sentience, awareness. . . . No one familiar with the kind of results yielded by most experiments on animals can have the slightest doubt that if this bias were eliminated the number of experiments performed would be a minute fraction of the number performed today. (1989, p. 80)

Bias against animals in the context of animal experimentation in turn has led to intense debates about (a) the cognitive status of nonhuman animals; and (b) the problem of cognitively marginal humans. In connection with the latter issue, some have argued that many nonhuman animals are cognitively more sophisticated than young infants, those with severe mental retardation, or advanced senility. Because these latter are included in the moral community of beings that count, why not include nonhuman animals—unless you are guilty of speciesism? Tom Regan (1979) labeled this "the argument from marginal cases," and it appears in nearly all appeals for extending the same ethical regard we accord so-called "marginal" members of our own species to cognitively equal or superior members of other species.

LaFollette and Shanks (1996) have distinguished between *bare speciesism* and *indirect speciesism*. Bare speciesism involves differential treatment of organisms simply on the basis of a biological species difference. It is hard to see how a mere species difference can possibly be morally relevant. By contrast, indirect speciesism is the view that the evolutionary changes giving rise to species differences were accompanied by changes in morally relevant cognitive properties that restrict the moral community to the human species. Issues concerning the mental lives of animals have been reviewed in the work of Niall Shanks (2002).

In an important early discussion of these matters, laid out in a footnote in *The Principles of Morals and Legislation* (1789), the utilitarian philosopher Jeremy Bentham observed:

> The day *may* come, when the rest of the animal creation may acquire those rights which could not have been withholden from them but by the hand of tyranny. The French have already discovered that the blackness of the skin is no reason why a human being should be abandoned without redress to the caprice of a tormentor. It may come one day to be recognised, that the number of legs, the villosity of the skin, or the termination of the *os sacrum* are reasons equally insufficient for abandoning a sensitive being to the same fate. What else is it that should trace the insuperable line? Is it the faculty of reason, or, perhaps, the faculty of discourse? But a full-grown horse or dog is beyond comparison a more rational, as well as a more conversable, animal than an infant of a day, or a week, or even a month old. But suppose the case were otherwise, what would it avail? The question is not, Can they *reason*? nor, Can they *talk*? but, Can they *suffer*? (1879, p. 311)

In this passage we find the earliest statement of the argument from marginal cases, in this instance "an infant of a day, or a week, or even a month old." Peter Singer, in his book *Animal Liberation* (1975), elaborated a view of the moral status of nonhuman animals along lines sketched here by Bentham, using the same utilitarian arguments. Singer focuses, as Bentham does, on the moral significance of animals' pain and suffering. As Singer observed in *Animal Liberation*, "If a being suffers, there can be no moral justification for refusing to take their suffering into consideration" (1990, p. 8). For Singer any

being capable of suffering has a place in the community of beings that have moral standing. He argues that just as racists and sexists wrongly treat certain individuals differently on the basis of morally irrelevant traits, so speciesists are guilty of a similar error. Though Singer sometimes uses the phrase "animal rights," he has made it very clear that, as a utilitarian moral theorist, he prefers not to talk about rights at all, whether animal or human.

By contrast, Tom Regan, in *The Case for Animal Rights* (1983), has developed an explicitly rights-based approach to the moral status of animals. If, as Regan argues, nonhuman animals have rights, then their interests cannot be sacrificed even if such sacrifice would greatly benefit human beings. Regan's basic idea is that creatures should be treated the same unless there is a morally relevant reason to justify a difference in treatment. A mere difference in species membership is not, in his view, a morally relevant difference. For Regan nonhuman animals have an inherent worth that trumps their instrumental value to us as subjects of painful experiments and as farm animals.

Defenders of animal experimentation such as Carl Cohen (1986) object to the comparison of speciesism with racism and sexism. For Cohen the capacity for moral judgment is what distinguishes humans from other animals. By contrast, Peter Carruthers (1992) has argued that the experiences of animals (if any) are not sufficiently like ours to confer moral standing on them.

SEE ALSO *Animal Ethics; Regan, Tom; Singer, Peter.*

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Niall Shanks

SPINOZA, BARUCH
1632–1677

Baruch (Benedict de) Spinoza scandalized the western European world and his own Jewish community in Holland with his declaration that God is nothing other than nature. His philosophy maintains that one substance comprises all of existence. God, the force of creation, cannot be outside, above, or beyond the created world. Because God is perfect, infinite, eternal, and coextensive with all of existence, the world itself must be identical with divine perfection. God is in everything, and everything is in God (both "pantheism" and "panentheism").

According to Spinoza, God expresses himself in infinitely many ways; he has infinitely many "attributes," which are further divided into infinitely many "modes." Humans conceive two attributes, "thought" and "extension," each of which is perfect, complete, infinite, and eternal. Thus, God is not merely spiritual or mental, but equally corporeal. Infinitely many ideas comprise thought, whereas "extension" names the interactive community of infinitely many bodies. Bodies and ideas express the same order and connection of causes. This means that any individual thing in nature exists, at the same time and to the same degree, as a thinking and a bodily power. Human minds are nothing other than the ideas that correspond to human bodies. All things, including rocks, mice, and computers, have "minds," ideal powers that correspond precisely to the powers of their bodies ("panpsychism").

Such metaphysical principles inspired the Deep Ecologist philosopher Arne Naess to declare, "No great philosopher has so much to offer in the way of clarification and articulation of basic ecological attitudes as Baruch Spinoza" (1977, p. 54). Deep Ecologists are also attracted to Spinoza's doctrine of *conatus* (striving), which contends that each and every thing strives to persevere in being and enhance its existence. The recognition that all beings aim at "self-realization," in an ecological interpretation, fosters an appreciation of other beings' integrity in a way that might restrain human exploitation. Spinoza's principles and his own attitudes condemn anthropocentrism, the view that the nonhuman world exists for the use and pleasure of people (see also Sessions 1977, Mathews 1991).

Deep Ecological interpretations of Spinoza have met with criticism from several theorists, notably the philosopher Genevieve Lloyd. Lloyd notes that, although Spinoza propounds a nonanthropocentric metaphysics, his "morality" is entirely human-centered and excludes any moral consideration of nonhuman beings, affirming that "other species can be ruthlessly exploited for human ends" (1980, p. 294). Her criticism centers on Spinoza's assertion that the "rational principle of seeking our advantage teaches us to establish a bond with men, but not with the lower animals, or with things whose nature is different from human nature" (Spinoza 1985, p. 566).

Naess rebuts Lloyd's criticism by pointing out that the term "moral" is never used by Spinoza and is entirely inappropriate to his philosophy. He contends that Lloyd misleads her readers by suggesting that there is a uniquely human moral community that enjoys special "rights" separate from "natural right," the capacity to preserve and enhance one's life. The "rights" a community institutes and upholds are simply techniques humans have within their power to live well. Such forms of association are different in character, but not in kind, from, for example, packs of wolves. Although Spinoza cannot support a program of animal rights, his views allow nonhuman animals to be "members of *life communities* on par with babies, lunatics, and others who do not cooperate as citizens, but are cared for in part for their own sake" (Naess 1980, p. 319).

Nevertheless, Lloyd indicates an ambiguity in ecological philosophy; although ecological thought aims above all to undermine anthropocentrism, it often does so by "humanizing the nonhuman" (1980, p. 307). Anthropocentrism is not obviously weakened by affirming that all beings resemble us in some ways, or by viewing the universe as a great Self. Spinoza himself consistently criticized the theological tradition for imagining God in human terms. Lloyd's critique and Naess's attraction to Spinoza's antimoralism points to new directions in which Spinozism might go in support of an ecological perspective. Rather than expanding human categories to foster respect for nonhuman reality, Spinoza's philosophy suggests that we naturalize humans as thoroughly as possible. Spinoza encourages us to see that we are constituted deeply by the myriad powers we depend upon to survive and flourish, whether they are our families, the atmosphere, the military-industrial complex, or our nonhuman animal companions. Our constitutive connections complicate any boundary between the human and nonhuman, whereas a moral law upheld in the name of humanity as a special genre of being might falsely elevate people out of the rest of nature. Spinoza affirms our necessary dependence upon the human and nonhuman world, and thereby points to the importance of caring for and transforming the quality of such relationships to enjoy more vital ways of being together.

SEE ALSO *Deep Ecology; Naess, Arne; Pantheism.*

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Hasana Sharp

ST. FRANCIS OF ASSISI
1181 or 1182–1226

St. Francis of Assisi, patron saint of the environment and animals, was born in either 1181 or 1182 in the town of Assisi in Umbria, Italy, and was baptized as Giovanni de Bernardone. His wealthy merchant father, who was in France on business at the time, renamed him Francesco, in honor of his maternal ancestors from France. As a young man, Francis pursued an education while engaging in carousing with his friends from the nobility. Never interested in entering into his father's commercial ventures, Francis experienced a spiritual crisis in his early twenties. He began spending time as a hermit, while seeking guidance from God. Much to his father's chagrin, Francis rebuilt dilapidated churches, aided those without adequate clothes or food, nursed lepers, and abandoned his own fine garments and possessions, to cleanse himself of worldly attachments. In 1209, Francis founded the Order of Friars Minor, bound by vows of poverty, chastity, and obedience. Three years later, St. Clare of Assisi, supported by Francis, organized an order for women, the Poor Clares, based on the same principles. In 1221, St. Francis founded the Third Order open to the laity. Francis died in 1226, and was canonized a mere two years later in 1228 by Pope Gregory IX.

St. Francis of Assisi is often misunderstood as the first saint to encourage Christians to care for nature, when he is actually a participant in a long tradition of Christian protection of nature beginning with Christian monks in the third century. His medieval biographers, such as Thomas of Celano, report Francis fed bees in winter, released animals from traps, and allowed native wildflowers to remain around the edges of a cultivated garden. These practices, however,

St. Francis of Assisi. *St. Francis Preaches to the Birds, a late thirteenth-century painting by the Italian artist Giotto. In Christianity, St. Francis is considered to be the patron saint of the environment and animals.* **THE ART ARCHIVE/MUSEE DU LOURVE PARIS/ALFREDO DAGLI ORTI.**

continued the values of late ancient Celtic and desert monastics, who protected wildlife from hunting and appreciated regional flora. Francis's original contributions lie instead in his resistance to Christian treatment of nature as a mere material possession; his concern for the marginalized, whether human or in nature; and his practical approach to the social issues presented by the growth of towns and cities as Europe slowly emerged from feudalism. In his "Canticle to Brother Sun," for example, Francis exhorted Christians to a non-hierarchal valuation of nature, by identifying the planets as brother and sister. When Francis preached his well-known sermon to the birds, he not only acknowledged the worth before God of all non-human creatures, he also subtly argued for the spiritual equity of humans who were economically marginalized or socially ostracized, such as the lepers Francis physically embraced. The Franciscan friars were mendicants, which meant they were not necessarily tied to the church's estates and property holdings, and could reach out to the urban poor—who, unlike the feudal peasants, had no access to the land. Franciscans ministered to the victims of natural disasters, like earthquakes, rather than adopting the fatalistic attitude that such tragedies were God's judgment on the unrighteous.

Many stories about St. Francis's environmental ethos can be interpreted in two ways. According to legend, St. Francis tamed the wolf who had been terrifying people who ventured outside the town walls of Gubbio by striking an agreement between the wolf and the citizenry: If the wolf stopped his attacks, the town's residents would feed him. On one level this tale calls for the protection of all God's creatures, even the large predators. On another, it argues that those unable to easily feed themselves will eventually attack or harm others. Sharing resources with those who have no honest way to make a living thus will prevent the hungry from becoming outlaws and threats to the greater society.

Francis withdrew to Mount Alverna for prayer, and in doing so received the stigmata or the wounds of Christ from a seraph, an angelic being. For Christians, Christ is the Creator of the universe and his body is an analog for the cosmos. At the time, avaricious churchmen utilized the centrality of the body and blood of Christ, in the bread and wine of the Eucharist, as a rationalization for church ownership of vineyards or collection of offerings of bread or grain; Francis received the environmentally critical symbolism of Christ's suffering and death as a result of his unselfish service to others. Francis thus reminded Christians that care for the poor and needy, and for God's Creation, should be the expression of their religious faith, rather than with feudal hegemony over natural resources. In experiencing a vision at an isolated and uncultivated locale, Francis continued a Biblical tradition of encounters with the divine in wilderness settings.

After the death of Francis, Franciscan appreciation of the environment contributed to the development of modern science through the investigations of friars such as Roger Bacon, who during the thirteenth century utilized the scientific method and advocated detailed observation of nature. Today, both the Roman Catholic Church and the Anglican Communion (Episcopalians) continue to sanction Franciscan orders that champion environmental causes, work to relieve poverty, sponsor retreats in natural settings, and encourage Christians to simple living and care of the earth.

SEE ALSO *Animal Ethics; Bible; Christianity; Ecotheology.*

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Susan Power Bratton

STEWARDSHIP

The term *stewardship* refers to a way of thinking about environmental responsibility that is based on the metaphor of human beings as stewards: persons who are responsible to an owner for the care or management of that person's household and goods. Environmental stewardship extends the concept of a household to include the whole earth or some part of it. It also extends the role of a steward to the human race, the present generation, an organization or agency, or an individual landowner. Synonyms or near synonyms for *steward* include *caretaker*, *curator*, *custodian*, *guardian*, and *trustee*.

THE STEWARDSHIP CONCEPT

Steward comes from the Old English word *stīweard*, from *stī*, meaning "hall," and *weard*, meaning "ward," or "guard." Its primary meaning is an official or servant who is responsible for the domestic affairs of a household, including supervising the other servants, managing money and keeping the books, and directing the serving of meals. The term also has been used to denote a ruler or highly placed noble serving as a minister to a ruler and to offices and occupations such as magistrate, labor union representative, flight attendant, shipboard caterer, and financial manager.

The two key elements of the stewardship concept are the ability to care for, manage, or control persons or things and accountability for the proper exercise of that ability. A steward exercises power and authority but does not have license to do so in a self-serving or careless manner.

Although the term *stewardship* is used widely in environmental writing, its implications and appropriateness have been debated. Critics charge that stewardship is based on the same problematic assumptions and values that underlie the environmental crisis: the idea that humans are separate from and superior to the rest of nature, which is seen as a pool of resources to be managed and controlled by the rational application of science and technology.

Defenders counter that the stewardship model recognizes that humans are unique in their power to transform, degrade, or destroy the earth and their ability to make individual and collective decisions about ways to use that power. For them, the concept of stewardship expresses a sense of responsibility for one's actions as they affect, directly or indirectly, other people and the natural environment over great distances and far into the future, a sense that has become rare in a competitive, individualistic, shortsighted, profit-oriented, and anthropocentric consumer culture.

RELIGIOUS TRADITIONS OF STEWARDSHIP

In many Western religious traditions God is the true owner of the earth and the one to whom human beings are responsible in every aspect of their lives. The stewardship concept is less prominent in or largely absent from Eastern and indigenous religious traditions. Some regard stewardship as a weak or marginal theme in Western religion, but others see it as firmly rooted in Jewish, Islamic and Christian scripture and tradition.

Psalm 24:1 declares, "The earth is the Lord's, and the fullness thereof; the world, and they that dwell therein." God tells the people of Israel, "The land is mine; with me you are but aliens and tenants" (Leviticus 25:23). Islam teaches that Allah has appointed humans as caliphs or viceroys in the earth (Qu'ran, 6:165). In Christianity the overt use of the term *stewardship* for a person's responsibility to God for the use of created things began with the sixteenth-century theologian John Calvin: "Let everyone regard himself as the steward of God in all things which he possesses. Then he will neither conduct himself dissolutely, nor corrupt by abuse those things which God requires to be preserved" (*Commentary on Genesis,* 1554). In the seventeenth-century English chief justice Matthew Hale extended the concept to human responsibility for the natural environment, writing, "In relation therefore to this inferior world of Brutes and Vegetables, the End of Man's Creation was, that he should be the vice-roy of the great God of Heaven and Earth in this inferior world; his Steward, *Villicus*, Bayliff, or Farmer of this goodly Farm of the lower World" whose charge is "to preserve the face of the Earth in beauty, usefulness, and fruitfulness" (*The Primitive Origination of Mankind* 1677).

In twentieth-century Protestantism the most common meaning of the term entailed giving a portion of one's income, volunteering one's time, or lending one's talents to the work of the church. With the rise of environmental concerns in the second half of the century, *environmental stewardship*, *stewardship of the environment*, and similar usages became increasingly common in religious and ethical literature. The concept and its scriptural roots have been used to refute the charge that rapacious domination is the orthodox Jewish and Christian attitude toward nature. It also has been used to define an ethical position between exploitive domination and subordination to nature.

Some theologically conservative Christians, especially those who expect the imminent end of the world, regard environmental stewardship as at best irrelevant to the church's mission to spread the message of salvation or at worst heretical earth worship. Political and economic conservatives criticize religious communities' advocacy for

religious environmental concern as overly influenced by "radical environmentalism." Although they may characterize their own position as stewardship (e.g., the Interfaith Stewardship Alliance), their skepticism about ecological threats and opposition to environmental regulation puts them at odds with most people who embrace that term.

In contrast, some religious writers, especially more liberal and radical theologians, have criticized stewardship language for being too hierarchical and managerial to express human solidarity with the rest of creation or God's active presence within nature.

SECULAR VERSIONS OF STEWARDSHIP

There are also significant uses of the term in secular contexts, suggesting that it need not assume a theistic or God-centered worldview. For example, there are organizations such as the Forest Stewardship Council, the Land Stewardship Project, and the Alberta Stewardship Network. Conservation programs that encourage voluntary efforts by landowner communities to promote ecological preservation and restoration on their property often are called stewardship programs, reflecting their reliance on a sense of obligation on the part of the property owner that transcends short-term economic self-interest.

What could take the place of God in a secular stewardship ethic? There are a number of human communities that environmental stewards might serve and to which they might be responsible:

1. Future generations: The present generation of human beings holds the earth in trust for those who will come after it, who are entitled to their fair share of the planet's bounty. Persons alive today thus have a responsibility to live sustainably, to use the earth's resources in ways that will not deplete them or impair the functioning of the earth's life-support systems.
2. The international community: Nations may be seen as responsible to the wider international community, including its most impoverished members, for the fair distribution of the benefits of economic development and for maintaining the quality and integrity of the global environment.
3. Citizens: Government agencies have stewardship responsibility for public lands and resources (the U.S. Bureau of Land Management, the National Park Service, etc.) on behalf of the nation's citizens.
4. Local or regional communities: Individual landowners may be held responsible to their neighbors for maintaining the ecological values (e.g., wildlife habitat, water quality, soil fertility) of their property.

Some secular stewards may see themselves as responsible not only for some portion of nature but also to nature as the whole community of life or as a cosmic creative process.

MANAGEMENT OR CARE?

Stewardship sometimes is presented as wise use of natural resources for the benefit of human beings. In contrast to such an anthropocentric, or human-centered, view, nonanthropocentric understandings of stewardship regard humans as accountable for the welfare of nonhuman individuals or communities as well. The approach that is adopted affects the characterization of stewardship: as the management of a tool or resource or as care for a loved and respected fellow being.

The term *management* suggests an effort to control someone or something to serve a purpose that is outside or separate from that entity, imposing order on activities that otherwise would be chaotic or directionless. Although one person may manage another in certain circumstances, to treat people only as tools or resources to be directed or controlled violates their inherent dignity as beings who have intrinsic value. For some, to treat animals, plants, ecosystems, or other natural entities solely as means to an end is also morally objectionable.

Whether the object of care is valued for its usefulness (a car or a tool) or loved or respected for its own sake (a child, elderly parent, or medical patient), the concept of caring implies an attempt to maintain or restore the proper functioning of a machine or the health and well-being of an organism in accordance with its inherent norms or requirements. In a nonanthropocentric definition of stewardship, *care* is a more appropriate term than *management* in defining human beings' relationship to nonhuman beings. Nonetheless, some environmental philosophers deny that humans have the right or competence to exercise power over other species. For them, care may imply a condescending, presumptuous, or paternalistic attitude toward "inferior" creatures that undercuts a proper regard for fellow beings.

INTERVENTION OR RESTRAINT?

The definition of stewardship as acting upon its object as caring or as management gives rise to the objection that stewardship is inappropriately interventionist when applied to nature. For some critics of stewardship the idea that humans have a moral responsibility to intervene in natural systems assumes that humans know what is best and that nature cannot flourish without them. Those who assume the role of steward overestimate their ability to understand and control vast, complex webs of environmental relationships and overlook the ability of ecosystems to be self-regulating. A totally managed and

humanized world also would deprive nature of its mysterious otherness and independence.

In response, advocates of stewardship argue that a hands-off policy toward nature is unrealistic and irresponsible. Very little of nature is untouched by humans, and not everything that once was thought of as "unspoiled wilderness" really was.

Humans must intervene in nature to meet their needs for survival and self-realization; stewardship means doing so in ways that will not waste resources or damage the environment to the detriment of human and other forms of life. Because so much of human activity has had destructive consequences, people have a responsibility to protect nature actively from those consequences and to reverse them where they can.

It also can be argued that humans are by nature creative transformers of their surroundings; denying them the right to do that violates their integrity and implies that they are unnatural. There is also a long-standing tradition, not necessarily embraced by all advocates of stewardship, that humans have a role in perfecting or completing an unfinished creation, carrying on the continuing work of the Creator or nature's creative powers.

The most plausible interpretations of stewardship fall between the extremes of total disengagement and total management. A restrained approach to stewardship would allow the minimum intervention necessary to maintain a sustainable, just, and dignified human civilization and protect and restore the species and ecosystems that human activity threatens or has harmed. Although human responsibility would be global in the sense that no part of the earth can be immune from being threatened or influenced by human activities, different degrees of intervention would be appropriate for different types of landscape, for example, more intervention in domesticated landscapes and less in wilderness areas.

CONTRIBUTIONS AND SHORTCOMINGS

Stewardship has contributed to the evolution of environmental ethics. It has helped draw questions about human impacts on the environment into the realm of moral and religious responsibility rather than leaving them to economists, industrialists, and engineers. It also has focused attention on the importance for environmental ethics of the choice of metaphors for defining the human place and role in nature.

As is the case with any moral model or metaphor, stewardship also has shortcomings. By itself, it does not provide criteria for good stewardship; stated in another way, its susceptibility to widely divergent interpretations offers too many possible types of criteria. It does not present a direct challenge to many of the cultural assumptions that for some philosophers and theologians lie at the roots of the environmental crisis. Even if stewardship does not require or endorse those assumptions, this ambiguity leaves it open to being reduced to more or less enlightened anthropocentric utilitarianism.

However, it is clear that for some who advocate a stewardship ethic such a reductive understanding is not adequate. To grasp how a particular stewardship ethic interprets environmental responsibility, one must look beyond its use of the word to its underlying convictions about humanity, nature, and the ultimate sources of moral obligation.

SEE ALSO *Animal Ethics; Christianity; Future Generations; Islam; Judaism; Land Ethic; Utilitarianism.*

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Peter W. Bakken

STRIP MINING

SEE *Mining: III. Mountaintop Removal.*

SUBSTANTIAL EQUIVALENCE

Substantial equivalence is a concept that was developed to aid in the evaluation of the safety of new food products, particularly genetically modified foods. Many traditional

foods, such as tomatoes and potatoes, contain some toxins but nevertheless have a long history of safe consumption. In evaluating the safety of novel foods, the question is not whether certain foods are completely safe but whether they are at least as safe as traditional foods.

Substantial equivalence is the principle that novel foods should be compared with traditional foods to determine whether a novel food is likely to present a new risk or a greater risk than the conventional food. The comparison involves both the biological composition of the foods and their nutrient, antinutrient, and toxin levels. Substantial equivalence is a doctrine of relative safety, not absolute safety.

If substantial equivalence is established for a novel food product, that product generally is considered to be as safe as its conventional counterpart. For many genetically modified foods, substantial equivalence can be established with the exception of the one or two specific new traits that the genetically modified food was engineered to contain. In these cases, risk assessment is directed toward those new traits. In rare instances, a novel food may be wholly unlike any traditional food and no substantial equivalence will exist, requiring extensive safety testing of the new product.

As genetically modified food products were being developed and tested in the late 1980s and early 1990s, concern arose about finding ways to evaluate their safety. The Organization for Economic Cooperation and Development (OECD) brought together a team of experts from many countries to consider how to assess the safety of genetically modified foods. One of the recommendations was the substantial equivalence concept. The principle of substantial equivalence later was endorsed by a United Nations Food and Agriculture Organization (FAO) and World Health Organization (WHO) joint expert consultation. The adoption of the substantial equivalence concept by the OECD, FAO, and WHO was not binding on any countries but did lead to the adoption of the doctrine by many member countries. The manner in which the doctrine was implemented in different countries, however, varied significantly and led to ongoing disputes about genetically modified food products.

In the United States, the Food and Drug Administration (FDA) is responsible for ensuring that all marketed food products other than meat and poultry are safe. The FDA treats genetically engineered food products the same way as traditional food products; no special requirements apply.

In general, FDA approval is necessary before a food product that contains a new additive is commercialized. This could include genetic material added to a conventional food to produce a desired trait. There is an exception to the FDA approval requirement for foods that are "generally recognized as safe" (GRAS) by experts. With respect to genetically modified foods, the FDA relied on the concept of substantial equivalence to determine that "[i]n most cases, the substances expected to become components of food as a result of genetic modification of a plant will be the same as or substantially similar to substances commonly found in food, such as proteins, fats and oils, and carbohydrates" and therefore will be GRAS (Statement of Policy 1992, 22984, 22985).

Although the FDA sets standards, the manufacturer of a food additive, not the FDA, is responsible for determining whether that additive is GRAS. A manufacturer does not need to report to the FDA that it has made a GRAS determination. As a result, use of the substantial equivalence doctrine by the FDA has produced a system in which genetically modified foods generally do not need regulatory approval prior to their commercialization.

Many European countries have adopted the substantial equivalence concept but have applied it much more stringently because of a high level of concern about the safety of genetically modified products. Many European countries generally do not permit the commercialization of most genetically engineered food products. This difference has led to ongoing international disputes between the United States and the European Union about the international shipment of and trade in genetically modified products.

The substantial equivalence concept has been criticized for lacking a definition of what precisely to compare or how similar items need to be in order to be substantially equivalent. This vagueness allows for a wide degree of flexibility in applying the doctrine, which can result in less rigorous regulation or safety evaluation than is appropriate. There are also concerns about the ability of substantial equivalence to provide an adequate basis for safety assessment for more complex next-generation genetically modified products. In 2007 the FDA issued a draft risk assessment that applied a substantial equivalence analysis to conclude that food products from cloned animals, such as meat and milk products, were as safe to eat as products from conventionally bred animals.

SEE ALSO *Animal Cloning; Food; Genetically Modified Organisms and Biotechnology; Risk Assessment; U.S. Food and Drug Administration.*

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Gregory N. Mandel

SUSTAINABILITY

The word *sustainability* has become ubiquitous in environmental affairs since the 1987 World Commission on Environment and Development (WCED) report *Our Common Future* popularized the concept of sustainable development. The idea, however, has a long history. The term *sustainability* has a range of definitions running into hundreds, making any preliminary definition necessarily highly abstract, but all cluster around the core idea that some system, process, range of welfare, or set of items can be maintained at a certain rate or level for the long term; the ingredients of this formulation and its applications, however, vary widely, as do their disciplinary roots and practical implications.

POLITICAL ECONOMY

The earliest clear example of the concept of sustainability in economic thought is in John Stuart Mill's (1806–1873) treatment of the "stationary state" in Book IV of his *Principles of Political Economy* (1848). In this work Mill argues that an end to economic growth is ultimately unavoidable but that this limitation need not imply a rejection progress; rather, he anticipated significant moral and emotional human improvement through a more egalitarian distribution of wealth and reduced economic competition. Although this prescription was original to Mill, in making it he acknowledged debts to Thomas Malthus's (1766–1834) earlier writings on natural limits, especially "An Essay on the Principle of Population," which had gone through six editions between 1798 and 1826 and significantly influenced opinion among Mill's utilitarian philosophical bedfellows in England. Malthus's argument, however, did not share Mill's optimism about prospects for social improvement, and was originally motivated precisely by Malthus's opposition to doctrines of human progress advanced in the wake of the French Revolution.

Malthus argued that unchecked population increases geometrically (e.g., 1,2,4,8) whereas food supply increases only arithmetically (e.g., 1,2,3,4); hence there is a constant tendency for demand on necessities to outstrip supply when population rises, along with a permanent likelihood of poverty and starvation for some section of the population, a circumstance that undercuts arguments for social improvement. This focus on population rather than differences in wealth and consumption was underscored by Malthus's opposition to contraception and was further emphasized by his supporters' tendency to concentrate on (possibly compulsory) birth control, but only for the poorer classes, priorities that were sharply condemned by the nineteenth-century radical left (e.g., Friedrich Engels's 1844 work *Outlines of a Critique of Political Economy*) and that still fuel suspicions of Malthusian influence on thinking about sustainability today.

Mill's idea of the stationary state presented a contrast to Malthus's views not only in its optimism and advocacy of contraception—Mill served two nights in prison for distributing advocacy literature on birth control methods in 1823—but also in the conditions he envisioned. Whereas Malthus saw the changes of population and resource base as a potential source of chronic instability, Mill's stationary state is stable and loosely egalitarian, and thus a progenitor of notions of a "steady-state economy" that have been popular among contemporary advocates of sustainability.

Both Malthus's outlook and Mill's utilitarian schemes grew increasingly irrelevant to mainstream political economy in the latter nineteenth and early twentieth centuries as technological improvements, along with increased agricultural and industrial productivity, appeared to dispel Malthusian gloom about an unavoidable disparity between a sprinting population and a crawling resource base. Cornucopian technological and productionist optimism were the prevailing ideas in economics at the turn of the twentieth century. Developments within economic theory also contributed, for the marginal-utility theory that arose in neoclassical economics at the nineteenth century involved a new scarcity postulate worked out simultaneously by Carl Menger, W. S. Jevons, and Leon Walras. This postulate saw need in radically subjective terms, as an internal human state rather than as the naturalistic, interactive phenomenon postulated by Mill and Malthus, and maintained that internal human desires defined need, and that satisfying these desires/needs, which themselves are stimulated by seeing desirable objects, drives human activity. This in turn means that individuals choose between satisfying various needs, with each person having an internal hierarchy of needs and endeavoring to calculatively obtain the best possible result in relation to goods that are in short supply. The existence of an infinite number of these needs places limits on any given single need at any particular moment; accordingly aggregate needs are infinitely expandable, but are rendered calculable by individuals making hierarchical choices that limit particular needs, This desocialized model of need also incorporated optimism about the functional substitutability of goods, assuming on the basis of this model that scarcity of a given

good (e.g., oil) would generate incentives to develop resource substitutes for that good (e.g., ethanol) and so absolute external scarcity could be kept at bay. This new theory came to dominate twentieth-century academic economics, pushing the consideration of external limits into the background (Xenos 1989).

The concept of hard external limits to economic expansion of a sort not amenable to technological fixes or resource substitution resurfaced with the Club of Rome's 1972 *Limits to Growth* report (Meadows et al. 1972). This report examined five variables—world population, industrialization, pollution, food production, and resource depletion—and ran these through successive computer simulations to explore possible outcomes of exponential growth combined with finite resources. The simplified models, though not aimed at explicit predictions, consistently manifested feedback loops producing dire consequences before 2100, suggesting a rate of nonrenewable resource depletion rapid enough to portend exhaustion within a little more than a century, with no likelihood of any technological rescue. The book popularized the idea of physical limits to growth and paved the way for concepts of sustainability based on that prospect. This work was still haunted by the specter of population growth, but since that time most sustainability-oriented environmentalists have increasingly emphasized the dangers of overconsumption and downplayed those of overpopulation. Nevertheless, the argument that continuous population increase will eventually place strains a depleting natural resource base, even in the most egalitarian social arrangements, remains part of environmentalist discourse. Accordingly, cornucopian and market-based critics of environmentalism such as Julian Simon (1996) and Bjorn Lomborg (2001) have characterized sustainability arguments as neo-Malthusian.

FORESTRY AND SUSTAINABLE YIELDS

Forestry has also informed modern ideas about sustainability. The work of the American forester-conservationist Gifford Pinchot (1865–1946) has been a major influence. Echoing Mill, Pinchot combined theories of resource scarcity with an anthropocentric utilitarian moral concern for human welfare. For Pinchot the forester's mission was "based on the elimination of waste, and directed toward the best use of all we have for the greatest good of the greatest number for the longest time" (Pinchot 1914, p. 25). In his autobiography *Breaking New Ground* (1947) Pinchot recounts that, upon his return to the United States in 1890 after a period of forestry training in Europe, he was horrified at American lumbermen's wastefulness. He and his allies, pointing to the dangers of timber famine, established a national U.S. Forest Service based on principles of efficient harvesting of resources through scientific forest management and replanting, and the prevention of fire, theft, improper use, and destruction. These practices aimed at preserving the resources in perpetuity. This mandate came to include economic and longterm social-justice concerns, as manifested in Pinchot's concerns about the theft of timberland land from Native Americans and his campaign in 1908 and 1909 to introduce systematic forestry on American Indian reservations. He claimed that this last measure, within eighteen months, "saved large sums of money to the Indians, gave many of them profitable employment, and by the introduction of Forestry promised to make that employment permanent" (Pinchot 1947, p. 412). Although these arrangements were truncated in 1909 by political dispute, they were resurrected in the mid-1930s under Forest Service head Ferdinand A. Silcox as the Indian New Deal, reviving ideas of social service in forestry that are still influential.

Thanks in large measure to the precedents set by Pinchot's work, the range of functions included as legally mandatory in forest planning have expanded. The Multiple Use Sustained Yield Act of 1960 formalized the U.S. Forest Service range of duties by requiring forest planning to consider issues such as outdoor recreation, location in relation to human settlements, watersheds, and fish and wildlife preservation in addition to the more familiar concerns about timber and grazing. In each case the operative principle is "sustainable yield"—the amount of a resource that can be extracted without undermining the natural system's core capacities to maintain or improve upon its full range of services.

Pinchot's original conception of forestry was anthropocentric and geared to economic development; a raft of other issues, however, has arisen in the past forty years. One major source of controversy is clear cutting, the clearing and replanting of an entire area of forest as opposed to selective felling in a given area. This practice, which had become dominant in the U.S. Forest Service by the late 1950s, is supported by timber interests (for whom it can be more profitable) and by many foresters, but most environmentalists regard it as abusive to forestlands, especially because of habitat loss, even if the species affected may be ecologically unimportant to the system's productivity. This controversy is an example of how anthropocentric and nonanthropocentric conceptions of nature's value can result in practical differences even when there is agreement among the parties about the goal of sustaining the long-term use of natural resources. The problem is most pronounced in areas where clear cutting might affect vulnerable species; not surprisingly, then, the first wave of organized opposition to Forest Service clear cutting occurred around the same time as the passage of the Endangered Species Act (1973) and the 1975 Convention on International Trade in Endangered

Species of Wild Fauna and Flora (CITES), which sought to integrate balanced species use with conservation. The latter was the first major international agreement in which the idea of sustainable use was implicit, though the phrase was not used; the convention does not expressly promote sustainable use by defining the term or demanding particular practices, but it does seek to prevent destruction and unsustainable use.

SUSTAINABILITY AND SUSTAINABLE DEVELOPMENT

Both political economy and forestry were prominent influences on the ideas sustainable development discussed in the 1987 WCED Report *Our Common Future* (often known as the Brundtland Report after its chair, the former Norwegian prime minister Gro Harlem Brundtland). Though it did not coin the phrase "sustainable development," the report furnished its basic definition as development that "meets the needs of the present without compromising the ability of future generations to meet their own needs" (WCED 1987, p. 8). It drew upon earlier precedents by linking sustainable use of resources to intergenerational, intragenerational, and international distributive justice and poverty relief, noting the extent to which poverty causes ecological depletion and linking these points to conservation concerns. The WCED sustainable-development model is, however, clearly anthropocentric, embracing technological optimism and suggesting a new kind of economic growth rather than questioning or rejecting the very idea of growth. The 1992 United Nations Conference on Environment and Development in Rio de Janeiro built upon this report in forging the Convention on Biological Diversity, the first treaty to expressly promote the idea of sustainable use as an international ideal.

A concern with yield is an important but not sufficient element of a practice of ecologically sustainable development. Ecological sustainability implies the satisfaction of three conditions in human interactions with nature: (1) Rates of use of renewable resources must not exceed their rates of regeneration; (2) rates of use of nonrenewable resources must not exceed the rate at which renewable substitutes can be developed; and (3) rates of pollution emission must not exceed the assimilative capacity of the environment (Jones 2003). Human impacts in these areas may be measured by using ecological footprint analysis, as developed by Wackernagel and Rees (1996).

VARIETIES OF SUSTAINABILITY

The concept of sustainability poses two major questions: What is to be sustained? Who or what should be the beneficiary of sustainability? In anthropocentric theories the sustaining of ecological systems aims at the flourishing of humans; indeed, some argue that a sufficiently broad conception of human fulfillment coupled with a recognition of human ignorance may lead to a policy convergence between anthropocentric and nonanthropocentric views (Norton 1991). For example, the loss of a species in a given ecosystem might superficially appear unimportant within an anthropocentric view of policy, but if the complexity of ecosystems and the possibility of human error are used to mandate caution, the sensible policy course may still be to avoid risking any possible unforeseen impacts of the loss, thus mandating the same policy as that which would come from a nonanthropocentric perspective. Alternatively it can be argued that, if some species are unnecessary to human continuity and one allows some resource substitutability (for example, moving away from consuming scarce Atlantic cod supplies and towards using more plentiful and functionally equivalent European haddock), then only natural capital critical to human survival need be sustained for future generations (Dobson 2000); such a view might call for the complement of a nonanthropocentric perspective to justify the protection of areas of nature not critical to human well-being.

A quandary of intergenerational justice is that granting equal resource access to every generation without calculating an endpoint yields absurd conclusions: Finite resources must be divided among an infinite number of claimants, and so "no one gets anything at any time" (Laslett and Fishkin 1992, p. 6). Some argue, therefore, for a compromise between discounting the future (i.e., measuring the entitlements of future people as becoming progressively smaller and less important the further away they are from us in time) and the need to impose legitimate limits on the present generation.

One option is a "just savings" solution in the manner of John Rawls's justice theory (Wissenburg 1998), whereby people of all generations are regarded as morally equal and equally entitled to a particular basic set of opportunities, thus creating an obligation for each generation to pass on that set of opportunities to the next generation. Alternatively, a moral appeal may be made to future generations' vulnerability, arguing that this vulnerability creates obligations for the current generation (Goodin 1985; Cowen and Parfit 1992; Dobson 2000). Even in purely anthropocentric terms the details of such options still need calculation, and here the distinction between weak and strong sustainability becomes significant. Weak sustainability espouses the substitutability of natural capital (i.e., naturally occurring goods that have beneficial economic effects, such as the ability of forests to produce oxygen and absorb carbon dioxide) for human-made capital (i.e., human products that may have

functionally similar economic effects to such naturally occurring goods). Weak sustainability maintains that so long as an even stock of total capital is maintained, economic growth can be beneficial and consumption rates maintained. In some formulations an even stock of welfare functions is to be maintained, and so the issue becomes still clearer: a choice between sustaining either a particular list of goods or a particular level of human welfare.

Strong sustainability insists on treating natural capital independently of human-made capital, rejecting the idea that natural capital (i.e. naturally occurring economically beneficial goods) can always in principle be substituted by man-made equivalent goods, and so strong sustainability theory advocates sustaining particular natural goods and processes (i.e., physical "stuff") rather than undifferentiated total capital or welfare (i.e., abstract measurements of welfare held at a particular level). Although weak-sustainability has been more popular among thinkers stressing the range of future individual choices, Bryan Norton has supported the strong-sustainability perspective by a series of highly ingenious arguments concerning future human options and collective goods, maintaining that future people's opportunities for living fulfilling lives mandates strong rather than weak sustainability (Norton 2005).

SEE ALSO *Brundtland Report; Convention on Biodiversity; Environmental Law; Future Generations; Intergenerational Justice; Limits to Growth; Norton, Bryan; Pinchot, Gifford; Population; Resource Management; Sustainable Development; U.S. Forest Service.*

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Piers H. G. Stephens

SUSTAINABLE AGRICULTURE

At the beginning of the twenty-first century there are renewed threats of the starvation of millions, not due to warfare but to straightforward imbalance between food production and consumption. As seen frequently in Bangladesh, starvation will occur not first in overcrowded inner cities but in the very fields where food is grown. *Sustainable agriculture* is the technical name given policies and agricultural systems whose bottom-line goal is the prevention of such systemwide failures of agriculture.

Agricultural sustainability is defined as the ability to provide sufficient, healthful, and accessible food supplies into the indefinite future for the populations that depend on the systems. Agricultural sustainability has two more particular meanings: 1) sustainability in the goal of agriculture, where it implies a permanent ability to feed its constituent populations; and 2) sustainability in the means (or tools) that actual agricultural systems use to

attain the goal of sustainable agriculture. The first goal for sustainability has a morally obligatory property: "We cannot responsibly establish a system of agriculture that is doomed eventually to fail to feed those whom the system is designed to feed." The second is a complex of technically measurable factors in the means (tools), to the goal, that enables us to confirm their success. The tools are various agricultural methods and integrated systems of agriculture. Among the factors determining the success of the means must be their ability to withstand predictable shocks such as droughts, pest invasions, and plant diseases. Some factors are directly measurable such as crop yields and rates of soil erosion (or the lack thereof). Others, noted by Richard Harwood (1990), may be more elusive such as the ability of a system to allow the nondisruptive evolution to new systems better fit to future environments and needs.

A key requirement for such future practices is that the natural and human resources needed for food production be prevented from becoming exhausted. Massive and constantly expanding use of current agricultural resources for the manufacture of biofuels is a prima facie violation of this requirement and its impact on the poor is already being felt.

OBLIGATIONS OF POLICY MAKERS

No plausible disagreement exists among agricultural professionals about the moral obligation to pursue "goal sustainability." The acrimonious debate is about whether different and often rival agricultural systems are capable of providing the means to the goal of sustainability. A constant review of agricultural systems to ascertain their current and future contribution to sustainability is a principal ethical duty of agricultural research and policy professionals. Because use of unsustainable means (tools/systems), especially on a national or large regional scale, will have tragic impacts on humans and the environment, such as those predicted for Bangladesh, the review of agricultural systems is ethically demanding. An ideal review is free of all bias, such as an unreflective preference for one's "usual way of doing things." Such a review of tools/means to a goal might be called simply "practical wisdom," a multifaceted virtue long ago identified by Aristotle. In the *Nichomachean Ethics*, Aristotle considered the nature of the intellectual virtues as well as of the moral virtues. And among the intellectual virtues, he sharply distinguished practical wisdom from scientific knowledge. The latter concerns the universal and changeless laws of nature, such as the law of gravity and the several laws of motion in physics. Practical wisdom is concerned more with doing than knowing in reference to things that are particular, not universal, and might be one way rather than another, this way, rather than that. The science of agriculture is called "agronomy." Adding the suffix "nomy"—law in Greek—to "agro" suggests that the science of agriculture is similar to astronomy, the science that discovers the universal laws of the motions of the stars and planets. But agricultural science should be conceived less like a type of Aristotelian scientific knowledge and more like a type of Aritstotelian practical wisdom. In addition to avoiding bias, the intellectual virtue of practical wisdom requires "memory," which in this context means memory of past failures that have burdened past agricultural systems (King 2004, p. 18). The function of "practical wisdom" in attaining a sustainable agriculture may be best illustrated by some history.

FAILURES IN CHOICE OF AGRICULTURAL SYSTEMS

Expensive agricultural projects by the U.S. Agency for International Development have repeatedly failed to be sustainable for the targeted populations in Asia, Africa, and Latin America because the farmers lacked access to and control of the resources needed for food production by means of those systems—such as artificial fertilizers, chemical pesticides and herbicides, and irrigation equipment. A careful review of the history of successful projects versus those that failed to provide sustainable benefits would have revealed such problems and the ways to avoid them. Further, involvement of the recipient communities in the design of their agricultural systems is vital to the long-term success of those systems (Korten 1980, Ingle 1982). The wise reviewer of tools needs to cultivate institutional memory as an essential component of the review of means and methods for sustainability.

Students of the applied sciences have noted that standard paradigms, of considerable value for efficiency in the exact sciences, like astronomy, exist also in applied sciences, like agronomy, where their function is to establish a priori categories of the "right way of doing things." What such paradigms provide in efficiency, however, they lose in efficacy, because other, more effective means lie beyond their purview. Further, prevailing agricultural paradigms can prevent a genuinely open search for optimum agricultural methods and means because, as elaborated by Thomas Kuhn (1970), the ruling paradigm shapes what subfields and competencies researchers will pursue, what equipment will be in their laboratories, and what courses they will have taken in learning to use that equipment. They will find it extremely difficult to give a fair hearing to alternative agricultural systems that use different tools and require different competencies.

The prevailing agricultural paradigm in the early 2000s is based on an industrial model and requires, among other things, the use of machinery (tractors, harvesters), fossil fuel energy (gasoline, diesel fuel), artificially

manufactured mineral fertilizers (nitrogen, potassium, phosphorous), chemical pesticides and herbicides (atrazine, Round-up), and energy- and capital-intensive irrigation systems (pumps, pipes). A paradigm suited to such high resource use shortens the amount of time it takes to produce a publishable paper because less energy-intensive, low-input systems are more time consuming to develop. Thus, the low-input systems, while plausibly more sustainable and accessible to resource- and capital-poor farmers, receive little or no attention from agricultural "experts" (agronomists) because developing them threatens the careers of young researchers. In short, it can be professionally very risky to think outside the business-as-usual agriculture box.

Genuine "practical wisdom" must consider that an eclectic tool kit assembled from elements taken from various paradigms of agricultural systems may be best to assure sustainability. For example, an "agronomist," who becomes an agro-ecologist in designing an agricultural system for an impoverished community of farmers, might substitute oxen for tractors and gravity-driven for pump-driven irrigation to reduce a local farmers' need for capital (money) while still relying on genetically modified crops engineered to be resistant to pests. Such an open review of potentially sustainable agricultural tools assembled from apparently competing paradigms implies that in the agricultural sciences there is less need for universal and unanimously accepted first principles. This is clearly abhorrent in theoretical physics but is perfectly acceptable in an applied science. The "useful good" is the object of applied science whereas physics, like astronomy, pursues something close to universal, mathematical "truth," one feature of which is self-consistency and elegant coherence. In agricultural sciences the paradigm cultivated in American agricultural schools was variously named conventional, industrial, energy-intensive, capital-intensive, or production-oriented agriculture. With the goal of increasing plant nutrition and yield improvement, influenced by the nineteenth-century chemist Justus von Liebig, the paradigm took on pretensions of an exact science. In the late twentieth century an "opposing" camp, not yet having coalesced enough to have created a recognizable paradigm of its own, began to emerge. The competing paradigm-in-the-making was variously labeled alternative agriculture, low-input agriculture, agroecology, and organic agriculture, each variant claiming to be more conservative in the use of resources, especially artificial fertilizers, chemical pesticides and herbicides, and fossil-fuel energy. Advocates of the newly emerging paradigm thus also claimed that alternative, low-input, agroecological, organic agriculture was also "sustainable agriculture." The name was offensive to conventional agronomists because it implies that conventional agriculture is unsustainable and thus in fundamental violation of a basic obligation of agriculture.

OBJECTIVE SIGNS OF SUSTAINABILITY

In any case, both conventional and alternative agriculture need something closer to the ideal of "practical wisdom." A policy maker reviewing candidate agricultural systems must require that they meet concrete criteria of sustainability. J. W. Hansen (1996), applying the rationality of conventional production agriculture, indicates that any prudent review of means to sustainability assumes that we know what we are looking for. A positive determination of "means sustainability," in other words, requires explicitly specifying objective and measurable characteristics of systems that promise goal sustainability. An example of such criteria would be the capacity to produce the same yield, year after year, without loss of soil fertility or increase in soil salinity. In the absence of such explicitly stated, objective, measurable criteria, no agricultural system can be declared to be sustainable with any certainty. And because the history of natural shocks to agricultural production, such as drought and pest invasions, warns against relying on the stability of environmental conditions, quantitative probabilities of the system's ability to withstand shocks must be determined. To this should be added Harwood's criterion: the capacity to support the evolution of new, even better, more sustainable agricultural systems, under changing environmental and cultural circumstances.

CAUTIONARY COMPLETION OF THE DEFINITION

These signs of "means sustainability" are not doctrinaire and seem intuitively obvious. But they do not deal directly with the kind of properties found in a definition coming from the alternative agriculture paradigm in which sustainable agriculture systems are defined qualitatively as ecologically sound, economically viable, socially just, culturally appropriate, and based on holistic scientific approaches, including indigenous and community-based knowledge systems. This conglomerate, qualitative definition is criticized by defenders of conventional agriculture for including extraneous, nonagricultural functions like continuity or compatibility with local cultural traditions, but above all, "community food security"—reliable access to the food produced in a region by most everyone who lives there, whether they themselves are farmers or not. Defenders of the definition respond that conventional, industrial systems have led to the worsening of poverty and hunger in less developed countries precisely because, even though such systems increased regional food production, regional increases in food production did not lead to increased local access to food. Because industrial production systems involve high costs to producers, their commodities must fetch high prices in the global marketplace, often resulting

Bangladeshi Farmers Cleaning Paddy, 2008. *For Bangladesh and other Asian countries, paddy is one of the main sources of agriculture. Researchers have been trying to promote new forms of sustainable agriculture to these and other regions around the world. Although the definition is not yet concrete, most agree that sustainable agriculture should be ecologically sound, economically viable, socially just, culturally appropriate, and based on holistic and scientific approaches.* **FARJANA KHAN GODHULY/AFP/GETTY IMAGES.**

in the export of the foods produced, which are thus unavailable, at affordable prices, to local people who are not themselves food producers. This circumstance is exacerbated by the economy-of-scale principle of conventional agriculture, which requires farmers to "get big or get out." As some farmers "get big" by acquiring the lands of their neighbors, those who are driven out fall victim to poverty and ultimately to hunger.

The qualitative definition of sustainability proffered by advocates of alternative agricultural systems, however, does not provide the quantitative measures that are vital to genuine sustainability and future food security. Organic food systems have an appeal in their conservative use of nonrenewable resources, but their capacity to provide adequate and reliable future yields needs substantiation. For there may be an unavoidable trade-off: relatively low in-put agriculture is often also relatively low-output agriculture. The inability as of the early 2000s of organic agriculture to provide for entire populations in European and North American societies does not, however, make it irrelevant to sustainability. If the failures already mentioned teach us anything, it is that in agriculture one size—that is, one system, one paradigm—does not fit all. What may work well, at least for now, in North America and Europe may be a disaster in Africa and Latin America. Today's practitioners of organic agriculture may, furthermore, be learning the arts—for practical wisdom in the area of agriculture is more an art (in the Aristotelian sense, a *techne*) than a science—needed for resilient future agricultural systems.

Agroecological systems involve harnessing ecological knowledge to food production and enhancing sustainability by reducing the need to overwhelm local ecosystems with energy and synthetic chemical inputs—for example, in weed and pest control. Such systems depend on an intimate knowledge of the local ecology and hence require a community-based approach, because local people may have a wealth of such knowledge, known as "vernacular ecological knowledge" or, more commonly, as "traditional ecological knowledge" (TEK). Traditional

agricultural societies are well suited to utilize agroecological approaches, because many have been doing so for many generations past. These approaches are not burdens on either the surrounding ecosystems or the host communities but are simply more sustainable augmentations of traditional practices or replacements for the conventional systems that involve "universal" prescriptions after they have catastrophically failed. Supporters of agroecology defend the dependence on community wisdom and labor as evidence that agroecological systems will be more responsive to community food security, the ultimate test, in their view, of true sustainability as a goal.

DEVELOPING-WORLD APPLICATIONS

Nadia Scialabba's United Nations 2007 FAO report, *Organic Agriculture and Food Security,* supplies some of the quantitative work needed on the theoretical capacity of organic agriculture to feed the world's population. She notes global models suggesting a capacity to feed the world at levels comparable to current conventional agriculture without an increase in land under cultivation and with reduced environmental impacts.

The alternative definition of "sustainable agriculture" differs from the definition given at the outset in part because it focuses explicitly on the human and environmental aspects of food production. This focus is in part due to the memory that U.S. agriculture became "unsustainable" from an ethical viewpoint at the turn of the twentieth century and again in the 1920s, when poverty, subhuman living conditions, and hunger were common in the farming communities. In efforts to find sustainable food systems, nothing could be more dangerous than leaving out the condition of the food producers and treating sustainability as a resource-input and food-output equation. Developing countries in the early 2000s provide evidence of the pervasive harm done to every kind of agricultural and environmental value when the human agents and their communities are not included in the selection of means to sustainability (Korten 1980).

It is scarcely conceivable that a global collapse of food adequacy would occur suddenly. The flip side of locally determined agricultural systems is that agricultural failure has its first visible impacts in rural locales among poor farmers who cannot feed their families. This is illustrated tragically again in Bangladesh where near famine strikes first among farm families in the months just before harvest. Neglect of political and socioeconomic factors in pursuit of sustainability will again create the environmental chaos observed by the soil scientist Charles Kellogg during one of America's brushes with unsustainability. He wrote, "The final exhaustion of the land follows, not precedes, the exhaustion of the people. In a final effort, exploited people pass their suffering to the land" (1938, p. 878).

SEE ALSO *Agriculture; Organic Farming; Sustainability.*

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Stanislaus J. Dundon

SUSTAINABLE ARCHITECTURE AND ENGINEERING

In the late twentieth century many citizens in Western societies began to recognize that if other societies consumed resources at the same rate that they did, the ecosystem soon would be exhausted and unable to reproduce itself. That recognition motivated the United Nations to charter the World Council on Environment and Development (WCED) to investigate ways in which the apparent conflict between economic development and environmental degradation might be reconciled. Under the auspices of the Brundtland Commission, the WCED published its findings as *Our Common Future* in 1987. That document, long considered the seminal text on sustainable development, defined sustainable development as "development that meets the needs of the present without compromising the ability of future generations to meet their own needs" (World Council on Environment and Development 1987, p. 8). In the conflict between economic development and environmental protection unsustainable development usually is associated with the industrial and transportation sectors. Although industrial wastes and automobile emissions contribute substantially to degraded environmental

Earthship in Taos, New Mexico. *One modern example of sustainable architecture is the "earthship," designed by architect Michael Reynolds since the 1970s. The low-tech designs range from multi-million dollar luxury homes to small, communal living environments.* **AP IMAGES**

and social conditions, they are not the largest source of the problem.

RESPONSES TO THE CHALLENGE

According to the U.S. Department of Energy (DOE), the production and operation of the built environment accounts for almost half of all greenhouse gas (GHG) emissions and more than half of annual energy consumption in North America. These general statistics were put in a critical context by a Brookings Institution study that projected that in 2030 about half of the buildings in which Americans live, work, study, and shop will have been built after 2000 (Nelson 2004). If these projections are accurate, the construction and operation of buildings could become the single largest threat to public health, safety, and welfare as well as the major cause of environmental degradation and threats to other species. These statistics present a serious ethical challenge to architects, engineers, and those who commission their services.

As the public conversation about sustainable development has matured, three responses to this challenge have developed: resignation, denial, and hope. If one takes these statistics as inevitable, as do neo-Malthusians such as Paul Ehrlich (1971), one tends toward resignation. If one considers them overblown or unreliable, as do those with an interest in maintaining the status quo, one tends to deny the mounting evidence that shows that people's habits are unsustainable. However, if one takes these statistics seriously but rejects historical determinism, one tends to be hopeful that environmental collapse can be avoided. This is the story line of sustainable development, a modern narrative in which people create hope for the future by taking collective actions that may alter the path of history.

MODERN ARCHITECTURE

The popular thesis among many environmentalists, that ancient architecture is the best model for sustainable development in the future, generally is accompanied by the corollary that modern architecture has been relentlessly antinature. Although many modern buildings consume vast amounts of energy because they ignore the natural energy flows of their locations, there also are buildings that look stylistically modern but act in harmony with the ecologies and cultures for which they were designed. It is inaccurate to imagine that modern and sustainable architectures embody singular and opposed sets of values; reality is far more complex.

A good example of midcentury modern architecture that works with natural forces is the Tremaine House in Santa Barbara, California (1947–1948), designed by the Austrian-American architect Richard Neutra (1892–1970). The deep overhangs of the roof shield the large expanses of glass from unwanted solar heat gain, and the operable transom panels above the sliding glass doors allow for natural cross-ventilation even when the doors are closed. Neutra (1948) referred to this system as CSSA/LS, or continuous sub-soffit airchange over a lowered spandrel. What makes Neutra's work a particularly good example of protosustainability (the initial ideas required for sustainability to emerge in the form articulated by the Bruntland Report) is the fact that he employed energy-saving technologies not only in houses for people of substantial means such as the Tremaines but also for people of modest means. This is demonstrated by his 1948 proposal that Brazilian schools be equipped with his CSSA/LS system along with technologies designed to harvest rainwater and produce electricity on site. Neutra's work demonstrates a balanced sensitivity to the competing interests of economic development, environmental preservation, and social equity—commonly referred to as the three Es—long before the Brundtland Commission declared them to be the core values of sustainable development.

Neutra was not alone in the search for environmentally and socially responsible architecture. Among his peers were the theorists Patrick Geddes (1854–1932), Lewis Mumford (1895–1990), and Frederick Keisler (1890–1965), as well as a diverse group of practitioners that included Frank Lloyd Wright (1867–1959), Alvar Aalto (1898–1976), Harwell Hamilton Harris (1903–1990), and the many practitioners of regionalism in the Bay Area of California, Texas, and Mexico, among other

places. In his collection of regionalist texts Vincent Canizaro (2007) demonstrated that some modern architects have championed the values that are associated with sustainability. In the world of engineering the appropriate technology movement that emerged in the 1960s demonstrates similar values.

After the appearance of *Our Common Future* in 1987 pressure from outside the building professions to build sustainably increased slowly; after the turn of the millennium the subject of sustainable design became a dominant discourse in both architecture and engineering. This does not imply that the legacy of Neutra and his peers dominated the theorizing and designing of sustainable environments. The sociologist Simon Guy and the architect Graham Farmer (2001) found six distinct traditions within architectural discourse, each based on differing and sometimes conflicting assumptions yet all claiming to define what sustainable design must be. Guy and Farmer's categories would include buildings as diverse as the low-tech back-to-the-land earth ships built in New Mexico by Mike Reynolds (1970), the technocratic and energy-efficient Commerzbank Tower designed for Frankfurt by Sir Norman Foster and Associates (1995–1998), and the communal solar kitchen developed for Jiutepec, Mexico, by the BaSiC Initiative (2004). Although some technocrats would prefer to standardize sustainable technologies as lists of best practices or universal technical codes, the practice of sustainable design has continued to diversify.

DISCIPLINARY APPROACHES

Another popular conception involves the division of work between architects and engineers in the planning of sustainable built environments. People are predisposed to associate architects with space planning and the superficial embellishment of building facades and engineers with technical problem solving. Although there is some truth in this categorization, reality is far more complex. Although these two modern professions emerged from a common European origin, over the last five centuries they have developed distinct cultures. Where architects tend to be expansive in their approach to problem solving—as in the arts—engineers tend to be reductive—as in the sciences. Where architects tend to emphasize the visual or communicative qualities of the environments they design, engineers tend to emphasize economic efficiency. However, the tendency to essentialize the values of the disciplines is as erroneous as it would be to characterize the visual characteristics of modern architecture as inherently antinature. The building professions are far more pluralistic than many critics suppose.

Among the diverse design practices developed in the early twenty-first century were those which derived from the critique of modern technology offered by science and technology studies (STS). Rather than focus on the expressive possibilities of building form, economic efficiency, or the artifacts themselves, STS scholars study the relationship of particular material technologies to the societies that develop, maintain, and operate them. The empirical study of the built environment as a sociotechnical system is a promising area of analysis that may influence not only the teaching of design but also the consequences of design practice.

SEE ALSO *Alternative Technology; Brundtland Report; Built Environment; Energy; Industrial Ecology; Sustainability; Sustainable Development.*

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Steven A. Moore

SUSTAINABLE DEVELOPMENT

Sustainable development is designed to meet present needs without compromising the needs and aspirations of future generations. Such goals inherently pose issues of ethics and values through discussions of both intragenerational and

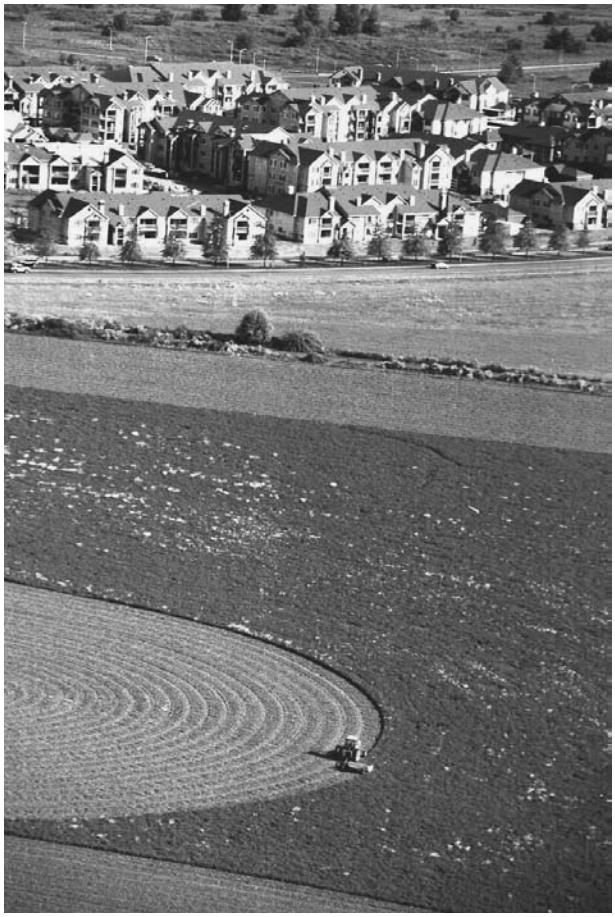
intergenerational equity; if current standards of living in some societies are unsustainable, is it possible to justify their existence in the present, much less their extension into the future?

HISTORY

Although the term *sustainable development* is often traced to the World Commission on Environment and Development's publication of *Our Common Future (1987)*, this report was the outcome of decades of concern about the impact of human beings on the natural environment. Notions of sustainable development emerged from the birth of the modern environmental movement, sparked by the work of authors such as Rachel Carson (1962), who focused on the impact of chemical pollution on the environment. These environmental concerns were linked to development as authors such Paul Ehrlich (1971) and organizations such as the Club of Rome (Meadows et al. 1972) highlighted the growth of the global human population and the stresses that growth was placing on the natural-resource base of the planet. This initial environment-development linkage was focused on the challenges human activities posed for the earth's natural-resource base. Consequently, initial efforts to address these challenges, including the United Nations Conference on the Human Environment in 1972, focused on the protection and preservation of that resource base.

Our Common Future (World Commission on Environment and Development 1987), also known as *The Brundtland Report*, reflects a shift in thinking about environment and development. By the mid-1980s, years of experience in development and international aid had demonstrated that the complexity of the connections between the environment and human well-being far exceeded the compass of analyses that were confined to the protection of natural resources. For example, it was in this period that the analysis of famine shifted from purely environmental causes (e.g., the absence of sufficient rainfall) to environmental causes as they intersect with local sociocultural factors and national and global political economies (e.g., Watts 1983). *Our Common Future* reflected this shift, turning from the previous environment-first approaches to the environment/development interface and thereby embracing a more holistic understanding of this interaction and its impact on human well-being.

The 1992 United Nations Conference on Environment and Development (UNCED) in Rio de Janeiro carried this new focus into an institutional context by producing Agenda 21, an action plan to address the interconnections between environment and development. The United Nations Commission on Sustainable Development (UNSCD) was founded to ensure appropriate follow-through after the conference. Nevertheless, the outcomes of UNCED mark something of a return to a resource-base-first approach to sustainability. For example, the Convention on Biological Diversity (CBD), a product of UNCED, focuses on the preservation of a particular key resource with the assumption that such preservation would preserve the resource in the context of development and, in so doing, improve human well-being.



The Extent of Urban Sprawl. *A tractor working in the fields near Portland, Oregon, seems dwarfed by a large tract of new apartments in the background. A study conducted by the Sierra Club reported that Oregon was ranked first in land-use planning.* **AP IMAGES.**

In later years major environmental assessments tried to better articulate the links between environmental preservation, development, and human well-being. The conceptual framework of the Millennium Ecosystem Assessment (MA) (2003) employed an ecosystem-services approach to draw this connection. Ecosystem services are the rewards human beings obtain from ecosystems, ranging from water filtration to raw materials to cultural/spiritual benefits. A change in a particular ecosystem will change the services that ecosystem provides to human beings—it will provide more

or less of a particular service and more or fewer services overall. Through this approach the MA evaluated the earth's ecosystems from an anthropocentric perspective, evaluating the current state and trends of these ecosystem services in terms of the benefits humans derive from them and projecting the future benefits that would be available from these ecosystems under current and other hypothesized policy and technological regimes. Hence the MA marks something of a return to a WCED-style understanding of sustainable development.

CONTEMPORARY TENSIONS BETWEEN ENVIRONMENT AND DEVELOPMENT

The most commonly discussed tension in the contemporary sustainable-development literature is that of intergenerational equity. The definition of *sustainable* cannot be separated from a sense of ethical responsibility to future generations. For example, does *sustainability* mean the maintenance of the basic conditions necessary for human life on earth or the maintenance of the current standard of living for future generations? The answer to this question informs choices about how to live in the present. Maintaining human life is a fairly low standard that might be achieved even with a substantially irresponsible use of natural resources. However, as the MA illustrates, the maintenance of our current standard of living into the future without substantial technological change is likely impossible because we are degrading 60 percent of the (broadly categorized) services we receive from ecosystems. If sustainable development is a worthy goal, it demands consideration of how current behavior prevents the attainment of that goal.

Less commonly discussed are the ethical dimensions of *intra*generational equity raised by contemporary thought and practice in sustainable development. Various ecological-footprint studies (e.g., Rees and Wackernagel 1995) suggest that current levels of consumption in the global north are possible only because very few people in the global south enjoy this resource-intensive standard. Furthermore, these studies make clear that it would require more than three planet earths' worth of resources to allow everyone in the world to enjoy this standard of living. This analysis points to an inherent incompatibility in the goals of environmentalists seeking the sustainable use of natural resources and those working on development efforts intended to raise the standard of living of those in the global south. Such observations have led some (e.g., Esteva 1992, Banerjee 2003) to question whether sustainable development represents a form of neocolonialism whereby those in the global south are encouraged to develop in a sustainable manner (a goal impossible under current technological regimes and societal values) so as to slow their growth and preserve the lifestyles and prerogatives of those living in the global north.

Issues of intragenerational equity are further complicated by the mainstreaming of environmental concerns into development thought and practice. Although such mainstreaming maintains environmental quality and preserves key environmental resources for human well-being, the frameworks that are emerging out of this effort may create or perpetuate challenges that hinder development efforts and maintain the difficult circumstances facing many of the world's poor. The United Nations Environment Programme's Fourth Global Environment Outlook (GEO-4), which employs a conceptual framework similar to that of the MA, is an example of the dangers of this mainstreaming. Titled *Environment for Development (UNEP 2007)*, GEO-4 uses an environmental reporting framework to evaluate sustainable development initiatives. Carr and his coauthors (2007) argue that the use of such frameworks in the evaluation of development initiatives inadvertently produces situations that disempower local communities and local knowledge in the development process, thus squandering key resources for development and losing sight of the intended beneficiaries of such efforts.

The framework employed by GEO-4 divides linked environment/development challenges into a series of causes, ranging from large-scale ultimate causes like population and economic growth to proximate causes ranging from increased sewage output into the environment to ecosystem-specific changes that affect human well-being. The responses to these changes purport to address these challenges at each of these levels. However, local actors are usually constrained in their individual efforts to responses at the ecosystem level, whereas governments and development agencies are privileged in their ability to address ultimate and proximate causes of environmental changes. This general set of outcomes is consonant with development studies that argue that contemporary development practice does not address the ideas or needs of the poor unless those ideas and needs fit into and support the ideas, values, and careers of those working for development agencies (Ferguson 1994, Escobar 1995, and Easterly 2006). For example, local (indigenous) knowledge, today a popular buzzword in development, rose to prominence only when the development community deemed such knowledge useful and/or appropriate. Before this shift in the outlook of the development community, this same local knowledge was largely ignored.

AN ETHICAL FUTURE FOR DEVELOPMENT

The mainstreaming of environmental concerns in development thought and practice remains a work in progress, and among the most significant challenges raised by this effort are the ethical issues surrounding intergenerational and intragenerational equity. In debates about tradeoffs between the present and future, work in sustainable

development has provided new openings for thinking about the ethical dimensions of environmental protection and development, and the value systems that allow unsustainable (and therefore unjust) practices to continue.

SEE ALSO *Brundtland Report; Convention on Biodiversity; Future Generations; Millennium Ecosystem Assessment; Sustainability; United Nations Environment Programme.*

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Edward R. Carr

SWAMPS

SEE *Wetlands.*

SYLVAN, RICHARD

1935–1996

Richard Sylvan was a seminal thinker in environmental philosophy. He also was known for pioneering work in logic, metaphysics, the philosophy of language, semantics, epistemology, social philosophy, political philosophy, ethics, the philosophy of science, the philosophy of mind, and computation theory.

EDUCATION AND EARLY WORKS

Sylvan was born Francis Richard Routley in Levin, New Zealand, on December 13, 1935. He met and later married the philosopher Val McCrae in 1963, and they jointly authored several works in environmental philosophy under the names R. and V. Routley. Following their separation, Val changed her name to Plumwood. Richard changed his name to Sylvan when he remarried in 1983. He studied at Victoria University, Wellington, and then Princeton before taking positions at the University of Sydney, the University of New England, and Monash University. From 1971 until his death he was a fellow at the Research School of Social Sciences at the Australian National University. Sylvan died on June 16, 1996, in Bali, Indonesia. He is buried in New South Wales at the edge of one of the forests which he cherished.

Sylvan was responsible for much of the development of environmental philosophy in Australasia. An example of his provocative style and controversial choice of topics can be found in the 1982 paper "In Defence of Cannibalism," which was published in Sylvan's *Discussion Papers in Environmental Philosophy*, one of several preprint series which he edited.

The content of "In Defence of Cannibalism" is less sensational than the title. The essay addresses the ethics of killing, in particular killing humans, and the ethics of eating dead animals, including dead humans. Sylvan carefully separated those questions. The title of the paper generated alarm among some members of the philosophical community, and Sylvan may have derived satisfaction from the unsettling effects of the paper.

DEEP GREEN THEORY

Sylvan's research program was much broader than the ambit of environmental philosophy; it was systematically linked with his and others' work in metaphysics, semantics, logic, epistemology, and value theory. He also connected it with work outside mainstream Australasian and Anglo-American philosophical inquiry as well as with work in other disciplines, including Taoism, Buddhism, nihilism, cosmology, demography, politics, and economics. Sylvan also addressed environmental policy issues in

his monograph *The Fight for the Forests* (Routley and Routley 1973), written with Val Plumwood.

Sylvan's work in environmental philosophy goes back to the early 1970s. His 1973 paper "Is There a Need for a New, an Environmental, Ethic?" is a landmark in the discussion of anthropocentrism. The last man argument presented in that paper remains an important locus of that discussion. Another important paper written in collaboration with Plumwood (Routley and Routley 1980) elaborates the argument. Sylvan's critique of anthropocentrism, or human chauvinism, aligned him with the central concerns of Deep Ecology, though he distanced himself from much of Eeep Ecology (Sylvan 1985). Sylvan went on to develop his own environmental philosophy, which he called Deep Green Theory (DGT) in *The Greening of Ethics* (1994). At the time of his death he was working on a fuller explication of DGT that was never completed. A manuscript published posthumously in 1997, *Metaphysics: From Radical to Deep Plurallism* [sic], addressed metaphysical and associated logical issues with a strong pluralist twist, which Sylvan believed was essential to providing a satisfactory foundation for environmental philosophy. Sylvan developed his views in opposition to those of his university colleague John Passmore, whose very different views were published in *Man's Responsibility for Nature* (1974), which rejected the need for radical revision in ethics to accommodate concern for the environment.

DGT aims to clear the "garbage" (Sylvan's description) from environmental philosophy and replace it with theoretical rigor. It is a pluralistic position that shares with Deep Ecology a rejection of the prevailing technocentric approach to the environment of industrial society. Although it shares a number of features with Arne Naess's eight-point platform for Deep Ecology (Naess 1989), its focus and emphasis are different. A central theme is that many environmental items are valuable in themselves; that is, their value does not depend on human values and interests. In developing his alternative position, Sylvan introduced a number of distinctions marked by a plethora of neologisms: *non-jective, gre-een, extranalities, expiricism, intraneous, extitution* (Grey 2000). Sylvan's DGT is a complex articulation of reflections which help to clarify central problems in environmental philosophy.

SEE ALSO *Australia and New Zealand; Deep Ecology; Environmental Philosophy: V. Contemporary Philosophy; Plumwood, Val.*

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William Grey

T

TAKINGS

The Fifth Amendment to the U.S. Constitution states that no person ''shall be deprived of life, liberty or property without due process of law; nor shall private property be taken for public use, without just compensation.'' This last clause, the ''takings clause,'' prohibits the U.S. government from seizing property without just compensation. In the United States it is this amendment that authorizes the federal government to seize properties for common use, a legal concept known as *eminent domain*. Many other nations have similar laws. The United Kingdom, New Zealand, and the Republic of Ireland have ''compulsory purchase'' laws; Australia has ''resumption or compulsory acquisition'' laws; and South Africa has ''expropriation'' laws. Takings restrictions date as far back as the Magna Carta, issued in 1215 as a curb on the absolute will of the king of England. All such laws protect property owners from unjust seizure but also allow governments to seize property in the common interest.

The requirement of compensation for the physical taking of property is uncontroversial. As regards regulations, however, the requirement is more complex. The environmental issue referred to as ''takings'' or ''regulatory takings'' relates to a property holder's claim to compensation for damages incurred or benefits forestalled, as a result of regulations—restrictions, prohibitions, or requirements—placed on the use or lease of a given parcel of property. For instance, if an owner of a piece of land is restricted from building on his or her property, say, because of an endangered-species regulation, the property owner may argue that this regulation has effectively ''taken'' the property, or taken a significant aspect of value on the property. The central theoretical question is the extent to which a given government action—or, in this case, a given regulation—constitutes a taking.

Until the late 1970s controversies over regulatory takings in the United States had been addressed chiefly by the courts. One of the earliest takings cases was *Pennsylvania Coal Co. v. Mahon* (1922). In this case the Pennsylvania legislature had prohibited the mining of coal underneath streets and houses. The controversy emerged because Pennsylvania Coal had, forty years earlier, granted strict surface rights to H. J. Mahon, under the express agreement that they would eventually mine coal under his dwelling. Pennsylvania Coal argued that the legislature's prohibition of mining under streets and houses constituted a taking because the coal company was no longer permitted to mine coal in these areas. The U.S. Supreme Court found in favor of Pennsylvania Coal, stating that ''[W]hile property may be regulated to a certain extent, if regulation goes too far it will be recognized as a taking.'' This case established the precedent that regulations, not only physical seizures of property, can constitute takings.

Since then two cases have emerged as central to modern regulatory takings law (Squillace 2008). In the first case, *Penn Central Transportation Co. v. New York City* (1978), Penn Central petitioned the city for the right to develop a high-rise tower above Grand Central Terminal. Because Grand Central had been designated by the city as an historic landmark, it was subject to zoning restrictions that prohibited such construction. The Court rejected Penn Central's regulatory takings claim, focusing on two issues: the character of the government action and whether the regulation interfered

with distinct and reasonable "investment-backed expectations." No compensation was paid.

In the second case, *Lucas v. South Carolina Coastal Council* (1992), David H. Lucas purchased two properties on the coast of South Carolina for $975,000. In 1988 the state passed the Beachfront Management Act, which restricted Lucas from developing his two properties. Lucas sued and won several critical cases, leading to a Supreme Court hearing. The Supreme Court held that the regulation had effectively deprived Lucas of all economically beneficial use of his property and therefore amounted to a "total taking." By appeal to the character of government action, the concept of reasonable "investment-backed expectations," and the notion of a "total taking," the Penn Central and Lucas cases provide a sound analytical framework for analyzing most regulatory takings cases.

Aside from this judicial history, the concept of takings has sparked heated political controversy. By the late-1970s, the United States had adopted broad-reaching environmental legislation such as the U.S. Endangered Species Act (ESA), the U.S. National Environmental Policy Act (NEPA), and the U.S. Federal Land Policy and Management Act (FLPMA). As these acts came into effect, some property owners, particularly in the western United States, began to question their legitimacy, citing as a precedent the conservationist platform of Gifford Pinchot, the first head of the U.S. Forest Service. Out of these concerns the so-called "sagebrush rebellion" or "wise use movement" was born. This political movement has influenced policy in all branches of government, but most notably in the executive and legislative branches.

For instance, when Ronald Reagan became president in 1981, he appointed James G. Watt, a central figure in the sagebrush rebellion, as secretary of the interior. Watt's appointment resulted in a series of controversial administrative decisions, the ostensible aim of which was to shore up property rights; the real aim, according to critics, was to dismantle environmental law. One of the central decisions came in 1988, when Reagan introduced Executive Order 12630, otherwise known as "Reagan's Order." This order, formally titled "Governmental Actions and Interference with Constitutionally Protected Property Rights," required all agencies in the executive branch to determine whether their proposed action may imply a taking and, if so, to conduct a takings impact assessment (TIA). If any takings implications were found, the order restricted an agency's ability to carry out that proposed action.

During the same decade, state legislatures battled over a variety of takings bills. By 1991 every state in the United States had considered some form of environmental takings legislation. The first federal takings bill had been introduced a year earlier, in 1990, by Senator Steve Symms of Idaho. Although particular bills vary widely in details, takings legislation usually seeks to establish guarantees of compensation for regulation or at least to assure that some assessment of costs and the possibility of compensation is put into place prior to the establishment of a regulation.

Regulatory takings poses complex philosophical and ethical issues, ranging from questions about the nature of private property to observations about harms to nature or to humans. At any point in the history of the "takings debate"—whether in the court decisions, in the legislation, in the policy of sitting administrations, or even in the more generalized civil sphere—philosophical issues regarding rights, harm, freedom, participation, representation, identity, self-actualization, moral status, public good, and so on, intertwine and overlap.

SEE ALSO *Environmental Law; Environmental Philosophy: V. Contemporary Philosophy; Land Ethic; Private Property.*

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Benjamin Hale

TAOISM

SEE *Daoism.*

TAYLOR, PAUL
1923–

Paul Warren Taylor was born in Philadelphia on November 19, 1923. He is emeritus professor of philosophy at Brooklyn College, where he specialized in normative and applied ethics. The author of several works in

ethics, including *Normative Discourse* (1961) and *Principles of Ethics* (1975), Taylor is probably best known for *Respect for Nature* (1986), in which he develops and defends a sophisticated biocentric (life-centered) environmental ethic.

Taylor's egalitarian biocentric ethic (1986) synthesizes elements of classical virtue ethics with Albert Schweitzer's ethic of reverence for life, Peter Singer's egalitarianism, and Kenneth Goodpaster's account of moral considerability. Taylor contends that one who adopts the ultimate moral attitude of respect for nature will become an environmentally virtuous person. He identifies environmentally ethical conduct with conduct motivated by respect for nature. Such environmentally virtuous conduct seeks to promote the flourishing of all living organisms. In Taylor's words, "Ethical action and goodness of character naturally flow from the attitude [of respect for nature], and the attitude is made manifest in how one acts and in what sort of person one is" (1986, p. 81).

Taylor admits that "we cannot see the point of taking the attitude of respect" until we understand and accept the biocentric outlook, but he insists that "once we do grasp it and shape our world outlook in accordance with it, we immediately understand how and why a person should adopt that attitude [of respect] as the only appropriate one to have toward nature" (1986, p. 90). The biocentric outlook, a scientifically grounded view of humanity's place in the natural order, consists of the following four theses:

1. *Homo sapiens*, like all other species, emerged as a result of random genetic drift and natural selection. As such, humans are members of the earth's biotic community on a par with all other living organisms.
2. The earth's biotic community forms a complex web of functionally interdependent organisms. In this web, the survival of each organism is determined in part by its relations to other organisms.
3. Each individual living organism is a "teleological center of life" pursuing its own good in its own way.
4. Humans are not superior to other living things. Their inherent worth is no greater than that of any other living organism. (1986, pp. 99–100).

Theses 1 to 3 are solidly supported by the sciences of biology and ecology. Taylor argues that those who accept these theses are rationally committed to thesis 4, which, together, support and make intelligible the attitude of respect for nature (1981, p. 206). This outlook sees living things "as *the appropriate objects of the attitude of respect* and are accordingly regarded as entities possessing inherent worth" (1981, p. 206).

Taylor derives his biocentric egalitarianism as follows. First, he argues that all living organisms are biologically goal-directed toward goods of their own. Next, following Goodpaster, he argues that any being with a good of its own deserves moral consideration. Coupling the latter conclusion with Singer's egalitarianism, Taylor concludes that every living organism possesses equal inherent worth and deserves equal moral consideration.

Numerous objections have been raised against Taylor's biocentric ethic. Principal among them are challenges to its account of moral considerability, its egalitarianism, its individualism, and its demands, along with a worry that Taylor commits the naturalistic fallacy.

To treat these challenges in order, some critics (e.g., Singer 1975, pp. 8–9) maintain that only sentient beings have interests and that only beings with interests deserve moral consideration. Taylor argues that it is arbitrary to restrict the class of morally considerable beings to sentient beings. Since all living organisms can be harmed or benefited and what benefits them promotes their good, Taylor insists that there is no nonarbitrary reason not to extend moral consideration to all living organisms. Mary Anne Warren (1997, p. 48) rejects Taylor's reasoning on the grounds that since lower organisms do not care whether their biological interests are satisfied, neither should humans.

Some biocentrists (Goodpaster 1978, Varner 2002) take issue with Taylor's egalitarianism. They agree that all living organisms deserve moral consideration, but deny that being morally considerable entails having *equal* moral significance. These critics reject Taylor's egalitarianism in favor of a hierarchical account of moral significance.

Other critics object to Taylor's stated view that "it is the good (well-being, welfare) of individual organisms ... that determines our moral relations with the Earth's wild communities of life" (1981, p. 198). These critics contend that Taylor's focus on individual welfare fails to address the actual concerns of environmentalists. Most environmentalists are concerned not with the welfare of individual mosquitoes, dandelions, and microbes, but rather with species preservation, ecological integrity, and pollution. These critics insist that a holistic ethic can better address these environmental concerns.

The idea of extending equal moral consideration to every living organism, including every insect and plant, strikes most people as not only too demanding, but outright absurd. How can people live their lives if they must give plants and insects the same moral consideration owed humans? Taylor tries to mitigate this objection by formulating a complex set of principles (self-defense, proportionality, minimum harm, distributive justice,

and restitutive justice) for fairly resolving the conflicts that inevitably arise between humans and other equally considerable organisms. Even with these principles in place, however, Taylor's biocentric ethic remains extremely demanding, since the principle of proportionality dictates that the basic interests of plants trump the nonbasic interests of humans.

A final worry is that at some point Taylor must move from the purely descriptive aspects of his biocentric outlook to the moral attitude of respect for nature, and that in doing so he must either commit the naturalistic fallacy or beg the question by smuggling a normative judgment (thesis 4) into his biocentric outlook. Taylor recognizes, however, that the biocentric outlook "is not wholly analyzable into empirically confirmable assertions" and thus is best viewed as "a philosophical worldview" (1981, p. 205). Moreover, he never attempts to *derive* an *ought* from an *is*; rather, he seeks to provide us with a rational, coherent perspective on nature that will allow us to accurately perceive (not deduce) the inherent worth of all living beings.

Whether these objections to Taylor's biocentric egalitarianism prove insuperable remains to be seen. Regardless of whether his ethic prevails in the end or ultimately forces us to look elsewhere for an adequate environmental ethic, Taylor's biocentric outlook helps those who accept it to have a greater appreciation and respect for nature.

SEE ALSO *Biocentrism; Nuclear Power; Risk Assessment.*

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Mylan Engel Jr.

TECHNOLOGY

Environmental ethics often deals with the ethical and philosophical implications of human powers over the natural world. Because those powers nearly always are manifested technologically, environmental ethics is in large measure a philosophy of technology. The historical genesis of contemporary environmental ethics coincides with the unprecedented environmental impacts brought about by the advent of advanced industrial technology in the mid-twentieth century. It was also at that time that the philosophy of technology developed as a variegated research field in the English-speaking world, aspiring to comprehensive reflection on the making and using of artifacts. Although they occasionally have entered into dialogue (Ferrè 1992), these two areas of philosophy have remained largely separate despite their potential for support and synthesis.

HISTORICAL BACKGROUND

From its beginnings philosophy has included some attention to technology. However, it was only with the emergence of the industrial technosciences in the late nineteenth century that philosophers systematically turned their attention to the conceptualization and evaluation of technology (Kaplan 2004).

Premodern Socrates questioned those who pretended to wisdom: not just poets and politicians but also artisans. In Socrates's account it was the artisan practitioners of *techne* who came closest to having legitimate knowledge. The term *techne* is often translated as craft or art, but can also be seen as a practice that is grounded in theoretical knowledge, or "an account," thus linking it closely to notions of expertise or know-how. In another dialogue (*Phaedrus*) Socrates indicated that he had nothing to learn from nature. In contrast, Aristotle's philosophy included nature, or *physis,* as a fundamental theme. Aristotle did, however, maintain a strict division between natural and artificial entities. Natural entities are self-generating substantial unities of form and matter. An acorn sprouts into an oak tree, fulfilling its essence. Artifacts, by contrast, never achieve that substantial integration because the source of their being is external to them; if a bed were to sprout, it would give rise to a tree, not a bed (*Physics*). The ancient theme of *techne* and *physis* underpins contemporary work in both philosophy of technology and environmental ethics on the meaning of and proper relationships between technology and nature (McKibben 1989, Haraway 1991, Latour 1993, Rothenberg 1993, Strong 1995).

In Christian adaptations of philosophy, nature is thought of as a creation of God, who also is disclosed by means of supernatural revelation. Christian theology thus identifies two paths to insight into the ultimate nature of reality: the word of God in Scripture and the book of

nature. On neither path, however, does technical thought make a significant appearance, although historians of technology such as Lynn White, Jr. (1967) have argued that Christian theology prepared the way for modern science and technology. White claimed that the Judeo-Christian teleology—God made nature solely to serve humanity—underpins the Western technological mastery of nature.

Modern Many of the founders of modern science and technology, such as Francis Bacon, René Descartes, and Isaac Newton, were motivated partly by the aim of natural theology: As Johannes Kepler phrased it, "to think God's thoughts after him." However, the modern era also signaled a radical break from ancient and medieval religious views that valorized contemplation and the control of one's desires and maintained that technology should be subject to ethical constraints. From the Renaissance through the Enlightenment, by contrast, traditional restraints were replaced with an ethical commitment to the unfettered pursuit of technology. Bacon argued that the production of knowledge would culminate in "the conquest of nature for the relief of man's estate" (*Novum Organum*). The modern approach to the world is essentially technological because it upholds an intimate alliance between knowing and changing the world. For example, Bacon wrote that "the nature of things betrays itself more readily under the vexations of art than in its natural freedom" ("Plan of the Work," paragraph 21). It is this commitment to technology, along with its subsequent questioning in response to problems, that frames the prominence of ethical issues both in the philosophy of technology and in environmental philosophy.

Steel Mills, Pittsburgh, Pennsylvania, ca. 1920–1950. *Beginning in the nineteenth century, industrial technology, such as steel production, brought about important changes in both environmental ethics and philosophy. Some have suggested that the powerful role of technology in modern times allows for a reduction in the sense of ethical responsibility for many individuals.* **THE LIBRARY OF CONGRESS.**

In the nineteenth century, technics and science began to merge and the machine-powered industrial technology employed in capitalist systems of trade and production brought massive changes. Systematic reflection on the social organization and ethical import of technology began at that time. Social theorists such as Karl Marx and Max Weber theorized technology in terms of human activity and the causal relations between technical change and social change (e.g., technology as an autonomous determinant of human affairs or as a social construction). Weber analyzed technicalization: the movement from traditional societies, in which techniques are situated within and delimited by nontechnical values, to modern societies, in which techniques are evaluated solely in technical terms. Marx argued that material culture largely determines the character of society because it is driven by the increasing capacities of machines rather than the needs of people. Yet Marx also maintained that industrial technology could support a just and fulfilling utopia if the social organization of labor, especially ownership of the means of production, was altered. Marxism has inspired reflections on technology within critical theory, especially in the Frankfurt School and among contemporary philosophers such as Andrew Feenberg (1991).

Contemporary The late nineteenth and twentieth centuries witnessed increasingly rigorous and diverse philosophical reflection on technology. Carl Mitcham (1994) organized those works into two groups: Engineering philosophy of technology argues that technology is central to human life, and humanities philosophy of technology is concerned with the moral and cultural boundaries of technology. Representatives of the first group include Ernst Kapp (1877), the first to write a book with *philosophy of technology* in the title, who pictured all technologies as ''organ projections'' (e.g., the telegraph extends the human nervous system). Friedrich Dessauer (1972) viewed technological activity as a mystical experience involving supreme participation in reality. Dessauer argued that technological invention offers direct contact with things-in-themselves. Insofar as they make ethical judgments of technology, members of this group tend to concur with Julian Simon (1995) and other contrarians in environmental ethics who emphasize the benefits of technology and are optimistic about the prospects of managing natural systems on a large scale.

Representatives of the second group tend to adopt a more historical approach to and mixed evaluation of technology, often motivated by a concern to preserve the harmonies of nature. This viewpoint allies humanities philosophers of technology with the romantic influences in environmental ethics, including Ralph Waldo Emerson and Henry David Thoreau (Marx 1964). Lewis Mumford (1934), arguing that humans are essentially linguistic rather than engineering animals, distinguished life-oriented technologies from the bureaucratic, systemic megamachine, which diminishes human meaning and constricts personal existence. Jacques Ellul (1964) argued that *la technique*—the whole ensemble of modern technologies—operates autonomously in the modern world to reduce life to the narrow demands of efficiency. José Ortega y Gasset saw technology as central to humans' ability to transcend nature and adapt it to their needs but also expressed concern that the unlimited power of technology will lull people into a flattened existence.

Bernard Charbonneau (Cèrèzuelle 2004), who influenced Ellul's thought, was a founder of the French environmental or political ecology movement who argued that the traditional warring ideologies (e.g., liberalism and communism) were insufficient responses to industrial society because they took its basic logic of production for granted. Charbonneau's work bridges environmental and technological ethics. He argued that World War I brought about a ''great mutation'' in which human freedom has been subordinated to the logic of an ever-accelerating technological industrialism. Humans seek freedom from nature's necessities in society, but those freedoms are paid for with the additional constraints of an impersonal, bureaucratic ''societal frame.'' Charbonneau argued that embodied and personal contact with nature is as essential to human freedom as is technological escape from nature.

Many philosophers of technology follow Heidegger in treating technology as a unified system with a defining essence. This complements the thoughts of White and others in environmental ethics who attempt to situate the contemporary human condition within a broader sweep of history and a worldview that is in need of revision. Aldo Leopold, for example, argued that people need to evolve from a self-image that pictures humanity as conqueror of nature to one that pictures humanity as citizen of the biotic community. By contrast, those influenced by the more recent ''empirical turn'' in the philosophy of technology—mostly in the United States but increasingly in the Netherlands as well—tend to focus on individual technologies as they coevolve with society and express their potential uses in specific contexts (Achterhuis 2001). This approach relates to the context sensitivity of the pragmatist and policy-turn influences in environmental ethics, which are both approaches that begin inquiry with actual environmental controversies and seek to offer practical advise.

KEY CONCEPTS AND THEMES

The philosophy of technology can be discussed in terms of a number of basic issues associated with the standard branches of philosophy: logic, epistemology, metaphysics,

and ethics. In both philosophy of technology and environmental philosophy, ethical and political concerns have had primary importance.

Responsibility and Precaution Hans Jonas (1984) argued that responsibility was not a central concept in premodern ethics because of the narrow compass of scientific knowledge and technological power. For Jonas, "responsibility . . . is a function of power and knowledge," which "were formerly so limited" that consequences distant in time and space had to be left to fate as attention was focused on the present (Jonas 1984, p. 123). Modern technology, by contrast, introduces such novel actions, objects, and consequences that the old ethical frameworks are not appropriate. With the extended powers of technology, modern people face the unprecedented task of considering the global condition of human life, the well-being of future generations, and the existence of entire nonhuman species. This demands "a new conception of duties and rights" (Jonas 1984, p. 8).

Science and technology lengthen the human reach. As Jonas noted, this means that people need "lengthened foresight" to guide their actions. However, foresight is blurred by uncertainty about the consequences of people's actions. For Jonas, the correct reaction to uncertainty in the context of potentially dangerous technologies is precaution. People must apply a "heuristic of fear" that will replace predictions of hope and inform themselves about what is at stake. In this view, precaution is a noble fear grounded in an appreciation of the fragility of human existence in light of technological dangers. This position clearly situates him in the precautionary principle debates within environmental ethics.

Technosocial systems are so complex that a new ethical imperative of responsibility is not easy to implement. Moral responsibility is distributed across multiagent systems, and technologies serve as moral aggregators that turn individual morally negligible acts (driving a car) into major moral consequences (global climate change). Garrett Hardin (1968) put this in terms of the "tragedy of the commons," in which individuals immediately experience short-term benefits while creating longer-term, more diffuse costs.

Hardin's insight relates to Albert Borgmann's 1984 analysis of modern technology as a "device paradigm." Through the example of a central heating system, Borgmann demonstrates how the machinery of devices fades into the background as people increasingly confront commodities (heat, in this case) isolated from the conditions that make them possible. People flip a light switch, pull the lever on a gasoline pump, or press a button on the thermostat but do not experience the full effect of those actions. As users, people do not engender the sociotechnical systems that "lie behind" and make possible these simple actions at the user interface: People click the print icon on the computer screen but do not fell the tree, process the paper, manufacture the printer, and so on.

Thus, the conveniences afforded by technology create situations in which responsibility for the aggregate or emergent consequences seems both nowhere and everywhere. Ulrich Beck (1992) argued that many predominant techniques of risk management block out responsibility. Society is a "laboratory" in which no one has to answer for the negative effects of technological experimentation. The institutions of modern society recognize the existence of risk but permit an "organized irresponsibility."

Environmental ethics and the ethics of technology have generated the same responses to this problem, which include limiting individual freedom through expanded governmental regulations and bureaucracies and altering markets to eliminate externalities. Other proposals include enhancing individual ethical responsibility through improvements in education that incorporate expansions of affective sensibility and the cultivation of more virtuous or less consumerist character traits. Also, role responsibilities can be broadened. For example, corporations and manufacturers can adopt extended responsibility for their products and users can practice more responsible consumption. In recognition of engineering as social experimentation, engineers have shifted the interpretation of their primary responsibility from loyalty to a company or client to responsibility for public health, safety, and welfare. This is demonstrated in the growing emphasis on cradle-to-cradle design, industrial ecology, and sustainable architecture (McDonough and Braungart 2002).

Democracy and Justice Modern liberal democracy is about limits to government, yet technology has at least as much power as governments to shape people's lives—to constrain people, free them, and even constitute their identities. Richard Sclove (1995) and others argue that democracy also should be about limiting science and technology, especially by consciously guiding those increasingly powerful forces through democratic processes of foresight, reflection, participation, and discussion. This argument underpins many practical attempts to reintegrate ethics and other values into technical production processes that have become dissociated from society.

Many examples of these practices come from environmental contexts as governments routinely mandate environmental assessment processes—including public comment periods—for proposed engineering projects with environmental risks. Pointing out the inefficiencies of these processes as well as their often undesirable outcomes, others argue for increased control by those with the technical

Windfarm in East Frisia, Germany. *Sheep graze among wind turbines in East Frisia, Germany. With the extended powers of technology, modern people face the unprecedented task of considering the global condition of human life, the well-being of future generations, and the existence of entire nonhuman species.* **OTMAR SMIT, 2008. USED UNDER LICENSE FROM SHUTTERSTOCK.COM**

knowledge required to ensure sustainable development or other environmental goals; this is a technocratic vision long debated in the philosophy of technology.

Proposals for the democratization of technology often are motivated by the desire to bolster human autonomy in a world largely driven by technological and growth imperatives. The human-built world is displacing and despoiling nature, prompting many people to seek greater control over technology through political processes. Such proposals often are advanced to rectify injustices stemming from the ways in which technologies shift the distribution of power. In particular, environmental burdens and benefits often are distributed unequally across lines of race, class, and gender, for example, when polluting industries are placed in impoverished neighborhoods. The Green Revolution demonstrated the ethical ambiguities of technology transfer to developing countries. The populations of those countries are also the most vulnerable to the impacts of global climate change even though they are responsible for a relatively small proportion of greenhouse gas emissions. Finally, technologies may carry certain political characteristics by their nature. A nuclear power plant, for example, requires a hierarchical distribution of power and advanced security superstructures, whereas distributed solar power generation entails far different political consequences (Winner 1986).

The Good Life The way people relate to the natural world depends on what they believe about themselves and their relationship with the environment. Thus, visions of human nature and the good life are ultimately at work—albeit implicitly—behind modern technological society. The predominant vision is that of material comfort and abundance espoused by Bacon and encapsulated in consumerism. At least for those in the developed world, modern technology has brought vast improvements in material well-being. As more people aspire to this lifestyle, environmental ruin may follow. However, fertility declines with increasing development, and greater wealth brings with it the ability to afford cleaner technologies and the possibility of caring for nature for its own sake.

However, more fundamental to this vision is the belief—coeval with human existence but now magnified beyond previous proportions—that the world as it is does not provide a suitable home for human beings; humanity must construct a home for itself. Human beings often do not find themselves at home within the worlds they create. Levels of happiness do not rise after people cross a certain income threshold, and antidepressants are among the most frequently prescribed drugs in some developed countries. Disconnected from nature and overwhelmed by the pace of modern media culture, children as well as adults tend to lead more hyperactive and desultory lives. Both romanticism and socialism critique these kinds of technological alienation. Jean-Jacques Rousseau focused on how technology alienates the individual from feelings and sentiments. Karl Marx analyzed the power of industrial capitalism to alienate individuals from their full potential and separate people from control over the tools and products of their labor.

Thus, both environmental ethics and philosophy of technology debate the merits and feasibility of alternative visions of the good life, including various types of postmaterialism, communalism, and bioregionalism. Such visions often are criticized as nostalgic idealizations of primitive existence when they are elaborated on a large scale rather than used to justify marginal or individual shifts to alternative technologies. Certainly, one would face strong humanitarian arguments against advocating anything as radical as giving up indoor plumbing or electricity as a social policy. Nonetheless, deep ecologists point out a fundamental human need when they speak of the ennobling power of wilderness. There is more to living well than material comfort, and not all burdens are odious. Indeed, in relinquishing technological aids and meeting nature on its own terms, people replenish a vital part of the human spirit. Debating the proper scope and character of technology, then, bears not just on matters of sustainability, survival, and justice but also on what it means to live well.

PRACTICAL CONTEXTS

Much of environmental ethics falls within the purview of the philosophy of technology because many of its central questions relate to the development, use, and impacts of artifacts. They also relate to the appropriate reach of technical knowledge and activities. For example, debates over sustainability in environmental ethics often stem from differences between those who picture it as a matter of technologically managing nature and those who picture it as an essential limitation on technology. This and other issues are manifested in practical contexts in which individuals and groups face decisions about technology. These contexts range from the construction of dams and power plants by societies, to business investments in new prototypes, to decisions to drive cars and run air conditioners by individuals. Thus, a focus on technology can help move environmental ethics out of academia and into the public, corporate, and private arenas in which such decisions are being made.

SEE ALSO *Bacon, Francis; Christianity; Descartes, Rene; Emerson, Ralph Waldo; Environmental Philosophy: I. Ancient Philosophy; Environmental Philosophy: III. Early Modern Philosophy; Environmental Philosophy: V. Contemporary Philosophy; Industrial Ecology; Ortega y Gasset, José; Precautionary Principle; Risk Assessment; Sustainability; Sustainable Agriculture; Thoreau, Henry David; Tragedy of the Commons; White, Lynn, Jr.*

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Adam Briggle

TELEOLOGY

The word *teleology* comes from the Greek words *telos,* meaning "end or purpose," and *logos*, meaning "word, thought, speech, principle." Teleology, as a specialty of modern philosophy, is the study of ends or purposes. With roots in Aristotle's philosophy, teleology refers both to a traditional model of scientific explanation—one that encompasses final causes—and an approach to ethics. Teleological explanations and teleological ethics have played a role, albeit a controversial one, in modern environmentalism.

ARISTOTELIAN AND MEDIEVAL ORIGINS

Based on his observations of nature, the ancient Greek philosopher Aristotle (384–322 B.C.E.) concluded that all natural objects have a characteristic and distinctive activity. Aristotle's teleological science differs from modern science in holding that one does not have a complete scientific understanding of an object until one understands this characteristic activity. The goal of this activity, what can be called its purpose or function, is identified as the object's *telos.* For example, in Aristotle's view one does not fully understand any artificial object, such as a house, until one understands the purpose it serves (shelter in the case of a house). Nor does one fully understand any natural object—including the stars, plants, and animals—until one understands the purpose it serves or the goal it strives to reach.

These brief examples demonstrate the close connection between teleological science and teleological ethics. Once one has understood the *telos* of a house or a plant or an animal (including the human animal), something one discovers through Aristotelian science, one also comes to understand what a *good* house is or what a good specimen of its species is—something with ethical implications. A good pine tree is one that grows straight and tall and produces much viable seed from which new pine trees might grow. A good pine tree is one that achieves its *telos*. Aristotle believed that this teleological framework could be applied to all natural objects, including humans. All natural objects achieve their good when they fulfill their function or achieve their *telos.*

This approach was further developed in the Middle Ages, when Christian philosophers synthesized Christian theology with Aristotle's science and ethics as the basis of natural-law philosophy. According to this perspective, as science comes to understand the natural *telos* of each living thing, the "laws of nature," it helps us understand God's "laws." Because the *telos* and purposes discovered in nature are God's purposes, the natural order can be equated with the moral order. Natural law thus has both a descriptive meaning, as the scientific laws of nature, and a prescriptive meaning, as the normative rules that we ethically ought to follow. In this ethical tradition fulfilling one's natural potential—a potential implicitly in harmony with the rest of nature—is the highest form of ethical activity.

APPLICATIONS TO ENVIRONMENTAL PHILOSOPHY

Several themes in contemporary environmental philosophy have parallels to this ethical tradition. Some environmentalists believe that ecosystems are naturally well ordered and harmonious. All parts of an ecosystem have a distinctive place and function in the overall scheme, each contributing to the natural order in its own way. Predators control the populations of their prey, bees pollinate flowering plants, and earthworms aerate the soil; hence each species has its telos in the ecological order. Undisturbed nature is thus good; ecological problems arise only when humans interfere with the natural order.

Other environmentalists have argued that all living things have moral standing because every living thing individually has a telos of its own—the end it strives to achieve—and thus a good of its own. For example, Paul Taylor argues that all living beings are ''teleological centers of life,'' and possess a good of their own that is independent of human interests or, for that matter, independent of any ecological function they may (or may not) perform in the larger ecological order (1986).

Major objections to the teleological tradition challenge its relevance to contemporary debates. Most tellingly, modern evolutionary science provides a significant and perhaps insurmountable challenge to the teleological tradition in both science and ethics. The process of evolution by natural selection offers an account of the apparent design found in nature without appealing to any purpose or *telos*. On this view the order and characteristic activity that is found in nature is not inherent in nature itself, as Aristotle thought, nor does it come from a divine plan, as the Christian Aristotelians in the Middle Ages believed; it results from random genetic mutation and natural selection.

For example, it is tempting to offer a teleological explanation for the long neck of the giraffe by claiming that the long neck exists (or was designed) in order to allow the giraffe to reach food high off the ground. Yet evolutionary biology explains that the giraffe did not develop a long neck *in order to* reach the leaves but that the longer-necked ancestors of giraffes survived and reproduced similarly longer-necked progeny because, having longer necks, they were better able to reach food high off the ground than competing organisms with shorter necks. On this view nature is aiming at nothing, and species have no assigned function in the natural order; nature is headed nowhere in particular. It is neither good nor bad; it just is.

But the appeal of the teleological tradition persists. Contemporary biologists are comfortable using teleological categories when speaking about the natural world. Even within a Darwinian framework, such teleological concepts as *function, purpose, goal,* and *design* are used regularly by scientists and philosophers. Consider the following examples: ''The purpose of the kidney is to remove waste from the blood''; ''the goal of brightly colored plumage on male birds is to attract females''; ''wetlands function as flood-control and water-filtration systems.'' In the teleological tradition, it is a reasonable inference from such purposive and functional ascriptions to a value or normative conclusion: ''This is a healthy kidney''; ''this is a successful male''; ''wetlands should not be destroyed.'' The contemporary challenge is whether such inferences are legitimate and, if so, what normative meanings inhere in them.

Many observers continue to resist any inference from natural facts to value claims. One approach is to claim that the functional language that is common and appropriate in the biological sciences is a kind of convenient shorthand and that all such ascriptions can be fully explained, albeit more awkwardly, in terms of antecedent causes. For convenience navigators treat the Earth as an object at rest, the Sun as a moving object, and the pole star as a motionless point of reference even though they know full well that the Earth orbits the Sun and turns on its axis. The science of navigation could be expressed in the language of modern astronomy, but with great sacrifice of economy and simplicity of expression. Thus, in the view of modern science, although kidneys, plumage, wetlands, and even long necks might perform a function, they do not do so out of a prior built-in purpose, as Aristotle supposed, or a divine design as his Christian exponents supposed. The functions themselves are simply the result of previous evolutionary processes. Inferring a value conclusion from these facts would require an implicit value component already assumed. For example, only by assuming that reproductive success is good could one infer that bright plumage is a good thing for male birds; and only by assuming that survival is good could one infer that long necks are good for giraffes.

Some philosophers argue that it does seem reasonable to assume that adaptation for survival and reproductive success (what biologists call ''inclusive fitness'') *is* good and therefore that it is reasonable to reach normative conclusions from biological facts. It seems reasonable to conclude that the adaptive capacity that a species has developed to outrun or hide from its predators is good for that species. It is good for the giraffe to have a long neck, and a kidney that does not filter blood effectively is bad kidney.

Assessing these debates would require carefully distinguishing between such concepts as *function, purpose, design,* and *goal.* When used in science, all of these concepts involve explaining some phenomena (kidneys, long necks, bright plumage, predators, wetlands) in terms of some future state or activity (filtering blood, reaching high food, attracting a mate, controlling prey populations, absorbing flood water). This is the essence of any teleological explanation. Aristotle's teleological science seems right in this: One has not fully understood such natural objects until one has understood how they function. But the questions remain: Are such forward-looking explanations scientifically valid? If so, is it always a good thing to attain this future state or perform this activity? Are functional explanations truly teleological? Is value built in to any notion of aiming for and attaining some future state? If so, is this value necessarily an ethically good thing?

Much modern science, particularly as it developed under the influence of physics and mechanics, argues that the only legitimate scientific explanations are those that refer back to antecedent causes, not forward to future goals, or final causes. Thus, some critics challenge the legitimacy of any teleological explanations at all in the biological sciences. Others argue that, although some teleological explanations are legitimate, others are not and that no value conclusions can be drawn from them in any case. For example, although it may be legitimate to think that the function of the kidney is to filter blood, it is not legitimate to think that the function of earth worms is to aerate soil; rather, as their digestive tracts extract nourishment from detritus, a fortuitous side effect is soil aeration. Still others argue that, although value conclusions might be drawn from biological facts, the values are always qualified and conditional. *If* you assume that survival and reproductive success is good, or *if* you assume that adaptive fit is good, then one can conclude that certain traits are good for certain species. But inclusive fitness and adaptability are not always an *ethically* good thing. That which is good for a species or an individual is not always identical with an ethical good, a distinction foreign to Aristotle. Thus, although the teleological tradition provides a framework for thinking and reasoning about relations between nature and ethics, it is fraught with philosophical and scientific controversies.

SEE ALSO *Agricultural Ethics; Christianity; Darwin, Charles; Ecosystem Health; Evolution; Natural Law Theory; Species; Taylor, Paul.*

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Joseph DesJardins

THEORY

One of the principal tasks of environmental ethics and philosophy is to posit and defend an adequate normative ethical theory. This agenda was set by two seminal essays: In "Historical Roots of Our Ecologic Crisis" (1967), Lynn White Jr. blamed the environmental crisis on the Judeo-Christian worldview, claiming that Christianity was the most anthropocentric of world religions. An environmentally friendly worldview, he implied, would have to be nonanthropocentric. But, he argued, traditional European and North American ethical theory is anthropocentric, requiring an effort at building a new ethical theory. In the 1973 essay "Is There a Need for a New, an Environmental Ethic?" Richard Routley constructed the now-famous "Last Man" thought experiment, in which the last human being "lays about him" destroying everything within reach. Routley correctly expected that most of his readers would judge the last man's behavior to be morally reprehensible, but standard European and North American ethical theory could not support such an intuition. The Last Man thought experiment claims to demonstrate that the foundations of environmental ethics must be nonanthropocentric.

This interest in theory marks environmental ethics and philosophy as distinct from the more immediate practical work of ecological restoration, the development of sustainable technologies, or the institution of ecologically informed environmental policy. In addition to the implementation of environmentally sound practices, environmental ethicists and philosophers focus on fundamental questions concerning the types of values attributed to nature, what it would mean to actually restore a landscape, what it means to engage in a sustainable technology, or what constitutes an ecologically informed policy. Underlying and motivating all of these more practical environmental aims are implicit theoretical, environmental, ethical, and philosophical assumptions about the value of the environment itself. Theoretical environmental philosophy exposes and critically engages such assumptions.

Theorists in environmental ethics and philosophy have historically been interested in both normative and metaethical theoretical questions. Metaethics addresses questions *about* ethics, whereas normative ethics focuses on questions *within* ethics. Metaethicists are interested, for example, in whether or not environmental ethical claims can be true or false, whereas normative ethicists work to formulate and defend particular systems or theories of environmental ethics.

NORMATIVE ETHICAL THEORY IN ENVIRONMENTAL ETHICS AND PHILOSOPHY

An ethical theory is an attempt to determine which entities are worthy of direct moral standing, which are worthy of only indirect moral standing, and which do not matter morally. Consider, as an illustration, a circle. If something lies within this circle of moral concern (or within the moral community), it possesses direct moral standing. Things with direct moral standing count, period. If something lies outside of the moral community, it might count,

but only indirectly at best. That is, something outside of the moral community might be tethered to (i.e., somehow important for or to) something within the moral community. It might also be the case that those things outside of the moral community possess no moral standing at all if it can be demonstrated that they serve no end for things within the moral community. So, for example, if our moral community included only human beings, then, although we would not necessarily be concerned with the loss of tropical plant species per se, we might still be concerned with them if their well-being somehow served a human end (e.g., provided chemical extracts that could treat a human illness). If, however, our moral community included all living things, then, in addition to being important as a source of medicine for humans, plants would also count directly.

Moral standing—whether direct or indirect—depends largely on what a given theory presupposes as the key to this inclusion. Typically the key to moral standing is a quality that entities possess or fail to possess. Because an entire moral-community structure depends on an established key to moral standing, normative environmental ethical theory has focused a great deal of energy on determining the nature of this key.

Although some environmental scholars downplay or dismiss the value of environmental-ethical theorizing, others point out the advantages to such theory building. First, they note that all actions and polices presuppose a theoretical foundation. Absent coercion, we are usually willing to perform only those actions that are consistent with our value assumptions. Hence, to engage in environmental ethical theory building is to engage at the same time in environmental policy making (albeit indirectly). Furthermore, given the inescapability and force of environmental ethical theory, it seems wiser to attend to such theory building than to ignore it. Second, the theoretical foundations provided by environmental ethical theory might be empowering. As opposed to environmental discourse that appears ungrounded, or environmental decision-making that happens only as the result of political maneuvering and power struggle, environmental ethical theorizing allows us to create a solid foundation from which to judge and defend a certain course of action and to understand the roots of other courses of action. Hence, even those without political power can participate in environmental discourse and possibly even in environmental decision-making. Third, environmental ethical theory provides us with at least a rough idea—but not the specific details—about how we ought to live. The application of theory, as opposed to concrete rules or policies, requires us to think for ourselves, allows us to adjust to novel situations and to consider how a given theory might manifest itself in different ways under different conditions. Finally, the establishment of an environmental ethical theory, and its corresponding notions of direct and indirect moral standing, establishes a powerful and important burden of proof. Given that those with direct moral standing would be "innocent until proven guilty," whereas those without direct moral standing would be "guilty until proven innocent," and given that the establishment of burden of proof is no small matter to those entities whose fate is thus decided, environmental ethical theory building takes on enormous importance.

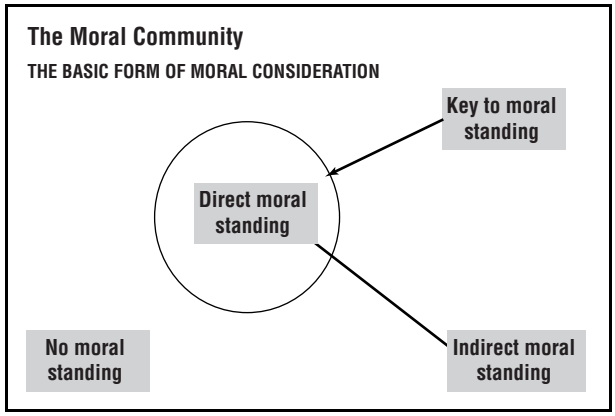

Figure 1. *Environmental ethical theories vary with regard to who or what possess direct, indirect, or no moral standing. For example, for some theories species and ecosystems might be members of the moral community directly, for others they might matter only because they support that which does count directly (i.e., they might merit only indirect moral standing), and for still others they might not matter at all. Different theories propose different relevant qualities (or keys) or moral consideration which then determines which things count (or do not count) and in what way.* CENGAGE LEARNING, GALE.

Like many disciplines, environmental ethics has its own vocabulary. Two key terms in environmental ethics are *instrumental value* and *intrinsic value*. Something is said to have instrumental value if it is a means to some other end (e.g., a child can have instrumental value if she can mow the lawn). Something is said to have intrinsic value when it possesses value that transcends its instrumental value (e.g., a child, even if she will not or cannot mow the lawn). The views of environmental ethicists differ most markedly in their attribution of either instrumental or intrinsic value to various nonhuman things in the world. These differences produce profound differences in how and to what extent one sees and likewise how one feels we ought to work to solve environmental "problems."

KEY PERSPECTIVES IN ENVIRONMENTAL ETHICS

The key perspectives in environmental ethics are the following:

1. *Anthropocentrism* is the position that all humans—and only humans—possess intrinsic value and direct moral standing. In this view, nonhumans have only instrumental value to the extent that human well-being may in some way depend on them. For the anthropocentrist, environmental ethics and policies are motivated and justified solely on the basis of their effect on humans, without regard for the nonhuman world. An anthropocentrist, for example, would be concerned about rapid global climate change only insofar as it affects the welfare of human beings. Anthropocentrists argue variously that it is either unintelligible or unnecessary to extend direct moral standing to the nonhuman world. The philosopher John Passmore (1974) represents the anthropocentric camp.
2. *Nonanthropocentrism* attributes intrinsic value to humans and to at least some nonhuman entities. Nonanthropocentrists vary in how inclusively they view the moral community. The U.S. Endangered Species Act (1973), as an example, is nonanthropocentric to the extent that it dissociates the value of a species from its economic and narrowly human-centered value. Each of the perspectives described below are types of nonanthropocentrism (except that extensionism is more general than nonanthropocentrism):
   a. *Extensionism* is exemplified by zoocentrism and biocentrism (see below). These perspectives vary according to the extent to which they argue moral consideration ought to be attributed to various kinds of other individuals. Extensionism attempts to extend traditional moral theories (such as utilitarianism or rights theory) to entities that have not traditionally been considered worthy of direct moral standing.
   b. *Zoocentrism* attributes intrinsic value only to humans and certain nonhuman animals, although adherents to this view differ about which animals possess direct moral standing and intrinsic value. A zoocentrist could, for example, be concerned about the loss of biodiversity insofar as it harms humans and nonhuman animals that possess clear indications of self-consciousness (e.g., primates). Peter Singer (1975) and Tom Regan (1983) are major proponents of zoocentric philosophy.
   c. *Biocentrism* attributes intrinsic value and direct moral standing to all individual living creatures. It takes "being alive" as the key to moral inclusion. Nonliving things (e.g., lakes or rocks) and collectives (e.g., species and ecosystems) possess only instrumental value or no value at all. Biocentrists would care, for example, about biodiversity loss because of its effect on all individual living things. The philosopher Paul W. Taylor (1986) defends this position, as do Kenneth Goodpaster, Robin Attfield, and James Sterba.
   d. *Universal consideration* is a position that attributes intrinsic value and moral standing to everything (living or not). Hence, from this perspective, biodiversity loss would be decried not only for its potential harm to all living things, but also for its negative impact on even nonliving things such as mountains, rivers, or rocks. The philosopher Thomas Birch (1993) has championed this position.
   e. *Ecocentrism* is a reaction against the atomism or individualism represented by extensionism. Adopting Charles Darwin's analysis of ethics as generated by community membership and inspired by principles of ecological science, ecocentrism reflects the social-like connectedness among individuals in nature. Emergent properties of biological wholes—such as species, biotic communities, and ecosystems—transcend the properties of the individuals that compose such collectives. Ecological collectives, ecocentrists argue, merit moral standing because of their emergent properties and connectedness. Ecocentrism thus focuses moral concern on the maintenance of biotic communities, species, and ecosystems and less on the welfare of animals and other organisms. Aldo Leopold represents ecocentrism, especially when he writes, "A thing is right when it tends to preserve the integrity, stability, and beauty of the biotic community. It is wrong when it tends otherwise." (Leopold 1949, pp. 224–225). The philosopher J. Baird Callicott (1989, 1999) is the most noted defender of Leopold's land ethic. The philosopher Arne Naess (1989) is the originator and noted defender of the ecocentric environmental ethic known as Deep Ecology, which is based on a mystical sense of self intimately connected with all of nature. Some argue that ecocentrism, taken to its logical conclusion, is equivalent to James Lovelock's Gaia hypothesis (1979), in which the entire Earth merits moral consideration.
   f. *Environmental virtue theory* began to emerge in the early part of the twenty-first century. Harking back to Aristotle's approach to ethical reasoning, environmental virtue ethicists suggest that we should focus our energies on the creation of virtuous people, or people of appropriate character, instead of on working to determine the proper key to moral consideration and membership in

the moral community. Traits such as respect, humility, caring, and attentiveness are often advanced as the key virtues. The philosophers Phil Cafaro (2001) and Ron Sandler (2007) represent this trend in environmental ethics.

METAETHICAL THEORY IN ENVIRONMENTAL ETHICS AND PHILOSOPHY

Although many metaethical questions surround environmental ethics and philosophy, three of them have been at the center of particularly robust debates. Environmental ethics is often regarded as one among several types of "applied ethics," such as biomedical ethics, engineering ethics, and business ethics. Applied ethicists rely on the prevailing European and North American ethical theories—variations on utilitarianism and Kantian deontology to new ethical questions that the eighteenth- and nineteenth-century authors of these theories could never have imagined or anticipated. Accordingly, some philosophers view environmental philosophy as work that takes traditional ethical theory and examines environmental concerns through the lens of these theories. These philosophers might therefore be concerned with what the prevailing European and North American ethical theories of utilitarianism or deontology might have to say about the rightness or wrongness of factory farming or sport hunting.

Other environmental philosophers, however, view the work of environmental philosophy and ethics as something quite beyond mere applied ethics—as work that explores new ideas about ethics and even metaphysics and that, although practical in its application, is also freshly theoretical. These philosophers might point to the unique nonanthropocentric ethical theories created by environmental philosophers or the work done in policy and philosophy or between various sciences (e.g., ecology, geography, geology, and biology) and philosophy as examples of uniquely theoretical environmental ethics. The work of Robert Frodeman has taken this approach (2003).

Second, there has been a debate between those who operate as if environmental ethicists, like classical European and North American ethical theorists, should pursue a unified ethical theory and those who recommend embracing several theories at once. The former favors ethical monism, the belief that there is only one proper ethical theory. Ethical pluralists, on the other hand, believe that there may be more than one legitimate ethical theory and a plurality of ethical truths. Pluralists worry about the homogenizing and totalizing effect of the pursuit of monism. Monists worry that pluralism is little more than ethical relativism. Pluralists deny this reduction to relativism and instead suggest that the standard of an acceptable ethic ought to shift from a focus on truth to a focus on reasonableness, pointing out that any number of ethical prescriptions can be reasonable. Are pluralists really suggesting that a number of incommensurable ethical theories can be coherently held at the same time, or are they suggesting that different persons implicitly or explicitly hold different ethical theories and that there is, therefore, no decisive way to declare that one or the other is the one true theory? Are monists really suggesting that there is only one true ethical theory or merely demanding that each person hold an internally consistent ethical point of view while allowing that there may be many self-consistent ethical theories? Synthesizing, in Hegelian fashion, monism and pluralism in environmental ethics, could a monistic theory be constructed that is sufficiently general to allow for a plurality of approaches and applications in the real world? Within the literature of environmental ethics, Christopher Stone (1987) advocates an extreme version of pluralism, whereas Peter Wenz (1993) advocates a more moderate pluralism. J. Baird Callicott (1999) has defended a moderate version of monism; Peter Singer (1990) represents a more extreme monism in his steadfast commitment to utilitarianism.

Third, there is a debate between those environmental philosophers who have focused primarily on the creation and defense of ethical theories (theories that defend the intrinsic value of nature) and environmental pragmatists who are motivated primarily by effecting environmental change in the "real world." Whereas the more theoretically motivated environmental philosophers contend that environmental philosophers should continue to create and defend abstract theories of values that underpin environmental attitudes and decision making, pragmatists contend that they should instead focus on variable and context-dependent accounts of value and truth (i.e., on solving real-world environmental problems). Pragmatists often assert that environmental ethical theorizing has had no real impact on environmental problems or policy formation and that we ought to make philosophy more practical. Although some pragmatists assert that environmental ethical theorizing is simply irrelevant or useless, some assert that it is actually counterproductive. Commonly taking a pluralist approach, some environmental pragmatists strive to marshal the values and ethical commitments of ordinary people to support of environment-friendly policies; others recommend suppressing the often conflicting values and ethical commitments of ordinary people—because they can be divisive—and focus on more situation-dependent solutions that all sides can live with. Ethical theorists might, however, argue that any such solutions cryptically rest on implicit values and ethical commitments and that the very notion of an environmental problem presupposes the significance of environmental values and ethics. Finally, although ethical

theorizing has not yet had the impact that environmental philosophers had originally hoped, it is also not clear why a pragmatist would necessarily care what ethical theorists do. It would seem that, as self-avowed pluralists, pragmatists would be content to let theorists theorize, while they, the pragmatists get on with their problem-oriented, situation-dependent solutions, What could be more unpragmatic—that is, impractical—than spending thousands of hours writing dozens of books and articles pointing out the unpragmatic product of the unpragmatic theoreticians?

SEE ALSO *Callicott, J. Baird; Gaia Hypothesis; Last Man Arguments; Leopold, Aldo; Naess, Arne; Passmore, John Arthur; Pragmatism; Singer, Peter; Sylvan, Richard; White, Lynn, Jr.*.

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Michael P. Nelson

THOREAU, HENRY DAVID
1817–1862

Henry David Thoreau was born in Concord, Massachusetts, and lived there all his life. A writer, naturalist, and philosopher, he was an important forerunner of American environmentalism and remains a key source of insight and inspiration for millions of environmental and political activists around the world. *Walden* is his most famous work. His influence on the development of environmental ethics has been profound.

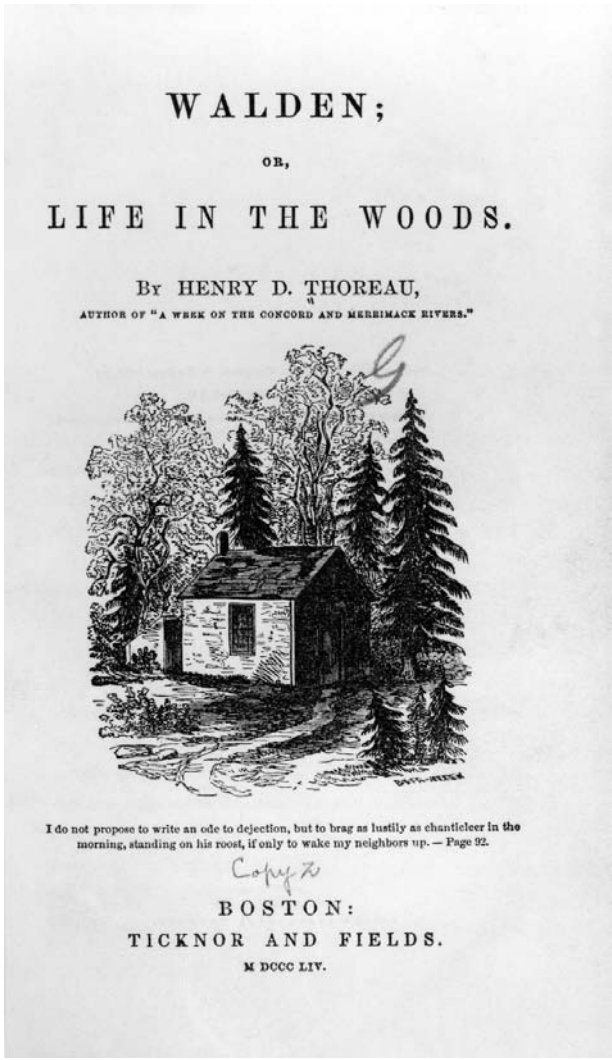
NONANTHROPOCENTRIC ETHICS

Thoreau was one of the earliest and strongest critics of anthropocentrism: the view that only human beings have rights or "intrinsic value" and that other creatures may be used in any way people see fit. For example, his first book, *A Week on the Concord and Merrimack Rivers* (1849), discussed the plight of anadromous fishes formerly found in great numbers in New England's rivers but by that time mostly blocked by dams.

One hundred thirty years before Earth First! Thoreau suggested that unjust treatment of the shad was grave enough to justify civil disobedience. This was a method of social protest which Thoreau pioneered, influencing both Mohandas Gandhi and Martin Luther King, Jr.

Thoreau made one of the earliest explicit calls for a nonanthropocentric ethic, writing: "Away with the superficial and

Henry David Thoreau. *A famous writer and philosopher and a dedicated critic of anthropocentrism, Thoreau pioneered the method of civil disobedience as a pro-environmental technique. Many of his works extoll the value of nature and the wilderness for the human experience.* **© BETTMANN/CORBIS.**



"Walden" Title Page, 1854. *One of Henry David Thoreau's most famous works, "Walden" speaks to the benefits of valuing nature and living in harmony with it. This original title page features the cabin near Walden Pond in which Thoreau lived for two years, two months, and two days while writing the book.* **LIBRARY OF CONGRESS.**

selfish phil-*anthropy* of men [emphasis and "fish" puns in the original]—who knows what admirable virtue of fishes may be below low-water mark, bearing up against a hard destiny, not admired by that fellow creature who alone can appreciate it!" (Thoreau 1849, p. 37). Reserving all love and concern for humans is both superficial, based on ignorance of what is below the surface, and selfish, an excuse for unjustified self-partiality.

WALDEN AND LATER WRITINGS

Walden represents a more searching, sustained attempt to specify and live a nonanthropocentric ethics. In that book Thoreau repeatedly asserted the intrinsic value of nonhuman nature—whether in trees, woodchucks, or Walden Pond itself—and tried to justify those assertions. However, *Walden* also discusses the benefits to people of recognizing the value of nature and living in harmony with it. Like Emerson's *Nature* (1836), but more practically and with a greater emphasis on wild nature, *Walden* teaches that nature is humankind's greatest resource. It provides all that humanity needs to flourish if people protect it and use it wisely.

However, wise use does not mean managing the whole of nature, and Thoreau's late essay "Walking" further develops the claims in *Walden* for the high value of wild nature. "In Wildness is the preservation of the World," Thoreau exclaimed there (Thoreau 1980, p. 112). "From the forest and wilderness come the tonics and barks which brace mankind" (p. 114). For Thoreau this vital connection was literal, physical, and sensual. "I think that I cannot preserve my health and spirits," he wrote, "unless I spend four hours a day at least . . . sauntering through the woods and over the hills and fields" (p. 95). This physical contact with nature revitalizes the mind, stimulating that "uncivilized free and wild thinking" at the heart of all human creativity (p. 96).

Walden and "Walking" give detailed advice for deepening one's experience of nature. However, it would be foolish to focus solely on improving the walker while failing to preserve the landscape he or she walks through, just as it would be a mistake to locate all value in the human experience and none in wild nature. The greatest value comes when one brings a lively mind to a vital place. Thoreau made much of the Concord countryside; still, as he reflected in his journal:

> I spend a considerable portion of my time observing the habits of the wild animals, my brute neighbors. . . . But when I consider [that] the nobler animals have been exterminated here,—the cougar, panther, lynx, wolverene, wolf, bear, moose, deer, the beaver, the turkey, etc., etc.,—I cannot but feel as if I lived in a tamed, and, as it were, emasculated country. (Thoreau 1906, pp. 220–221)

Thoreau wanted "to know an entire heaven and an entire earth" rather than "a maimed and imperfect nature." In the end, humanity cannot separate its own flourishing from that of nature.

One of Thoreau's major insights was that human flourishing no longer requires the further taming of nature but rather the preservation of what wildness remains. "I would not have every man nor every part of a man cultivated, any more than I would have every acre of earth cultivated," he wrote (1980, p. 126). A "true culture" must respect spontaneity as well as order, creativity and daring as well as safety and good behavior (p. 124). It also must preserve wilderness landscapes so that it can preserve wildness in people's hearts and minds: "To preserve wild animals implies generally the creation of a forest for them to dwell in or resort to. So it is with man" (p. 117).

SEE ALSO *Civil Disobedience; Earth First!; Emerson, Ralph Waldo; Environmental Activism.*

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Philip Cafaro

TRADITIONAL ECOLOGICAL KNOWLEDGE

Humans have understood their environments in terms of traditional (or indigenous) ecological knowledge (TEK). TEK has been a major determinant of the ways in which people have interacted with their environment—for all peoples at some point in the past, and for many today as well, though much TEK has been lost via the diminution or disappearance of cultural groups, or greatly modified by interaction with scientific ecological knowledge (SEK), the knowledge generated by the more formal, organized investigation of the world that has become increasingly dominant.

TEK is central to environmental ethics and philosophy because understanding it opens up new perspectives on the ontology, axiology, epistemology, and praxis of ecological knowledge in general, and because understanding TEK and its similarities to and differences from modern SEK could be critical for developing and managing more sustainable ecosystems. (*Knowledge* herein is defined as consisting of values, descriptive data, and theory in a person's mind, which is shared to differing degrees within groups of different sizes to which individuals belong.)

HOW CAN WE UNDERSTAND TEK?

A major difficulty in defining and discussing TEK is that the TEKs of different indigenous groups are different because of variations in local cultural and environmental contexts; therefore, only those brought up in a specific culture and environment are likely to fully understand that culture's TEK. This insider's (*emic*) perspective contrasts with an outsider's (*etic)* perspective. Although some social scientists believe that it is fruitless for outsiders to attempt to understand TEK, others believe that it is possible to gain useful etic understanding and to generalize about TEKs, and that such work may be critical for their survival. A major challenge to generalization is the variation in TEK among individuals within local groups and in SEK within groups of scientists, e.g., plant breeders (Cleveland 2001), so that to compare TEK and SEK requires a comparison of variances and central tendencies—monolithic TEKs and SEKs do not exist.

Understanding TEK etically, however, requires a baseline for describing similarities and differences among

A San Bushman Teaching His Son to Hunt in Namibia. *Traditional Ecological Knowledge, or TEK, is an integral part of environmental philosophy. TEK is commonly understood to be based on direct interactions between humans and their environment, but what remains to be decided is whether the effects of indigenous peoples on their local ecosystems has been positive (conservationist) or negative (destructive). The UN Declaration on the Rights of Indigenous Peoples grants such native populations the right to pursue development and maintenance of their land as they see fit.* **JOY TESSMAN/NATIONAL GEOGRAPHIC/GETTY IMAGES.**

TEKs (and between TEKs and SEKs, as discussed below). Because most who have attempted this comparison have SEK, it is SEK that has provided the methodological base for comparison. (Therefore, attempts to understand TEK include the following assumptions: (a) There is an external objective reality that both TEK and SEK are based on; and (b) SEK can provide a description of this reality that can serve as an ontological comparator.)

Indeed, in an increasingly crowded and interconnected world, it is not possible to assume that each local group and its TEK and natural-resource management regimes can be understood only emically, because all activities affect other groups with different values and different management strategies. Therefore, negotiating conflicts based on some etic standards is required for the survival of TEKs and the external ecological reality they refer to.

HOW IS TEK CREATED, AND HOW IS IT RELATED TO ECOLOGY AND ETHICS?

A major controversy in the study of TEK has been whether indigenous classification of the environment is the result of the universal structure in nature that imposes itself on the human mind, perhaps facilitated by universals in human cognition (the intellectualist view), or whether it is the result of culture-dependent differences in goals, values, and theories (the utilitarian view) (Medin and Atran 1999). Boster's research with Aguaruna farmers in the Amazon is an example supporting the first view: Their cassava classification tends to classify the smallest distinct taxonomic unit in patterns similar to those of scientists. Support for the utilitarian view is a more common research finding, however: For example, the Mende of Sierra Leone use growth duration as a

major criterion for classifying African rice varieties, with a mixture of varieties of different durations managed and planted to avoid labor bottlenecks and interharvest food shortages; Hopi and Quechua farmers classify and choose maize varieties based on ceremonial and religious values (Cleveland et al. 2000).

Differences in conclusions about the basis for classifying the environment may be due in part to differences in the nature of the plants or other organisms and environments involved. For example, the pattern of phenotypic expression (the appearance of an organism) of qualitative traits (e.g. seed or leaf color) in a clonally propagated crop (cassava) is much different than for quantitative traits (e.g. plant height or yield) in sexually propagated crops (rice), especially cross-pollinated ones (maize). Indigenous people may simply enjoy "playing" with diversity, yet their perceptions of genetic variation (to the extent revealed in plant phenotypes) depend on their ability to observe it and are determined in turn by the scale at which it occurs, the extent to which it is hidden by environmental variation, and on how important it is to them.

The preceding discussion assumes that TEK is based on direct interaction of individuals with the environment. However, TEK can also be learned indirectly—through teaching or imitating a respected individual, which introduces additional challenges for understanding TEK

TEK PRACTICE AND THE ENVIRONMENT

There is evidence that indigenous peoples have had massive effects on their environments, often in ways that increased useful production for humans, as summarized for the Americas by Mann (2005). But what criteria should be used to judge whether an effect is positive in the sense of conserving ecosystem functions, or negative in the sense of disrupting them? Change in biodiversity is often used as a criterion, and it is sometimes assumed that evidence that indigenous people and biodiversity coexist in space and time means the actions of the former are responsible for the latter. For example, the Global Plan of Action for crop genetic resources of the Food and Agriculture Organization of the United Nations (FAO) calls for more emphasis on in situ conservation based on evidence that "the rich diversity that exists today offers ample testimony of what has already been achieved" through farmer management and development of their crop genetic resources (FAO 1996, para. 26). Similarly, data showing a correlation between increased human presence and loss of biodiversity support the assumption that indigenous peoples tend to destroy their environments—for example, in the massive extinctions of large mammals with the exception of Africa during the last 10,000 to 50,000 years that followed indigenous peoples movements (Koch and Barnosky 2006).

Regardless of how the effects on the environment are judged, the question remains as to the connection between peoples' action and their TEK. Those who accept the conclusion that indigenous peoples conserve their environments often assume that their TEK is accurate and "ethical" because it leads to action that conserves the environment. On the other hand, those who accept the conclusion that indigenous peoples destroy their environments often assume that their TEK relatively is inaccurate and "unethical" because it leads to action that destroys the environment. Research on the relationships among TEK, behavior, and the effects of behavior on the environment is difficult to do and has produced conflicting results, making generalizations problematic and suggesting that these relationships are often contingent on local histories, cultures, and environments.

HOW DOES TEK COMPARE WITH SEK, AND CAN THEY WORK TOGETHER?

Social scientists often contrast SEK and TEK, seeing the former as rationalistic, reductionist, theoretical, generalizable, objectively verifiable, abstract, and imperialistic—in sharp contrast to the latter, which they see as organic, holistic, intuitive, local, socially constructed, practical, and egalitarian. On the other hand, there is evidence that SEK and TEK are more similar than different (Agrawal 1995). For example, since the 1920s, work by social scientists, historians, and philosophers on the nature of SEK has explicitly explored the ways in which it is shaped by personal psychology, historical contingencies, and social context, and some current research on TEK shows that it can be theoretical and objectively verifiable. One difficulty, discussed above, is how outsiders understand TEK if communication is structured so that indigenous people cannot explain the abstract or generalized basis for their specific TEK; outsiders may assume their practices are untheorized responses to changing, unpredictable circumstances.

Soleri and colleagues (2002) used scenarios based on basic biological principles to elicit TEK from traditional farmers in different parts of the world about genotype-by-environment interaction (i.e., the relationship between nature and nurture) and heritability based on a fundamental biological model. They found patterns in TEK across different crops and countries, and between TEK and SEK that supported the hypothesis that empirical and theoretical TEK and SEK consistently reflect similar environmental patterns and relationships. However, they also found differences among farmers, and among scientists, and between TEK and SEK, which could often be explained in terms

of differences in crop varieties, environments, or cultural values.

Similarly, Ellen concluded that indigenous rain-forest peoples' observations of many individual species leads inductively to ecological models that are "privileged over accumulated inductive knowledge" (1999, p. 106). In some cases TEK may even be more complete than SEK—Malawian farmers' taxonomy of cassava varieties based on plant morphology visually distinguishes varieties between which scientists can see no differences, but whose distinctness was supported by molecular analyses for cyanogenic glucoside levels and genetic analysis (Mkumbira et al. 2003). TEK may also be less complete than SEK—Wola farmers of New Guinea are aware of geomorphological forces that destroy and renew their soil but not of processes on a geological time scale (Sillitoe 1996).

TEK IN RESEARCH, DEVELOPMENT AND POLITICAL CONTEXTS

All of the aspects of understanding TEK discussed above can be influenced by the research, development, and political contexts in which TEK is used. For example, an outside researcher's personal values and relationships with an indigenous community may affect her or his research and conclusions about TEK. Definitions of TEK in applied contexts often depend on the assumptions and goals of those in control. For example, the way in which "sustainable agriculture" is defined affects the way in which TEK is defined, which in turn leads to different roles for indigenous peoples in their development as controlled by outsiders (Cleveland and Soleri 2007).

The use of TEK in improving the well-being of local communities was pioneered by local and nongovernmental organizations and by indigenous communities themselves, but it has become institutionalized in the last two decades in mainstream economic development—for example by the World Bank and many national governments. This institutionalization has been criticized by many indigenous groups and their supporters for decontextualizing TEK and co-opting it for the goals of mainstream development, which may result in destroying TEK or even entire cultures.

Success in using TEK in "development" and applied science depends on its long-term results in social, cultural, economic, and environmental terms for local people and the world. This use of TEK challenges the cultural-relativist viewpoint that each local people's TEK is valid and should be respected by outsiders. In an increasingly crowded and interconnected world, however, TEK and natural-resource management practices cannot be judged only emically, because all activities affect other groups with different TEK and different management strategies. Therefore, we need to evaluate local solutions in global contexts of social, economic, and environmental sustainability.

TEK AND INDIGENOUS RIGHTS

Part of the problem with understanding the relationship between rights and TEK is that TEK often includes different concepts of rights than those of outsiders. It is possible, however, for outsiders to elicit indigenous peoples' knowledge of rights. For example, interviews using scenarios of potential conflicts over rights to crop genetic resources elicited consistent concepts of rights from Zuni community members (Soleri et al. 1994). There is a wide range of concepts of rights in TEK among various indigenous groups; they usually place more emphasis on community rights and on individual rights that benefit the community than SEK, which emphasizes individual rights to knowledge for personal gain and their protection through state-enforced legal systems such as patents.

Claims of indigenous farmers' rights to resources are often based on assumptions that indigenous farming is environmentally sustainable and that farmers' conservation of resources is based on accurate ecological knowledge and/or ethical principles of natural resource conservation. For example, Article 8(j) of the 1992 Convention on Biological Diversity (CBD) on in situ conservation calls for signatories to "respect, preserve and maintain knowledge, innovations and practices of indigenous and local communities embodying traditional lifestyles relevant for the conservation and sustainable use of biological diversity" and to "encourage the equitable sharing of benefits" arising from the use of those resources (CBD 1992). Yet, as discussed above, there are variations in sustainable resource use within communities and between indigenous communities.

Some arguments for indigenous peoples' human rights to land and biological resources rest on an assumption that these peoples are inherently conservationist; such arguments often mix value judgments about human rights with empirically testable hypotheses about the extent and efficacy of indigenous peoples' conservation of biodiversity. For example, indigenous rights and environmental conservation advocates may try to portray indigenous peoples in terms of European and North American environmentalist stereotypes—dubbed by some as "green Orientalism." If the empirical data do not support the claim that an indigenous people are conservators, then those who do not share the belief in their human rights—to which indigenous conservation has been linked—may deem this as sufficient justification for not recognizing indigenous rights to their traditional environments (Cleveland and Murray 1997).

On September 13, 2007, the United Nations General Assembly voted 143 to 4 (Australia, Canada, New

Zealand, United States; eleven abstentions), to adopt the nonbinding "United Nations Declaration on the Rights of Indigenous Peoples," which "sets out the individual and collective rights of the world's 370 million native peoples, calls for the maintenance and strengthening of their cultural identities, and emphasizes their right to pursue development in keeping with their own needs and aspirations," thereby ending nearly twenty-five years of "contentious negotiations" (United Nations General Assembly 2007). As this entry has shown, implementing these rights will not be easy. Successful implementation will depend on continuing research on the factors affecting variation in TEK within and among indigenous groups, and on the relationship of TEK to SEK. It will also depend on resolving conflicts over rights between individual indigenous groups and between indigenous groups and the more industrialized modern societies within which they exist. Such resolution in turn will require dealing with the reality that in an increasingly crowded and globalized world, consensus on dealing with common environmental resources will depend on some groups modifying their knowledge, including claims to rights.

SEE ALSO *Agriculture; Biodiversity; Convention on Biodiversity; Environmental Philosophy: V. Contemporary Philosophy; Sustainability.*

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David A. Cleveland

TRAGEDY OF THE COMMONS

The word *tragedy* is used to refer generically to anything really bad. As Carol Rose (1986) notes though, the word has an older meaning, referring to literary works that depict a protagonist caught up in events inexorably leading to his or her doom. Some of that older meaning is implicit in the logic of what we now call the tragedy of the commons. The phrase was invented by Garrett Hardin, who credits the idea to W. F. Lloyd. (See also the work of H. Scott Gordon.)

THE LOGIC OF THE COMMONS

Suppose there is a plot of land. The land has a *carrying capacity*: a number of animals the land can sustain more or less indefinitely. (The concept of carrying capacity is somewhat problematic. While it points to something real, because there really are limits to what the land can

support, such limits are not fixed. Carrying capacity is somewhat fluid, and a function of many variables. For example, whether Kruger National Park in South Africa can carry 15,000 elephants depends on whether we want to leave room for rhinos, which is not simply an ecological issue.) Suppose the parcel's carrying capacity is 100 animals. The land is jointly owned by ten shepherds, each of whom owns ten animals for a total flock of 100 animals. The land is thus at its carrying capacity. As things stand, each animal is worth, for example, one dollar to its owner, so that, at carrying capacity, 100 animals are worth $100. Crucially, although the ten shepherds treat their individual flocks as private property, they jointly treat the land as one large pasture, with no internal fences, so that each of their animals grazes freely.

Now suppose one shepherd adds an eleventh animal. We now have 101 animals altogether, and thus have exceeded the land's carrying capacity. There is not quite enough food per animal now; therefore they are a bit leaner, and the value per animal drops to 95 cents per head. The total stock of 101 animals is now worth $95.95, which is $4.95 less than the total stock was worth before, when it was within the land's carrying capacity.

Why would a shepherd add the extra animal, when it so clearly is a losing proposition? At the original carrying capacity, the individual flocks of ten were worth $10. Having added one more sheep, the shepherd now has eleven and each is worth 95 cents. That works out to $10.45, which means that the individual shepherd actually made a profit of forty-five cents by adding the extra animal, even though the value of the total stock went from $100 to $95.95.

Although the total cost to the group of adding the extra animal exceeded the total benefit, the individual shepherd receives 100 percent of the benefit while paying only 10 percent of the cost. The other nine shepherds own ninety percent of the animals, so they suffer ninety percent of the loss involved in the falling price per head. Individual shepherds, though, see only individual costs and benefits, and act accordingly. The logic of the commons has begun its seemingly inexorable grind toward its tragic fate.

The tragedy of the commons is one version of a more general problem of *externalities*. An externality, also called an "external" or "spillover" cost, is that portion of the cost of a decision borne by someone other than the decision-maker. We say cost is "internalized" when the arrangement is changed so that decision-makers now bear the entire cost of their decisions. One general purpose of property institutions is to internalize externalities, preventing people from shifting the cost of their activities onto others. Ideally, property regimes should evolve, internalizing externalities as they become significant—both "positive" externalities associated with productive effort and "negative" externalities associated with misuse and overuse of commonly held resources. A system is more likely to be economically and ecologically sustainable when overuse is costly not just to the community as a whole but also specifically to the individuals who decide to overuse.

PRIVATE PROPERTY AS A SOLUTION TO COMMONS PROBLEMS

In an unmanaged commons, individual shepherds are left to decide for themselves whether to step up the intensity of their resource use. They do not take full responsibility for the cost of their overuse, though, because the cost falls mainly on other members of the group of communal users. The payoff of overuse is negative for the group but positive for the individual who elects to overuse.

Is there nothing those shepherds can do? One option would be to cut their jointly owned territory into ten smaller parcels, so each shepherd owns a small parcel with its own individual carrying capacity. Under this new arrangement, instead of dispersing the environmental degradation over the entire commons, the damage is concentrated on the offender's own private land. Thus, in the hypothetical example, instead of dispersing damages worth $4.95 over a hundred animals and ten owners, the damage is concentrated within the individual shepherd's own parcel. To keep the example simple, suppose the parcel covers an area one-tenth the size of the original communal plot. Suppose also that when the damage is concentrated in one-tenth of the area, the resulting damage is ten times as great per square foot. In that case, the flock of ten, which had been worth $10, is now a starving flock of eleven, worth about $5.05. The value of each animal has been cut roughly in half, a painfully obvious mistake. Consequently, under a system of individual parcels, everyone learns in a hurry not to add an eleventh animal.

Private ownership gives an owner a right to exclude. By conferring a right to exclude, the system gives an owner the opportunity to conserve a resource. In giving such an opportunity, the system also provides an incentive, because whatever owners save, they save for themselves.

AN ALTERNATIVE SOLUTION: COMMUNAL MANAGEMENT

In a large range of cases, parcelization is a viable alternative to managing land as an unregulated commons. It is not always a viable alternative (before the invention of barbed wire, parcelizing western rangeland was not feasible), and it is not always the only viable alternative. Another option is for the shepherds to leave the territory in a common pool, and instead of each tending a small flock of ten sheep, ignoring the costs they impose on each other as they add

more sheep, they could pool their flocks and become joint owners of a single large flock of one hundred.

Each shepherd now has an interest in all of the sheep. Under a communal arrangement, a shepherd considers not whether to add the eleventh sheep, but whether to add the 101st. Adding an extra sheep means that, for each shepherd, the result is not that the value of his flock goes from \$10 to \$10.45. lnstead, the value goes from a 10 percent ownership stake in \$100 to a 10 percent stake in \$95.95. Therefore, under the communal arrangement, no one wants to add the extra sheep. Here, too, as in the case of switching to private parcels, an external cost has been internalized and each of the ten shepherds now has a self-interested reason to respect the land's carrying capacity.

Regardless of whether they cut their land into parcels, or pool their flocks of sheep, the fact remains that in the real world, a community of ten people has a good chance of being able to come together to devise and enforce rules governing the land's use that will enable them to avoid collective suicide. However, there is an additional issue to consider.

THE OPEN ACCESS COMMONS: A DIFFERENT SORT OF PROBLEM

Suppose the group has gone communal, pooling both their land and their livestock. So far, so good. Now, however, suppose that whatever rules the ten shepherds might devise to regulate the addition of extra animals, they are not able to stop an eleventh shepherd from entering the picture with yet another flock. With a fixed and known set of players, viable conventions tend to emerge, but if a community is not able to restrict the inflow of new users, then we have an *open access* commons, which makes the tragedy far more likely.

Sometimes, everything depends on whether it is possible to add the extra player rather than for existing players to add the extra animal. For a community to manage itself successfully, it must be able to control negative externalities within the community, but it is likewise critical that the community be able to restrict access, controlling the size and membership of the community of users. Robert Ellickson contrasts the unregulated or open-access commons with communes. A *commune* is a restricted-access commons. ln a commune, property is owned by the group rather than by individual members. People as a group claim and exercise a right to exclude. Typically, communes draw a sharp distinction between members and non-members, and regulate access accordingly. Access to public property tends to be restricted by time of day or year. Some activities are permitted; others are not.

Some medieval commons lasted, non-tragically, for hundreds of years. Elinor Ostrom describes a Swiss commons whose written records date back to the thirteenth century. Cattle were privately owned but grazed in communal highlands in the summer. People grew private crops on individual plots in the valleys, intending to use part of their crops to sustain their cattle over the winter. The basic limitation on communal summer grazing was that owners could send only as many cattle to the highland meadows as their private land parcel could sustain over the winter, with fodder grown during summer.

Allowing individual owners freely to decide whether to add to their individual stock is above all what governors of a commons cannot do. To avoid tragedy, governors of a common pasture must manage the overall livestock population, based on their estimate of the pasture's overall carrying capacity. There are several ways to do this. Managers can allow a given owner to graze cattle on common land only in proportion to: (a) how much hay he produces, (b) what proportion of the land belongs to him, or (c) the number of shares he owns in the cooperative.

Ostrom says, "All of the Swiss institutions that used to govern commonly owned alpine meadows have one obvious similarity—the appropriators themselves make all major decisions about the use of the common property resource. ... Thus, residents of Törbel and other Swiss villages who own communal land spend time governing themselves. Many of the rules they use, however, keep their monitoring and other transactions costs relatively low and reduce the potential for conflict" (p. 65). The lesson is that successful commons are flexible and under local control. Rules sometimes need to change in response to circumstances and local people know what needs changing locally.

In the Swiss commons, Ostrom says, no citizen could send more cows to the Alp than he could feed during the winter. As David Schmidtz and Elizabeth Willott (2003a) summarize, partners recognize an imperative to avoid the tragedy of the commons and in each case do so by taking the option of overgrazing out of the hands of individual partners. History indicates, though, that members of successful communes internalize the rewards that come with that collective responsibility. In particular, they reserve the right to exclude nonmembers. A successful commune does not run itself as an open-access commons.

Hardin himself viewed commons tragedies as problems for which there is no technical solution. To Hardin, the only solution, when there is a solution, is "mutual coercion, mutually agreed upon." Ensuing decades seem to have shown that Hardin was overly pessimistic. In particular, what Hardin deemed the ultimate commons tragedy, namely global human overpopulation, has not followed Hardin's predictions. The population is still increasing, but population growth rates have fallen everywhere, and in many countries, have fallen below zero. Part of the solution

EXCERPT FROM GARRETT HARDIN'S ''THE TRAGEDY OF THE COMMONS''

SOURCE: from Hardin, Garrett. 1968. ''The Tragedy of the Commons.'' *Science* 162:1243-1248.

was birth control technology, which on a priori grounds Hardin believed women would never use owing to the biological ''imperative to breed'' (Willott 2002).

While Hardin was overly pessimistic, it would likewise be a mistake to be overly optimistic. Society's institutions have a history of evolving in response to commons problems. Property law evolves, as do easements, nuisance law, tort law, zoning law, and regulatory agencies, along with a matrix of conventions of neighborliness. However, such remedies have a history of being imperfect. (Some small solutions turn out to be small mistakes. Some big solutions turn out to be big mistakes. And even genuine solutions can do only so much.) Although some problems get solved, others are merely mitigated. As old problems are solved or mitigated, new ones emerge. Sometimes, new problems are caused by the very regulations people devise to solve old problems. In a world filled with producers, consumers, emerging technologies, people wanting to live in neighborhoods with public spaces, and recalcitrant difficulties with enclosing such public spaces as the atmosphere itself, there will always be commons problems.

SEE ALSO *Consumption; Europe: II. Western Europe; Private Property; Takings.*

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Early sections of this entry borrow from Schmidtz, and from Schmidtz and Willott (2002, 2003b). Later sections borrow from Schmidtz and Willott (2003a).

TRANSGENIC ANIMALS

Transgenic animals are animals whose genome has been changed by means of advanced biotechnology. There are several kinds of transgenic animals. An important distinction

can be made between animals that have had their genome modified by having genes knocked out, or copied, and animals that have had genes not normally found in that species inserted into their genome. (The inserted genes can come from another species or can be artificial constructs.) Technically, only the second group of animals are transgenic. The term *transgenic*, however, is used widely to refer to all animals that have had their genome modified in some way.

THE SCIENCE

Most work on transgenic animals has been carried out on laboratory mice; rats have been the second most frequently modified animal. Other species that have been genetically modified include pigs, sheep, goats, cattle, fish, rabbits, and cats. The first and still widely used method of genetic modification is so-called pronuclear microinjection, in which DNA is injected into the pronucleus of an early embryo. However, this method is not very efficient, nor is it precise, and a number of other methods of gene transfer or gene knockout have been developed. One of those methods makes use of cloning technology. In this case the genetic modifications are made on individual cells from a cell line. Afterward a genetically modified cell is inserted into an enucleated egg and turned into an embryo through the use of a cloning technique. New viral vectors and sperm-mediated DNA transfer that bring the desired genetic material into predesignated areas of the genome are other methodologies that are being developed. These technologies are likely to make the production of transgenic animals technically more efficient (Robl et al. 2007).

THE APPLICATIONS

The vast majority of transgenic animals are used in basic research or biomedical research to study biological development and function or as disease models that mimic human diseases and are therefore useful in the study of medical conditions such as Parkinson's disease, cancer, and cystic fibrosis and the testing of new drugs. A well-known example is the OncoMouse. This mouse, which was produced by Harvard University and Dupont in the late 1980s, was genetically modified to carry an activated cancer gene that significantly increases its susceptibility to cancer. Tens of thousands of animal models, mainly mice, had been developed by the first decade of the twenty-first century.

Since the early 1990s researchers have attempted to develop a new biomedical application of transgenic animals: so-called bioreactors. These are animals, typically of farm animal species, with special traits that make them useful in pharmaceutical production. An example is the goat developed by GTC Biotherapeutics that produces recombinant human antithrombin, an anticlotting protein, in its milk that can be used as medicine for humans. This product was the first of its kind to reach the market (Choi 2006).

"Britney," a Transgenic Chicken. *Dr. Helen Sang, head of the Britney research team, is shown with a third generation chicken at the Roslin Institute in Edinburgh, 2000. The scientists began the project with plans to use the protein in the eggs to treat cancer. The Roslin Institute was also the creator of probably the most famous transgenic animal to date, Dolly the sheep.* © MC PHERSON, COLIN/CORBIS SYGMA.

There is perhaps a possibility of developing transgenic animals, typically pigs, for xenotransplantation. Thus, it is envisaged that complete organs from animals will be transplantable into humans. Here the aim of modification is to make the tissue of the animal immunologically compatible with the human body to prevent rejection. Progress has been made in this area (Yamada et al. 2005), but many problems remain.

In the agricultural area attempts are being made to produce animals with traits that will allow improved production, better animal health, and/or reduced environmental impact. The Enviropig developed by researchers at the University of Guelph in Canada is an example. It has been genetically modified to be able to digest the phosphorus in a cereal grain diet. This removes the need to add phytase enzymes to the pigs' diet and reduces the amount of phosphorus released into the environment. The Enviropig thus ideally reduces production costs and environmental impact at the same time (Forsberg et al. 2003). The number of agricultural applications of transgenic animals in the research and development phase has been limited by high production costs, technical barriers, and fears of rejection by the public.

Because it is in principle possible to transfer a gene from one living organism to another regardless of species barriers and it is becoming possible to produce artificial genes on demand, the theoretical applications of the technology are limitless. Several aspects of the technology, however, remain inefficient and imprecise because many basic aspects of the function and interconnectedness of genes are poorly understood. There is little doubt, though, that the technology will play a greater role in the future,

especially in cases in which individual modified animals exhibit a trait that makes them valuable enough to cover the cost of their production, cases in which their contribution to scientific research cannot be obtained in other ways, and cases in which the use of the technology is socially acceptable. Thus, it is likely that transgenic animals will be utilized primarily for biomedical applications.

ETHICAL CONCERNS

The most common ethical concerns about transgenic animals can be divided into three main areas. Those areas and the most important issues within each of them are discussed below.

Humans and the Environment Concerns about potential risks to humans and the environment figure prominently in many discussions. Risks to humans most frequently are equated with risks to human health presented by food or medicinal products derived from transgenic animals. A very limited amount of research has been done in this area because few products have been developed. There is, however, a substantial literature on what risks should be taken into consideration when those products are evaluated. In the medical area it usually is suggested that risk assessments should follow the approach by which newly developed drugs are tested. In the food area risks arising from changes in amino acids leading to allergenicity, toxic effects, or changes in nutritional value are important parameters (National Research Council and Institute of Medicine of the National Academies 2004). At the beginning of the twenty-first century no food product from a transgenic animal had been developed far enough to necessitate serious attempts to conduct a risk assessment.

Risks relating to a specific use of transgenic animals can be found in the area of xenotransplantation. Here questions about the risk of transferring diseases from pig donors to human recipients have not been resolved. Especially important is the question whether there is a significant risk that the porcine endogenous retrovirus (PERV), which lies dormant in the pig genome, will become active after transfer to the human body. There is no doubt that this could cause serious health problems for humans, and the situation often is compared with the history of AIDS and severe acute respiratory syndrome (SARS); however, there is no agreement about how this risk should be evaluated (Moalic et al 2006; Martin et al. 2006; Levy et al. 2007).

Another risk to humans that is mentioned frequently relates to the possible socioeconomic effects of the technology, especially in agriculture, where it could accelerate the development of large-scale industrialized factory farming and deepen the divide between the developing world and richer countries. This risk is not specific to transgenic animals but relates to developments in technology in general.

There are also potential risks to the environment. The concern here is that transgenic animals might escape and breed with wild populations, thus spreading their genes in an uncontrollable environment. The most frequently cited example is transgenic fish, for example, salmon with genetic alterations that allow for faster growth. The concerns in this area can be about the indirect consequences this might have for humans (in this case economic losses for the fishing industry) or about direct concerns involving the animals and the wider ecosystem. Whether one is concerned about a particular application of the technology because it constitutes a risk to human interests or because it constitutes a risk to other species or the integrity of the ecosystem, the risk that transgenic animals will escape and evade human control and confinement is a socially important issue (PEW Initiative on Food and Biotechnology 2003).

There are also concerns about the use of transgenic animals constituting a step onto a slippery slope that will lead to unacceptable uses of biotechnology on humans. Although current uses of transgenic animals are intended primarily to gain basic scientific understanding of molecular biology and study human diseases, it is clear that the more skilled scientists become at applying biotechnology to animals, the easier it will be to apply the same technologies to humans. The factors that will prevent technologies from moving from the animal sphere to the human sphere are not the technical limitations but ethical objections, and people concerned about the slippery slope are worried that those objections eventually will be pushed aside by the appeal of the technical possibilities (Kass 1997).

Animal Welfare Transgenic animals have been used mainly in basic biological research and as disease models. Often the goal is to produce animals that underexpress or overexpress certain genes or express a mutated, disease-causing human gene. In all these cases normal body function in the organism is disrupted in some way. Modifications can involve any part of the animal genome, and the effects on the animal's phenotype range from those which are lethal to those which have no detectable effect on the health of the animal. It is therefore impossible to generalize about the effects of genetic modification on the welfare of animals.

The effects that occur can be divided into two main categories: intended and unintended. Welfare problems stemming from intended genetic change are hard to avoid because the point of inducing the change is to affect the animal. Thus, a mouse carrying the human Huntington's disease gene will inevitably suffer welfare

problems as it develops the disease, including rapid progressive loss of neural control that leads to premature death. Unintended effects are connected with the inaccuracy of the technology and insufficient understanding of the function of different genes in different organisms. Both types of effects contribute to the unpredictable nature of genetic modification at the phenotypic level.

To deal properly with both intended and unintended effects on animal welfare, it is important to monitor the animals and, when severe effects occur, take action to alleviate or end their suffering. In laboratory animal science it should be considered part of good practice to find ways to conduct experiments that minimize the discomfort and suffering imposed on animals and to define so-called humane endpoints, that is, points at which animals have to be euthanized (Olsson and Sandøe 2004).

There is wide agreement about the need to limit the discomfort and suffering imposed on animals. However, from a philosophical perspective it may be questioned whether the focus should be only on preventing pain and other kinds of suffering in animals (and perhaps promoting positive experiences). It may be argued that animal welfare is also about the extent to which an animal is allowed to fulfill its species-specific potential regardless of its subjective experience.

Very often this broader perspective on animal welfare will point to an additional group of considerations that have to be taken into account in deliberations about animal welfare. Concern about an animal's opportunity to engage in certain kinds of behavior does not prevent one from caring about its subjective experiences. Nevertheless, the two kinds of considerations sometimes are difficult to reconcile in practice. Considerations within a narrow perspective in which the subjective experiences of the animal alone matter may be outweighed by considerations in the broader perspective (Gjerris, Olsson, and Sandøe 2005).

Some of those engaged in the ethical debate on transgenic animals argue that welfare is not all that matters in dealing with animals. They may defend the view that animal integrity also must be considered.

Integrity The term *integrity* means wholeness or fullness. In the literature two notions of animal integrity are prominent. The first is based on a biological understanding, and the second on a phenomenological understanding. The first stresses the genetic integrity of the animal and therefore focuses on the importance of not changing animal genomes to suit human purposes. The obvious objection to concerns about the violation of genetic integrity through gene technology is that the genome of an animal species is in constant flux because of naturally occurring evolutionary forces and through well-established breeding practices such as conventional selective breeding. A difference between genetic changes induced by natural selective forces and human-induced changes can be stated, but it is difficult to argue for a relevant difference between introducing genetic changes with modern biotechnology and introducing changes with older, conventional methods (Rollin 1996). This has led some to conclude that transgenic animals raise no new or additional ethical concerns. Others claim that this alone constitutes a reason to reexamine conventional breeding methods with a more critical eye (Gjerris and Sandøe 2006).

The second notion of integrity is based on the experience of the animal as an inviolable whole. Animal integrity can be understood as an inherent limit in the relationship between humans and nature, a "red line" that governs what is ethically acceptable for humans to do to animals. Integrity in this case derives from an experience and understanding of animals as beings that in and of themselves set up an ethical requirement of noninterference. This requirement may be violated only if the reasons are adequate from an ethical perspective. Integrity signifies a difference between the knowledge of the animal people have through their understanding of its usefulness to humans and the knowledge people have when they conceive of the animal independently of human needs. A cow is a producer of hide, milk, and meat; it holds no surprises when it is experienced from the perspective of human need. However, when it is experienced in a nonreductionist perspective, the cow amounts to more than that. Respecting the integrity of animals is thus the polar opposite of wholesale reification of an animal as a natural resource (Gjerris and Sandøe 2006).

SEE ALSO *Animal Cloning; Animal Ethics; Factory Farms; Farms; Genetically Modified Organisms and Biotechnology; Patenting Life.*

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TRANSPORTATION

From the canal systems and railroad lines of nineteenth-century America to the current rapid growth of motorized transport in developing countries, the development and expansion of transportation systems has been a central feature of modern societies. In all its forms, transportation is the means by which human beings traverse the natural world, and is of great concern to environmental philosophy. The modes of transportation available to a population shape both the distribution of goods and services within that population and its manner of growth. Historically, advances in transportation have greatly increased the mobility of populations. For instance, in Roman times, individuals traveling on horses on Roman roads averaged around 10 miles per hour, and oxen, used for transporting many goods, averaged 2 miles per hour. Premodern sailing ships too rarely achieved average speeds of more than 9 knots (10 miles per hour). By the mid-nineteenth century, in contrast, it was not uncommon for steam-engine locomotives to move goods and passengers at speeds of over 50 miles per hour, and modern steam ships too could travel at speeds significantly faster than premodern sailing ships. By 2008, average travel times had decreased even further, with contemporary motor-vehicle travel routinely averaging 65 miles per hour and the airplanes in current use often traveling at speeds of over 500 miles per hour. Traveling by air, a contemporary individual can cross in a matter of hours distances that would have taken premodern predecessors months to traverse.

Developments in transportation have done more than just afford individuals greater mobility, though.

They have also determined the forms of human settlement. For instance, prior to modern refrigeration technologies, the transportation of perishable goods was inherently limited, and thus the areas from which food sources for urban populations could be derived was directly related to the distance that food goods could be safely transported. From early times, major population centers tended to be situated along waterways, which provided the most efficient means for transporting food and other goods. As various technological innovations in transportation occurred, developmental patterns followed suit. In the United States, many cities were founded as service hubs along the paths of the larger canals and railroad systems of the nineteenth century. As these cities grew, they in turn provided new destinations for workers and travelers in a synergistic process of expansion. In Europe and North America, the development of railroad systems in the nineteenth century had a particularly significant impact upon the movement of persons and goods. Creating an even greater change in the landscape, however, was the invention of the automobile and its rapid diffusion within Western societies in the twentieth century. With the advent of the automobile, virtually all locales became readily accessible to settlement and development. The ever increasing expansion of the roadway system and the relative affordability of automobile travel have allowed individual workers easily to commute long distances from home to work, and this ability eventually led to the suburbanization so prominent in the United States in the later half of the twentieth century. In the United States alone, there are currently over 4 million miles of public roads, and the total number of miles traveled by motor vehicles reached 2.7 trillion miles in 2000. The growth of airplane transportation has had a similar impact upon human movement, particularly at the global level, since the development of inexpensive and reliable airplane transport has allowed persons and goods to travel immense distances with little effort.

Within large urban centers, other modes of transportation have significantly affected passenger travel as well. Many modern cities developed subway or light-rail systems to move large numbers of persons, particularly commuters, more efficiently. Bicycles also provide a relatively inexpensive form of transportation for many urban dwellers, and in some countries, particularly China, bicycle traffic has constituted a major portion of intraurban transportation. While most modern technological developments have tended to encourage greater individual travel, in recent years some technological advances have had the opposite effect. Most important, the development of modern telecommunication networks and the Internet have allowed many workers to telecommute to work from their homes. Similarly, face-to-face business meetings, document transfers, and even medical diagnostics can all be done electronically in 2008, eliminating some of the need for real travel associated with such activities in the past.

The brief outline above illustrates how the history of social and economic development is tied to the history of transportation. The means of transportation available to people within a society crucially affects their access to various goods and their options concerning work and place of residence. In many ways the various technological advances in transportation that have taken place since the beginning of the modern era have undeniably provided many persons with a greater range of options concerning their choices for employment, residency, and leisure activities. This is no doubt why there exists in Western countries such a strong association between the idea of the automobile and notions of individual freedom and independence. Yet the benefits that increased mobility and greater access to goods provides for some members of society must be seen against the larger impact that various means of transportation have upon the greater good. In this sense, the ethical concerns about issues of transportation raised by environmental ethicists are best seen in terms of a discussion about the environmental costs of various modes of transportation. Unfortunately, these costs are often far less obvious to individual users of transportation than the direct benefits that such transportation provides them. Likewise, the historical and ongoing public-policy debates that deal with the environmental impact of various forms of transportation can most profitably be seen in terms of differences in how participants in those debates weight the various potential benefits and costs associated with transportation issues. Thus, to understand and evaluate such discussions and debates properly, one must first know the nature of the major environmental costs of transportation involved.

DIRECT ENVIRONMENTAL COSTS

The primary forms of direct environmental costs associated with modern forms of transportation stem from pollution. Pollution of one form or another has been associated with virtually all major forms of transportation utilized by human beings. Indeed, often the development of one form of transportation responds to problems associated with a form of pollution stemming from a previous mode of transportation, only to give rise to newer kinds of pollution. For instance, the use of horses as the primary mode of transportation in major urban centers in the nineteenth century produced such large quantities of solid waste, mainly manure, in those cities that it posed serious health risks, as well as raising quality-of-living issues, for residents. As such, the transition to the use of automobiles and rail systems in major cities represented the alleviation of one type of pollution and the problems associated with it. It was soon discovered, however, that the new forms of

Traffic Congestion in Beijing, China, 2007. *Along with the benefits provided by transportation, including increased mobilization and greater access to goods, there are a number of costs that must be considered as well, particularly negative effects to the environment. Automobiles are powered by internal-combustion engines, a major source of air pollution. Many nations have used legal measures, such as clean air acts and greater fuel-efficiency standards, in order to reduce the amount of harmful pollutants emitted by automobiles.* **AP IMAGES.**

transportation gave rise to new kinds of pollution with a fresh set of problems. This picture presents a cautionary reminder that we should carefully account for all forms of pollution associated with the development of a new transportation technology, lest we merely replace one set of environmental problems with another. Such considerations are particularly relevant to current discussions about the relative merits of various alternatives to the use of gasoline engines in automobiles, such as hydrogen-fuel-cell technologies, electric cars, and ethanol conversion.

Currently, the major direct environmental costs of transportation discussed by environmentalists center primarily around pollution generated by the use of vehicles powered by internal combustion engines, particularly automobiles and airplanes. Since these two forms of transportation account for most personal travel in the United States and for a large portion of commercial transportation as well, this focus is certainly appropriate. At the dawn of the twenty-first century, there were around 200 million automobiles in use in the United States alone, and well over 80 percent of Americans currently rely on personal automobiles or other motor vehicles, such as trucks and motorcycles, for their daily transportation needs. There has also been a significant increase in the number of airline miles traveled per capita. Indeed, in the United States, airline travel is the fastest growing segment of personal transportation. According to statistics of the U.S. Bureau of Transportation, air travel increased from 118 billion passenger-miles in 1975 to over 600 billion passenger-miles by 2000, and the number of aircraft in use by commercial carriers increased by more than 30 percent from 1990 to 2000. In 2008 there are nearly 30,000 commercially scheduled flights per day in the United States. This has resulted in a concurrent increase in the amount of pollutants produced by air transportation, which now accounts for the fastest growing source of carbon dioxide emissions, for instance. In 2000 airline traffic accounted for around 3.5 percent of

all carbon dioxide emissions, and if current trends in air travel continue, that percentage is expected to grow to 15 percent by 2050. Also, transit by motor vehicles and airplanes involves significantly more pollution problems than major alternatives, such as rail travel. Air travel produces over five times, and automobile travel over three times, the total amount of pollutants per passenger-mile as rail travel. Finally, these forms of transport are also generally less fuel-efficient, domestic airline travel averaging around 3,800 British thermal units per passenger-mile, automobile travel averaging around 3,500 British thermal units per passenger-mile, and domestic rail travel averaging around 2,100 British thermal units per passenger-mile. This is not to say that other forms of transportation do not involve any significant pollution problems, but only to emphasize that the greatest environmental problems involving transportation stem from pollution related to our reliance on motor-vehicle and air transport.

The pollution problems stemming from heavy dependence on automobiles for transit in urban areas was brought strongly to the forefront of public attention during the early environmental movement and eventually contributed greatly to the passage of clean-air acts at both the federal and state levels. Automobiles produce pollution containing lead (many countries still allow the use of leaded gasoline), benzene, carbon monoxide, nitrogen oxides, ozone, volatile organic compounds, and other environmentally harmful chemicals. These pollutants have been linked to a host of environmental problems, including smog, acid rain, low-lying ozone, and toxic air pollution. Such problems have resulted in significant damage to the environment and human health. As a result, since the 1960s there have been a number of efforts in countries such as the United States and Great Britain to reduce the level of harmful pollutants emitted by automobiles. Some of these efforts have taken the form of legislation, such as clean-air acts, that restrict levels of harmful pollutants like carbon monoxide and nitrogen oxides or mandate fuel efficiency for vehicles, while others have stemmed from industry and consumer initiatives. As a result, the motorized vehicles of today emit significantly less pollutants than their counterparts of the 1960s and 1970s. However, automobile emissions still produce significant amounts of pollutants. The Environmental Protection Agency estimates that automobiles still account for about 75 percent of all carbon monoxide emissions in the United States. The greater number of vehicles on the roads in 2008 also mitigates to some extent the emission reductions that have been gained. Furthermore, while the fuel efficiency of motor vehicles is somewhat greater in 2008 than in past decades, the fuel efficiency of many vehicles, particularly popular sport utility vehicles, remains less than optimal. In the United States, the Corporate Average Fuel Economy standard, which represents the weighted average of the fuel economy of a manufacturer's fleet of passenger vehicles, was first introduced in Congressional legislation in 1975, but since 1985 remained unchanged at 27.5 miles per gallon for passenger vehicles until 2007. Furthermore, the category of light trucks, which sport utility vehicles were categorized under, was set at the much lower standard of 20.7 miles per gallon. In view of the increase in sport utility vehicles and light trucks in the 1990s, it is perhaps not surprising then that the total fuel economy for all passenger vehicles in the United States actually peaked in 1986 at 26.2 miles per gallon. In 2005 the standard for the light-truck category was changed in part to reflect environmental concerns, and for the year 2007 the standard for light trucks has been set at 22.2 miles per gallon. A number of other countries have set fuel-efficiency standards for manufacturers that are higher than the standards in the United States, including China, which introduced a new set of standards for fuel efficiency in 2004.

Since the turn of the twenty-first century, an even greater concern about the pollution associated with petroleum-based transportation is related to global climate change. Motor vehicles are major producers of the main greenhouse gases that have been linked to global warming. In particular, such vehicles are among the primary producers of carbon dioxide, the principle greenhouse gas that contributes to global warming. Global warming occurs when greenhouse gases such as carbon dioxide build up in the atmosphere and prevent heat from leaving the earth's atmosphere. It has been estimated that in Western nations, motor-vehicle travel accounts for around 20 to 30 percent of all carbon dioxide emissions. Though there remains some debate about the extent of global warming, the potential effects upon the global environment are significant, since human, animal, and plant habitats across the globe will be altered as a result. Rising sea levels, changes in weather patterns, and alterations in the distributions of animals and plants brought about by global warming could effect agricultural practices, displace populations, and contribute to the spread of disease. Thus, even though the extent and causes of global warming are not fully known, it seems clear that the amount of carbon dioxide emissions produced by the current transportation system in countries that rely significantly on personal-motor-vehicle transit poses at least a significant risk to the environment and future generations.

As with all forms of pollution, it is the cumulative effect of the pollution associated with transportation that is particularly problematic. While the pollution produced by any particular automobile ride is unlikely to have a seriously deleterious effect upon the environment, there are significant environmental risks and potential harms to humans, animals, and ecosystems associated with the large-scale utilization of automobiles. Thus, the costs of transportation to the environment outlined above must be evaluated in terms of the total system of transportation

utilized within any given society. In the United States, that system clearly encourages the private use of automobiles as the primary mode of transportation. Since the mid-twentieth century, most governmental support and funding for transportation in the United States has gone into the construction of highways and roads, and only a small proportion has been provided for the creation and support of public transit systems, such as commuter trains or light-rail systems. Since the 1990s, some small initiatives have taken place to alleviate the impact of automobile traffic, such as the creation of high-occupancy-vehicle traffic lanes in some metropolitan areas, the expansion of light-rail systems in some urban districts, and the construction of bicycle lanes within many cities. Nonetheless, public policy on transportation in the United States still is focused on facilitating the use of automobiles, and despite the above mentioned efforts, the average commuting time has actually increased in recent years. For example, the number of drivers commuting more than sixty minutes to work by automobile rose by over 50 percent from 1990 to 2000, and the number of solo drivers commuting to work has increased by over 13 million from the 1990s.

INDIRECT ENVIRONMENTAL COSTS

While the pollution associated with contemporary forms of transportation might represent the largest and most direct impact upon the environment, many environmental ethicists have argued that it is equally important to understand the less direct effects associated with current transportation systems. First among these is the urban sprawl associated with the development of the roadway system in the United States and some other Western nations. The seemingly endless expansion of development afforded by the extension of roadway systems has raised a host of environmental concerns. Most obviously, such development makes more natural areas open to human development and thus allows the environmental degradation of those areas. The expansion of the roadway system and the accompanying development of areas along those roadways also require the use of vast amounts of resources, such as concrete and steel, and there are serious environmental impacts associated with the extraction and processing of these resources. By spreading populations out over greater distances, such sprawl creates inherent inefficiencies in the distribution of goods and services, which also entails a greater use of natural resources. In this vein, while cybercommuting might lessen the need for some workers to commute to work on a daily basis, it has the potential negative affect upon the environment of allowing individuals even greater opportunities to move into formally wild areas further away from urban centers. Finally, the reliance on petroleum inherent in a transportation system based primarily on personal motor vehicles exacerbates the well-known environmental costs related to the exploration, extraction, and refining of crude oil.

Our particular forms of transportation no doubt have other indirect environmental costs on the environment, such as those associated with invasive exotic species of plants and animals whose spread has been facilitated by various forms of modern transportation, the environmental costs related to disposing of toxic materials used in the construction of modern vehicles and vehicle-related products, and environmentally caused health problems brought about by the immense concentration of trucks and railways around major shipping ports. The point here is not to give an exhaustive list of all such costs, but merely to illustrate some of the more prominent ones and to show that a careful accounting of the environmental impact of our transportation systems needs to take in the full range of consequences that result from activities associated with the development and utilization of transportation if public policy for transportation is to be properly geared toward the overall good.

TRANSPORTATION IN A GLOBAL CONTEXT

In light of the extensive concern about the environmental effects that current modes of transportation are having within Western developed countries, it is not surprising that there is also a great deal of growing anxiety about the severe environmental impact of expanding these modes of transportation within developing nations. Within the evolving globalized economy, an ever greater amount of industry and commerce is shifting to formally less developed countries. As such countries industrialize and expand their economies, they also are taking on means of transportation that model those of the Western world, both because doing business in international markets requires having a sophisticated transportation infrastructure in place and because the creation of new wealth within these countries gives more people within their economies the ability to purchase hitherto unaffordable technologies like automobiles. The rate at which this expansion is taking place in recent years is exponential. For instance, automobile ownership in China more than tripled from the 1990s to the 2000s and has been accompanied by a corresponding and ongoing boom in the expansion of the highway system in that country. As countries such as China increasingly utilize motorized-vehicle transportation, they will incur the environmental costs that such transportation involves and can seriously aggravate global environmental problems. A particularly prominent example of this is the decline of Chinese bicycle culture. Until recent years, bicycle use dominated local travel in Chinese cities. However, with the increased use of automobiles in China, the dominance of the bicycle is beginning to fade in large urban centers. In

Beijing, for instance, bicycle travel accounted for over 60 percent of all trips within the city in 1995, whereas in 2006 that number had fallen to less than 40 percent. Other large Chinese cities have experienced a similar transition, and many Chinese cities are now even banning bicycle use on many roadways.

CHALLENGES TO DEVELOPING RESPONSIBLE TRANSPORTATION POLICY

As noted earlier, modern systems of transportation offer benefits and incur costs. At least two difficulties can make implementing transportation policies that properly balance these benefits and costs particularly troublesome. The first difficulty concerns the evaluation process itself. Transportation systems are exceedingly complex entities, and both the goods and services they engender and the problems associated with them are numerous and multifaceted. As mentioned previously, even the kinds of environmental harms associated with transportation come in a variety of forms, some of which are not readily apparent from the outset. It is no simple matter to account for all the various factors, good and bad, long-term and short-term, associated with transportation systems. Such a process also involves comparing and weighting goods and values of diverse kinds. For example, one needs to consider how values and goods such as those of environmental integrity and species welfare are to be gauged in relation to those such as individual freedom and economic growth.

The second problem is a pragmatic one. As many environmental philosophers have noted, one of the difficulties with getting people to take environmental problems seriously is the very scope of such problems. Environmental harms are often both indirect and long-term, and thus their costs are frequently ignored by the very people who bring them about. It is difficult enough to convince people to consider the long-term welfare of others in their decisions; it is even much more difficult when those considerations run contrary to the satisfaction of their immediate interests. The potential conflict between morality and self-interest becomes particularly thorny in such situations, especially because the harmful consequences are so far removed from view. This explains in part why it is difficult to get people voluntarily to change their choices of transportation, even when we can objectively evaluate the long-term consequences of the various options. As a result, it may be that societies can effect enough change in transportation to make a significant environmental difference only through public policies that involve strong incentives or strong restrictions. Because of the individualistic framework of much of modern society, restrictions on transportation choices are likely to be strongly opposed by many. Developing incentives that are comprehensive enough to alter transportation patterns and strong enough to sway individual choices will involve a degree of foresight and planning that has so far been lacking in the development of transportation policy. The task of developing effective transportation policies thus remains a difficult challenge for those concerned about the environmental impact of our transportation choices.

SEE ALSO *Automobiles; Built Environment; Energy; Pollution; Urban Environments.*

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UNITED KINGDOM

The United Kingdom (England, Scotland, Wales, and Northern Ireland) is a densely populated country with a complex history of human habitation and land use. Its cultural richness is due to centuries of invasions and settlement of peoples and, in the nineteenth century, the wealth generated by the industrial revolution, which occurred against a background of colonization and plunder of other nations' resources and labor. The population density and the complex historical tensions among the different countries, religious groups, and social classes that make up the United Kingdom (UK) have been instrumental in shaping the British psyche and the relationship to nature that underlies many of that nation's contemporary responses to environmental issues.

THE OPEN SPACE MOVEMENT

Robert Hunter (1844–1913) supplied the vision and rhetorical power needed to drive what was to become the open space movement. Hunter worked for the Commons Protection Society and used his legal training and painstaking research of historical documents to resist further enclosure of common land by landowners. That drive was intended not just to protect woodland and open moors from being built on or aggressively farmed but also to keep them open for ordinary people's recreational enjoyment.

Although ancient royal parks and forests provided open space for city dwellers close to them, other burgeoning industrialized areas had no such resources. The working and living conditions of factory workers and the poor air quality led to concern for the health of city dwellers. Time spent in nature was seen as morally uplifting as well as providing fresh air, and this led to an increasing number of wealthy benefactors and city corporations creating urban parks with open or very cheap access to provide healthy recreation for the masses.

The drive for open access to countryside has persisted to the present time. In 1884 the first attempt to pass a Freedom to Roam bill in Parliament failed, as did many subsequent attempts. In 1932 six people were jailed for leading a mass trespass of four to five hundred people on Kinder Scout in the Derbyshire Peak District, England, and that led to greater public support for the "right to roam." The Ramblers Association, whose origins lay in the local walking clubs that had sprung up in the 1880s, rekindled this form of civil disobedience by holding annual mass trespass events beginning in 1985. Those unlawful but peaceful events were instrumental in providing the pressure that resulted in the Countryside and Rights of Way Act 2000. That act led to a mapping exercise culminating in the Right to Roam 2005, which gives walkers access to mountains, moor, heath, down, and common land in England and Wales. Similarly, the Land Reform Act 2003, which was implemented fully in 2005, grants the statutory right of responsible access to almost all land and water in Scotland.

THE NATIONAL TRUST AND OTHER NGOS

Legislation such as the Right to Roam has opened up privately owned land, but one of the most effective means of social transformation in terms of giving people access to nature and conserving natural and cultural landscapes has been to buy land and have it designated for that

purpose. The National Trust, established in 1895 by Robert Hunter, Octavia Hill, and Hardwicke Rawnsley, began doing that with the purchase of four and a half acres of coastline at Dinas Oleu, Wales. The National Trust now manages 250,000 hectares (617,761 acres) of countryside, moorland, beaches, and coastline in England, Wales, and Northern Ireland. It also owns and maintains historic houses, gardens, industrial monuments, churches, and pubs. Its focus is not just the conservation of nature but also the conservation of the historical fabric of the country and, perhaps most strikingly in the national parks of England and Wales, the conservation of the social fabric or ways of life that have shaped the cultural landscapes that characterize the UK. The National Trust for Scotland has 128 properties and a similar profile of aims and activities. Both organizations are nongovernmental charities funded by donations, legacies, and a broad membership (3.68 million combined in the first decade of the twenty-first century) and supported by volunteer labor. Although they are nongovernmental organizations (NGOs), these organizations are seen as part of the establishment: safe, nonthreatening, and often willing to compromise.

Other mainstream campaigning charity bodies have originated with visionary individuals or small groups, sometimes beginning by focusing on a small local issue in which they are out of step with public opinion. The Royal Society for the Protection of Birds began as a campaign to stop the use of grebe feathers on women's hats in 1889. It grew to have a million members, two hundred nature reserves (130,000 hectares [321,235 acres] in total), and a scope of action that is focused on protecting wildlife habitats. The larger mainstream campaigning bodies tend to work in the areas of informing the public, including educational programs for children; doing or funding research; lobbying Parliament; using the legal system to challenge damaging developments; and providing a focus for their memberships' concerns. Some focus more on lobbying and legal challenges; for example, the Campaign for the Protection of Rural England, along with its equivalent Welsh body, specializes in putting pressure on planning authorities. This organization began in 1926 and has maintained a sharp focus on resisting urban sprawl and ribbon developments: expansions of towns that eat into the countryside. Other campaigning bodies see themselves as umbrella organizations, such as Transport 2000 (and Transform Scotland), which began in 1973 and has maintained a focus on transport issues and worked to represent and inform government and other campaign groups about transport.

PUBLIC PARTICIPATION

Grassroots activity operates at a number of levels. There is mass membership in established organized campaign groups and the Green Party, where members of the public can pay for membership and see themselves as "doing their bit" for the environment. Practical volunteering is used widely; for example, the National Trust has 43,000 volunteers. More radical groups are characterized by many loose affiliations between different types of campaigns and multiple memberships by individuals, along with mass attendance at events.

An umbrella name predominant in the contemporary protest movement is Earth First! Both globally and nationally this has been a nonhierarchical rubric for other groups or individuals who use direct action to protest against destructive organizations or actions. Direct action under this name can consist in anything from a single individual stopping a shop operating for a morning by gluing his or her hands to its door to the organization of mass protests such as the 2007 climate camp to protest the addition of a new runway at Heathrow Airport. Contemporary direct action under any banner tends to consist in actions that are usually illegal but not dangerous to the public and often combine humor with a serious message. For example, critical mass cycling events involve large groups of cyclists using the same route during rush hour, clogging the road, but the cyclists are invited to wear fancy dress and create a colorful spectacle, adding an element of consciousness-raising to practical activities.

With road building protests there is more emphasis on stopping proposed projects. Direct action can involve damage to machinery or protesters placing themselves in danger to prevent tree felling or excavation. The Newberry bypass in Berkshire, England, was a new section of road intended to ease traffic congestion that ran through a designated area of outstanding natural beauty, a National Trust nature reserve, and a historic civil war battlefield. To defend those areas and protest road building in general, trees and specially dug tunnels were occupied by particularly devoted protesters (ecowarriors) and numerous camps were set up along the proposed route. Although all the camps were evacuated and work began on the bypass in 1996, the protesters received a significant amount of publicity, with the media highlighting a young man called Swampy (Daniel Hooper), the last to be evicted from the tunnels to protect Snelsmoor Common. The dedication and risk to their lives of those individuals over a long period as well as a march of five thousand people impressed the public. The cost to the construction company of delays and security, which was estimated at £23.7 million, as well as the costs of policing such protests, had an effect on plans for road building in the future.

Protests such as Newbury brought hard-core environmental campaigners who might travel from one protest to another together with local people whose concerns were more place-specific and conservation organizations

Climate Change Protesters, London, 2007. *Protestors demonstrated for the week-long Camp for Climate Action outside the BAA office near Heathrow Airport in London, England. The United Kingdom is home to many active grassroots environmental organizations, including well known groups such as Earth First! Despite the popular ethos of a love for nature, the UK deals with several environmental problems, particularly with litter.* **CATE GILLON/GETTY IMAGES.**

with specific interests. In this instance it also triggered a report from the World Wide Fund for Nature (WWF-UK) criticizing the government's watchdog for conservation, English Nature (EN). It appeared that if EN could not protect an area with the multiple designations that the Newberry site had from a stretch of road that was only 13.5 kilometers long and was predicted to be ineffective at reducing traffic elsewhere, it was powerless.

PROTESTS AGAINST GENETICALLY MODIFIED ORGANISMS

A campaign that brought together NGOs, campaigners, and the wider general public involved the introduction of genetically modified organisms (GMOs). Resistance to a new form of technology was the focus. Genetic modification (GM) was uniquely placed to bring together opposition from a number of fronts. The technology was seen as controlled and promulgated by multinational companies to the detriment of poor farmers globally, foodstuffs with GMOs were perceived by the public as dangerous, and the growing of GM crops was predicted to create "superweeds" that would have a negative impact on biodiversity.

Alongside campaigns by established groups such as Friends of the Earth, new groups emerged. One of the most effective groups at getting information to people and "outing" industry front groups was the Norfolk Genetic Information Network (now GMWatch). Another that has

worked in a scientifically literate way at the interface of science and public information is the Institute for Science in Society (I-sis), a nonprofit organization founded in 1999 by Mae-Wan Ho and Peter Saunders.

Anti-GM, like many environmental campaigns, is not just about legislating against or preventing something but also about engaging the public in decision making and encouraging informed debate. Not only did the GM issue stimulate debate across the country, the wider general public got involved by not buying GM food, much to the surprise of major UK supermarkets, which had to advertise that they were "GM free." Resistance to GM was a wider European phenomenon, and legal battles still were being waged in the first decade of the twenty-first century between the European Union and the World Trade Organization about allowing the importation of GM foods. In Britain at that time, crop trials were destroyed by protesters' direct action of pulling up the plants, sometimes at the risk of imprisonment.

ENVIRONMENTAL PHILOSOPHY AND DEBATES

A number of themes characterize environmental debates in the UK, including the layperson's love of nature. In a country dominated by cultural landscapes and with no real wilderness this speaks to a love of countryside as a place of interaction between people and nature. In farming areas and in cities and towns previous human activity provides a richness that people love and work to conserve. However, the problem of litter, which may be worse than in many other places in Europe, suggests a lack of care at even the most basic level. As in other countries, commercial forces drive developers to build uninspiring houses on greenbelt land rather than well-designed ecodevelopments on brownfield inner-city sites, and town councils do nothing to prevent historically rich and socially cohesive towns from becoming what the New Economics Forum has called "clone towns" as chain stores move in. The Transition Towns movement addresses the related problems of global climate change and community disengagement and alienation at the local level.

Environmental philosophy in the UK has emphasized approaches that are scientifically and historically informed and the creative possibilities of human-nature collaboration. There is wide recognition of romantic figures such as Ruskin and Wordsworth as a resource one can go to for inspiration. Another underlying theme is the importance of transforming rather than denying the urban experience coupled with a politically aware concern for providing opportunities for everyone to experience nature and live in socially vibrant communities.

Robin Attfield (2003) developed a biocentric practice-consequentialist line of argument and has supported and represented it as well as broadening it to include global issues. Global justice issues and international relations also appear in the work of Nigel Dower. Environmental economics is represented by figures such as John O'Neill (2006), whose virtues ethic approach is interwoven with questions of social justice. Similarly, Alan Carter combines environmental and equality concerns and combines academic work on environmental questions with work supporting policy groups or campaign organizations.

Work on animal welfare is also evident (the term *speciesism* was coined by the psychologist Richard Ryder); perhaps the most nuanced work in this area is that of Mary Midgely (1983), who has mounted a defense of a benign form of speciesism while emphasizing shared nature between humans and nonhuman animals. A mainstream philosopher who has developed arguments with regard to animals (including a defense of fox hunting) and a somewhat nostalgic approach to the countryside is Roger Scruton. The nature of the place, the richness of its nature writing, and the inspirational science of Darwin have led Alan Holland to develop the fine-grained, culturally aware, and environmentally rich notion of a worthwhile life as an approach to ethics.

The beauty of some UK landscapes also can be seen as generating the resurgence of interest in the aesthetics of nature. Ronald Hepburn was responsible for the environmental turn in the study of aesthetics, which was taken up by Emily Brady, who has focused on both cultural and natural landscapes and developed an integrated aesthetic that brings together an experiential view and an ecologically informed view. The urban situation and the densely populated nature of the country have contributed to a shift in the work of Warwick Fox. His theory of responsive cohesion is crafted to cover not just interhuman ethics and the ethics of the natural environment but also the ethics of the built environment.

Clare Palmer, the founding editor of *Worldviews: Environment, Culture, Religion,* an emigrant to the United States, has done important critical work on process philosophy and environmental ethics as well as on animal ethics. Andrew Brennan, an emigrant to Australia, has argued for a pluralist approach to environmental ethics.

Environmental philosophers in the UK have to battle against the conservative forces of philosophy as well as the current Research Assessment Exercise, which has been perceived as privileging theoretical over practical philosophy in the distribution of academic funding. However, the relative academic freedom and openness to interdisciplinarity of the higher education sector has meant that it was the first place in the world to establish a dedicated master's course in environmental philosophy. Lancaster University's degree in values and environment, which

now runs from the University of Central Lancashire, was set up in 1989, and the journal *Environmental Values* was established at Lancaster in 1992.

SEE ALSO *Animal Ethics; Civil Disobedience; Earth First!; Environmental Activism; Environmental Law; Environmental Philosophy: V. Contemporary Philosophy; Genetically Modified Organisms and Biotechnology; Green Politics in Germany; Land Ethic; Midgley, Mary; Nongovernmental Organizations; Ruskin, John; Space/Place; Speciesism; Urban Environments; Wordsworth, William.*

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UNITED NATIONS EDUCATIONAL, SCIENTIFIC AND CULTURAL ORGANIZATION

The United Nations Educational, Scientific and Cultural Organization (UNESCO) was founded in November 1945 and came into force in November 1946 after ratification by twenty countries. By 2007 UNESCO had 192 member states and 6 associate members. It disseminates and shares information and knowledge in the fields of education, science, culture, communication, and information. Furthermore, it also works as a laboratory of ideas and a standard setter in forging universal agreements on emerging ethical issues, such as those concerning contemporary environmental challenges. Environmental concerns currently occupy a prominent place on the organization's agenda and generate systematic reflection on how international policy can promote an ethical approach to the environment.

UNESCO has developed international programs that help reinforce the capacities of developing countries to improve the management of the earth's resources in the fields of the natural sciences, engineering, and technology. Priorities in this area are related to capacity building in the basic and engineering sciences for the use of water and associated ecosystems, including the oceans. To complement this effort, the organization promotes the proper use and maintenance of natural resources, preparedness for and mitigation of disasters, and the use of renewable sources of energy.

The Man and Biosphere Programme, launched in the early 1970s, is especially relevant to environmental ethics. It promotes interdisciplinary research to improve people's relationship with the environment, targeting the ecological, social, and economic dimensions of the loss of biodiversity. Its World Network of Biosphere Reserves works as a vehicle for knowledge sharing, research and monitoring, education and training, and participatory decision making. Designed to balance community needs with the conservation of natural resources, these biosphere reserves seek to provide a harmonious marriage of conservation and development. With more than 480 sites in over 100 countries, the World Network of Biosphere Reserves provides context-specific opportunities to combine scientific knowledge and governance practice in order to reduce loss of biodiversity; improve livelihoods; and enhance social, economic, and cultural conditions for sustaining the environment. Thus, these biosphere reserves contribute to the pursuit of the seventh Millennium Development Goal, to ensure environmental sustainability.

The biosphere reserves can also serve as learning and demonstration sites in the framework of the Decade of Education for Sustainable Development. UNESCO assumes that education lays the ground for environmentally and ethically informed, responsible, and sound decisions and actions. The educational priorities of UNESCO include technical and vocational education, science and technology education, and education for sustainable development. UNESCO values equity for all communities and the long-term stability of the economy and ecology.

According to UNESCO, education and training are primary agents for mobilizing communities toward sustainable development. They fulfill this role by increasing people's capacities, transforming their visions for themselves and their societies into reality, and enhancing linkages between cultural and biological diversity. Yet education must respect cultural landscapes and sacred sites, promote learning about the interactions of biological and cultural diversity, and maintain biosphere reserves and World Heritage sites.

UNESCO is actively pursuing the Millennium Development Goals, especially those aiming to halve the proportion of people living in extreme poverty in

CAPE HORN BIOSPHERE RESERVE

The Cape Horn Biosphere Reserve (CHBR) protects one of the world's most pristine ecoregions, the Magellanic subantarctic rain forests, at the southern end of the Americas (Rozzi et al. 2004). It includes the archipelagoes south of Tierra del Fuego, and the fjords, ice fields, and glaciers on Darwin Cordillera, just 1,000 kilometers north of the Antarctic Peninsula. With five million hectares of marine (three million ha) and terrestrial (two million ha) ecosystems, it is the largest biosphere reserve in southern South America. The CHBR has at least three attributes that are relevant to environmental philosophers.

First, its creation in 2005 resulted from a six-year collaborative effort between the regional government and an interdisciplinary team of ecologists, artists, and humanists led by the Chilean philosopher and ecologist Ricardo Rozzi. The creation of the CHBR involved ten guiding principles, which can be adapted for interdisciplinary research and conservation work in other regions:

1. interinstitutional cooperation,
2. a participatory approach,
3. an interdisciplinary integration of environmental philosophy, sciences, arts, and policy,
4. networking and international partnership,
5. communication through the media,
6. identification of flagship species,
7. "direct encounters" with human and nonhuman beings living in their habitats,
8. economic sustainability and ecotourism,
9. territorial planning and administrative sustainability,
10. "conceptual sustainability" based on continuous long-term *in situ* research (Rozzi et al. 2006).

Second, the Research, Education, and Conservation Center of the CHBR is in the Omora Ethnobotanical Park. In 1999 Omora Park inaugurated a program in field environmental philosophy and biocultural conservation that integrates comparative ethnoecology, ecotourism, and environmental ethics. In 2004 this program was further projected through a partnership with the Department of Philosophy and Religion Studies at the University of North Texas (University of North Texas 2008).

Third, the CHBR is located in a remote region of the Americas, only 1,000 kilometers north of Antarctica. With its location at the end of the continent, it is home to a uniquely rich biological and cultural diversity (Callicott et al. 2006). For example, more than 5 percent of the world's species of mosses and lichens are found here in less than 0.01 percent of the earth's land surface. This high diversity of small flora was critical in making the case to UNESCO representatives for the establishment of the CHBR. Lichens and mosses, although very small organisms in comparison to charismatic megaflora and megafauna, can play important roles in promoting conservation when their ecological and aesthetic values are understood by the general public and by policy makers (Rozzi et al. 2008). Such a shift in the "cognitive lenses," which allows a keener assessment and greater appreciation of biodiversity, has both scientific and philosophical value.

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Ricardo Rozzi

developing countries by 2015, to achieve universal primary education in all countries by 2015, to eliminate gender disparity in primary and secondary education by 2005, to help countries implement a national strategy for sustainable development by 2005, and to reverse current trends in the loss of environmental resources by 2015.

The social and human sciences have a vital role to play in helping to understand and interpret the social, cultural, and economic environment. UNESCO's priorities in the social and human sciences are advancing human rights; fighting against all forms of discrimination, racism, xenophobia, and related intolerance; and promoting ethics in science and technology, with an emphasis on bioethics (United Nations 1997).

Different solutions and alternatives started to be developed in response to environmental problems. But especially in developing countries, incipient structures of environmental and educational management have been and are exposed or vulnerable to suffering the impact of various types of economic or political crisis in those countries or regions.

One of the most frequent effects of these crises has been and continues to be the elimination of budgets or the discontinuation of funds. These irregularities have sometimes prevented governments from complying with international agreements. This happens also with UNESCO's programs, which often arise as good intentions but have hitherto been difficult to materialize. All this results in a limited development of criteria to assess the effectiveness of management, cooperation, conservation, education and training, monitoring, and participation of integrating countries. For example, in the case of Latin America and the Caribbean, there is not enough information on whether the implementation is carried out by state agencies—federal, municipal, or mixed management—or by nongovernmental institutions. Although UNESCO's programs are seen with positive expectations, they will still have to face bureaucratic structures, lack of political commitment, or insufficient human resources and institutional capacity.

UNESCO has a Division of Philosophy and Ethics, the only outpost of philosophy in the United Nations system. Through its Universal Ethics Project, this division is leading a worldwide discussion on universal ethics. Emphasis has been placed on the ethical principles at stake in environmental sciences and policies. What is the moral value of the environment? What in nature is worth protecting, preserving, and respecting? What do we mean by global sustainability? How much should we protect the interests of future generations? What are the implications of the principle of justice, for policy decisions related to environmental issues?

Here we can also find difficulties to adequately attain such valuable objectives. But, in the case of philosophy, this is not only due to institutional budgetary limitations, but also to the very nature of the philosopher's task, often linked to purely theoretical work. The UNESCO's *Courier*, published in celebration of World Philosophy Day (November 15, 2007), gathered the critical opinion of various thinkers, aiming at a strengthening of the social responsibility of the philosopher, and they recognize that the philosophical impact on society is not what it could be. The question posed here is how they could make themselves useful.

Michel Onfray (France) advocates ceasing to lecture everybody and being comfortable to remain only in the realm of the word, and trying to produce philosophical effects on the existential level. Norwegian Jostein Gaarder stresses questions as what shift in consciousness we need, what is a sustainable wisdom, what qualities of life are important, and if the unsustainable consumerism is really the only possible model of life.

Gaarder relates this to his proposal of a universal declaration of human obligations, since it is no longer meaningful to talk about rights without simultaneously stressing the individual state's or person's obligations and responsibilities.

To promote sustainable consumption, UNESCO and the United Nations Environment Programme are working together to understand young people's consumer behavior and work with them in promoting more sustainable consumption patterns for the future. Launched in March 2000, the Youth Exchange Programme, for example, includes a training guide, a Web site, online discussions, and related workshops aimed at young people's consumption.

In 2007 UNESCO undertook several important initiatives. It launched the Biosphere Connections partnership to support conservation of biodiversity and sustainable development in conjunction with the airline coalition Star Alliance, the Man and Biosphere Programme, the Ramsar Convention on Wetlands, and the World Conservation Union. The same year it also launched the International Initiative in Defence of the Quality of the Night Sky as Mankind's Scientific, Cultural, and Environmental Right. This initiative maintains that future generations have the right to skies free of light pollution.

UNESCO's Communication and Information Programme will help to build a society based on the sharing of knowledge and incorporating the sociocultural and ethical dimensions of sustainable development. The world urgently requires global visions of sustainable development based on observance of human rights, mutual respect, and alleviation of poverty—goals which lie at the heart of UNESCO's mission and activities.

SEE ALSO *Biodiversity; Consumption; Environmental Education; Future Generations; Hunger; Sustainable Development; United Nations Environment Programme.*

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Alicia Irene Bugallo

UNITED NATIONS ENVIRONMENT PROGRAMME

The United Nations Environment Programme (UNEP) promotes international cooperation on the environment and serves as the focal point for environmental action and coordination within the United Nations system. Its origins can be traced back to the United Nations Conference on the Human Environment in Stockholm in June 1972. At that time it was acknowledged that a growing number of regional and environmental problems would require extensive cooperation among nations and action by international organizations in the common interest. Shortly after the Stockholm conference, the United Nations Twenty-Seventh General Assembly approved Resolution 2997 in December 1972 (United Nations 1972). In that resolution the United Nations established UNEP in the context of "the urgent need for a permanent institution within the United Nations system for the protection and improvement of the environment" (United Nations 1972, p. 43). The UNEP Governing Council is composed of fifty-eight members elected by the General Assembly for three-year terms. Seats are allocated on a regional basis.

ORIGINS AND STRUCTURE

In Resolution 2997 it was decided that UNEP should promote international cooperation on the environment; review the world environmental situation to ensure that emerging international issues would receive adequate consideration by governments; promote the acquisition, assessment, and exchange of environmental knowledge; and review the impact of environmental policies on developing countries. The mission of UNEP is "to provide leadership and encourage partnership in caring for the environment by inspiring, informing, and enabling nations and peoples to improve their quality of life without compromising that of future generations" (UNEP, "What UNEP Does," para. 2).

UNEP's headquarters are in Nairobi, Kenya. UNEP also supports six regional offices around the world and a growing number of liaison and outpost offices, collaborating centers, and convention secretariats. Based in Africa, it is positioned to have a firsthand understanding of environmental issues facing developing countries.

UNEP seeks partnerships in all sectors and describes its work as assessing global, regional, and national environmental conditions and trends; developing international and national environmental instruments; strengthening institutions for the wise management of the environment; the transfer of knowledge and technology for sustainable development; and encouraging new partnerships and mind-sets within civil society and the private sector. The implementation of this work is done through seven divisions: Early Warning and Assessment; Environmental Policy Implementation; Technology, Industry and Economics; Regional Cooperation; Environmental Law and Conventions; Global Environment Facility Coordination; and Communications and Public Information.

ACHIEVEMENTS AND PUBLICATIONS

Since its inception UNEP has been a principal actor in major international initiatives and events. Significant milestones include the Convention on International Trade in Endangered Species (1973), the Bonn Convention on Migratory Species (1979), the Vienna Convention for the Protection of the Ozone Layer (1985), the Montreal Protocol on Substances That Deplete the Ozone Layer (1987), the Intergovernmental Panel on Climate Change (IPCC) (1988), the Basel Convention on the Transboundary Movement of Hazardous Wastes (1989), the United Nations Conference on Environment and Development (1992), the Convention on Biological Diversity (1992), the Stockholm Convention on Persistent Organic Pollutants (2001), and the World Summit on Sustainable Development (2002).

UNEP promotes dialogue and cooperation among stakeholders and has assisted in the establishment of a number of notable demonstration projects, including the OzonAction program designed to help implement the Montreal Protocol, the International Coral Reef Action Network, and the Great Apes Survival Project.

In addition to a large number of books on a broad range of environmental topics, UNEP publishes annually the *UNEP Year Book*, formally known as the *GEO Year Book*; the magazine *Our Planet*; and the youth magazine *Tunza*.

UNEP's Medium-Term Strategy (2010–2013), approved in February 2008, sets out the next phase of the evolution of UNEP as it becomes more effective, efficient, and results-focused for the UNEP program of work. This focus will enable UNEP to better deliver on its mandate by building on its expertise and comparative advantage in a limited number of priority areas: climate change; disasters and conflicts; ecosystem management; environmental governance; harmful substances and hazardous waste; and resource efficiency–sustainable consumption and production.

UNEP will deliver on the six cross-cutting priorities by utilizing the capacity and expertise of UNEP divisions and regional offices and will actively reach out to government, other United Nations entities, international institutions, MEA secretariats, civil society, the private sector, and other relevant partners to support delivery of the MTS. The vision of UNEP for the medium-term future is to be "the leading global environmental authority that sets the global environmental agenda, that promotes the coherent implementation of the environmental dimension of sustainable development within the United Nations system and that serves as an authoritative advocate for the global environment" (UNEP Working Group on Medium-Term Strategy, 2010–2013, Consultation Paper No. 1).

ENVIRONMENTAL PHILOSOPHY

UNEP's values relating to environmental philosophy and ethics are stated in its founding documents and mission statement. The Declaration of the 1972 United Nations Conference on the Human Environment in Stockholm identified both natural and human-made elements of the environment as essential to human well-being and to the "enjoyment of basic human rights and the right to life itself" (UNEP 1972). In establishing UNEP, United Nations Resolution 2997 identified a need for measures designed to safeguard and enhance the environment "for the benefit of present and future generations of man [SIC]" (United Nations 1972, p. 43). UNEP's mission is "to provide leadership and encourage partnership in caring for the environment by inspiring, informing, and enabling nations and peoples to improve their quality of life without compromising that of future generations" (United National Environment Programme, "What UNEP Does"). These statements describe environmental values that direct UNEP activities. Historically, those activities primarily have been related to human rights, human rights to life, and concern for future generations.

On the 1997 World Environment Day in Korea the UNEP executive director chaired the Environment and Ethics Roundtable. The resulting document, *The Seoul Declaration on Environmental Ethics* (UNEP 1997), expanded UNEP's scope for ethical consideration. The declaration began by acknowledging that there is no choice but to redefine the values and principles that underlie human relationships with the earth. Without such fundamental changes, it suggested, further environmental degradation will lead to the collapse of the natural systems that support life. Again, there is a concern for safeguarding the rights of future generations. However, the document also rests on the assumption that the existence of all life, including human life, can be sustained only if the entire community of life on earth is sustained. *The Seoul Declaration* also stated that its framework of ideals, principles, and guidelines will evolve over time.

UNEP supported the development and publication of *Environmental Education, Ethics and Action: A Workbook to Get Started* (2006).

SEE ALSO *Convention on Biodiversity; Environmental Policy; Intergovernmental Panel on Climate Change.*

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Bob Jickling

UNIVERSITY-INDUSTRY RELATIONSHIPS

The ties between universities and private industry have been transformed from arms-length relationships between two distinct entities with different purposes into an interaction among overlapping institutional spheres in which each side has assumed some of its partner's traditional roles and characteristics. Government, at various levels, increasingly encourages university-industry interactions in order to foster public economic goals such as job creation and economic growth. As a result, university-industry relationships have become university-industry-government relationships, sometimes referred to as the ''triple helix'' (Etzkowitz 2008).

THE GROWTH OF SCIENTIFIC RESEARCH IN THE UNIVERSITY

The university, from its medieval origins until the late nineteenth century, was devoted to the production, preservation, and transmission of culture. Since 1900, however, it has become the source of new industries and private corporations while maintaining and expanding its traditional roles. In the late nineteenth century growing science-based electrical and chemical industries initiated relations with universities to serve their research needs and to supply them with personnel.

These university-industry relations were conducted across well-defined borders between the academic and commercial domains. The university's increasing involvement in science, however, engendered a more organized approach to managing research and its practical consequences. For instance, when researchers at the University of Toronto invented an insulin treatment for diabetes in 1922, the university found that it had to patent and license the technology in order to protect itself from potentially unethical manufacturers (Bliss 2007). The University of Wisconsin encountered a similar situation when a faculty member, Harry Steenbock, in 1924 patented the irradiation process based on his work on antirachitic vitamine (Apple 1989). Thus, even before universities realized that they could earn income from inventions made on campus, they were impelled to create mechanisms to insure an orderly process of technology transfer and protect their reputations.

Traditionally, university-industry relations denoted the provision of research support from a firm to a campus-based researcher. The contemporary form, however, involves the participation of academic scientists in the formation of private companies through the use of their academic research. The university takes on an entrepreneurial role, assisting in the founding of private firms and contributing to regional economic development. As the university acquires an industrial penumbra, industry takes on some of the values of the university, sharing as well as protecting knowledge.

THE FORGING OF UNIVERSITY-INDUSTRY RELATIONSHIPS

There are both formal and informal modes of university-industry relationships. The liaison and technology-transfer offices of the university constitute the formal mechanisms through which introductions are made in seminars for potential industrial partners, disclosure statements of inventions are collected, and patents licensed and contracts are negotiated. The activities of these formal programs to paint in broad brush-strokes are similar to the informal channels, with perhaps the key difference being that financial results from the formal channels are typically shared with the university (Etzkowitz and Webster 1995).

Informal relations with industry typically occur through contacts between professors and their former students and may lead to consulting and joint-research projects with a company. Informal relations may be viewed as an ''underground economy'' that is not counted as part of official academic work. Typically, both modes are present: the formal organizations and the informal ties through which social and intellectual capital moves from graduating students into firms and back again into the university.

Traditionally, university-industry relations denoted the provision of research support from a corporation to a campus-based researcher. Though offering far fewer restrictions than government support in many cases—and finding favor with the academic research staff—such funds represented a tiny proportion of academic research support. For instance, industrial R&D support to U.S. universities and colleges was 7.4 percent in 1959; 2.7 percent in 1969; 3.6 percent in 1979; 6.6 percent in 1989; 7.4 percent in 1999; 6.7 percent in 2001; and 5.1 percent in 2006 (NSF/SRS 2006). Most of these funds flowed through consulting relationships with faculty members who provided advice on campus to company visitors and at the industrial lab, conducted tests of materials and products in their laboratories, and occasionally carried out small research projects for a company (Etzkowitz 2002). From the early years of the research university in the late nineteenth century, university-industry relationships were largely established at the behest of industry to serve the needs of existing companies. Engineering schools reorganized themselves to serve the research needs of growing

science-based electrical and chemical industries and to supply them with personnel. The linkages included cooperative programs that sent students to industry for part of their training, university professors undertaking research at the request of industry, and donations of money and equipment by industrial firms to support engineering education (Noble 1976). These relationships, however, declined in the 1930s because of the Depression, elevating foundations as important sources of sponsored research.

However, during the Depression a new series of relationship formats were being created at MIT—for example, the faculty-formed firm, an explicit role for the university in shaping regional economic development, the interdisciplinary center, and the invention of the venture capital firm (Etzkowitz 2002). The older forms of university-industry connections involved payment for services rendered, whether it was received directly in the form of consultation fees or indirectly as endowment gifts. The new formats of university-industry relationships are built upon the development of scientific-research capabilities and the creation of a series of boundary-spawning mechanisms like technology-transfer offices and spinoff firms. This institutional transformation is reflected in the enactment of the Bayh-Dole Act of 1980, which transferred ownership of intellectual property emanating from government-sponsored research to universities on the condition that they take steps to promote their utilization. Similar new legal frameworks followed in other countries, often supported by funding programs, to legitimate and foster university-industry interactions.

Contemporary university-industry relations arose from two distinct sources and an emerging third hybrid stream: basic research interests funded by research councils and similar bodies, industrial projects for which academic input is solicited and in a creative fusion, and a joint formulation of research programs with conjoint basic and applied goals and multiple funding sources. Basic research increasingly takes place in research groups that function as "quasi-firms" that have many of the attributes of a private corporation except for the profit motive.

Incubators provide a means to subsidize the infrastructure of company formation and a training mechanism to teach academics to operate a firm. Centers integrate disciplinary research groups into broader interdisciplinary collaborations and carry out "translational research" to bring research findings closer to utilization. Technology-transfer offices arrange intellectual property protection and negotiate the terms for movement of commercially promising research into private companies, including those founded by members of the university. Science parks provide a home for research units of corporations, which often emanate from universities, offering projects and collaborative opportunities to their academic counterparts.

As a "third mission" of contributing to economic and social development is integrated into the university, the dissemination of academic knowledge takes place through patents as well as publications. The hybrid forms of university-industry relationships involve the multiplication of resources through university and faculty participation in capital-formation projects such as real estate development in science parks and the formation of companies in incubator facilities. The objective is to multiply the value of intellectual property derived from academic research through the stock market, either directly or indirectly.

CONCLUSION

The university is undergoing a "second academic revolution," integrating teaching, research, and economic development. As the university engages in technology transfer, it becomes a source of new product development, which is, of course, a traditional industrial function. The growth of university-government relationship was intertwined with the formation of national identity in Germany in the early nineteenth century, with the so-called Humboltdian academic model integrating teaching and research—the first academic revolution (Jencks and Riesman 1969).

In the United States, university-government relationship transcended the emergency of World War II as academics realized, during the postwar period, that theoretical advances could arise from problem-oriented research and vice versa. As new arrangements are put in place, old formats remain in use, creating a complex interplay among organizations and roles with ensuing conflicts and confluences of interest. As the university acquires an industrial penumbra, industry takes on some of the values of the university, sharing as well as protecting knowledge. Governments assume a new role in innovation by encouraging university-industry interactions of various kinds.

The line between facts and values is in most instances blurred. But since the first expression of a plant gene in a different species of plant in 1983, ethical, environmental, and religious concerns have shaped debates over the developments in agricultural biotechnology and genetic engineering (Tokar 2001; Kleinman 2005). Environmental concerns have been at the forefront of the debates over genetically modified organisms (GMOs). The discovery in 1999 of deadly effects of pollen from genetically engineered corn on immature butterflies upped a notch the tenor of environmental consequences of genetic engineering (Tokar 2001). As a result, much of the public debate about GMO has centered on the risks of gene transfer, the role of big business, and instances of the connivance of university scientists.

Since the issues and implications of GMOs are global, such issues are best tackled within collaborative frameworks. This was illustrated by the farm-scale trials of genetically modified crops in the United Kingdom. As the exercise revealed, irrespective of the genetic design and constitution of the crop plants, ecological effects were expected to arise as a result of the conditions in which each crop was cultured (Ormerod et al. 2003, p. 940). It is plausible that any future ecological cost from genetic modification will reflect the diversifying opportunities, methods and conditions for crop growth as any other factor in the brave new GMO landscape (Ormerod et al. 2003).

The university-industry-government interaction is a global phenomenon. The increasing recognition of universities as actors in national and regional innovation systems is leading to the blurring of boundaries between corporations and the academy and their replacement with a web of ties.

SEE ALSO *Alternative Technology; Genetically Modified Organisms and Biotechnology; Technology.*

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URBAN ENVIRONMENTS

Born in America, Australia, and Norway, environmental philosophy has its deepest roots in the tradition of wilderness advocacy and thus has tended to focus on the value of wild nature, the interests of wild creatures, and the integrity of unaltered ecosystems. Only recently have some environmental philosophers begun to turn their attention to urban environments, broadening the field and connecting it with branches of the environmental movement other than wilderness advocacy, including the environmental justice movement and the broader discourse on sustainability.

A BLIND SPOT

From its inception environmental ethics has focused mainly on the normative status of wilderness and wildlife. The many arguments about moral standing and intrinsic value have been aimed at finding a more appropriate balance between the domestic and the wild, mainly by valorizing the wild. One example is Paul W. Taylor's theory of respect for nature, which purports to be biocentric but provides inherent worth (intrinsic value) only for wild organisms, expressly excluding domestic ones. Landscapes that have not been touched by human hands are the normative reference against which all other landscapes are to be judged not only ethically but aesthetically, according to Allen Carlson's theory of positive environmental aesthetics.

The historical alliance of environmental ethics with the tradition of wilderness advocacy once all but precluded serious direct engagement with urban environments. There is thus what Andrew Light has called "an urban blind-spot" in environmental ethics: "[B]y and large, cities are considered sources of environmental disvalue: a landscape either to be mined for examples to be avoided or ignored altogether as a product of human intentions—an artifact rather than a part of nature and so outside the proper boundaries of the discipline" (Light 2001, p. 8).

A handful of environmental ethicists have attempted to remedy that blind spot, motivated by a sense that environmental ethics is incomplete if it automatically excludes from consideration the landscapes in which people live. Roger J. H. King, for example, found a "self-destructive logic" in an approach to environmental ethics that "presupposes that humans are at best interlopers on what should otherwise have been a nonhuman scene." The one-sided valorization of wilderness yields a "halt-and-withdraw" strategy that "holds nothing open for the future; the narrative line ends in tragedy for nature and for humans." (King 2000, pp. 115–116)

The literature on urban environments has expanded in two directions. One approach focuses on the role

Aerial View of Manhattan. *The island of Manhattan, a part of New York City seen here from the Empire State Building, is the epitome of an urban metropolis in the United States. Many believe that environmental ethics have ignored urban environments until only more recently, instead choosing to focus more on wilderness habitats. Some places, like New York's Central Park, provide ta mix of both environments: a lush natural habitat in the midst of one of the largest urban centers of the world.*

urban environments can play in fostering concern for wild nature and putting that concern into practice. Light argued that in the short term at least, practicing ''ecological restoration'' in urban settings can be a means toward the goal of fostering ''ecological citizenship'' (Light 2001, p. 28). King maintained that cities should at least foster an ''environmental conscience'' and to that end proposed as a principle that ''the built environment should make nature a visible, palpable presence in daily human experience'' (King 2000, pp. 115, 130).

Another approach starts with the recognition that cities and suburbs are the environments of most direct concern to most people, with the implication that those environments should be understood and evaluated on their own account, not simply or exclusively held to the standard of wildness. In discussing long-term considerations, Light stated, ''If environmental ethics is to fully embrace the urban, then it must describe the brown space of the city to be as important a locus of normative consideration as the green space'' (Light 2001, p. 31). Alastair Gunn went so far as to redefine the natural environment in terms of the conditions for human thriving, stating that ''to the extent that human beings are able to thrive in a given environment—to live long lives, to be physically and psychologically healthy, to fulfill a significant portion of their potential—then that environment is natural for humans'' (Gunn 1998, p. 348). There is no reason in principle why a city or a suburb cannot be natural in this sense.

Taking both of these approaches into account, an urban turn in environmental ethics opens up a broad range of normative questions concerning human well-being, justice, sustainability, and political legitimacy (Kirkman, 2004).

GOOD PLACES

One set of normative considerations in urban environments concerns the conditions that contribute to or detract from human health and well-being. Those considerations need not be limited to matters of physical health, though the availability of food and clean water and protection from various kinds of risk are important. Also of interest, though, are features of the environment that contribute to or detract from mental health and personal development, including access to cultural and educational institutions, opportunities for recreation, and opportunities for economic activity. Taking all these elements together provides a basis for judging whether a particular urban setting constitutes a good place to live.

Attention to matters of human well-being in urban environments meshes with the concerns of environmentalism in a number of areas. First, attention to matters of human health in urban environments relates to the

antitoxics branch of the environmental justice movement. The signal event for the rise of antitoxics activism was the discovery of toxic waste in the soil of Love Canal, a suburban neighborhood near Buffalo, New York, and the likely effects of that waste on the health of children who lived and played there.

Second, the experiential or aesthetic richness of landscapes has long been important to environmental advocates and their conservationist predecessors. An entirely technological landscape probably would be dreary and dispiriting; this attests to the need for some measure of scenic diversity, some space left open for wild nature in the urban fabric. Ironically, much of the initial appeal of suburban development was the location of houses in a parklike setting with carefully arranged bits of wildness close by. However, a major impetus for more recent critiques of suburbanization is the perception that the resulting landscape has degraded to a dreary monoculture of lawns interrupted only by a dreary monoculture of parking lots.

Third, in addition to the provision of green space, decisions about where and where not to build mesh with broader concerns about the relationship of the domestic to the wild and the need to be attentive to nonhuman nature. In places where human well-being is at stake, it is especially important to note that inattentive building can expose people to undue risks. Examples include development in flood-prone areas or even below sea level, schools or hospitals built on ground prone to shaking during earthquakes, and neighborhoods intruding into the habitat of large predators or into landscapes subject to frequent wildfires.

JUSTICE

Landscapes in and around metropolitan areas are diverse, affording different opportunities for and obstacles to well-being. The work of establishing a particular built environment incurs costs that may be externalized to other parts of the landscape. Economic and educational opportunity has shifted to suburbs, for example, leading to deterioration of the inner city. At the same time people in one area may have to live with pollution generated in the process of providing goods and services from which people in another area derive the greatest benefit.

These are matters of justice that may be distilled into two basic questions: Who has access to good places to live, work, and play? and Who bears the costs of establishing and maintaining those good places? The answers to those questions are intertwined with matters of distribution, consent, and compensation.

A concern for justice in urban environments connects to the broader environmental movement at two points. The first involves the rise of the environmental justice movement in the 1990s. At first considerations of race and class were brought into the antitoxics movement, and it was noted that poor and minority communities are exposed to disproportionate risks in their neighborhoods and that government agencies are not evenhanded in protecting communities from those risks.

Environmental-justice theorists have looked beyond the imposition of risk to patterns of exclusion and segregation in the urban landscape. The United States, for example, has a long history of excluding minority groups from the most desirable neighborhoods: A combination of federal laws, lending practices, and personal prejudice led to concentrations of poor and minority groups in deteriorating inner cities. Laws and, to some extent, lending practices have changed, but the legacy of past discrimination persists (Torres, Bullard, and Johnson 2000). In some cases that legacy is embodied in the physical infrastructure of the city, which was put in place with the explicit intent of physically blocking the expansion of minority communities into particular areas when that was both legal and acceptable public policy (Bayor 1996).

Matters of justice are at the root of environmental ethics in its traditional guise. The built environment is a rearrangement of the existing natural environment to suit particular human ends; intentionally or not, this has the effect of including and excluding other living things and changing the composition and form of the biotic community. Aside from the long-term impact of such changes on human well-being, people may owe some consideration to nonhuman living things and systems in their own right. From this perspective it is at least possible to pose the question of whether an injustice has been done, for example, in appropriating the habitat of an animal or plant population and altering it so that that population no longer can survive there.

SUSTAINABILITY

A further set of normative considerations in urban environments concerns the degree to which human life in those environments—and civilization itself—can be sustained in the future. As environmentalists have long maintained, the domestic environment is carved out of and remains dependent on its broader environmental context, which includes not only raw materials and sources of energy but also the relatively benign and predictable setting afforded by stable landforms, stable climate, healthy ecosystems, fertile soil, and clean air and water. Patterns of human activity in a domestic environment are sustainable to the extent that they tend to conserve finite resources and maintain the dynamics that underlie the benign and predictable setting on which they depend; they are unsustainable to the extent that they tend not to do that.

Urban form is deeply implicated in charges of unsustainability leveled against contemporary civilization.

Metropolitan growth in the United States has been shaped by nearly exclusive reliance on the automobile for local transportation. As a consequence, vast areas of the American landscape are all but uninhabitable without the automobile: The functions of economic and civic life are scattered across the landscape, connected to one another and to residential areas only by roads and highways. Automobiles powered by fossil fuels are a major factor in resource depletion, local pollution, and global climate change, in effect undermining the long-term sustainability of American-style metropolitan regions.

By contrast, moderately dense urban forms in which the functions of economic and civic life are intermixed with residential areas may be more sustainable, at least by some measures. For example, residential energy use is generally lower in relatively dense urban areas than in suburban or rural areas (Light 2001), and in that setting more efficient forms of transportation become feasible, including walking, cycling, and mass transit (Gillham 2002).

SEE ALSO *Built Environment; Ecological Restoration; Environmental Justice; Landscape Architecture, Design, and Preservation; Sustainability; Sustainable Architecture and Engineering; Taylor, Paul.*

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Robert Kirkman

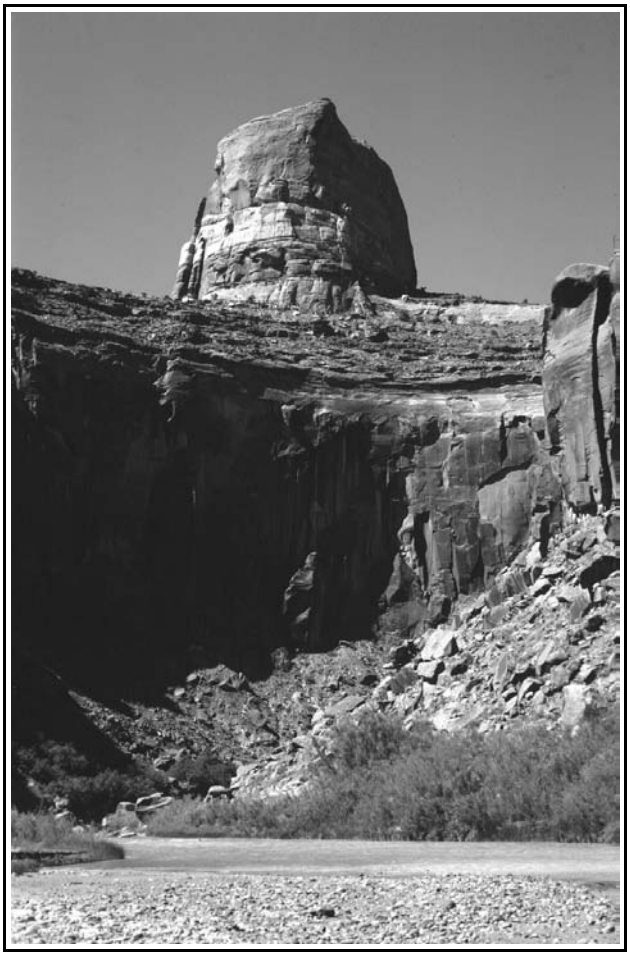
U.S. BUREAU OF LAND MANAGEMENT

The Bureau of Land Management (BLM) is responsible for managing more than 260 million acres of federal public lands, mostly scattered across the eleven western states. Created by Congress in 1946 through a merger of the General Land Office and the Grazing Service, the BLM is the largest land management agency in the Department of the Interior. Most of the BLM's acreage consists of arid and semiarid federal lands that went unclaimed during the disposal era (c. 1862–1891), when national policy was to transfer public lands into private ownership under the Homestead Act, General Mining Law, and other such laws. In addition, the BLM oversees 700 million acres of subsurface mineral resources underlying federal, state, private, and tribal lands, as well as nearly 3 million acres of timberland in western Oregon.

For its first thirty years, the BLM operated without a clear charter from Congress. In the then lightly populated West, the agency's principal focus on minerals and range resources evoked little concern among local residents, many of whom relied on mining and ranching for their economic well-being. But as the region's population expanded and urbanized and as public interest in recreation, wildlife, and wilderness grew, resource use and access conflicts became increasingly contentious, leading critics to complain that the BLM was too beholden to its traditional mineral and ranching constituencies.

In 1976 Congress responded by adopting the Federal Land Policy and Management Act (FLPMA), which is now the BLM's organic charter. The FLPMA directs the BLM to manage its lands under the "multiple-use" principle, which includes "recreation, range, timber, minerals, watershed, wildlife and fish, and natural scenic, scientific and historical values" but "without permanent impairment of the productivity of the land and the quality of the environment." To do so, the BLM must prepare comprehensive resource-management plans that effectively zone its lands for the various uses. In addition, the BLM is authorized to designate "areas of critical environmental concern" (ACECs) and was directed to inventory its lands for potential wilderness designation, a process that has placed 24 million acres in legally protected Wilderness Study Area (WSA) status. Though FLPMA includes wildlife as a delineated multiple use, it does not contain a biodiversity provision; rather, state wildlife agencies are primarily responsible for managing wildlife populations on the public lands.

Besides its FLPMA obligations, the BLM is governed by a diverse and sometimes conflicting array of resource-development and environmental laws. These laws range from the National Environmental Policy Act and the Endangered Species Act to the Mineral Leasing Act,



Grand Staircase-Escalante National Monument, Utah. *Grand Staircase-Escalante National Monument covers nearly 1.9 million acres of public land in the Unites States and serves as an outstanding source of scientific research and education. The U.S. Bureau of Land Management is responsible for managing public land, most of which consists of the arid and semi-arid land that went unclaimed in the latter half of the nineteenth century during westward expansion.* **U.S. GEOLOGICAL SURVEY.**

Taylor Grazing Act, and the Energy Policy Act of 2005. During the 1970s, once FLPMA and related environmental laws began taking hold, several western states and angry ranchers launched a political movement dubbed the Sagebrush Rebellion, which was designed to recapture control of the BLM lands. Predicated on the later-discredited theory that the states really owned the unreserved federal public lands, the Sagebrush Rebellion evaporated once Ronald Reagan was elected president in 1980 and installed James Watt as secretary of the interior to pursue an aggressive development agenda on the public lands.

During the Clinton presidency (1993–2001), however, the BLM radically changed its policy direction. Under the leadership of Secretary of the Interior Bruce Babbitt, the BLM pursued a vigorous reform agenda, not only revising its mining and rangeland regulations to incorporate new environmental standards, but also expanding the agency's wilderness review and protection authority. President Clinton created fourteen new BLM-managed national monuments (including the landmark Grand Staircase–Escalante National Monument in southern Utah) that were incorporated into a new National Landscape Conservation system, the first time that the BLM was invested with such extensive preservation responsibilities. On the BLM's Oregon and California timberlands, Secretary Babbitt instituted a new ecosystem management policy designed to promote biodiversity conservation.

But these shifts in BLM policy priorities have not held. In the aftermath of the 9/11 tragedy, the Bush administration pursued an aggressive energy-development agenda on BLM lands across the interior West. The result was an avalanche of new oil and gas leases and drilling projects that later encumber these lands. Furthermore, the BLM modified its mining responsibilities, loosened its rangeland-management regulations, and reduced its wilderness-protection obligations. Not all of these efforts succeeded, however, because the courts blocked several of these reforms. Nonetheless, the BLM remained into the early 2000s an Interior Department agency still in search of a clear identity, having been whipsawed between two very different competing visions of appropriate federal conservation policy.

SEE ALSO *Biodiversity; Environmental Law; Environmental Policy; Land Ethic; Wilderness.*

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Robert B. Keiter

U.S. DEPARTMENT OF AGRICULTURE

The act creating the U.S. Department of Agriculture (USDA) was signed by President Abraham Lincoln on May 15, 1862. In the same year Lincoln signed the Homestead Act and the Morrill Act, which created the land-grant-college system. These three acts had a significant bearing on the mission and methods of the department over the years.

The Morrill Act provided grants of federal land to states to establish colleges emphasizing agricultural and mechanic arts. The land-grant colleges developed strong research and educational ties to the agricultural communities in their states and to the USDA. Later, state-oriented systems of extension and secondary education were created to complement the university and USDA research efforts.

The USDA evolved from the U.S. Patent Office to become a research and education agency with a natural affinity to the state land-grant universities, in keeping with the mandate of the act that created the Department of Agriculture: "to acquire and diffuse . . . useful information on subjects connected with agriculture in the most general and comprehensive sense of that word, and to procure, propagate, and distribute among the people new and valuable seeds and plants" (Rasmussen 1975, Vol. 1, p. 614).

Agriculture in the United States accounts for over 933 million acres, 40 percent of America's land area. Virtually all cropland is privately owned, as is three-fifths of grassland pasture and range. Add the national forests and grasslands, which come under purview of the USDA Forest Service, and the USDA is directly involved in the land use of over 50 percent of the nation's land area. Its efforts in research, education, and cooperative extension service education indirectly affect resource use in other domains. For example, wetlands restoration affects the population size and diversity of wildlife, and wildlife can impact the income of farmers and farmland owners. Wildlife health and wellbeing is of concern to the USDA's Animal and Plant Health Inspection Service (see sidebar) and other agencies, notably the departments of the Interior and of Health and Human Services.

The USDA relates directly and indirectly to farmers; landowners; the food, fiber, and timber industries; recreationists; environmental interests; and others in rural America. The programs of the USDA are clustered under the management of seven undersecretaries: those for natural resources and environment; for farm and foreign agricultural services; for rural development; for food nutrition and consumer services; for food safety; for research, education, and economics; and for marketing and regulation. Under these clusters are many programs administered through its agencies, such as the following:

The Farm Service Agency, through its 2,346 state and county offices, is the USDA's local interface with farmers and landowners through programs affecting production management, soil conservation, and agricultural markets and finance. The agency produces and stores aerial photography and land records; administers programs on crop production, storage, finance, and insurance; provides disaster assistance and insurance; and gives technical advice and support for conservation and environmental projects.

The Food and Nutrition Service claims, "No one should go hungry in America." It administers programs affecting about one in five people, from school children to the elderly. Key operations include supplemental food for women, infants, and children; the National School Lunch Program; Food Stamps for low-income persons; child and adult food care; food assistance for disaster relief; and related research and education.

The Food Safety and Inspection Service assures the safety, quality, and labeling of meat, poultry, and eggs in the nation's food supply through research, testing, and inspection. The federal-inspection program is allied with state programs and coordinates on standards with international organizations. Under the Organic Foods Production Act of 1990, the Food Safety and Inspection

THE ANIMAL AND PLANT HEALTH INSPECTION SERVICE

The Department of Agriculture's Animal and Plant Health Inspection Service, through a system of regulations, permits, and controls, protects the health and welfare of the nation's agriculture and natural resources. Globalization and transportation has increased the exposure of America's people, animals, and plants to disease, bioterrorism, invasive or destructive species, and other threats. Since 1972, the animal- and plant-protection functions of the USDA have been consolidated under a single agency, the Animal and Plant Health Inspection Service, which monitors the condition of domestic and wild animals and plants, regulates international transportation of plants and animals, and evaluates and controls the welfare of animals in human care. (See the Web sites of the Animal and Plant Health Inspection Service and of the National Agricultural Library's Animal Welfare Information Center.)

Service is responsible for standards and labeling in the rapidly expanding organic meat and produce sector.

The Natural Resource Conservation Service (formerly the Soil Erosion Service, then the Soil Conservation Service) was formed during the drought and economic depression of the 1930s. The principal land-use-management agency of the USDA, it is a source of information and support for environmental improvement. The Natural Resource Conservation Service provides technical information and council through its Conservation Technical Assistance program. It administers resource programs such as the Wetlands Reserve Program and the National Resources Inventory, and provides technical support for resource programs in other agencies, such as the Conservation Reserve Program in the Farm Service Agency. (For an overview of conservation and other programs of the USDA, see its Web site.)

The USDA's knowledge base is rooted in the research programs of the Agricultural Research Service, the Economic Research Service, the National Agricultural Statistics Service, and the Cooperative State Research, Education, and Extension Service. Partnering with the research, education, and extension establishment in the USDA is the National Agricultural Library, with its agricultural and natural-resource collections and its information centers for alternative-farming systems and for animal welfare.

SEE ALSO *Agriculture; Animal Ethics; Environmental Education; Farms; Food; Food Safety; Forests; Hunger; Resource Management; Soils; U.S. Forest Service; Wetlands.*

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Gene Wunderlich

U.S. DEPARTMENT OF THE INTERIOR

Established in 1849 to oversee the young nation's internal affairs, the U.S. Department of the Interior (DOI) has evolved into the federal government's principal land-management and conservation agency. The DOI is responsible for nearly 450 million acres of federal public lands, most of which are apportioned between three agencies: the Bureau of Land Management (BLM), the National Park Service, and the U.S. Fish and Wildlife Service (FWS). In addition, the DOI houses several other agencies, including the Bureau of Reclamation, U.S. Geological Survey, Office of Surface Mining Reclamation and Enforcement, and the Minerals Management Service. Since its inception, the DOI has also handled federal relations with the nation's native inhabitants, through the Bureau of Indian Affairs (BIA). With oversight responsibility for these diverse agencies, the DOI does not have a single central mission but rather pursues an assortment of missions, some with a strong resource-development agenda and others with a much different preservationist agenda.

EARLY EVOLUTION OF THE DOI

In the beginning, the DOI had even more diffuse responsibilities. Congress created the DOI by consolidating several unrelated domestic bureaus into it to unburden the other cabinet agencies. Thus, Interior originally housed the General Land Office, Patent Office, Pensions Office, and Indian Affairs, and oversaw territorial governments and the District of Columbia jail system. Several of these bureaus were gradually incorporated into other newly established cabinet agencies, leaving Interior primarily responsible for the nation's publicly owned lands and resources. In 1905 Congress transferred the new forest reserves from Interior to the Department of Agriculture, thereby establishing the U.S. Forest Service and dividing oversight of federal public lands between these two cabinet departments. Despite periodic proposals to consolidate the four federal land-management agencies into a single Department of Natural Resources, Congress has consistently rejected this idea, leaving the bureaucratic landscape intact.

Within the DOI federal conservation policy has steadily evolved over the past 150 years. Acting through the General Land Office, DOI originally oversaw disposal of the nation's public lands into private ownership under such laws as the Homestead Act of 1862, the Pacific Railroad Act, and the General Mining Law. In 1872, however, Congress passed the Yellowstone Act and retained nearly 2 million acres of this unique landscape in public ownership as a ''public park or pleasuring ground for the benefit and enjoyment of the people,'' thus opening a new preservationist chapter in federal land policy. (Runte 1987, p. 46). In 1891 Congress authorized creation of the forest reserves, which has led to the retention of more than 150 million acres of public forest lands in federal ownership. By the beginning of the twentieth century, under the leadership of President Theodore

Roosevelt and Gifford Pinchot, federal policy had shifted away from disposal of publicly owned lands and resources to retaining and managing them under the new banner of "conservation"—a Pinchot-inspired doctrine holding that the public interest was better served by government ownership and scientific management of the nation's natural resources for utilitarian goals.

This new conservation philosophy took hold, and the DOI was soon freighted with several new professional bureaus responsible for implementing these new policies. In 1902 Congress created the Bureau of Reclamation to provide water resources for the arid West through the construction of federally funded dams and aqueducts. In 1905 Congress established the U.S. Forest Service to manage the new national forest system, but placed it in the Department of Agriculture. In 1910 the Bureau of Mines was established to promote mine safety and mineral technology. In 1916 Congress passed the National Parks Organic Act to consolidate the existing national parks and monuments into a national park system and to create the National Park Service to manage them under a strong preservation mandate. During the dust-bowl era of the 1930s, Congress adopted the Taylor Grazing Act, giving the DOI regulatory oversight of livestock-grazing practices on the public-domain lands. In 1940 the U.S. Fish and Wildlife Service was created to manage the growing national wildlife refuge system. In 1946 Congress merged Interior's General Land Office and the Grazing Service to create the Bureau of Land Management to oversee the unreserved public lands, those federal lands that were not under the aegis of the other conservation agencies.

POST-WAR

Congressional legislation since World War II has further muddled the DOI mission and aggravated the latent tensions between its resource-development and preservation-oriented agencies. The 1964 Wilderness Act not only established the national-wilderness preservation system, but it also instructed the Park Service, Forest Service, and FWS to review their undeveloped lands for possible inclusion in the system. During the 1970s a plethora of new environmental laws, including the Clean Water Act, National Environmental Policy Act, and the Endangered Species Act, required all federal agencies to take into account the environmental consequences of their actions before undertaking any action. In 1976 the Federal Land Policy and Management Act gave the BLM a new organic charter that provided for multiple-use management through an interdisciplinary resource-planning process and new wilderness review and management responsibilities. In 1980 Congress passed the Alaska National Interest Lands Conservation Act, which transferred nearly 60 million acres of Alaskan public lands into national-park, wildlife-refuge, or wilderness status.

The result for the DOI agencies has been an increasingly overt tension between preservation and utilitarian management policies. This conflict is evident in such settings as the Arctic National Wildlife Reserve, which has long been coveted by oil companies for its petroleum potential while environmental interests have sought to protect it from industrial development. Another example of this tension can be found in the BLM. Under the leadership of Secretary of the Interior Bruce Babbitt (1993–2001), the BLM was given responsibility for fourteen new national monuments as part of a new National Landscape Conservation System. But Babbitt's successor, Secretary Gale Norton (2001–2006), moved oil and gas exploration across the interior West to the forefront of its agenda.

One effort to reconcile these divergent conservation philosophies has come in the form of new ecosystem-management policies designed to achieve ecologically and economically sustainable resource-management goals at the regional or landscape scale. The efficacy of these policies is still being tested. Meanwhile, the Interior agencies are pursuing their individual missions under a welter of sometimes conflicting laws and policies, leaving the DOI a pastiche of different agencies and often clashing conservation priorities.

SEE ALSO *Environmental Law; Environmental Policy; Pinchot, Gifford; U.S. Department of Agriculture; U.S. Fish and Wildlife Service; U.S. Forest Service.*

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Robert B. Keiter

U.S. ENVIRONMENTAL PROTECTION AGENCY

The United State Environmental Protection Agency (EPA) was formed in 1970. As a dynamic, ever-changing, and powerful federal agency, the EPA often faces ethical choices on a range of issues, such as the mandatory

cleanup of contaminated sites and assigning liability without culpability, assessing the varying impacts of environmental regulation by race and income, whether or how to regulate nanotechnology, how to pursue and define social preferences for sustainability, and how to navigate global environmental issues like climate change. The EPA must deal with a broad range of factors in its decision making: public involvement and participation, land use, cumulative environmental impacts, the institutional ethics of economic development, legal constraints, and risk assessment processes only partially based on science.

HISTORY

Prior to the founding of the EPA, other federal agencies handled parts of some environmental issues. Their authority was often unclear, inconsistent, and sometimes conflicting. Fifteen federal agencies or parts of federal agencies handled some aspects of some environmental problems. Some states were initiating their own environmental agencies, and often-conflicting sets of regulatory procedures were beginning to emerge. There was a growing recognition of the severity, national scope, and political urgency of environmental issues.

The EPA is a creature of many federal statutes and rules. In 1970 President Nixon signed Executive Order 1110.2 which began the process of forming this new, powerful federal agency. By 1979 at least twenty-seven new environmental laws had been passed. The first waves of national environmental regulations were solidified with the passage and implementation of the National Environmental Policy Act (NEPA), the Resource Recovery Act, and the Clean Air Act in the early 1970s.

The EPA is still a relatively young and very powerful federal agency. It was designed to provide independent and objective information about the environment and to develop rules and regulations to protect it. It was also designed to have a wide purview, covering environmental issues pertaining to air, water, and land. Because of the novelty of national environmental regulations, the EPA was charged with examining new policies, assisting Congress with legal advice, and mediating political controversies.

DEVELOPMENT OF THE AGENCY

The EPA's initial tasks were massive. With every new environmental law, the EPA had to develop and enforce rules and regulations. It also had to be ready to litigate to defend these new laws and to enforce them. Many new environmental laws, such as the Clean Air Act and Clean Water Act, contain provisions that allow citizens to sue the polluter and the EPA if the EPA fails to enforce the law. Environmental groups have successfully litigated against the EPA many times on issues that lie at the foundation of modern environmental policy. For example, litigation by environmental-advocacy organizations forced the EPA to develop clean air standards.

During its first twenty years the EPA reacted to environmental issues and controversies emerging from court cases and from Congress, setting and enforcing environmental regulations that were nationally uniform and legally defensible. The early years were also notable for the cadre of dedicated senior EPA staff working to improve the presence and acceptance of the EPA from industry, states, Congress, and the public generally.

The relationship of the EPA to the states is an evolving aspect of environmental federalism. Revenue allocations flow from EPA headquarters to the ten EPA regions. Each region has from three to five states and territories within its jurisdiction. From the EPA regional offices revenue is distributed to state environmental agencies. Because many states are historically hostile to environmental regulations, EPA revenues usually make up a substantial part of many state environmental-agency budgets. States are usually free to run their programs as long as they comply with the minimum EPA requirements, although exceptions abound. If states do not want to enforce or accept a particular national program, then EPA will run it for them. States usually prefer not to lose control of regulating the environment.

The dynamic of intergovernmental relations in environmental regulatory regimes in the United States is rapidly evolving to include land-use practices that affect the environment. Ecosystems and bioregions transcend political boundaries and require cooperative national action. Protecting and preserving the environment also requires grassroots implementation at the community land-use level, a challenge not yet met by the EPA.

CHANGING MANDATES AND MERCURY MISSIONS

As the EPA has grown and evolved, so have the number of environmental laws and regulations. Often they have emerged at the EPA as part of an agency mission. Many of the early activities of the EPA involved seemingly distinct concerns about air, water, land, and solid wastes. But the environment is, in reality, multifaceted and complexly integrated. Pollution can move through an ecological cycle of land, air, and water. Along the way, it can accumulate in parts of an ecosystem and do damage to the entire system. For example, metals like mercury may accumulate in the fat and in the nervous system of fish. People who rely on these fish for food are exposed to this mercury. According to a 1969 study, the amount of heavy-metals pollution in the environment was so high that it infected mothers' milk and babies' bones to such a degree that if mothers' milk were a commercial food

item, the U.S. Food and Drug Administration would not have approved it.

The degree of danger from chemicals like DDT or metals like mercury often constitutes a separate set of controversies tied closely to concerns about liability for the damages from such exposures. There is some disparity in the degree of risk from various industrial pollutants that different cultures and communities are willing to accept, making uniform standards difficult to determine. Further, some of the cultures and communities that do not accept dangerous industrial facilities in their midst and/or require cleanup of such to residential standards of living are able to readily obtain legal remedy. Others, however, are forced into a series of "scientific" debates about the reasonability of their concern about risk. These communities end up with greater exposure to environmental risks, slower cleanup of hazardous waste sites, lower compensation and fines for environmental harms inflicted on them, and cleanups performed only to industrial, not residential, standards. These lower cleanup standards are less expensive and facilitate the sale of property. But meeting such minimal standards also keeps a higher amount of waste in those communities where such standards are imposed and makes them inappropriate for residential uses and uses for facilities for vulnerable populations like schools and hospitals

1970S: NEW LAW, RULES, AND REGULATIONS

The EPA's first public priorities were environmental protection and protecting public health, without unduly burdening the national economy. This set of priorities translated, in practice, to controlling pollution and dangerous chemicals. Standards for clean air and water were also developed and refined during the 1970s. The EPA was often sued by industries if such standards seemed too far reaching and the EPA was sued by environmentalists when it was seen to move too slowly in the development of standards or the enforcement of them.

1980S: CLEANUP

Polluting industries were not well regulated until the early 1970s, and even then regulations only partially covered some industries. Thus some egregious waste sites created before regulation was initiated or by some unregulated industries became of national concern. Mandatory cleanup laws were developed and enforced, often through the courts. As a result the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA), also known as Superfund, was enacted in 1980 to, among other reasons, identify potentially responsible parties (PRPs) for the waste-site cleanup. The law required the creator, shipper, or property owner to clean up the "Superfund" site—defined as one that was egregiously polluted. Once the PRPs are found, they must either do an adequate cleanup or pay for cleaning up the site. The EPA can force any one of a group of PRPs to pay because they are jointly and severally liable. That one then may sue the other PRPs if it has to clean up more than the share of the waste for which it was responsible. If there are many PRPs, and some declare bankruptcy or are otherwise unreachable, the secondary litigation can be extensive.

If the cleanup laws required proportional sharing of responsibility for the culpable parties, there would be much less resistance against the EPA's assigning liability for cleanup when there was no other culpability than property ownership. The reason for assigning responsibility to property owners who may not otherwise be culpable is simply that unabated and unmitigated pollution can spread via the air and water to schools, organic crops and fields, and whole communities, while the actual polluters may be hard to find, bankrupt, or corporately dissolved. There is tension between U.S. traditions of private-property rights and freedom on the one hand, and the rigorous and unforgiving requirements of pollution control and abatement on the other. As many communities became concerned about accumulating emissions, impacts on the environment and human health, and other risks from the pollution of the land, air, and water, waste sites became battlegrounds pitting neighbors against one another, neighborhoods against city hall, environmentalists against industrial corporations, and parents against commercial economic development. Liability for environmental cleanup costs have followed the owner of the land, so when a municipality forecloses on a land for failure to pay taxes, the municipality may be liable for the environmental cleanup costs. On the other hand, if the land remains abandoned, it does not generate tax revenue or get cleaned up. Thus there is a chance the pollution could migrate off the polluted property and that abandoned, polluted property will suppress the property values of surrounding properties.

In the 1980s the EPA forced the clean up of Love Canal, New York, which was built on top of a chemical company's waste dump and contaminated with carcinogenic chemicals. New York State declared it a health emergency in 1978. It was one of many events that provided the political impetus to the Superfund Act. In 1983 the EPA also relocated the community of Times Beach, Missouri, near St. Louis because of excessive dioxin contamination for using waste industrial lubricants to oil the communities' roads which was then spread over the soil by floodwaters.

In the early 1980s the EPA began to respond to the environmental justice movement. Distinct from any mainstream U.S. environmental organization, environmental

justice groups were grassroots affairs, predominantly communities of color affected disproportionately by environmental harms. It had been business as usual in the United States to place toxic and noxious facilities near and around low-income and African-American communities. A study by the United Church of Christ performed in 1986 and revisited in 2006 (Bullard et al. 2007) showed that race, more than any other characteristic, indicated the likelihood of the placement of a commercial waste site, regulated or unregulated, near a community. The more African American a community was, and is, the more likely that it has one of these unwanted land uses, to a 99.9 percent certainty or one in ten thousand chance of randomness. With the rise of environmental regulation and citizen monitoring, knowledge of environmental impacts increased. With this knowledge came evidence of unequal access to legal remedy and unequal environmental results that had been previously unaddressed in U.S. environmental policy. The failure of the U.S. environmental movement to include the interests and values of oppressed people of color also contributed to the rise of environmental justice groups. Their motto, which came out of the First People of Color Environmental Leadership Summit, held in Washington, D.C., in 1991, is "We speak for ourselves." They are now formally represented by the Office of Environmental Justice, developed in the EPA during the first decade of the twenty-first century.

Lead was and is a high-priority pollutant for the EPA. Lead comes from vehicle emissions, industrial pollution, old paint in homes and on bridges, water pipes, and many other sources. It can irreversibly impair the nervous system of unborn children and children up to the age of five. It is associated with several types of cancers and other dangerous health risks. In 1985 the EPA set new limits on lead in gasoline because of air pollution. This has been one of the most successful programs implemented by the EPA. Lead emissions from motor vehicles were reduced, and lead levels in the U.S. population decreased. This measure greatly enhanced the EPA's credibility as a regulator of corporate activities in the interests of public health.

ENVIRONMENTAL INFORMATION AVAILABLE TO COMMUNITIES

Late in the 1980s the EPA began a push to make information about hazardous chemicals and pollution more available to the public. The primary concern then was with first responders to emergencies, such as fire and police personnel. With the Emergency Planning and Right to Know Act in 1986, industries that emitted over a certain threshold of chemicals from a short list of 300 had to report them annually. That list now includes over 650 chemicals. However, there are more than 80,000 chemicals used in U.S. commerce, and less than 2 percent of them have been checked for safety. Many states and some municipalities are now developing their own right-to-know laws. These often mimic the federal law. These laws have been criticized because the information is often self-reported by industry and because only when emissions exceed a certain threshold are industries required to report them. Not all industries are included. For example, universities and colleges emit significant chemicals without reporting requirements. Also, many claim that not all chemicals with significant environmental impacts are included. Despite these serious shortcomings, these laws have been a tremendous organizing tool for environmentalists and environmental justice advocates.

1990S: PREVENT THE POLLUTION

The 1990s saw environmental mandates shift to pollution prevention. The decade was inaugurated in 1990 with a major amendment to the Clean Air Act of 1963. Some 30 million tons of toxic chemicals were prevented from going into the air in the early years of its implementation. Food quality, second-hand smoke, and safe drinking water also dominated the environmental policy development at the EPA. Concern for environmental justice continued to grow in prominence, and EPA began to study issues of sustainability.

TWENTY-FIRST CENTURY: POLICIES IMPLEMENTED, GLOBAL CONCERNS LOOM

During the first decade of the twenty-first century many of the pollution-prevention, -control, and -regulation policies established over the last quarter of the previous century continued to be implemented. Like most federal agencies, the EPA responded to the 9-11 bombing of the World Trade Center towers in 2001. The EPA issued a strategic plan for homeland security in 2001 and updated it in 2004. However, because the United States did not endorse many important world environmental treaties such as Kyoto, it is difficult for the EPA to coordinate environmental policy with other countries. It is also difficult for international U.S. businesses which must comply with these global concerns in order to operate in other countries and compete internationally.

THE EPA TODAY

The strength of the EPA is its credibility here and abroad. Its information, monitoring, research, and power to control behavior through regulation in the face of unknown contingencies contribute to its credibility. Some of the vulnerabilities of the EPA stem from its lack of inclusion of all affected communities and from controversies that surround its enforcement policies. The primary enforcement theory at the EPA is compliance, not general or specific deterrence. For example, if the accused polluter simply confesses, the EPA applies a "reduction of gravity

rule" to reduce the monetary penalty by 50 to 75 percent right off the top. Citizens are often excluded from EPA decision making, even when it affects them. For example, in a federal environmental-impact statement, citizens are not given notice of a preliminary environmental assessment of their neighborhood until after it has been determined, based on this preliminary assessment, whether there are significant environmental impacts that require a full environmental-impact assessment be done or not. Citizens who may care, may know, or may simply want to participate are not given an opportunity until the process is far advanced.

Because the EPA is tied tightly to the specifics of each piece of legislation setting environmental policy and mandating its responsibilities, it is difficult for it to strategically plan for future environmental contingencies. This uncertainty makes it difficult for it to work with new, non-legislated ways of approaching environmental controversies, issues, and problems, such as the rising social concern for sustainability. However, the EPA is adaptable to changing political environments. It is exploring supplemental environmental projects (SEPs), begun in the late 1990s, so that convicted polluters can mitigate the damage they have caused in a community. By exploring collaborative, multistakeholder SEPs—SEPs with more than two stakeholders, usually community, industry, environmental, and sometimes labor organizations—the EPA is moving beyond the mandated citizen participation of the 1970s and 1980s and into citizen involvement for long-term environmental planning.

SEE ALSO *Environmental Justice; Environmental Law; Pollution; Risk Assessment.*

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Robert Collin

U.S. FISH AND WILDLIFE SERVICE

In the lands that later became the United States, early European settlers encountered an apparently unlimited supply of wildlife and other natural resources and often had utilitarian, negativistic, and dominionistic views of wildlife. They embarked on a process of wildlife slaughter and habitat destruction, including deforestation, on a mass scale. That process continued through much of the nineteenth century and caused the local or regional extirpation of many species, including most large predators, white-tailed deer, elk, turkey, waterfowl, and the American bison. The first conservation efforts in the United States occurred at the state level because wildlife was considered a public resource held in trust by the states for the benefit of all the people; this was known as the public trust doctrine. However, individual states struggled to protect wildlife species that crossed state and national boundaries or were in the possession of commercial hunters and trappers.

Vermont was one of the first states to face a landscape stripped of natural resources. Deforestation in that state influenced George Perkins Marsh's *Man and Nature* (1864), which suggested that societal collapse would follow environmental degradation, and led Gifford Pinchot, the first chief of the U.S. Forest Service, to craft an anthropocentric and utilitarian ethic for conservation in the United States. That ethic defined wise use of natural resources as generating "the greatest good for the greatest number for the longest time" (Pinchot 1947, pp. 325–326) and provided the context for the emergence of the U.S. Fish and Wildlife Service (USFWS).

EARLY HISTORY OF THE USFWS

The roots of the USFWS can be traced to 1871, when Congress created the U.S. Commission on Fish and Fisheries to protect rapidly disappearing food fish stocks. A parallel effort to study the food habits of migratory birds led to the establishment of the Office of Economic Ornithology in the Department of Agriculture in 1885. The U.S. Commission on Fish and Fisheries was renamed the Bureau of Biological Survey in 1905 and was given management responsibility for the U.S. wildlife refuge system that started with Theodore Roosevelt's establishment of the first Federal Bird Reservation on Pelican Island, Florida, in 1903. In 1939 the Fisheries and Biological Survey bureaus were transferred to the Department of the Interior.

In 1940 those bureaus were combined into the Fish and Wildlife Service, and in 1956 the Fish and Wildlife Act created the USFWS. During the early years the responsibilities of the USFWS reflected its utilitarian roots: It focused on enforcing the law, regulating trade, and conducting research. Those activities were intended to protect and manage game species and minimize conflicts between wildlife and agriculture. The utilitarian approach to conservation was largely responsible for the restoration of elk, white-tailed deer, the American bison, turkey, bear, and many other species throughout the United States.

CHANGES IN THE ROLE OF THE USFWS

The role of the USFWS changed drastically in the 1960s and early 1970s, when the environmental and animal rights movements began to flourish. During that period the environmental ethics guiding wildlife conservation diverged from the early anthropocentric and utilitarian focus articulated by Pinchot. Aldo Leopold's *Sand County Almanac* (1949) helped promote an ecocentric ethic—the land ethic—for wildlife conservation. The more ecocentric ethical views prevalent in the environmental movement played a role in the establishment of the Endangered Species Act (ESA) of 1973. The ESA prohibited the importation, exportation, taking, or possession of a registered endangered species and gave USFWS responsibility for listing of, recovery planning for, education about, and delisting of species.

The ESA protected animal and plant species without consideration of the economic, cultural, and social preferences of humans. The ecocentric approach to wildlife conservation taken by USFWS was responsible for some notable conservation successes, including the delisting of the American alligator, gray wolf, grizzly bear, and bald eagle. However, the tendency to subordinate human interests to the protection of listed endangered species led to conflicts between the USFWS and several rural communities. Conflicts surrounding the spotted owl in the Pacific Northwest and the coho salmon in the Klamath Basin in Oregon were among the most publicized. Those conflicts raised questions about how to integrate the interests of stakeholders at the local, regional, and national levels. In some cases the conflicts threatened wildlife management objectives by alienating private landowners. Critics of the ecocentric focus of the USFWS argued that fear of ESA-related restrictions was a disincentive for wildlife conservation on private land and might motivate landowners to get rid of threatened species before restrictions on property uses were mandated. Landowners in some areas did restrict access to their land in efforts to prevent the discovery of endangered species.

Fish and Wildlife Service Officer with Illegal Trade Items. *The responsibilities of the USFWS during their early years involved enforcing the law, regulating trade, and conducting research. Today, despite a period of a more ecocentric approach that emerged in the 1960s and 1970s, the USFWS continues to take an utilitarian approach to wildlife preservation and conservation.* **PHOTO BY CARL ZITSMAN/U.S. FISH AND WILDLIFE SERVICE.**

REESTABLISHMENT OF THE UTILITARIAN PERSPECTIVE

In the mid-1990s the ethical perspective of USFWS started moving back toward anthropocentric utilitarianism. Unlike the earlier shift to ecocentrism, this move was tied to presidential influence over the USFWS rather than to a national social movement. In the 1992 presidential race Bill Clinton promised to move the country beyond a false choice between environmental protection and economic growth. His administration pushed the Habitat Conservation Planning process to achieve that objective. Habitat Conservation Plans provided a loophole in the absolute rule of not harming endangered species. With an approved Habitat Conservation Plan, landowners, government entities, and corporations could kill individuals from a population of endangered species under the protection of incidental take permits. The 14 incidental take permits issued before the 1992 presidential race paled in comparison to the 425 approved as of July 2003.

The shift toward anthropocentric utilitarianism in USFWS operations expanded with the 1995 Safe Harbor Program and the 2007 Endangered Species Recovery Credits system. The Safe Harbor Program exempts landowners from further restrictions on their land when they agree to manage the land for endangered wildlife, and the

Credits system allows private and public entries to harm endangered species in exchange for purchasing conservation credits that require proper habitat management elsewhere.

This move back to anthropocentric utilitarianism has increased the ability of the ESA to accommodate human interests but could weaken protection for endangered species. Critics argue that sidestepping the exclusive focus on biotic integrity will allow human interests to displace the needs of other species.

SEE ALSO *Conservation; Environmental Law; Forests; Habitat Loss; Leopold, Aldo; Resource Management; Utilitarianism.*

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U.S. FOOD AND DRUG ADMINISTRATION

The U.S. Food and Drug Administration (FDA) is responsible for protecting the public health by assuring the safety, efficacy, and security of human and veterinary drugs, the nation's food supply, medical devices, cosmetics, and several other products. The FDA is also responsible for advancing the public health by helping to speed innovations that make medicines and foods more effective, safe, and affordable (FDA Mission Statement). In the area of food safety, the FDA executes the Federal Food Drug and Cosmetic Act (FFDCA) (21 U.S.C§§ 301–399) by setting standards for food and food products, inspecting food production and distribution facilities, and ensuring proper labeling. In the area of animal health, the FDA is responsible for regulating the manufacture and distribution of food additives used in animal feed and of drugs that will be given to animals.

Under this diverse portfolio of products and activities, the FDA also has a mandate for environmental protection. The FDA is required under the National Environmental Policy Act (NEPA) (21 C.F.R. Part 25) to take environmental considerations into account in all final agency actions. For example, during the review of animal drugs under FFDCA, the FDA considers the excretion of drugs in animal waste and the effects of drug residues on the environment. NEPA requires that U.S. agencies include an environmental impact statement (EIS) with every major federal action that significantly affects the quality of the human environment. Environmental assessments (EAs) are prepared to help determine if an action will have a significant impact on the environment and whether an EIS is required.

The FDA is often faced with situations in which goals of human and animal health protection, speeding innovation, and environmental protection are at odds. Decisions under NEPA do not require that the action most beneficial to the environment be taken. For example, the FDA might be faced with a policy choice about whether to accept environmental harm from its actions to protect human or animal health or to make foods safer or more affordable. A contentious instance of this dilemma is the approval of the subtherapeutic use of antibiotics in feed to promote animal growth during agricultural production. Environmental and consumer groups have argued for a precautionary approach to limit or ban the use of antibiotics in animal feed. Concerns include the harmful effects of antibiotic residues on native species in the environment and the increased development of resistant microorganisms that cause disease.

The ethical principles of beneficence (doing good) and nonmaleficence (doing no harm) are prominent when the FDA makes decisions in the face of competing goals or interests. The distribution of risks and benefits to various stakeholder groups—the environment, animals, and humans—is an important consideration. Equity in decision making comes into play when the FDA considers this distribution. Integrity, autonomy, and justice are also prominent in how the agency makes decisions. For example, transparency in decision making, avoiding conflicts of interest in conducting safety studies, and giving consumers or users of products the right to know and choose based on good information are manifestations of these principles in the FDA's regulatory context.

An example of an emerging issue that spans environmental protection and the FDA's jurisdiction is the agency's proposal to regulate genetically engineered animals as new animal drugs (NADs) under the FFDCA. The claim by the agency is that the introduced and engineered gene is the "drug," because it alters the structure or function of the body of animals. The FDA has

been considering regulatory approval of genetically engineered (GE) fish with growth-promoting genes since the late 1990s. This decision has been stalled in part because of continuing controversy over genetically engineered organisms in food and agriculture. Environmental and consumer groups and scientists are concerned about the environmental risks of GE fish, including adverse effects on native populations, relatives, or other species of predators or prey from the introduced fish if they were to escape or were intentionally released. Many in the aquaculture industry are excited about the potential of GE fish to resist disease, grow faster, or have fewer resource needs (thus improving the environment). As the regulatory agency with primary responsibility for GE animals, the FDA will need to carefully consider its authority in this area under NEPA.

The FDA will also be faced with considering ethical principles in its decision making about GE animals. Federal agencies like the FDA are asked to weigh the risks, benefits, and costs of their decisions (to use, in effect, a utilitarian ethical framework) to comply with the order of the Executive Office of the President (1993). However, procedural justice, autonomy, inherent objections on fundamental grounds (''playing god''), and the integrity of the regulatory approval system are also prominent in GE animal oversight, as reviewed by Thompson (2007).

SEE ALSO *Animal Ethics; Environmental Policy; Food Safety; Genetically Modified Organisms and Biotechnology; Risk Assessment; U.S. Department of Agriculture; U.S. Environmental Protection Agency.*

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U.S. FOREST SERVICE

The United States Forest Service (USFS) administers 155 national forests and twenty national grasslands—some 193 million acres of land—in forty-four states, Puerto Rico, and the Virgin Islands. The USFS was established in 1905 within the U.S. Department of Agriculture to administer the nation's newly created national forests and the related forestry programs of the federal government. The creation of the USFS was a key event of the Progressive-Era conservation movement as it gained definition and broad public and political support during the presidency of Theodore Roosevelt (1858–1919, president 1901–1909). Since then the USFS has played an important role in the evolution of conservation policy, science, and practice; it has been both a generator and barometer of changing environmental values and ethics. A major force in shaping American natural-resource management, it has had a broad influence on forestry and environmental policy internationally, at other levels of government, and in the private and nongovernmental sectors.

ORIGINS AND EVOLUTION OF THE USFS

By the mid-1800s, widespread clearing of the forests of the eastern United States for farming and for timber, fuel, and other forest products had begun to raise concerns among protoconservationists. In his classic *Man and Nature; or, Physical Geography as Modified by Human Action* (2006 [1864]), George Perkins Marsh critically examined deforestation and its impact on climate, soil conditions, hydrologic dynamics, watershed function, and forest plant and animal life. Correcting the ''terrible evils'' of deforestation, Marsh wrote, was among ''the most obvious of the duties which this age owes to those that are to come after it'' (p. 279). Through his writing and his advocacy Marsh influenced those who later created the USFS, echoing his mandate to ''care for the moral and material interests of our own posterity'' (p. 279).

In the three decades following the Civil War, the rapid development of the mid-continent's cities, towns, and farms, along with the advent of new sawing, milling, and transportation technologies, led to the near-complete removal of the white pine forests of the upper Great Lakes. As these forests were depleted, devastating slash fires often followed in the wake of the loggers and fed growing fears of a ''timber famine.''

As public attitudes and political sentiment began to shift, the federal government took its first concerted actions on behalf of forest conservation. In 1876 Congress appointed Franklin B. Hough (1822–1885) as a special agent in the Department of Agriculture, charged with assessing the state of the nation's forests. In 1881 Hough's responsibilities were expanded within a new Bureau (later Division) of Forestry, the precursor to the USFS. The Forest Reserve Act of 1891 empowered the president to withdraw forestlands from the nation's public domain and to designate them as forest reserves under the administration of the U.S. Department of Interior.

Over the following fifteen years 100 million acres of forest reserves were created, primarily in the western states and territories. The Organic Act of 1897 directed the Secretary of Interior "to make such rules and regulations and establish such service as will insure the objects for which forest reservations are created . . ." (U.S. Congress 1897). Those "objects" were "to protect and improve the forests for the purpose of securing a permanent supply of timber for the people and insuring conditions favorable to continuous water flow" (U.S. Congress 1897). Under the Transfer Act of 1905, the reserves were renamed national forests. The Transfer Act shifted responsibility for their administration to the Department of Agriculture, where the old Division of Forestry was reassigned and rechristened as the U.S. Forest Service.

These developments exposed latent philosophical tensions in the emerging national conservation movement. The change in nomenclature from *forest reserves* to *national forests*, with the implication that the nation's forest estate was not to be set aside but used, revealed the movement's clashing values. Utilitarian conservationists (often identified with Roosevelt's "chief forester," Gifford Pinchot) stressed the instrumental value of the nation's forest resources and the need for efficient, scientifically informed forest management. In its classic formulation the USFS administration of the national forests was to serve "the greatest good for the greatest number over the long run." It pursued this policy by applying principles of sustained-yield silviculture developed in the European forestry tradition. By contrast, preservation-minded conservationists (often identified with the author and naturalist John Muir) emphasized the intrinsic, aesthetic, and spiritual values of forests and pushed for their protection from the incursions of settlers, loggers, grazers, miners, and dam builders. The clash of these schools played out most famously in the extended conflict over a proposed dam (eventually approved in 1913) on the Tuolumne River in Yosemite National Park's Hetch Hetchy Valley.

The timber values of the national forests dominated USFS management goals and actions through the twentieth century. The service's views and values did not, however, go unchallenged. Through the 1920s and 1930s scientists, foresters, and conservationists, within and beyond the USFS, began to champion a wider variety of forestland assets: water, wilderness lands, wildlife, and recreational opportunities. Aldo Leopold, who joined the USFS in 1909 and spent the first half of his career working in the agency, became a leading voice for recognition of the full spectrum of forest values and for their effective integration into conservation planning. Leopold's appreciation of the implications of ecology for sustainable land management drew on his own early field experience in the national forests of the American Southwest. Leopold's land ethic, by emphasizing the integrity, diversity, and self-renewing capacity of ecological communities—what he termed "land health"—sought to bridge the divergent utilitarian and preservationist strains of conservation thought; all forest values, he held, depended on the healthy functioning of the forest as a whole.

POST–WORLD WAR II DEVELOPMENTS

The end of World War II brought new pressures to bear on the national forests and the USFS. Before the war exploitation of timber resources was concentrated in the nation's private forestlands. After the war the baby boom (and the corresponding construction boom) across the United States increased demand for timber from the national forests. Large-scale industrial forestry operations became the norm, most visibly in the form of expanded clear-cutting. In the USFS narrowly defined economic values overwhelmed ecological rationales for better integrated forest management.

At the same time the more urban and suburban postwar generation took to the national forests in growing numbers for recreation, which became an increasingly important use of forestlands. This shift in turn contributed to a widening public awareness of environmental values and the rise of the environmental movement. Thus, as material and recreational demands on the national forests intensified, so did the movement for protection of roadless wildlands within the forests, culminating in passage of the Wilderness Act in 1964.

In an attempt to reconcile these competing public demands—and by implication the varied interpretations of the "greatest good"—the USFS followed the mandate of the Multiple Use and Sustained Yield Act of 1960 (MUSY). MUSY directed that the national forests be "administered for outdoor recreation, range, timber, watershed, and wildlife and fish purposes" (U.S. Congress 1960). MUSY stated that all of these uses should be accorded equal importance and directed the USFS to "[achieve] and [maintain] . . . a high-level regular output of the renewable resources of the national forest without impairment of the land's productivity" (U.S. Congress 1960). MUSY's goals proved difficult to realize. In the absence of any robust set of common values or shared commitment to land health, multiple competing interests continued to strive for predominance in national forest management, and the USFS remained a magnet for political controversy.

By the late 1980s an array of intractable forest management issues were playing out on the national stage: forest fragmentation, with its the attendant impacts on biological diversity; delineation and protection of the remaining roadless areas in the national forest system;

The Northern Spotted Owl. *In 1986 the U.S. Forest Service initiated steps to protect the spotted owl from extinction by limiting timber sales in mature portions of National Forests, the species' natural habitat. This sparked a lengthy and heated controversy between environmentalists and the timber industry when measures to protect the spotted owl may have led to layoffs and decreased business for loggers and mill workers. In 2008 the spotted owl continued to be classified as a threatened species.* **PHOTO BY JOHN AND KAREN HOLLINGSWORTH/U.S. FISH AND WILDLIFE SERVICE.**

the impacts of heavy grazing on forests, grasslands, watersheds, and riparian communities; disruption of historic fire regimes because of a century of fire suppression and postwar development at the urban/wildland interface; intensified recreational demands on forests; and local timber economies that were faltering because of mechanization, dislocation, and the impacts of the globalizing economy. Caught between the intensified scrutiny of the environmental movement (and especially the deep ecology–inspired Earth First! Movement) on the one hand and the property rights–focused wise-use movement on the other, the USFS (and other public land agencies) found itself torn between the opposing forces of forest utility and forest protection. The struggle in the late 1980s and early 1990s over the fate of the northern spotted owl and the logging economy in the national forests of the Pacific Northwest was emblematic of the broader effort to overcome conservation's philosophical divide. Out of this complex set of circumstances, foresters and other resource managers began to revisit their philosophical foundations and to search for a new management paradigm. In the USFS this trend was reflected by the formation, in 1989, of the Forest Service Employees for Environmental Ethics (FSEEE). This self-criticism within the forest service, and within professional forestry more generally, was evidenced in other land-management agencies and in the natural-resource management professions. One result was the emergence of *ecosystem management* as a potentially more integrated and unified approach to land stewardship. Embracing a broader range of intrinsic and instrumental values, recognizing the dynamic nature and scale-dependent processes of ecosystems, and acknowledging the active and mutual influence of human and natural communities, ecosystem management (and its variants) remained as of the early 2000s a work in progress, subject to varied interpretations and vulnerable to changing political forces. It has, at minimum, ushered land ethics back toward the center of discussions about national forest management, USFS decision making, the public interest, and "the greatest good."

As the USFS enters its second century, it continues to play a leading role, nationally and internationally, in shaping the ethos of the conservation/environmental movement. Even as the demand for forest products ("green"-certified or otherwise) continues, national forests are increasingly appreciated for nontimber values and services: as water sources, carbon sinks, and biodiversity repositories; as anchors for whole and sustainable landscapes; as open space and settings for healthy human communities; and as classrooms for an increasingly land-detached public. The USFS faces the challenge of managing the national forests in response to shifting demographics, new scientific knowledge, and uncertain economics, even while facing continuing threats from invasive species, habitat fragmentation, accelerating climate change, and other widespread forces of environmental change.

SEE ALSO *Conservation; Ecology: III. Ecosystems; Environmental Law; Forests; Hetch Hetchy; Marsh, George Perkins; Muir, John; Pinchot, Gifford; Preservation; Resource Management; U.S. Department of the Interior; Utilitarianism; Wilderness Act of 1964.*

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Curt Meine

U.S. NATIONAL PARK SERVICE

The design of the U.S. national parks and the management philosophy of the National Park Service (NPS) have grown out of the mainstream principles and practices of American landscape design. The agency's two main missions are (a) to protect natural scenery, cultural features, and wildlife of the parklands and (b) to make them accessible for public enjoyment. The tensions between these two goals make up much of the history of the NPS and have spawned many changes and posed many challenges in the management of the National Park System.

FOUNDING VISION OF NATIONAL PARKS' DESIGN AND MANAGEMENT

The three men who most heavily influenced the initial design and management philosophy of the national parks were George Perkins Marsh (1810–1882), Andrew Jackson Downing (1815–1852), and Frederic Law Olmsted Sr. (1822–1903). Marsh advised the nation to set aside lands as public parks and preserves and to protect its natural resources (1864). Downing translated the idea of wilderness into design concepts. He was, according to NPS historian Linda Flint McClelland, ''intensely aware of the tremendous influence that primeval nature, with its dramatically changing landforms, variations of light and shadow, sounds of moving water, and enveloping vegetation could exert on the human senses'' (1997, p. 20). He introduced the picturesque style to the United States, adapting English landscape garden techniques to heighten the observer's experience of nature. Olmsted elaborated this tradition, creating systems designed to promote the circulation of human traffic amid a series of pictorially composed views. Olmsted's recommendations—which became the guiding principles of the NPS—articulated the model for national parks: Undiminished nature should be made accessible, accommodating development while subordinating it to the environment and scenic values. Accordingly, park designers adopted naturalistic approaches to landscape preservation and development, integrating roads and structures into their native surroundings and minimally disrupting topography and vegetation to provide recreational access and to educate the public about their environment's natural and cultural legacies.

ORIGINS, PUBLIC EXPECTATIONS, AND PARK MANAGEMENT

The first national park in the history of the United States—and the world—was Yellowstone National Park, created in 1872. The year 1890 saw the creation of Yosemite, Sequoia, and General Grant national parks as the idea of protecting unique natural environments became a solidly entrenched feature of U.S. policy. The park system expanded over the ensuing quarter century, culminating in the founding of the National Park Service in 1916.

J. Baird Callicott has argued that humans go to the wilderness in a spiritual quest to engage the natural world and counter the alienation fostered by modern urban civilization (1998). Fittingly, then, the law that founded the NPS, the National Park Service Organic Act of 1916, expressly set down the service's dual purposes: ''to conserve the scenery and the natural and historic objects and the wildlife'' and ''to provide for the enjoyment of same,'' but so as to ''leave them unimpaired for the

Everglades National Park. *A Great Egret (*Adrea alba*) stands among cypress trees in Everglades National Park in south Florida. The park, formally established in 1947, encompasses 2,354 square miles of mangrove swamps, pinelands, pond apple and cypress forests, and saw grass prairie. Hundreds of thousands of tourisits visit it each year.* **NPS.**

enjoyment of future generations.'' (National Park Service 2008b). Reflecting the then-fashionable aesthetic of the sublime and picturesque, America's national parks evolved as sanctified places, neither simply religious nor aesthetic (Frow 1997).

The National Park Service began to develop a transportation system in the 1920s that focused primarily on road construction to facilitate automobile usage. The early transportation planning by the Bureau of Public Roads in the 1920s sought to design a system of ''touring'' roads that connected many of the largest western parks (Hartzog 1988). As automobile usage increased, the deficiencies of the early road design became more apparent, bringing still more road design and construction. Attempting to solve automobile congestion, the NPS upgraded existing roads and infrastructure, thereby stimulating renewed cycles of increased use and ecosystem deterioration. Park visitation rose dramatically during the ensuring years: from 358,000 in 1916 to 287 million in 1999, dropping to 266 million in 2003 and rising to 275 million in 2007 (National Park Service 2008a).

FROM PRESERVATION AND CONSERVATION TO RESTORATION AND RESILIENCE

The tension between preservation of the parklands and the depredations caused by visitors' use has played out against the tradition of American Progressivism's conservation policy. As Worster (1979) has noted, in contrast to preservation, conservation holds that (a) the resources of public lands, including national parks, are abundant or renewable and thus meant to be consumed and (b) rationalized long-term practices can manage continuing production to maximize prosperity for the whole nation. An implication of conservation philosophy is that even once-ravaged parts of the natural environment can be maintained and restored (as accomplished, for example, between 1900 and 1925 with once-decimated deer herds. As sanctuaries the national parks now play a major role in restoring native species, protecting their genetic integrity, and affording the public the chance to become acquainted—or reacquainted—with them. Invasive species are removed, and the negative effects of erosion,

WOLVES RETURN TO YELLOWSTONE

Attempts to manage wildlife respond to changes in policy, practice, natural processes, and scientific knowledge. When the national parks were established, a variety of large mammals were present (gray wolves, grizzly bears, deer, and elk), although hunting and trapping almost exterminated many once-abundant creatures (deer had been killed by hunters until almost none remained by the 1880s). Changes in policy and actions based on limited observations often led to dramatic swings in the populations of individual species, oscillating from severely diminished to far in excess of a habitat's carrying capacity, with considerable variation from region to region. For example, the Progressives' view that natural resources needed to be efficiently managed included increasing "crops" such as cattle, sheep, and deer by eliminating predators. Serious predator extermination began in the late 1800s and proceeded through the early 1900s (Worster 1979). By the 1940s gray wolves were rare in the Yellowstone National Park region, with no evidence of any population (save for a random stray) by the 1970s. It appeared that the elimination of large carnivores led to the recovery of the population of deer, elk, bison, and moose (as well as to fewer lost livestock) (US–Parks 2008).

As the numbers of grazing animals increased, montane riparian willow and aspen stands became overgrazed. Because the change along rivers and streams was pronounced, the adverse effects rippled to beavers, fish, birds, and then organisms in the networks of interdependency through adjacent grasslands.

These adverse conditions prompted a turnabout in policy: It seemed a good idea to reduce the elk, bison, moose, and mule deer to remove the direct threat to vegetation and the rest of the ecosystem. There were many options—each loaded with socially charged and contested assumptions and implications—ranging from increased hunting to covert shooting by government personnel to attempts to redistribute the large animals. In 1987 the U.S. Fish and Wildlife Northern Rocky Mountain Wolf Recovery Plan experimented with the reintroduction of gray wolves; in 1991 they were restored to Yellowstone and central Montana.

The reintroduced gray wolves have thrived to the point that they have been removed from the endangered species list. There certainly are now fewer elk, and they have changed their habitat use. It is not clear, however, to what extent this is due to wolves, other predators, or changes in the weather (National Park Service 2008, US–Parks 2008). More research and interpretation need to be done to understand the impact of the wolves, not only on the entire ecosystem but on the "behaviors and life-history traits that confer resilience to environmental disturbances at various temporal and spatial scales . . . at different hierarchical levels" (Weaver et al. 1996, p. 964).

At the same time that native species have been preserved or restored, the tourist population in the parks has boomed. Since 1995 more than 100,000 visitors have swarmed over the park to observe the once-absent species. Hence the NPS still faces the perennial dilemma: developing management policies and practices that can realize its two elusive and often conflicting goals: preserving both wildlife and public access.

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flooding, and other disturbances caused by human activities such as "road construction, visitor impact, and facility maintenance" are remediated (Majerus 2000, p. 77; National Park Service 2001). Such projects are undertaken in diverse environments: grassland prairies, hardwood forests, wetlands, streams, lakes, and marine systems such as coral reefs.

In the process of restoration, managers have to decide what to restore (to what state) and what to remove. Some critics have argued that NPS policies have to generate a more sophisticated idea of checks and balances among species to achieve stabilized populations and environments. They contend that management practices need to deal with the cases in which an isolated

species was restored only to have the ecosystem unpredictably collapse in new ways. Some argue that complexity theory may provide the best scientific basis for management policy: "Ecosystem restoration is invariably difficult and disturbed; . . . ecosystems often exhibit classic traits of complex systems . . . [and] responses to perturbations, including restoration efforts, can be highly nonlinear and lead to management surprises" (Gross 2004).

As Walker and Salt explain, with complexity theory comes another concept that dramatically changes goals and practices: "Resilience [is] the capacity of a system to absorb disturbance and still retain its basic formation and structure. . . . Resilience thinking presents an approach to managing natural resources that embraces human and natural systems as complex systems continually adapting through cycles of change" (2006, p. 10). They argue that, because current research usually simulates the future by extrapolating from the past (using conventional data about average conditions and incremental growth but setting aside major events), it provides an inadequate, even misleading, basis for sustainable resource management (Walker and Salt 2006, Peterson et al. 2003). There is a growing consensus that new modes of research and practice are needed (National Park Service 2000).

In the view of many policy analysts, studies and actions concerning complex, dynamic ecosystems need to respond to whole communities and events for longer periods and over wider areas (including regional variations and differences in elevation). Complexity studies often revise previous interpretations, such as the impact of pavement on stream communities: "Thresholds appear to exist, which may be catastrophic," but are not immediately apparent, because paved roads and parking lots "most likely do not cause degradation directly. Instead, [they] are a surrogate for a wide range of other variables, such as [altered water flow], increased stream temperature, enhanced erosion, habitat degradation, and so on" (Hilderbrand et al. 2001, p. 401). Sprawl reduces and fragments habitat and erodes existing buffer zones, in turn harming wildlife and plants (Trombulak 2000). The NPS has attempted to address these problems, temporarily closing areas to protect sensitive species, capping commercial development, improving wildlife corridors, and funding alternative modes of transportation, but traditional NPS management practices favoring development and some recreational activities continue to dominate park policy, perpetuating many of the threats to the ecological viability of national parks.

To be properly understood and operationalized the key concepts need to be more precisely defined and the environmental factors more thoroughly researched. For example, "habitat types are rated for development potential (e.g., camping areas and trails) on the basis of their resistance . . . (the ability of a habitat to tolerate human impacts, such as trampling, without undergoing major changes in community composition and structure) and their resilience (the ability of vegetation on a habitat to recover once it has been destroyed or severely disrupted)"; but there is no universal rule of relationship (NPS 2007, p. 4). Counterintuitively, sometimes resilience and resistance vary inversely to each other, as in the forest communities of Mount Rainier National Park or with the fauna's low resistance but high resiliency to nonnative fish introductions in Yosemite National Park lakes (Hilderbrand et al. 2001).

Complexity theory is pushing management practices away from the goal of restoration and toward resilience, resulting in a tension between these two newer approaches in both scientific research and management policy, even as the older differences between preservation and conservation persist. Although the various tasks facing the NPS do have some positive connections, they also pull in notably different directions—certainly the research and practices vary for each, thus multiplying management challenges to generate alternative scenarios that can offer satisfactory visitor experiences that will not damage the parks' ecological integrity.

SEE ALSO *Ecological Restoration; Endangered Species Act; Land Ethic; Preservation; Wilderness.*

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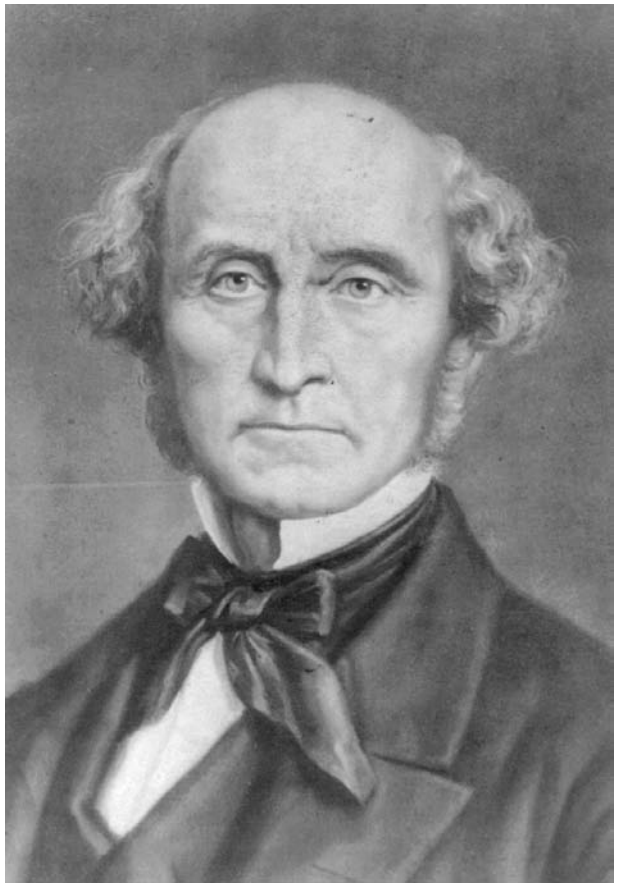
UTILITARIANISM

Utilitarianism is a popular ethical theory that has greatly influenced the development of law, economic theory, and many areas of public policy, including technological and environmental planning. Along with rights theory, it may be said to form the ethical basis of modern liberal democracy. This entry explores the possibility of basing environmental ethics on utilitarianism.

According to the most famous advocate of utilitarianism, John Stuart Mill, "The creed which accepts as the foundation of morals, Utility, or the Greatest Happiness Principle, holds that actions are right in proportion as they tend to promote happiness, wrong as they tend to produce the reverse of happiness. By happiness is intended pleasure, and the absence of pain; by unhappiness, pain, and the privation of pleasure" (2001 [1863], chap. 2).

Utilitarianism is the most widely accepted consequentialist theory. Consequentialism is the approach to ethics that considers that the rightness of an act is determined by the good achieved by that act for those affected, and by nothing else. Thus no act is inherently right or wrong, and the rightness or wrongness of an act is independent of such factors as the motive or character of the agent. The British jurist Jeremy Bentham (1789) is usually considered to be the founder of utilitarianism. He, Mill, and Henry Sidgwick (the third great classical utilitarian) believed that nothing is good in itself except happiness, which they identified with pleasure; they are thus known as hedonistic utilitarians, from the Greek word for pleasure. Everything else is valuable only instrumentally, as a means to producing pleasure. Thus utilitarians reject claims about the intrinsic value of environmental objects, species, and ecosystems, which are commonly believed to be central to environmental ethics.



John Stuart Mill, 1884. *Mill (1806–1873) is considered one of the greatest advocates of the ethical theory of utilitarianism. Mill attempted to defend the controversial theory against its critics. For example, his idea of "rule utilitarianism" qualified the belief that an act is good or bad based only on the amount of happiness it produces, by suggesting that an actor must consider whether an experience shows an action to produce positive consequences for it to be "right."* **THE LIBRARY OF CONGRESS.**

More recently, utility has been seen as the satisfaction of interests or preferences. Its proponents, notably the celebrated Australian philosopher Peter Singer (1993), regard it as a complete theory of ethics, that is, as capable of identifying the right thing to do in every conceivable situation.

SOME PROBLEMS

From the beginning, utilitarianism was controversial, for several reasons. First, many people were offended by the determinedly secular nature of the theory. It was not so much that it questioned the widely accepted idea that

morality was a function of divine command, but that it left no room for it or any other moral authority.

Second, since the amount of happiness is all that counts, ethically it does not matter whose happiness is affected. Insofar as institutions such as slavery and racist and sexist practices diminish the happiness of their victims (a reasonable thing to suppose), slavery and racism and sexism must be abolished. Thus utilitarianism is profoundly democratic and egalitarian, unlike the society of the day.

Third, conservative moralists were shocked by utilitarianism's implicit acceptance of behavior that was widely regarded as sinful. If pleasure is the only good, then any activity that gives pleasure must be good, and the more pleasure it gives, the better it is. The only moral or legal constraint that utilitarians accept is what Mill called the "Harm Principle": An act is wrong only if it causes avoidable nontrivial harm to others.

Fourth, if only pleasure is valuable in itself, then no source of pleasure is any better or worse than any other. As Bentham put it, "Quantity of pleasure being equal, pushpin [a children's game played with pins and a hat] is as good as poetry." Not only that, the pleasure of torture afforded a sadist is not bad in itself; torture is abominable only because it inflicts great pain on the sadist's victim. Worse still, the ideal life could be achieved by plugging people into a computer-generated reality-simulation system (as in the film *The Matrix*) or a pleasure machine (which would constantly stimulate the pleasure center of the brain).

Finally, Bentham's *act utilitarianism* seems to require that in each situation the agent should predict the consequences of an action and calculate the effects on happiness, but, it was argued, this would cripple decision making because it is not possible to make any such calculation.

Classical utilitarians ignored or dismissed the first three criticisms, which are less relevant at the beginning of the twenty-first century. Mill attempted to deal with the fourth by arguing that as well as degrees of *quantity* there are also degrees of *quality* of pleasure, and that those who have experienced both lower and higher pleasures will acknowledge that, say, philosophical speculation is superior to mud wrestling. Most commentators have considered this argument elitist and unconvincing. Logically, it appears to involve a contradiction, for pleasure per se is acknowledged to be the only good, but if some pleasures are qualitatively better than others, then some other standard of good appears to be implicitly invoked.

Mill addressed the fifth concern by proposing what has become known as *rule utilitarianism*: The right act is the one that follows a rule that experience has shown to have positive consequences. This gets around the problem that act utilitarianism requires the agent successfully to figure out the consequences of an action, thus requiring what is often referred to as moral luck. This solution, however, is bought at the expense of also requiring the agent to ignore special features of a situation. Experience suggests that adherence to the rule "Do not murder" has good consequences overall, but surely a utilitarian would accept that it would have been ethical to take out the Nazi high command in the early days of World War II, thus perhaps saving many lives and much misery. Rule utilitarianism, it is said, thus collapses into act utilitarianism.

ANIMALS AND THE ENVIRONMENT

Utilitarianism is usually associated with anthropocentrism, for instance in the work of William Baxter (1974), who famously claimed that penguins are valuable only because people happen to enjoy watching them walk about on rocks. However, Bentham argued that since pain and suffering are inherently bad, it is as wrong to inflict suffering on any sentient beings (animals capable of feeling pleasure or pain) as it is to inflict it on humans. This idea was largely ignored until it was taken up by Singer (1975). Singer argued that since it is wrong to discriminate on the grounds of sex (sexism) and race (racism), it is equally wrong to discriminate on the grounds of species membership (speciesism). Suffering is bad, regardless of the species of the suffering organism. Many of our uses of animals cause suffering, and hence Singer advocates that we should cease animal farming, research and testing involving animals, and hunting, fishing, and other recreational use of animals.

Singer's utilitarian position has both positive and negative implications for environmental protection. On the one hand, protection of the interests of animals often happens to coincide with protection of the environment. For instance, industrial agriculture, as exemplified by giant pig-raising operations, may be condemned because it causes the animals to suffer, has effects injurious to humans, and destroys natural values. On the other hand, the interests of individual animals may happen not to coincide with the protection of the environment. Advocates for animals and advocates for the environment can and do find themselves in opposition, as in the case of invasive introduced species. The eastern brush-tail possum, an Australian marsupial that was introduced to New Zealand in the mid-nineteenth century, has now reached plague proportions, with a population of up to 70 million in a country with an area of some 269,000 square kilometers, the size of Colorado. These possums destroy entire areas of native forest, and the only way to protect the forest is to kill millions of the animals, which, even with the most humane methods, inevitably involves

the suffering of many animals. In Singer's view, killing possums to protect forests cannot be justified, because trees, not being sentient, do not have interests.

A number of other problems may be briefly mentioned. First is the problem of predation in nature. This undoubtedly causes considerable suffering. For instance, African wild dogs in pursuit of their prey rip chunks of flesh out of the latter. Some chimpanzees reportedly captured a living bonobo, ripped the arm from the creature, and ate it while the bonobo screamed in agony. Domestic cats are not the only animals that play with their food while it is still alive. Killer whales toss around their favorite prey, seal pups, in a similar manner. We could reduce this suffering by painlessly eliminating predators, though of course we would then have to painlessly cull prey animals to keep them from overpopulating. Alternatively, we could painlessly kill grazing animals and feed them to predators. Indeed, utilitarianism would seem to require that we engage in these or similar activities.

Second, if we could increase total utility by transforming natural areas for the benefit of sentient beings, this might be permissible or even obligatory. Mark Sagoff (1984) argues that wilderness areas and national parks could be converted into game parks, where animals could be fed and receive veterinary care. This would also solve the predation problem.

Third, because utilitarianism focuses entirely on the interests of sentient individual organisms, it does not attach any value to species or ecosystems, except insofar as these can be reduced to the aggregated value of individuals. Thus, for a utilitarian, it is no worse to kill a member of a common species, such as a minke whale or a black bear, than to kill a member of an endangered species, such as a blue whale or a polar bear.

For these and other reasons, Sagoff (1984) has argued that animal liberation and environmental ethics are fundamentally incompatible. Similarly, utilitarianism cannot recognize value in naturally occurring inanimate objects, such as rock formations and caves, or in the built environment and works of art, except insofar as sentient beings happen to enjoy or prefer them. Even then, if something is valued only instrumentally, there is no reason why it cannot be substituted for by something providing equal or greater happiness. Thus if the Board of Trustees of Britain's National Gallery were dedicated utilitarians, they might decide secretly to sell one of the Gallery's more celebrated paintings—Leonardo da Vinci's *Madonna of the Rocks*, say—to a wealthy collector, replacing it with a perfect copy and using the proceeds to add to its collection.

PUBLIC POLICY

Utilitarianism has been very influential in shaping public policy, in particular through risk-cost-benefit analysis. Such analysis operates by identifying all the risk, costs, and benefits of a proposed action, assigning a dollar value to each, and summing them. One then accepts only proposals with a favorable risk-cost-benefit balance (or, in the case of competing proposals, the one with the most favorable balance). Risk-cost-benefit analysis is widely used to evaluate and rank projects such as dams and new highways, regulations of emissions and food additives, social programs such as free mammograms for women of varying ages, environmental actions such as endangered-species management plans, and so on. The best known philosophical advocate of risk-cost-benefit analysis is Kristin Schrader-Frechette (2001).

Bentham and Singer notwithstanding, risk-cost-benefit analysis is anthropocentric. This is because the methods used in such analysis—such as calculations based on the economic value of a life predicted to be saved by highway improvements or industrial health and safety standards, and willingness to pay—can be applied only to humans. This does not mean that endangered species, forests, and ecosystems are not valuable, but it does mean that their value effectively depends on human preferences.

Despite the theoretical defects that many philosophers see in utilitarianism, in practical terms it may turn out to be an effective basis for environmental policy. This is because its egalitarianism implies intergenerational equity, and therefore an obligation to future generations to leave the earth in at least as good a condition as we inherited it in. True, we do not have detailed knowledge of what will make future generations happy or what their preferences will be. However, we can be reasonably certain that these will not include exposure to a toxic environment, drowned coastlines, desertification, and mass species extinction. Since we do not wish these things on ourselves or our direct descendents, we should not wish them on future generations as a whole. This has profound implications for our consumerist lifestyles.

SEE ALSO *Animal Ethics; Consumption; Cost-Benefit Analysis; Environmental Policy; Future Generations; Natural Law Theory; Risk Assessment; Shrader-Frechette, Kristin; Singer, Peter; Speciesism.*

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Alastair S. Gunn

V

VEGANISM

SEE *Vegetarianism.*

VEGETARIANISM

In the United States, between 2 percent and 5 percent of the population "classify themselves as *vegetarians*; of that number perhaps five percent are strict vegans" (Koerner 2007). Although vegetarians renounce animal flesh, they consume animal fluids (milk and milk-derivates such as cheese, yogurt, butter, and ice cream) and/or eggs.

TYPES OF VEGETARIANISM

Thus the vegetarian tribe is divided into "lacto-ovo" vegetarians; "lacto-vegetarians," who eat dairy but no eggs; and "ovo-vegetarians," who eat eggs but no dairy. Some describing themselves as vegetarians eat fish ("pesco-vegetarians") or chicken ("pollo-vegetarians") or both ("pesco-pollo vegetarians").

There are many reasons for choosing a vegetarian diet: personal distaste for meat; a personal health, especially avoidance of saturated animal fats (a concern that is similar to the avoidance of saturated vegetable fats); or ethics. Although eating yogurt and/or egg whites, chicken and/or fish may be either preferable to or more healthful than eating beef or pork, from an ethical point of view, many strict vegetarians consider these eaters of animal products and/or animals such as fish and chickens to be carnivores whose claim to vegetarianism depends on equating "meat" with "red meat."

Vegetarianism itself has been criticized as ethically inadequate and inconsistent by a more radical group known as "vegans." The same ethical considerations that lead vegetarians to renounce meat-eating lead vegans to repudiate dairy, cheese, eggs, and honey; clothing items such as fur, leather, wool, and silk; and animal-tested products, including shampoo, cosmetics, and, drugs. Vegans believe that vegetarians only partially— and therefore inconsistently—break from a cruel, violent, and ecocidal system of food production. Milk cows and birds in battery cages—no less than veal calves—are confined for "lacto-ovo" consumption; and dairy and egg farms pollute the air and water.

The vegan pioneer Donald Watson (1910–2005) disparaged vegetarianism as "but a half-way house between flesh eating and a truly humane, civilised diet" (1944, p. 1).

As with vegetarianism, there are subcategories of vegans, including fruitarians, raw-food vegans, and freegans (who practice a minimal consumption, "dumpster-diving" lifestyle).

HISTORY OF VEGETARIANISM

Vegetarianism (which will be used here to include veganism) has a long and rich history that is as old as European and American cultures (see Berry 1998, Iacobbo and Iacobbo 2004, Spencer 2002, Walters and Portmess 1999 and 2001, Spencer 2004, Tristram 2007). As a health-promoting diet and an ethic rooted in compassion for all living beings (*ahimsa*), vegetarianism emerged more than 3,000 years ago as a philosophy and practice of the ancient South Asian religions: Hinduism, Jainism,

and Buddhism. The vegetarianism of the Greek philosopher Pythagoras (ca. 496–552 BCE) and animal-protectionist ethics spread throughout the ancient world and resurfaced in the seventeenth century (indeed, until the mid-nineteenth century, those who abstained from meat were called "Pythagoreans"). At the dawn of modernity, vegetarianism became increasingly influential throughout European society; radicals deployed its nonviolent and egalitarian outlook as a critical weapon against class rule and what they viewed as European barbarism, and prominent medical figures espoused it as ideal for health as well as morality (Stuart 2007).

VEGETARIANISM AND THE ENVIRONMENT

As the twentieth century unfolded, however, the influence of vegetarianism in the United States began to wane as the livestock industry became increasingly powerful and meat became an affordable staple for working-class families (Rifkin 1992). In a culture trained in the mindset that meat promotes strength and vegetarianism fosters weakness, a dramatic revival, growth, and broadening of vegetarianism began in 1971, with the publication of Francis Moore Lappé's book *Diet for a Small Planet*. In this and subsequent books (1977, 1998, 2003), Lappé described a corporate-controlled, industrialized, factory-farmed system of animal agriculture that is inefficient, wasteful, cruel, and destructive to every facet of the environment. The global livestock industry is, she argued, a vehicle of European-American imperialism that displaces millions of people from the land, destroys the livelihood of independent farmers, exacerbates poverty and inequality, and aggravates world hunger by diverting resources into producing feed rather than food. To this destructive, unethical, unjust, and unsustainable system of agriculture, Lappé contrasted a vegetarian mode of farming that produces maximum output with minimum input; that promotes health, rights, justice, and democracy; and that is environmentally sound and sustainable.

Lappé's work—along with Peter Singer's *Animal Liberation* (2001 [1975]), Singer's and Jim Mason's *Animal Factories* (1990 [1980]), and John Robbins's *Diet for a New America* (1998 [1987])—vividly portrays the human, animal, and environmental costs of the global meat culture, and this systemic outlook inspired the *vegetarian environmental* movement. This movement has fused issues of health, animal rights, social justice, world hunger, violence, globalization, and environmental concerns into a holistic theory unrivaled in depth, comprehensiveness, and awareness of the multidimensional crisis—health, moral, social, and environmental—facing humanity. Pursuing the lead of these theorists, a number of books have documented the central role of the livestock industry in the devastation of the social and natural worlds (see Mason and Singer 1990 [1980], Jacobs 1992, Rifkin 1992, Hill 1996, Robbins 2001, Lyman 2001, and Jacobson 2006).

By 2000 growing alarm over the human, animal, and environmental toll of the global meat, dairy, and egg industries percolated into scientific sectors, international government bodies, and—in a slow and hesitant way—some mainstream environmental groups such as the Sierra Club. Throughout 400 pages, a landmark 2006 United Nations report, "Livestock's Long Shadow," identified the livestock industry "as one of the top two or three most significant contributors to the most serious environmental problems, at every scale from local to global" (Steinfeld et. al. 2006). The data compiled in this report and countless thousands of corroborating studies leave little room for doubt that the livestock industry is a significant threat to the planet. The number of farmed animals (including fish) in the world has quadrupled in the last fifty years, putting a great strain on air, land, and water. Livestock uses 70 percent of all agricultural land and 30 percent of the earth's entire land surface (Steinfeld et. al. 2006). Crops grown for animal feed rather than human food consume 87 percent of the nation's fresh water, 90 percent of the soy crop, 80 percent of its corn, and 50 percent of all grains (Vesterby and Krupa 1997, Pimentel 1997). Compared to a vegetarian diet, meat production demands seven times more land (Leckie 2007), eight times more fossil fuel energy (Pimenel 1997), and ten times as many crops (Pimentel 1997; Robbins 1998 and 2001; Horrigan et. al. 2002). In this system of carnivorous consumption, 41 million tons of plant protein for cows returns 7 million tons of protein for humans (Pimentel 1997).

The livestock industry is a major cause of air pollution, soil erosion, desertification, water pollution, and acid rain. U.S. farms generate 130 times as much excrement as the nation's entire human population (Worldwatch Institute 1998). Factory farm effluvia—a slurry of manure, pesticides, antibiotics, hormones, and fertilizers—poison water supplies, decimate fish populations, degrade coral reefs, and have contributed to the emergence of more than 150 oxygen-starved "dead zones" in the oceans (Larsen 2004).

Moreover, 70 percent of the Amazon rain forest has been slashed and burned to graze cattle, and much of the remainder has been converted to fields for growing feed. In addition to being a principal cause of forest destruction and species extinction, the livestock industry is a significant factor in global climate change (Steinfeld et. al. 2006). Meat, dairy, and egg industries emit 18 percent of all carbon dioxide, 37 percent of the methane gas (a heat-trapping gas that is twenty times stronger than

carbon dioxide), and 65 percent of nitrous oxide gases (300 times more potent than carbon dioxide). The UN report concluded that the livestock industry produces more greenhouse gases than all the world's transportation systems (Steinfeld et al. 2006).

CONFLICTS BETWEEN VEGETARIANS AND ENVIRONMENTALISTS

These facts suggest the possible importance of vegetarianism and animal rights for the environmental movement and the urgency of finding common ground for a triangular alliance. Yet rather than uniting in the war to prevent massive species extinction, catastrophic ecological breakdown, and irreversible climate change, vegetarian and environmental camps remain divided by deep differences in philosophy and lifestyle (Motavalli 2002, Sapontzis 2004). Both camps break with anthropocentrism (the belief that only human beings deserve ethical consideration). Environmentalists advocate a new holistic "ecological consciousness" and "land ethic" but often neglect to advocate concern for individual sentient or conscious nonhuman beings. Whereas vegetarians now identify themselves as ipso facto environmentalists, certainly not all environmentalists embrace vegetarianism. At stake are competing views on animal rights, whether or not hunting and meat-eating are ethical and compatible with environmental values, and how to balance the values of individuals and ecosystems.

Ethical vegetarians shift the criterion for having rights from rationality to the far broader characteristics of consciousness or sentience. For Singer (1975) and Regan (1983) a necessary and sufficient condition of meriting moral consideration is the capacity to experience pleasure and pain, although both place a moral premium on advanced levels of consciousness and intelligence. If it is a fundamental moral axiom that it is wrong to cause injury, suffering, or death to another individual unless there is a compelling reason to do so, ethical vegetarians argue that—except in very rare cases such as self-defense—we never have adequate reason to harm animals. This is true not only for exploiting animals for "sport," "entertainment," and fur, but also for killing them for food, because humans cannot only live but flourish on a purely plant-based diet.

Many environmentalists opposed to industrial agriculture agree that factory farming is cruel and unethical but nonetheless assert that raising animals on small "family" farms without intensive confinement and manipulation is acceptable and good. Their justifications for raising animals for slaughter include the argument that such animals would not live at all if not bred for food, that they live a satisfying and worthy life on nonindustrial farms, and that killing and consuming other animals is a natural fact of life. This position turns on a "welfare" rather than "rights" position (see Regan 2004); it contends that the moral wrong lies in causing animals severe or unnecessary suffering (such as on factory farms) rather than in exploiting them for human purposes. On the welfare view, slaughtering animals for food is ethical if done "humanely"—a concept ethical vegetarians dismiss as Orwellian doublespeak, arguing that there is nothing humane about any kind of killing and taking a being's life against its will.

Whereas vegetarians view hunting as unnecessary and therefore unjustifiable killing, some environmentalists support hunting as a means of affirming our evolved human place in the biotic community. And some argue that hunting has positive ecological benefits by stabilizing "game" (prey) populations such as deer that would otherwise overpopulate (Lott 2007, Miniter 2007). Vegetarians respond that hunting in fact is the prime cause of deer overpopulation and argue that hunters' predilection for killing large, healthy males over weaker individuals and females disrupts ecological and evolutionary dynamics (Pickover 2005). Unlike the animal-rights ethic that defends the rights of sentient individuals as inviolable, environmental ethics is often holistic, valuing ecosystems and species populations over individuals. Whereas many environmentalists champion Aldo Leopold's "land ethic" (1970) as the most comprehensive embrace of the biotic community (Callicott 1993), the animal-rights philosopher Tom Regan (1983) has denounced it as "environmental fascism" that sacrifices the individual to the good of the whole. Other environmental ethicists have worked to reconcile these contrasting positions (Jamieson 1997).

Although, some environmentalists agree with vegetarians that factory farming is cruel, they also support obtaining meat from noncommercial wild sources through sustainable hunting and fishing, just as they might argue that small-scale, organic farming is humane and beneficial for the environment (Pollan 2007). Some land spaces—such as high-elevation, short-grass prairies and steppes—are unsuited for cultivation but can support cows and sheep; thus it might be argued that their highest use is meat production (*Science Daily* 2007). Rebutting vegetarians who boast the ecological virtues of a plant-based diet, environmentalists point out that a frugal organic farmer who consumes modest amounts of meat from his or her own livestock can leave a lighter "ecological footprint" than a vegetarian who drives a Hummer, is a frequent flyer, and buys produce from global rather than local sources.

Vegetarians counter that such environmentalists have not explained how their vision of a global network of small farms can satisfy the competitive need for profits

(Collin 2003), much less the surging demand for meat—especially in the world's most populous nations, China and India, and a burgeoning overall population projected to double to 12 billion by 2050 (Worldwatch Institute 1998, Steinfeld et. al. 2006, Freston 2007). Moreover, vegetarians argue, environmentalists' uncritical praise for organic farming is naïve and romantic because organic-farm products are satisfying high-end consumer demand and becoming just another form of mass production and large-scale killing of animals (Cienfuegos 2004, Davis 2007, Lucas 2007, PETA n.d.)

CONCLUSION

Vegetarianism is not a panacea for ever-worsening social and environmental crises, but it could be a significant part of major changes that people—especially those in the developed world—can make to avert ecological disaster. These changes include reducing consumption and shifting from industrial to local agriculture, from chemically intensive to genuinely organic farming, and from fossil-fuel to alternative energy. The shift from a meat-based to a vegetarian diet would not only benefit the environment but also save billions of animals from suffering in factory farms and slaughterhouses, keep small-scale farmers from being displaced from their land, and protect billions of people against the suffering of diseases of excess (in the developed world) and of lack (in the undeveloped world).

SEE ALSO *Animal Ethics; Biocentrism; Factory Farms; Farms; Food; Global Climate Change; Hunger; Population; Regan, Tom; Singer, Peter.*

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Steven Best

VIRTUE ETHICS

Virtue ethics is the branch of ethics that focuses on issues of character, excellence, and human flourishing. Some philosophers believe that virtue ethics is the correct approach to ethics in general; other philosophers see it as a necessary supplement to Kantian and utilitarian approaches that focus on the treatment of others (Swanton 2003). In recent years more philosophers have come to believe that virtue ethics is a valuable approach to environmental issues, although they have different reasons for that belief.

THE VALUE OF VIRTUE ETHICS

Some philosophers see standard attempts to prove the intrinsic value or moral considerability of nonhuman beings as inconclusive or failed. In embracing environmental virtue ethics they seek a more solid grounding for environmentalism, arguing that protecting the environment is necessary to promote human well-being or flourishing (Hursthouse 2007). Other philosophers find some intrinsic value claims convincing but believe that appeals to human flourishing provide further arguments for environmental protection. They attempt to supplement appeals to altruism with appeals to people's enlightened self-interest (O'Neill 1993). Yet other philosophers see an urgent need to specify the kinds of character traits that are needed to live environmentally sustainable lives. For this group environmental virtue ethics is the proper framework in which to discuss the creation of sustainable societies (Newton 2003).

INFLUENTIAL WORKS

Four books have been particularly influential in the development of environmental virtue ethics. John O'Neill's *Ecology, Policy, and Politics* (1993) was an early attempt to ground environmentalist claims in human flourishing. Rejecting accounts of human well-being based on subjective states or mere preference satisfaction, O'Neill developed an Aristotelian conception of well-being in terms of objective goods such as health,

friendship, knowledge, and the ability to develop people's natural capacities. Nature must be protected both to preserve the basic resources people need to live and to protect opportunities for people to develop their higher capabilities, such as scientific knowledge, artistic creation, and personal connection to the natural world. Like many environmental virtue ethicists, O'Neill attempted to rein in an overly economic view of the world. He questioned the wisdom of cost-benefit analysis, asserting that it provides "policy without [political] debate" (O'Neill 1993, p. 78), and argued that people must limit the power of markets through regulations that will uphold strong conceptions of the common good.

Louke van Wensveen's *Dirty Virtues* (2000) showed philosophers that popular and scholarly environmental discourse already contained discussions of virtue and character (an appendix lists 189 virtues and 174 vices mentioned in the previous three decades of environmental literature). She found this environmental virtue discourse to be productive and dynamic both in its discussion of new ecological virtues such as attunement and earthiness and in its reinterpretation of established virtues such as frugality and gratitude in an ecological context. Wensveen's analysis attempted to bring order to that discourse by developing criteria for what should count as genuine ecological virtue. Her procedure was a mixture of the old and the new; to Aristotelian criteria focused on the social sustainability of various human qualities she added the newer criteria of psychological and ecological sustainability.

Philip Cafaro's *Thoreau's Living Ethics* (2004) argues that Henry David Thoreau's life and writings provide a coherent and inspiring environmental virtue ethic that links attentiveness to nature to human excellence and flourishing. Thoreau thus points the way toward a comprehensive, life-affirming environmental ethics in which the traditional "thou shalt nots" of environmentalism are complemented by a description of positive ideals of character. By recognizing nature's value, people enrich their lives. By restraining physical consumption, people are more likely to lead healthy and enjoyable lives and allow future generations to do the same thing. By devoting themselves to pursuits higher than moneymaking, they act in their enlightened self-interest, with great benefits for the many other species with which they share the earth.

Cafaro also argued that Thoreau's evolutionary experimentalism—in which human nature and hence human virtue may change over time, and our particular virtue judgments are always assumed fallible and hence must be tested in life—provides a more plausible foundation for environmental virtue ethics than do the unchanging human nature and timeless objectivity to which many contemporary virtue ethicists subscribe (following Aristotle).

Ronald Sandler's *Character and Environment* (2007) is a theoretically rigorous defense of environmental virtue ethics that contains detailed positions on issues such as the proper criteria for judging right action and whether virtue ethics approaches are necessarily anthropocentric. It provides a naturalistic account of the proper characterization of virtue that is grounded in a broad sense of human flourishing but leaves open the possibility that virtues may be virtues because they recognize or promote other goods, such as the intrinsic value of nonhuman beings. Surveying the many accounts of environmental virtue, Sandler developed a typology that does justice to the many ways in which character traits may be environmental virtues. His typology includes virtues of sustainability (temperance and frugality), communion with nature (attentiveness and wonder) and respect for nature (care, compassion, and ecological sensitivity), stewardship (honesty and diligence), and environmental activism (cooperativeness, perseverance).

CRITICISMS AND DEFENSES

One criticism of environmental virtue ethics is that its account of environmental virtues is undertheorized and ad hoc. In light of Wensveen's list of 189 environmental virtues, it is not clear how to make sense of such a plenitude. Environmentalists can identify their favorite virtues and exhort like-minded people to cultivate them, but what imposes discipline on discussions of particular virtues? What allows philosophers to put those accounts together into a cohesive whole, whether in an account of general human virtue or in terms of particular lives well lived? Because environmental virtue ethicists see the need for new virtues and the reinterpretation of old ones, they cannot rely on accepted accounts of virtue from general ethical theory; in addition, general virtue theorists disagree about what makes a virtue a virtue.

Environmental virtue ethicists have tried to answer this criticism by developing specific criteria for what makes a virtue a virtue. Wensveen (2000) argued that genuine virtues must contribute to ecological sustainability because environmental degradation undermines the ability to live and pursue virtue. Most proponents of environmental virtue ethics attempt to ground their general accounts of virtue in a substantive account of human flourishing; the virtues are those qualities which constitute or contribute to that flourishing. Their accounts of this flourishing differ, however, and more work needs to be done to generate an account of human flourishing that also upholds diversity and possibility. Moving beyond exhortation, the hope is to converge on the personal

qualities that make people good people who are likely to live well and protect nature.

Reflecting a criticism of virtue ethics in general, some argue that environmental virtue ethics is not sufficiently action-guiding. They claim that virtue ethics tells people what sort of character to cultivate but cannot do what an ethical philosophy must do: tell people how to act in particular situations. One response to this criticism is that it is not the job of ethics to provide rules and that the failure of deontology and utilitarianism to supply compelling rules for dealing with hard ethical cases shows that such a goal is impossible to reach (Hursthouse 2007). Cultivating the virtues, especially practical wisdom, will put people in the best position to make good moral decisions in hard cases and act on them. Another response is to develop "v-rules" that specify how people with the requisite virtues would respond to particular ethical challenges (Sandler 2007). Thus, it is possible to say something about how a temperate person might respond to the blandishments of modern commercial society or how someone with the virtues of attentiveness and ecological sensitivity might decide which forms of recreation are acceptable in natural areas.

Perhaps the strongest answer to the objection that virtue ethics is not sufficiently action-guiding is to remove the focus from virtue and place it on the notion of flourishing. Peter Wenz (2005) argued that there is evidence that the excesses of modern consumerism harm human health, distract people from more enjoyable activities, and impede human flourishing in other ways; thus, there are good reasons to rein them in. Cafaro argues that the pursuits of the naturalist lead to greater health, happiness, knowledge, and wisdom; thus, there are good reasons to explore and protect nature (Cafaro 2001). Once the definition of human flourishing is broadened to include the flourishing of all living things, people have even stronger guidance in limiting environmentally destructive practices and protecting nature.

The most persistent criticism of environmental virtue ethics states that it is anthropocentric because it stresses the contribution of environmental protection to people's well-being and focuses excessively on human character. This focus on people leads to the same human selfishness that created contemporary environmental problems. Holmes Rolston makes this criticism in "Environmental Virtue Ethics: Half the Truth but Dangerous as a Whole" (Sandler and Cafaro 2005): If people protect nature solely to help themselves live better lives, they are not acting from correct motives. Even worse, they will sacrifice nature if it is in their own selfish interests to do so.

In response, a few environmental virtue ethicists embrace anthropocentrism. Yes we are anthropocentric, they concede, but any reasonable ethics necessarily focuses on human needs and wants. They claim that those considerations provide powerful reasons for environmental protection that will actually motivate people to protect nature.

Most environmental virtue ethicists, however, make a place in their philosophies for the intrinsic value or moral considerability of nonhuman nature. Some say that they ground ethics in human and nonhuman flourishing; the virtues are those qualities which further both (Cafaro 2004). Others say that people can best get from the "is" of nature's intrinsic value to the "ought" that compels people to protect that value, by bringing in issues of human flourishing (O'Neill 1993). Still others argue that a pluralistic account of moral considerability in which different kinds of entities are considered from the perspective of the appropriate virtues is more plausible and accurate than monistic accounts of intrinsic value (Sandler 2007). All these approaches emphasize that human flourishing and the flourishing of nature are necessarily intertwined; the same actions and personal characteristics allow people to be good neighbors and citizens and good environmentalists.

APPLICATIONS

Ethical approaches should not just be judged by how well proponents respond to criticisms, or defend the weakest links in their arguments. Perhaps more important is how well they help philosophers explore new areas and illuminate old ones. Some of the best work in environmental virtue ethics has focused on giving detailed "thick" accounts of particular environmental virtues. This includes Geoffrey Frasz on "Benevolence as an Environmental Virtue" (Sandler and Cafaro 2005) and on friendship ("What Is Environmental Virtue Ethics That We Should Be Mindful of It?" Cafaro 2001); and Louke van Wensveen on temperance ("Attunement: An Ecological Spin on the Virtue of Temperance," Cafaro 2001) and on the Seven Deadly Sins (Wensveen 2000). It includes Thomas Hill, Jr. on humility ("Ideals of Human Excellence and Preserving Natural Environments," Sandler and Cafaro 2005), Philip Cafaro on wisdom ("The Naturalist's Virtues," Cafaro 2001), and Rosalind Hursthouse (2007) on wonder. This work can deepen people's understanding of environmentalism and provide a better sense of what it would mean to be benevolent, temperate, properly humble, and wise people.

Lisa Newton's textbook *Ethics and Sustainability* (2003) provides another example of applied philosophy built on a base of environmental virtue ethics. After giving an account of environmental virtue grounded in Aristotle and Aldo Leopold, among others, Newton works out the kinds of technological, social, and economic policies needed to create sustainable, flourishing

societies. She also discusses the sorts of lives people will have to lead to make those societies work. The book culminates in an account of simplicity as the virtue most in demand at this point in societal evolution. Newton's work shows that environmental virtue ethics can help specify the sorts of lives people need to live to do justice to nature and live good lives within it. It thus helps people think comprehensively and practically about how to make sustainable, just, generous human societies a reality.

SEE ALSO *Cost-Benefit Analysis; Sustainability; Thoreau, Henry David; Utilitarianism.*

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Philip Cafaro

VON HUMBOLDT, ALEXANDER
1769–1859

Alexander von Humboldt, who was a polymath, an explorer, and one of the founders of modern geography, was born in Berlin on September 14, 1769, the year in which James Cook sailed the *Endeavour,* and died in that city on May 6, 1859, the year of publication of Charles Darwin's *Origin of Species*. A Prussian, he received training in biology, geology, and political economy at Göttingen and Frankfurt. After a period in the Prussian civil service, he sailed with Aimé Bonpland for South America in 1799 and travelled across the llanos, the Andes, and Mexico. On that journey (Von Humboldt and Bonpland 1881 [1852]) he determined heights and positions by using a barometer and a chronometer, developed ideas about the geography of plants (Von Humboldt and Bonpland 1977 [1805]), and made an innovative attempt to relate the political and economic conditions of New Spain to its physical geography and to natural and human resources (Von Humboldt 1988 [1811]). Later in his life he visited the Urals and the Altai.

In *Cosmos,* which was published between 1845 and 1862, von Humboldt stressed relationships between phenomena and attempted to explain the links between phenomena in different climatic zones. He believed that the earth is an integrated organic whole. He also had a vision of man as a part of nature:

> The general picture of nature which I have endeavoured to delineate would be incomplete if I did not venture to trace a few of the most marked features of the human race, considered with reference to physical gradations—to the geographical distribution of contemporaneous types, to the influence exercised upon man by the forces of nature and the reciprocal, although weaker, action which he in his turn exercises on these natural forces. Dependant, although in a lesser degree than plants and animals, on the soil, and on the meteorological processes of the atmosphere with which he is surrounded, escaping more readily from the control of natural forces, by activity of his mind, and the advance of intellectual cultivation, no less than, by his wonderful capacity of adapting himself to all climates—man everywhere becomes most essentially associated with terrestrial life. (Von Humboldt 1850–1859, vol. 1, pp. 360–361)

Von Humboldt, as D. N. Livingstone pointed out, "constantly sought for the universal behind the particular, for underlying patterns and unities that tied nature together in such a beautiful, functioning system" (1992, p. 135).

Cosmos included a survey of the current theories about the structure of the universe, a sketch of the historical progress of science and of geographical exploration and discovery, an exposition of the content of the disparate sciences, and a discussion of nature poetry, aesthetics, and landscape painting.

Von Humboldt was influenced by many other thinkers—Kant, Rousseau, J. G. Forster, Agassiz, Ritter,

Goethe, von Liebig, and Schiller, among others—and had a strong influence on scientists such as Darwin and Alfred Russel Wallace. His holistic views were fundamental for the development of geography (Mathewson 2006), but he also demonstrated the importance of detailed and reliable measurements, established many of the basic tenets of plant geography, and was a founder of global and regional climatology, a term he probably coined (Dickinson 1969). In his essay on Mexico he demonstrated that he was a regionalist, illustrating the interrelated conditions that give its character to an area. This was a striking contrast to the encyclopedic compilations of many previous geographers, topographers, and explorers.

Von Humboldt's work spawned what has been termed Humboldtian science:

> To signify a scientific style that conducted observations with the latest instruments, corrected measurements for errors, and linked these to mathematical laws; constructed maps of isolines connecting points with the same average values; identified large, even global, units of investigation; and used nature rather than the laboratory as a site of investigation. The term as applied to nineteenth century science has since acquired other connotations, including connecting different types of large-scale phenomena, demonstrating their independencies, seeking a universal science of nature, and using large-scale international organisational structures to execute local readings as part of a global effort. (Olesko 2003, p. 384)

Von Humboldt was the last truly universal man. His funeral was one of the most imposing state funerals in the history of Berlin, and his name is given to over a thousand places in the world.

SEE ALSO *Darwin, Charles; Environmental Philosophy: IV. Nineteenth-Century Philosophy; Regionalism.*

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Andrew S. Goudie

W

WAR

War, armed conflict with the intent to kill and destroy, has been pursued between groups, societies, and nations throughout human history. Such activity, with all of its associated devastation, continues into the twenty-first century, despite a widespread international attempt in 1928 to renounce for all time at least war between nations. Its brutality also continues into the 2000s, despite a lengthy series of intergovernmental attempts—especially in 1899, 1907, 1929, 1949, and 1977—at constraining the more vicious and pernicious aspects of international war. Its frequency notwithstanding, few comparable attempts have been made over the years to constrain internal (noninternational, civil, insurgency) war.

The environment—that is, the world at large, encompassing the atmosphere, lithosphere, hydrosphere, and biosphere, upon which all humankind depends for its well-being and very survival—is undergoing ever more serious deterioration by the civil sector of society. It is thus particularly troubling that damage to the environment is also an inevitable consequence of warfare. Such wartime damage can be incidental or intentional. It occurs within the theater of military operations and beyond it. Moreover, environmental damage occurs not only during wartime, but also as a result of preparing for war and as a result of some postwar recovery efforts. Perversely, it must be noted that war can also lead to a number of beneficial environmental outcomes.

This entry covers both the environmental consequences of war and the environmental causes of war. It further examines the ethical development and implications of wartime environmental protection, whether as an anthropocentric extension of social justice or perhaps in part as an ecocentric concern in its own right, and briefly also religious norms related to war and the environment.

INCIDENTAL ENVIRONMENTAL IMPACT ON THE BATTLEFIELD

Incidental environmental damage to the battlefield is an inevitable outcome of war. Such incidental damage can result from the profligate use of high-explosive munitions against enemy personnel and matériel. Another common source of incidental damage is the use of tanks and other heavy off-road vehicles. These environmental insults are especially disruptive of local habitats and the wildlife depending on them. Battle-related actions can also result in less persistent local soil, water, and air pollution.

Conversely, a theater of military operations often precludes the usual peacetime exploitation (often overexploitation) of a rural area by hunting, logging, fishing, grazing, or farming. This permits population recoveries of the local flora and fauna, the most notable case being in the demilitarized zone between North and South Korea.

INTENTIONAL ENVIRONMENTAL IMPACT ON THE BATTLEFIELD

Intentional environmental impact in a theater of military operations can take various forms, including especially forest clearing, oil releases, area denial (e.g., land mines), and on occasion even the use of chemical, biological, or nuclear weapons.

Intentional forest destruction is carried out during wartime primarily to deny the enemy cover and concealment.

Agent Orange. *The aftermath of a herbicidal attack with agent orange by the United States during the Vietnam conflict of 1961–1975 against a lush mangrove forest for the immediate purpose of denying the enemy cover and concealment is depicted here. It was U.S. actions of this sort that awoke a widespread revulsion against massive military disruption of the environment and, more generally, contributed significantly to ushering in the newly emerging environmental ethic in the world at large.* **PHOTO TAKEN BY ARTHUR H. WESTING IN GIA DINH PROVINCE, SOUTH VIETNAM, AUGUST 15, 1970.**

This has been accomplished by spraying the area with herbicides (including the notorious agent orange), by using heavy tractors equipped with special forest clearing blades (so-called Rome plows), by saturation bombing, and, at propitious times and places, by setting self-propagating wild fires. Depending upon the site and severity of attack, recovery from any such assault can take years to decades. Indeed, it was U.S. forces' sustained use of all of these tactics during the Vietnam War of 1961–1975 that alerted the world to the levels of environmental destruction that can be associated with war.

Intentional oil releases are possible in certain theaters of military operation for purposes of enemy harassment or area denial as well as for punitive purposes. This can be variously accomplished by sabotaging oil wells; by breaching pipelines, collection centers, and storage tanks; and by attacking oil tankers—in each instance with or without igniting the escaping oil. The most spectacular example of such action was by Iraqi forces during the Persian Gulf War of 1991. Much rural surface area, groundwater, and Persian Gulf seawater and shoreline became severely contaminated with liquid oil, and the torched escaping oil heavily contaminated the regional atmosphere with dense smoke (soot plus combustion gases), with adverse health effects on wildlife, livestock, and humans.

Area denial with land mines (both antivehicle and antipersonnel) or with remotely delivered scatterable mines and cluster-bomb submunitions is a common military practice for purposes of hindering, slowing down, or channeling the movements of enemy forces, as well as of sapping their morale. Such area denial is a pernicious military tactic because the area remains perilous for years, even decades, after its battlefield use, thereby hindering subsequent forestry, herding, farming, or other development. Postwar rehabilitation efforts are a daunting task that is technically difficult, time-consuming, expensive, exceedingly dangerous, often environmentally disruptive,

and never fully successful. On the other side of the ledger, after a war, previously overgrazed or otherwise overexploited minefields can undergo considerable habitat recovery, both floral and faunal. For example, such recovery occurred following World War II in the heavily mined rangelands in Libya and elsewhere in North Africa. A somewhat comparable maritime example was the recovery during World War II of the drastically depleted North Sea fishery, where a combination of naval actions and sea mines made it long impossible for fishing boats to enter.

Chemical, biological, and nuclear weapons are weapons of mass destruction that lead to intentional environmental disruption. Antipersonnel chemical agents were used extensively (and openly) by both Allied and Axis forces during World War I, but not before or since on such a grand scale. Antiplant chemical agents are covered above. Biological agents have been used essentially only once in modern times, on a relatively minor scale (and secretly) by Japanese forces during World War II. Nuclear weapons have also been used only once, by U.S. forces during World War II over Hiroshima and Nagasaki. The potential for long-term environmental disruption by any of these so-called unconventional weapons is truly enormous.

INTENTIONAL RELEASE OF DANGEROUS FORCES

Under certain conditions, it is possible for a belligerent to manipulate some component of the natural or built environment so as to result in the release of pent-up energy, so-called dangerous forces. This sort of hostile action—often referred to as *environmental warfare*—becomes especially tempting when the hostile manipulation involves a relatively modest expenditure of effort (i.e., of triggering energy) leading to the release of a substantially greater amount of directed destructive energy. Environmental modifications of particular concern here involve the pent-up forces contained in fresh-water impoundments, nuclear power stations, certain industrial facilities, and, to a lesser extent, forest and other wild lands.

Water impoundments formed by the many hundreds of major dams that have been constructed throughout the world contain enormous quantities of water. Many such dams could be breached with relative ease either through direct attack or sabotage, and the release of the impounded reservoir would cause immense levels of death and destruction. Hostile actions of this nature have been spectacularly successful in various wars, for example, the Sino-Japanese War of 1937–1945, World War II, and the Korean War of 1950–1952.

Nuclear facilities have become essentially permanent additions to the human environment. Almost two hundred clusters of nuclear power stations, plus a number of additional nuclear reprocessing plants and nuclear waste repositories, are distributed in over thirty nations. These sites are amenable to direct attack or sabotage, with the possible attendant release into the surrounding area, measurable in thousands to millions of hectares, of iodine-131, cesium-137, strontium-90, and other radioactive elements. What has been learned from the aftermath of U.S., British, and French nuclear testing on several Pacific islands in the 1940s and 1950s and from the Soviet Chernobyl accident of April 1986 is that the contaminated zone essentially defies rehabilitation. Thus, both the Pacific islands and the region surrounding Chernobyl remain uninhabitable despite massive attempts at decontamination.

Certain industrial facilities, if attacked, can release a cloud of toxic chemicals spreading over hundreds of hectares and proving variously detrimental to plants, animals, and humans. Providing ample evidence of this source of wartime danger are the horrifying releases into the air in Seveso, Italy, of dioxin from a factory explosion in July 1976, and similarly in Bhopal, India, of methyl isocyanate in December 1984, as well as the catastrophic explosion in Mexico of a huge liquefied-natural-gas storage facility in Mexico City in November 1984.

Wild fires can be started and become self-propagating over large areas under special habitat and weather conditions in forest, grassland (prairie), and tundra ecosystems. Initiated by napalm or other incendiary munitions (and sometimes preconditioned by herbicidal attack), such fires have the potential to cause extensive damage to wildlife, livestock, and humans, and under certain site conditions lead to severe soil erosion and loss of nutrients (so-called *nutrient dumping*). Grassland recovery is measurable in years, forest recovery in decades, and tundra recovery in many, many decades.

WARTIME ENVIRONMENTAL IMPACT BEYOND THE BATTLEFIELD

Environmental disruptions caused by military activities during wartime but beyond the theater of military operations can be more or less severe, and are generally excused as part and parcel of the necessities of war. These disruptions derive from the construction of base camps, fortifications, and lines of communication, and also often from armed forces' heavy exploitation of timber, food, and feed. Preemptive self-inflicted scorched-earth tactics in anticipation of an enemy advance can be utterly devastating, as exemplified during World War II by such actions carried out by Soviet forces in western Russia and also by German forces in northern Norway. Finally, persons displaced from a war zone and concentrated into refugee camps can cause severe environmental damage to

the surrounding flora and fauna, as seen during and following a number of early-twenty-first-century internal wars in Africa.

PREWAR AND POSTWAR ENVIRONMENTAL IMPACTS

Whether at peace or war, most nations continually maintain armed forces. Such armed forces are kept for various reasons, especially (1) to deter an attack from outside the country's borders or, failing that, to defend against such an attack; (2) to threaten an attack on another nation in support of some foreign-policy objective or, failing that, to carry out such an attack; and (3) to deter or quell internal uprisings. In fact, a majority of the wars since the 1980s have fallen into the third of these categories.

There are manifold environmental ramifications of nations' maintaining armed forces for any or all of the three reasons mentioned above. Environmental disruption can result from any of the following:

- Establishing military fortifications and other military facilities
- Equipping and supplying armed forces with weapons and other military needs
- Disposing of those items once they become obsolete or otherwise unwanted
- Training armed forces and testing the weapons they use
- Routine deployment of armed forces nationally, in other nations, and in areas beyond any national jurisdiction.

Among benefits, the often large exclusion zones surrounding nuclear and other sensitive military facilities, especially in the industrialized nations, often become important de facto nature reserves and wildlife sanctuaries. Moreover, during peacetime, a number of nations (India being a prime example) employ a portion of their armed forces to police their nature reserves, controlling wildlife and timber poachers and other harmful trespassers.

ENVIRONMENTAL CAUSES OF WAR

Over the past nine millennia or more, war has been widely recognized as a successful societal strategy for acquiring needed or desired land and other natural resources. So it should come as no surprise that environmental scarcities, especially in the nonindustrialized world, lead to human violence—and indeed already have in such diverse places as Haiti, Pakistan, the Philippines, and South Africa.

The growing numbers of people, especially in the nonindustrialized world—together with their ever expanding demands for such increasingly scarce natural resources as cropland, forestland, freshwater supplies, and ocean fish—have increasingly significant social consequences. In many such impoverished nations, the social consequences are certain to cause further internal unrest, population movements, and even occasional insurgencies. And in many instances the adversities of climate change exacerbate this intractable problem of growing environmental scarcities. Indeed, among military planners, climate change is already identified as a threat multiplier, perhaps even promoting terrorism, within many of the more fragile and unstable regions of the world.

SOCIETAL CONSTRAINTS ON ENVIRONMENTAL DAMAGE IN WARFARE

Social values and environmental values have been of philosophical and religious concern to both Western and non-Western cultures since ancient times. But only since the late twentieth century have social and environmental concerns begun to intersect and become mutually reinforcing, for example, in the emerging ethical norms related to the notion of sustainable development. Modern tangible manifestations first of social values and subsequently of environmental values did not arise until the after World War II. And (as indicated earlier) the widespread emergence of recognizable ethical concerns over wartime environmental damage had to await the depredations of the Vietnam War of 1961–1975.

It was the human atrocities associated with World War II that fostered and crystallized worldwide ethical concerns and gave rise to meaningful expression of those concerns. Such concerns were first tangibly expressed through passage of the 1948 Convention on the Prevention and Punishment of the Crime of Genocide (UN Treaty Series No. 1021), soon followed by adoption of the 1948 Universal Declaration of Human Rights (United Nations General Assembly, resolution 217 A [III]). Those two early postwar manifestos would not have received the overwhelming governmental support they each enjoyed had they not been expressing the newly burgeoning cultural norms (ethical values) they were codifying.

Neither of these two instruments recognized environmental concerns. In fact, widely shared environmental norms did not begin to surface for another two decades or so, and gained momentum only over a period of some further years. Thus, expressions of emerging, widely shared core environmental values did not surface until adoption of the 1972 Stockholm Declaration on the Human Environment (UN document No. A/conf.48/14/rev.1), to be followed a decade later by the almost universal adoption of the 1982 World Charter for Nature (UN resolution No. 37/7), and that in turn by the 1992

Rio Declaration on Environment and Development (UN document No. A/conf.151/5/rev.1). Unsurprisingly, all three of these instruments were based essentially on anthropocentric concerns. But interestingly, all three variously proclaimed the need to avoid wartime damage to the environment.

Ethical concerns related to war—aimed not at its abolition but rather at civilizing its conduct—began to be seriously expressed as early as 1899 and 1907 via the then almost universal adoption of the core international treaties comprising what came to be known as the law of war, although later often referred to as international humanitarian law, together with the related and overlapping body of international arms control law. Largely through the tireless efforts of the International Committee of the Red Cross, the law of war was updated and enlarged at various times since, especially in 1929, 1949, and 1977. Most of the law of war concerns international war, and again not surprisingly, it derives almost entirely from anthropocentric concerns.

Three major bodies of international law have the potential for expressing (revealing) widely held cultural norms or ethical values relating to the environmental impact of war. Two of these—international environmental law and international human rights law—fail to do so. The third, the law of war, does contain a number of provisions that incidentally offer environmental benefit, among them the clearly expressed nearly universal anathema against the use of chemical and biological weapons and the expanding revulsion against the use of antipersonnel land mines. (Curiously, as of 2008, there had not clearly surfaced a similar sentiment that would renounce the use of nuclear weapons, doubtlessly the most socially and environmentally destructive weapon of war.) Of comparable environmental benefit, substantial support based on social concerns has been demonstrated for constraining attacks upon certain targets, including agricultural areas, dams, and nuclear electrical generating facilities, the latter two because they would release the dangerous forces noted earlier. Similarly, it has long been widely accepted that an occupying power is enjoined from the nonusufructuary exploitation of forests and agricultural works in enemy territory.

The most interesting expression of a cultural norm concerning war and the environment was the addition to the law of war of the 1977 Protocol on International Armed Conflicts (UN Treaty Series No. 17512, articles 35.3 and 55.1), prohibiting means of warfare that may be expected to cause widespread, long-term, and severe damage to the natural environment. The sentiment expressed there was an unveiled international rebuke of U.S. actions during the Vietnam War and seemed to derive in part from ecocentric concerns.

Religious norms have had hardly any influence on societies' cultural norms, whether military or environmental. Indeed, the influence seems to flow largely in the other direction. By way of example, the Christian religion of Western Civilization and the Buddhist religion of Central and East Asian Civilizations are strongly pacifist in their origins and essence. Indeed, one of the central tenets of Christianity is, "Blessed are the peacemakers; for they shall be called the sons of God" (Matthew 5:9). And the very first of the five precepts of Buddhism is the rule to abstain from taking life, including animal life. Nonetheless, the associated societies have long records of military activity unsurpassed in magnitude and ferocity. And secular proenvironmental norms are now being ever more widely embraced despite the antienvironmental tenets found in both Eastern and Western (Genesis 1:28) teachings to be fruitful and fill the earth, to subdue it, and to have dominion over all other living things on earth.

SEE ALSO *Chernobyl; Ecological Restoration; Ecotage and Ecoterrorism; Environmental Law; Fire; Forests; Pollution; Rio Declaration; Water.*

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Arthur H. Westing

WARREN, KAREN J.
1947–

Karen J. Warren was born on Long Island, New York, on September 10, 1947. She received a bachelor of arts degree from the University of Minnesota in 1970. The University of Massachusetts at Amherst awarded her a master's degree in 1974 and a doctorate in 1978 for one of the earliest dissertations on environmental ethics. She was the second Ecofeminist Scholar-in-Residence at Murdoch University, Australia, in 1995; held the Women's Chair in Humanistic Studies at Marquette University in 2004; and as of 2008 is a professor of philosophy at Macalester College in St. Paul, Minnesota, where she has taught since 1985. An international expert in environmental ethics, feminism, and peace studies, she is known for her work in connecting those fields. Committed to philosophy as democratic practice, she has taught prison inmates and developed award-winning environmental curricula for schoolchildren.

Warren's publications and philosophical practices demonstrate the potential of ecofeminism to restructure human relationships with other humans and with nonhuman others; create life-affirming, intentional interspecies communities; and rethink philosophy as a forum for public thinking and action. Her editorial work in introducing ecofeminism to North American audiences has influenced feminist scholars worldwide. She shares the social ecologist's insight that environmental issues are connected with social justice, in contrast to approaches, such as wilderness-oriented ethics, that tend to overlook the relationship between environmental degradation and human suffering. Warren edited the section "Ecofeminism and Social Justice" in *Environmental Philosophy: From Animal Rights to Radical Ecology* (2005). That collection, widely used as a university text, appeared in a fourth edition. Her *Gendering the History of Western Philosophy* (2008), a more directly feminist project, is a fifteen-chapter book that pairs male and female philosophers through the centuries, with introductions by Warren and commentaries by other feminists.

Warren's best-known work as of 2008 is "The Power and Promise of Ecological Feminism," first printed in *Environmental Ethics* in 1990, widely reprinted, translated into five languages, and revised in 2005. She argues that there are important connections between the domination of women and the exploitation of nature; that is, women and nature are objects of the same oppressive patriarchal conceptual framework. She defines key features of an oppressive conceptual framework: oppositional value dualisms, hierarchical thinking, and a logic of domination that assumes that alleged superiority justifies the subordination of alleged inferiors. Patriarchy structures a man-woman dualism hierarchically to establish male privilege and uses that privilege to validate women's oppression.

Man-nature dualism is inseparable historically from gender oppression, and so feminism and environmental ethics are linked. However, ecofeminism unifies through solidarity, not sameness, and so it can celebrate difference and oppose all forms of domination. Warren articulates the boundary conditions of ecofeminism: It (1) does not promote social domination but is (2) contextualist, (3) pluralistic, and (4) inclusive; (5) it is theory in process that (6) takes objectivity as a false promise and opts instead for critical analysis of which biases are better than others, (7) makes a place for traditionally neglected values (e.g., care and friendship), moral emotions, and emotional intelligence, and (8) reconceives ethics and the meaning of being human.

A distinctive feature of ecofeminism is attitude. Using her experience in mountain climbing, Warren advocates caring over conquering to show the limitations of the conquering and the potential for success, growth, and development of caring. She defends first-person narration as ecofeminist methodology: It gives voice to felt sensitivity and experience, expresses values overlooked in mainstream ethics, develops a stance not imposed but emergent from diverse individual voices, and suggests what might count as an ethical solution in a particular situation.

Warren's first single-authored book is *Ecofeminist Philosophy: A Western Perspective on What It Is and Why It Matters* (2000), a philosophical work for nonspecialists that integrates previous research with original material to define ecofeminism, explore its potential, and defend it against typical criticisms. Key metaphors are a quilt and a fruit bowl. A quilt's borders define its limits, but different quilters can contribute to its design. Similarly, theory has necessary conditions, but diverse thinkers can add specifics. Ecofeminism is thus inclusive theory in process and always is revisable, like a quilt whose individual patches can be replaced or repaired without abandoning the larger design. The fruit bowl is used to explain

ecofeminist ethics. Fruit is selected from the bowl to fit specific situations, for example, bananas when one is making banana bread, but none is inherently better. Similarly, no ethical principle has intrinsic superiority, though monist exclusionary principles that disallow emotional intelligence are prohibited. Methodologically, Warren revisits her arguments for taking empirical data seriously in a significant and original challenge to the traditional pursuit of universal truth through abstract, detached philosophical reasoning.

Warren's feminism has been criticized for political naiveté. She has claimed, for instance, that feminism can be defined as "the movement to end all forms of oppression," though a completely non-oppressive context is impossible. Nonetheless, Warren draws attention to women's lived experience of disproportionate harm in consequence of environmental degradation and shows that ecofeminism neither favors a privileged class of white Western women nor reinscribes essentialism. Rather, ecofeminism is a conceptually mature possibility of novel ethical relations between humans and between humans and nonhuman others.

SEE ALSO *Animal Ethics; Ecological Feminism; Queer Theory.*

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Trish Glazebrook

WASTE MANAGEMENT

Waste can be defined as unwanted material, or as material that the holder discards or intends to discard. The distinction between wastes and resources depends on one's willingness and technical ability to reuse artifacts and materials. One person's waste can be another person's resources.

Industrial mass manufacture and modern packaging have led to a dramatic and still ongoing increase in the volume and variety of the waste produced by households, industrial concerns, and other workplaces. Such waste includes various categories of hazardous waste, such as anthropotoxic, ecotoxic, infectious, and radioactive waste.

Waste management is often discussed in terms of a *waste hierarchy* that lists the major treatment methods in order of decreasing priority. One common variant of the hierarchy has six steps:

1. *Prevent* the creation of future waste.
2. *Minimize* the volumes and the harmful properties of future waste.
3. *Reuse* the artifact.
4. *Recycle* the material in the artifact.
5. Incinerate the waste, and use the heat to *recover energy*.
6. *Dispose* of the waste.

The waste hierarchy is not always applicable to hazardous waste. In the Third World, recycling often takes the form of scavenging. The waste pickers are poor, marginalized people, including children, with no or inadequate protection against toxic or infectious waste. When recycling involves serious occupational risks, it may be wrong to prefer recycling to final disposal.

WASTE DISASTERS

Public discussions on waste disposal have largely focused on a few major environmental disasters and scandals, among them the following: In 1978 a local resident in Love Canal, close to Niagara Falls, New York, suspected that her children's health problems were related to leakage of chemical waste in the neighborhood. It emerged that the entire settlement was built on top of an old landfill containing more than 20,000 tons of chemical waste. Leakage of several toxic chemicals was confirmed, a federal emergency was declared, and eventually more than 800 families were evacuated and relocated. The Love Canal events stimulated the creation of the Superfund Act, adopted by the U.S. Congress in 1980, which provides funds for cleanup of contaminated areas.

In 1982 the U.S. Environmental Protection Agency closed down Times Beach, a town in Missouri. More than

Computer Waste, Guiyu, China. *A worker with a hammer smashes a junk computer to pieces to obtain the usable parts. Environmental groups have contacted Guiyu, a cluster of five villages southwest of Shanghai, with a cautionary tale for poor countries that accept high-tech waste, drawing attention to the toxic chemicals released when the locals melt the computer parts to extract precious metals such as gold and platinum.* **AP IMAGES.**

2,000 inhabitants were relocated, and all buildings were demolished. The agency had discovered potentially dangerous levels of dioxin, originating in waste oil that had been sprayed on streets and parking lots to control dust. In hindsight, it has been questioned whether the actual risks were severe enough to justify the drastic measures taken by the Environmental Protection Agency at Times Beach. However, it should be remembered that these decisions were based on more uncertain information about the health effects of dioxins than what was later available.

In 1986 the cargo ship *Khian Sea* sailed with around 14,000 tons of toxic incinerator ash from Philadelphia to the Bahamas. After being denied permission to unload there, the ship sailed around the world for sixteen months, changing its name twice, in a vain search for a country where it could get rid of its freight. Eventually, most of the waste was dumped into the ocean.

In the early 2000s the exportation of e-waste, waste from electronic appliances, from industrial to developing countries became a major issue. One of the best-known examples is the Guiyu area in China's Guangdong Province, which receives large quantities of electronic waste, in particular from the United States. Here and in numerous places in the Third World, unprotected workers disassemble computers by hand and sort the material for recycling.

GEOGRAPHICAL JUSTICE

A large part of the ethical discussion of waste management has focused on questions of geographical justice. Empirical evidence shows that the disadvantages associated with waste treatment and disposal fall mostly on underprivileged persons, who benefit little or none from the products that gave rise to the waste. Internationally, rich countries figure as the major exporters of waste, and poor countries and regions as the major importers. Internally in the United States, studies have shown that communities receiving hazardous wastes from other communities are economically underprivileged and have high proportions of ethnic minorities. This phenomenon has been called *environmental racism.*

Companies and public authorities searching for places to site waste-treatment plants and dumps have often found it difficult to convince local populations and their elected representatives. Local resistance to waste facilities has been named the NIMBY phenomenon (not in my backyard). The allegation is that locals obstruct the creation of a facility that would contribute to the common good. The NIMBY phenomenon has sometimes been interpreted as an expression of irrational risk aversion of an uneducated public.

The NIMBY attitude is not necessarily irrational or unethical. Individuals need not be wrong in refusing to accept disadvantages for themselves (waste dumps in their neighborhood) to achieve advantages for others (removal of waste from other areas). In other contexts, taking a risk to help others is often considered supererogatory, virtuous beyond the call of duty. When members of a local community are required to accept a risk exposure not imposed on others, they may legitimately ask why they and not others are selected for this sacrifice.

Attempts are sometimes made to solve siting problems by compensation, for example, by offering monetary or other advantages to homeowners in exchange for accepting a waste facility in the vicinity. Such compensation is often controversial. On the one hand, it may be claimed that those who (have to) accept a disadvantage of this kind should not do it for free. On the other hand, the practice can be interpreted as buying people off to make them accept dangers that they would not otherwise accept. The line between fair compensation and corruptive practices is not easy to draw. One important factor in this demarcation is the magnitude of the dangers compensated for. It is much more controversial to buy acceptance of a large risk than to buy acceptance of a small risk.

The exportation of waste has often been criticized. In particular, protests have been waged against the transportation of waste from industrialized to developing countries. The Basel Convention, which entered into

force in 1992, prohibits such exportation for final disposal, but allows it for recycling. A 1995 amendment, the Basel Ban Amendment, prohibits all exports of hazardous waste from industrialized to developing countries. This amendment was as of 2008 not in force (because of too few ratifications). The European Union has nevertheless adopted it and made it binding on all its member states. Other industrial nations, including the United States, oppose it and do not implement it.

INTERGENERATIONAL JUSTICE

Leakage from toxic waste can make neighborhoods uninhabitable and waters unpotable for many generations. Therefore, waste management involves issues of intergenerational justice.

Discussions of intergenerational justice in waste management have focused mostly on spent nuclear fuel. This deadly material remains lethal for tens of thousands of years. (Owing to radioactive decay, some dangerous isotopes disappear in relatively short periods, but isotopes with long half-lives remain for tens of thousands of years or longer.) The waste-management solution preferred by governments and the nuclear industry is deep geological disposal, which involves placing the waste in final, sealed repositories in stable geological formations usually around 500 to 1,000 meters below ground. Then humans and the environment are protected by a combination of highly durable containers and a geological environment so selected that any leakage will move very slowly. Critics claim that there is nevertheless insufficient guarantee against future groundwater contamination, which would threaten the health of coming generations.

The planned Yucca Mountain Repository in Nevada was as of 2008 projected to receive spent fuel from American nuclear plants from 2017. However, crucial regulatory, legal, and political decisions remained to be made. The project is based on extensive scientific and engineering studies showing that the risks associated with the repository are very small. However, some of these studies have been subject to controversy. The repository has also met with strong local opposition, and Native Americans have claimed that it infringes on their holy lands.

A major alternative solution to sealed repositories is monitored retrievable storage. Such storage would give future generations control over the waste. They would have to monitor it, unless they chose at some stage to transfer it to permanent storage. This solution has the comparative advantage of not binding future generations to possible imperfections in our current technology, the disadvantage of leaving a problem for them to solve, and also the disadvantage of keeping nuclear material easily retrievable for conversion into weapons-grade material for nuclear warheads. Hence, the choice of principles for managing nuclear waste involves complex ethical issues concerning what risks and what responsibilities we can and should hand over to coming generations.

PRODUCER RESPONSIBILITY

According to the polluter-pays principle, the polluting party should pay for the damage done to the environment. According to the principle of extended producer responsibility, the manufacturer's responsibility covers the entire life cycle of the product and the waste it gives rise to. This means that the producer has to plan and pay for recycling or other measures needed for responsible waste management. Deposit systems for bottles exemplify application of extended producer responsibility.

Extended producer responsibility, combined with the principles for waste management enshrined in the waste hierarchy, lead to far-reaching demands on producers. The highest levels of the waste hierarchy, prevention and minimization, are often in conflict with producers' interests in expanding business and maximizing sales of their products. Waste management is an area with many potential conflicts between business interests and the environment. Hence, it is also an area in great need of ethical discussion.

SEE ALSO *Environmental Law; Future Generations; Industrial Ecology; Intergenerational Justice; Pollution; Risk Assessment; Sustainability; U.S. Environmental Protection Agency; Water.*

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WATER

Earth is the blue planet, the water planet. Nearly three-quarters of the earth's surface is covered by water, mostly in oceans. Water gives rhythm and pulse to life. Moving through all living entities—our bodies, the land, the atmosphere, and our cultures—water connects, transports, and transforms.

That water is life has become a truism. But the fact is, the earth has a biosphere because it has a hydrosphere. Owing to its vital place in life, water has turned into a culture and language unto itself. There are countless sayings, imageries, and references to water. Many fluid phenomena—the fluidity of globalization, liquid capital, and streams of consciousness—have been tied to a water metaphor as flexible and mysterious as the molecule itself.

Ubiquitous as water may be, freshwater is a finite resource. Most water is saline; only 2.5 percent is fresh. More than two-thirds of all freshwater is locked in ice at the polar regions or in glaciers in distant mountainous areas, a little less than one-third is groundwater, and only 0.3 percent is surface water (rivers, lakes, and reservoirs).

Water is in constant motion all around us: in the atmosphere, on the earth's surface, and in its depths. It constantly alternates among three physical states: gas, liquid, and solid. Evaporated or transpired by plants, it rises up into the sky and falls to the earth again as rain or snow, where it finds its way back underground or into lakes, rivers, and oceans. The hydrological cycle then repeats itself. The amount of water on the earth is basically the same as it was 4 billion years ago, and it has been recycled ever since.

Water has the rare characteristic of being less dense as a solid than as a liquid. Consequently, ice floats. Without this crucial property, rivers and lakes in the higher latitudes would freeze from the bottom up, with only a melted puddle on top during the warm season. Water freezing and thawing is capable of breaking granite. Water seeps into cracks, expands and contracts, and with a slow steady force turns even the hardest stone into soil. Water also has a great capacity to absorb heat. Ocean currents play a large role in the earth's climate patterns, tempering climates in many coastal regions.

Water has a pervasive presence in every aspect of our daily lives. We drink it, bathe in it, and cook with it. Our food consists in considerable part of water. Spinach equals milk in being approximately 90 percent water; tomatoes 95 percent; and beef, seemingly so solid, 60 percent. We ourselves are composed mainly of water (two-thirds of our body weight), and we need about 2 to 3 liters a day to live. We can survive for a month without food, but only 5 to 7 days without water.

CULTURAL, RELIGIOUS, AND PHILOSOPHICAL LEGACIES OF WATER

Because of its vital role, water has always been intrinsically linked with culture. Virtually all civilizations developed around water: Tribes settled on the shores or banks of water bodies, and cities originated at the confluence of rivers. The first complex societies—societies as diverse as ancient China, India, Mesopotamia, Mexico, and Peru—were irrigation-based cultures with ingenious water-management structures, a centralized government, and extensive division of labor. The Romans were also skilled water engineers, building innumerable aqueducts for public water supply using various techniques of hydraulic architecture. Karl A. Wittfogel called them "hydraulic civilizations."

Through the ages, poetry, music, and religion have found a deep well of meaning in water and crosscurrents of meaning in a vast pool of reflections and emotions about water. Narcissus epitomized the rise of self-consciousness in his self-reflection on the surface of a pond. The cosmogonic power of water has been a major theme in many ancient accounts of origin. These poetic sources are precursors of the later scientifically developed theory of evolution, which confirmed that all life forms emerged phylogenetically and ontogenetically out of water.

In the *Enuma Elish*, the Mesopotamian-Babylonian creation epic of the third millennium B.C.E., the primordial waters are Apsu (meaning sweet-water "ocean," "deep abyss," or "outermost limit") and Tiamat (meaning "primeval waters," the one who "is too deep to fathom," the salt sea). Apsu and Tiamat are brought under control by gods (their offspring) to create the topography of earth and sky.

We see a similar structure in Genesis (compiled between approximately 1400 and 400 B.C.E.), the first book of the Old Testament. Clearly influenced by the *Enuma Elish*, its opening lines read, "In the beginning . . . darkness was upon the face of the deep; and the Spirit of God was moving over the face of the waters." The Hebrew word *Tehom*, meaning "deep [waters]," is etymologically related to *Tiamat*.

The Greek philosopher Thales of Miletus (c. 624–545 B.C.E.) considered water an originating and guiding principle (*archē*). There were similarities between Thales' philosophy and the ancient legends and myths, specifically the ones about Oceanus and his consort Tethys, who was both sister and wife of Oceanus and whose name has etymological ties to *Tiamat* and *Tehom*. Thales, however, broke with the traditional belief that the gods organized, shaped, and controlled the cosmos. Hence, for Aristotle, Thales was no longer a theologian, like the old poets, but the founder of natural philosophy, investigating the basic

principles of matter and theoretically moving toward a scientific treatment of natural phenomena.

Nearly a century later Heraclitus of Ephesus (c. 535–475 B.C.E.) found in the *movement* of water a guiding principle: "All things flow" (*Panta rhei*), and "One cannot step in the same river twice." Heraclitus, less concerned with finding unity in a material substrate, was a protophenomenologist, interested in the everyday experience of change: "Cold things warm up, the hot cools off, wet becomes dry, dry becomes wet." Heraclitus emphasized that opposites are equally capable of transforming and are permanently changing into one another—a constant flux governed by Logos, the first proposed law of nature in Western natural philosophy.

Similarly, the ancient Chinese text *Tao Te Ching* of Lao Tzu (sixth century B.C.E.) masterfully invokes the paradoxical powers of water: "Nothing in the world is as soft and yielding as water. Yet for dissolving the hard and inflexible, nothing can surpass it" (chap. 78). Water is powerful yet unassuming. Thus, "The supreme good is like water, which nourishes all things without trying to. It is content with the low places that people disdain. Thus it is like the Tao" (chap. 8). Water is exemplary for leadership in that as the highest power, it accepts the lowest place: "All streams flow to the sea because it is lower than they are. Humility gives it its power. . . . If you want to govern the people, you must place yourself below them. If you want to lead the people, you must learn how to follow them" (chap. 66).

Humility is also an important value in the Bible, often thematically combined with God's punishment of human hubris. The Flood is the most famous biblical water story, the ultimate expression of God's wrath. In the deluge, only Noah, his family, and the pairs of animals on his arc are saved. At that point the imagery moves from water as an agent of punishment to water as a cleansing agent, and there appears a rainbow, the symbol of God's covenant with his people, in which humans have the first right to the goods of his creation, but in return have to take care of the earth.

In Islam there is a similar ethic of stewardship: The blessings of water come with human responsibility for its proper use. All life forms, including plants and animals, should be supported according to their needs. The Koran explicitly states that the supply of water is fixed and should not be wasted. Water is architecturally revered most majestically and aesthetically in Alhambra, the fourteenth-century Muslim palace in southern Spain. From every room can be heard fountains with running water, which have a cooling effect. A stately pool, a symbol of power, reflects the building at its entrance.

The revered place of water appears in a wide variety of religious rituals and cultural practices, such as baptism and pilgrimages to sacred wells. The spring in the Grotto of Lourdes (in southern France), where Mary is said to have appeared to fourteen-year-old Saint Bernadette in 1858, soon became the world's leading pilgrimage site even though the holy water was "not exactly inviting," in the words of Emile Zola. The healing powers attributed to the water that wells up from the grotto attracts 5 million pilgrims a year from all over the world. People drink it, bathe in it, and buy plastic Mary figures filled with it. It is probably no coincidence that the Virgin Mary is portrayed as dressed in blue and white, water's colors, which contributes to Mary's image as the life-giving mother of Christ.

Water is a recurrent theme in literature. The French philosopher of science Gaston Bachelard (1884–1962), in *Water and Dreams*, saw water as a prime source for the imagination. He connected water's symbolic power to purify to its material power to clean and rinse and ultimately rejuvenate, as expressed metaphorically in the notion of the Fountain of Youth. According to the philosopher of technology Ivan Illich (1926–2002), this symbolic force of water has been compromised in modern life. For him, water in its engineered form reduced to H_2O hardly speaks to the imagination. Chemically purified and piped, water as a living element has been separated from our daily consciousness.

Water has always played an important role in the arts. Famous Dutch seventeenth-century landscape painting was born out of seascapes (a fact that resonates with the trajectories of early myths of origin). In sculpture, architecture, multimedia, and landscape art, contemporary artists such as Tadao Ando, William Pye, Roni Horn, Basia Irland, and Herbert Dreiseitl—to name just a few—all explore innovative ways with water, implicitly articulating the larger cultural interest in the element. William Shakespeare in *King Henry VIII* invokes water to convey the fleeting nature of virtue: "Men's evil manners live in brass; their virtues we write in water." Virtues are seen as ephemeral, as fluid, like water, while vices are like brass—here to last.

LEGACIES OF MODERNITY

The late nineteenth century and entire twentieth century saw a massive harnessing of water through extensive damming, draining, and diverting. Progress was measured, in part, in terms of the control, mainly through large-scale water-engineering projects. The leading water-development paradigm was one of economic growth driven by a utilitarian ethic. Any drop reaching the ocean instead of being used for agriculture, industry, or hydropower was considered a waste. From the late nineteenth century, an unprecedented boom of large-scale water projects ensued, followed a century later by a rising tide

Delivering Water under the Hot Desert Sun. *A group of Kenyan Oromos (an ethnic division of Ethiopia) travel through the desert to deliver water to Oromo Liberation Front (OLF) troops in 2006. The walk takes a full day, and they each carry at least 30 kilos of water on their back. Although three-quarters of the earth is covered with water, freshwater for drinking is a finite resource, and in many places such as Africa this scarcity is already displaying its effects. In addition, the quality of water too is declining, as toxins and other industrial waste pollute the supply.* **GETTY IMAGES.**

of problems varying from silting reservoirs to oxygen-depleted dead zones and heightened coastal vulnerability because the massive destruction of wetlands has taken away a buffer zone of natural barriers against hurricanes and cyclones.

In this whole process, water consumption has skyrocketed. A growing world population has led to greater needs for food and industrial production and an explosive rate of urbanization. Consequentially, the amount of water available for humans and other species keeps declining. About 70 percent of global water use goes to agriculture, and 22 percent to industry, while domestic and municipal use accounts for a mere 8 percent. The high percentage of water for agriculture is partially due to low water-use efficiency, further aggravated by archaic water laws and irrigation subsidies, which take away incentives to use water more efficiently. Moreover, meeting the Millennium Development Goal on hunger entails doubling food production by 2050, which means more irrigation.

An important closeted use of water has been exposed through John Anthony Allan's notion of *virtual water*, also referred to as embedded water, embodied water, hidden water, or water footprint. It is the water used in the production of a good or service. Allan called it "virtual" because once, for example, an irrigated crop of wheat is grown, the water used to grow it is no longer actually contained, molecule for molecule, in the wheat. It thus takes 2,000 liters of water to make a cotton T-shirt, 2,400 liters for a hamburger, and 400,000 liters for a car.

Also declining is the quality of water, polluted by heavy metals and other industrial toxic wastes, by microbial pathogens and excessive nutrients from untreated sewage and intensive use of agricultural fertilizers. Whereas once dilution was the solution to pollution, such practice has reached its saturation point. According to Jeremy Jackson, a leading oceanographer, the oceans are at a tipping point; that is, environmental damage any moment now could pass an unknown point of no return, at which the ocean's

resilience, its capacity to bounce back into a healthy state, is exhausted. With the bulk of the human population (60% of people worldwide) already living along or near coasts, and with ongoing growth (by 2025 coastal populations are expected to reach 6 billion people), coastal and ocean ecosystems are on a fast track to devastation. Worldwide fish stocks are already in steep decline. Sea-level rise caused by climate warming will have tremendous consequences for millions of people.

Some foresee that, owing to population growth, increasing environmental degradation, and global climate change, by the end of the twenty-first century water will be the single dominant factor in world natural-resource politics. Freshwater is a crucial limiting factor for health, food security, economic growth, biodiversity, and environmental sustainability. The total volume of water on the earth may be sufficient to accommodate our needs on a sustainable basis, but, as has been argued by various U.N. agencies, nongovernmental organizations, and other water organizations, creating sustainable conditions requires a serious political commitment. Much water is wasted, polluted, drained, or misallocated.

Uneven distribution of water is one of the most poignant problems. People in developing countries use on average 10 liters of water per person each day, while in Europe the average is 135 liters, and in the United States, 570 liters. Roughly 1.2 billion people, one-fifth of the world's population in 2008, lack access to potable water. And approximately 2.4 billion people, two-fifths of the population, do not have adequate sanitation services. Water-related diseases cause 80 percent of all illnesses and deaths in the developing world. In addition, many African and Asian women and girls spend hours a day walking to get water, an activity that severely reduces their participation in other productive activities, including education.

Increasingly, water scarcity is seen in terms of a crisis of management. Moreover, the water crisis is linked to a development crisis and an energy crisis. Its solution is a matter not only of engineering know-how, which we have in abundance, but also of political will. To build a secure and sustainable future for a huge and still growing world population, considerations of equity may become more crucial than concerns of economic efficiency and invisible-hand allocation of water by the free market. Emerging is a paradigm shift from large-scale, utilitarian, supply-side management of water to an environmentally sound and equitably just allocation of water.

TOWARD AN INTEGRATED SENSE OF WATER

Since the early 1990s an approach known as integrated water-resource management has gained ground. Integrated management explicitly advocates a holistic approach, managing water at the basin or watershed level and integrating land and water; upstream and downstream; surface water, groundwater, and coastal water. A more transparent and participatory style of management replaces sector-by-sector and top-down management. In multiple-stakeholder processes, hydrological and engineering expertise is complemented with ecological concerns, while also tending to urban, agricultural, industrial, and recreational interests. Water connects them all and calls for a water ethics that integrates local problems of water quality and quantity in transregional and global political contexts.

Peter Gleick, a leading water-policy expert and director of the Pacific Institute, speaks of a "soft path" that complements the twentieth-century large-scale centralized infrastructure with "lower cost community-scale systems, decentralized and open decision-making, water markets and equitable pricing, application of efficient technology, and environmental protection." Conservation is one of the main strategies to keep more water in the system. Sandra Postel, another well-known water expert and director of the Global Water Policy Project, calls conservation our "last oasis."

A variety of changes in technology and legal structures have been explored, and these, together with an increased awareness of the need for water conservation and proper economic incentives, have resulted in more efficient water use. There has been a resurgence of traditional technologies, such as rainwater harvesting (the systematic capturing of rainfall or floodwater) and small-scale run-of-river irrigation systems. Such technologies are often more cost-effective and less disruptive to the social and environmental functioning of local communities. Various new water-conservation techniques have been implemented, such as highly efficient time-released drip irrigation systems. Two commonly mentioned contemporary technologies to increase available freshwater are desalination and water reuse. Desalination, however, is energy- and capital-intensive and generates vast amounts of wastewater, twice as saline as seawater. Oil-rich and water-poor countries like Saudi Arabia get most of their water through desalination and account for almost one-fourth of the world's desalinized water. Reuse is more widespread. Countries as different as Japan and Dubai make extensive use of grey water (nonsewage wash water used in the home) for landscape irrigation. Water gets polluted, but it can be cleaned, one of the great assets of water. More and more municipalities consider treated sewage water as an option for providing water.

New laws also have beneficial effects. Two excellent examples of such legal change are the implementation in the United States in the 1970s of the Clean Water Act and the Safe Drinking Water Act, which require industries to

clean up their wastewater. These laws made many industries more water-efficient, because it turned out to be cheaper not to produce the waste than to clean it up. As of 2008 it takes 5 to 6 tons of water to make a ton of steel, for example, whereas it used to take 200 tons.

Water privatization may be seen as another tool of efficiency. While most water-provision and sanitation systems are publicly owned and operated (globally, 90%), there is a tendency toward private-sector participation in these very basic municipal services. The proponents of privatization argue that it will improve the quality of service, reduce costs, and mobilize more financial investment and technical expertise. Opponents counter that privatization leads to poorer service and higher costs because competitive water markets are hard to arrange (owing to the nature of the service) and profits are valued over service. There have been intense political campaigns against privatization in Ghana (2003), Uruguay (2004), and, most famously, Bolivia, the site of the Cochabamba Water Riots of 2000. Some countries (e.g., the Netherlands, 2004) have enacted laws banning the privatization of public water supply.

Progressive water pricing is often mentioned as a regulative approach to conservation that encourages more responsible water use by means of an incentive. In such a system, a daily minimum amount of water is sold at an affordable price. As a customer's use increases, the price per unit also increases in a stepwise manner. This is the reverse of the usual approach of markets, in which high-use customers are charged less per unit than low-use customers. From a progressive-water-pricing perspective, agricultural water stands out as seriously underpriced.

In reaction to conventional antiprogressive water pricing and water privatization, a growing movement has emerged for implementing a U.N.-mandated human right to water, which would entitle all people to sufficient, safe, accessible, and affordable water. This right would trump contractual rights to water and property rights in water.

There are awareness campaigns about the value of water, water-education programs in schools and municipalities, venues to involve various stakeholders in water management and in citizen-based projects of wetland, riparian, and coastal restoration. Environmental restoration requires amending our relation to the land as much as restoring the land itself. Watershed restoration involves a broad spectrum of human-water-land relations spanning ethics, aesthetics, politics, and participatory activities and encompasses modes of knowledge as diverse as science, engineering, elders' experiences, storytelling, and children's imagination. Celebrations such as World Water Day and local river festivals provide playful ways to reconnect with water and to enhance motivation to learn about water quality and quantity.

Almost 2,500 years later, we are relearning the old Daoist and Heraclitean aquatic wisdom: In water's humility lies its power; in its constant flow lies its stability. All living entities—including the earth's biosphere—depend on the ongoing cycling of water. On a planetary level, we are all downstream. Our future and the future of the planet are written in water.

SEE ALSO *Aquifers; Conservation; Consumption; Daoism; Global Climate Change; Islam; Nongovernmental Organizations; Population; Sustainability; Watersheds; Wetlands.*

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Irene J. Klaver

WATERSHEDS

Watersheds are land areas in which all the ground and surface water flows to the same place, creating a systemic link among land, water, and everything that lives on the land. Shaped by biological and geological forces, watersheds give rise to a variety of ethical issues involving political boundaries, population growth, urbanization, externalities, income inequality, changing knowledge, and future generations.

Shaped by nature rather than by political forces, watersheds often cross political boundaries. For instance, rivers often have been perceived as convenient boundary markers. Consequently, because watersheds are situated on both sides of rivers, there is often no single political entity to provide oversight of watershed matters. Rivers that provide water to more than one nation-state include the Danube, Jordan, Ganges, Indus, Nile, and Colorado rivers. Within nations watersheds cross a multitude of provincial, prefectural, and state and local boundaries. Effective management requires the cooperation of diverse political entities. Because the power of a jurisdiction does not always correspond to its demand for water, there is a need for cooperation and ethical behavior in caring for and distributing water.

ALLOCATION

The press of population growth on the resources of some watersheds has been so great that ethical issues have been created that involve not only allocation of water among humans but also the fulfillment of the water needs of a watershed's land, plants, and animals. Although water allocation has been a topic of global conferences since the 1970s, the conferences have been slow to recognize the ethical issues implied in allocation decisions within watersheds. Before the 1990s some conferences treated water solely as a marketable commodity without any discussion of ethical issues. However, subsequently the ethical issues of providing a basic amount of water as a human right and meeting the needs of the entire ecosystem of a watershed were acknowledged. In 2002 the United Nations Committee on Economic, Social, and Cultural Rights called for the combined basic physical and cultural and social needs for water to be met without regard to costs. The Earth and Johannesburg summits of 1992 and 2002 gave explicit recognition to the need of the entire ecosystem for water.

URBANIZATION AND EXTERNALITIES

The growing urbanization of human populations creates an ethical challenge when cities draw on water from outside their boundaries, often from rural watersheds. In essence cities are drawing on nature's services in distant watersheds. This raises two ethical issues. The first is the ethical obligation to leave enough water to meet the water needs of the supplying watershed. The second is compensation of rural areas for the use of the natural services. For instance, New York, Beijing, and Los Angeles draw on water far from their boundaries. Los Angeles and Beijing have caused depletion of distant water supplies, and New York used eminent domain to flood villages to create space for its reservoirs. The procedure used in New York, though it created conflict, was fairly open and included compensation for the actions taken by the city; in contrast, the Los Angeles story is famous for deception and chicanery.

The interconnected and open nature of watersheds has created a class of ethical issues through what economists call *externalities*: the impact of decisions on third parties not responsible for those decisions. One example stems from the generally open access to watershed waters and land. Because watercourses are ubiquitous and impossible to patrol, the decisions of individuals and corporations to refrain from polluting them depend on an ethical determination rather than fear of a legal penalty. There is even more open access to the air that affects watersheds. Fuels selected by power companies can create acid rain in distant watersheds.

Private ownership of property provides another example. For instance, much U.S. forest land is privately owned, but little is under a management plan to maintain diversity in the types and ages of trees needed for watershed protection. Economic incentives favor cutting down the biggest trees, which often offer the most protection. Although state governments may be able to make legal arguments in favor of taking over the privately held forest land in a watershed by eminent domain to protect the water supply, the local communities would be likely to consider this approach unethical. Because of such community pressures, New York City signed an agreement with communities in its distant rural watershed not to take land by eminent domain and instead seek land through voluntary sales and has created incentives to induce private forest land owners to put their land under conservation management.

Inequality of income among watershed residents and users creates two types of ethical questions. The first

concerns the way society provides and finances watershed services; the second concerns the way wealthy persons and companies observe laws. Often high-cost water protection and distribution infrastructure systems, even if built by governments, bring water to the middle and upper classes, leaving lower-income persons with relatively more expensive water sources or without safe water. Even when water is provided universally within a watershed, the taxes used to finance the infrastructure are often regressive, resulting in lower-income persons paying a higher percent on their incomes than higher-income persons. Also, although taxes and fines may be set to encourage conservation and prevent pollution, persons with a high income and wealthy companies can afford to pay them. Additionally, companies can pass the cost of fines to the public in the form of higher prices, which can also, depending on the consumption pattern of the product, affect lower-income groups more than upper-income groups.

Because knowledge, weather, and technology are always changing, there is an ongoing ethical need to devise new laws as the situation demands and redress the harms that have been done. For instance, the water in most river basin watersheds is insufficient to meet current needs, and global climate change is exacerbating the problem. Existing water agreements may be unrealistic. For instance, the Colorado River Basin agreement was based on atypical, historically high water flows. Around the world many others rivers face demands that exceed their potential supply, including the Yangtze in China, the Nile in Egypt, and the Litani and Jordan rivers in the Levant. However, many international water treaties do not address allocation issues. Further, serious pollution of water supplies may have occurred as a result of the use of technologies whose toxicity was not well understood. An example is the polluting of the Hudson River in New York with cancer-inducing polychlorinated biphenyls (PCBs) by the General Electric Corporation. The responsibility to remediate situations such as these faces companies and governments around the world.

Future generations depend on the ethical choices made by the contemporary generation to provide them with adequate water supplies. Many contend that free markets cannot ensure such protection because people tend to value near-term benefits and market criteria cannot capture the holistic nature and needs of watersheds. They argue that preserving watershed services for future generations requires decision making that honors the need for safety and precaution, based on an understanding of how the web of relationships in a watershed works.

POSSIBLE SOLUTIONS

Political boundaries and urbanization problems can be addressed in watershed treaties and collaborations. Treaties on the sharing of water across boundaries, although hammered out over time, can represent a set of rules rather than an ongoing process. Collaboration, however, is a process in which the diverse stakeholders in a watershed make a commitment to work with one another to evolve workable compromises to protect and share the water in a watershed. Collaborations that involve distant partners or technological complexities are likely to require regulations to protect water.

Collaboration Collaboration tools are being developed to help stakeholders understand the implications of choices before they make them. For instance, a model system for water allocation that was developed for Middle Eastern countries not only allows consideration of diverse options but allows variation in the input of social values as well as financial costs. Both treaties and collaborations can address inequalities of need through compensation programs that are in essence payments for the ecosystem services of a watershed. There has been growing recognition that residents of rural areas should be compensated for the provision of nature's services from their land to cities.

Water as a Human Right The need to prioritize watershed services has generated a variety of approaches to providing basic water allocation as a human right. It is argued that this right should become embodied in international law to help build protection of basic water rights into water treaties and collaborations. Within single watersheds with poor communities ladders of use have been recommended. The ladder gives first priority to enhancing open sources, then public taps, then communal sources, and finally individual taps. Another technique is the use of virtual water: the importation of water-intensive crops such as wheat from water-rich to water-poor watersheds to allow the water-poor areas to retain their water for basic needs. For example, Egypt saves water by importing wheat. However, the dependence on virtual water would create an ethical demand for the continued provision of those crops. The impact of the financing of the imported crop on the distribution of income is also an ethical issue.

Education Education and access to information are vital tools for addressing the externality problem created by open access to watersheds. For instance, many governments fund education about the value of and ways to use a watershed for both children and adults through schools and other community facilities. An example of an information tool is the U.S. toxic-release inventory law, which requires companies to publish releases of certain toxic substances into the environment. It was discovered that the companies reduced their emissions to avoid adverse publicity. Also, the information has been used for legal suits by citizens against polluters.

Financial, Taxation, and Subsidy Policies Ethical issues created by inequality of income distribution and private ownership of land within watersheds can be addressed through progressive financial, taxation, and subsidy policies. For instance, rising unit prices can be charged for escalating use of water for inessential purposes such as private swimming pools. The United States provides an example of subsidies helping to reduce inequality. Because U.S. national taxes tend to be progressive and local taxes tend to be regressive, national water infrastructure grants were especially beneficial to poorer members of watersheds. In the United States tax deductions for privately owned land put under conservation easements address environmental and economic needs simultaneously.

Restoration and financial compensation by polluters will not prevent the loss of many lives (human, animal, and plant) and enduring harm to landscapes and habitat. This is why many people recommend the use of the precautionary principle and advocate cradle-to-grave clean technologies so that people can keep track of what they bring to and create in watersheds, honoring the privilege of using those resources by leaving a watershed and its inhabitants and constituent parts at least as well off as they originally were.

SEE ALSO *Environmental Education; Future Generations; Habitat Loss; Pollution; Population; Rivers; Urban Environments; Water.*

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Joan Hoffman

WETLANDS

Wetlands are found on every continent except Antarctica, and at every latitude from the tropics to the tundra. About 6 percent of the land surface of the Earth is wetlands, and in the boreal regions this is 11 percent. Wetland ecosystems on global scales cover more than 1,280 million hectares, an area 33 percent larger than the United States.

Individual wetlands are often relatively transient features of a landscape. They may have differing water levels depending on seasonal changes and climate. They may fill with debris. Water-loving plants invade the margins of a lake; as detritus collects, marsh-loving plants replace them; afterward the bog fills and shrubs and trees can enter. Meanwhile wetlands will be generated elsewhere on the landscape.

Though sometimes transient, wetlands considered as a biological phenomenon are often long-lived and constantly present throughout Earth's evolutionary past, and there is no cause for wetlands not to persist indefinitely in the future. Like the forest and the sea, mountains and rivers, lakes and islands, wetlands are a form of landscape that Earth has regularly been producing over the epochs of natural history.

Wetlands vary in size from small soggy areas and pools to vast tracts covering many thousands of hectares, both freshwater and brackish. Wetlands are dominated by water, but there is a wide water gradient from drier uplands to deep water, and this often differs depending on rainfall from season to season and year to year. As a result, what is recognized as wetlands varies, depending somewhat on whether the focus is plants adapted to flooding and saturated soil or wildlife so adapted, or the water table relative to ground surface, or the wet/dry season of the year.

Wetlands may be the most threatened of all landscape types. The world has lost half its wetlands since 1900. The United States has lost over half its wetlands. Most wetlands in Europe have been drained or filled for development. Africa, South America, and Asia are continually developing vast wetland areas for food and fiber. The Millennium Ecosystem Assessment, sponsored by the United Nations, has an assessment: *Ecosystems and Human Well-Being: Wetlands and Water*. The authors express concern: ''The degradation and loss of wetlands is more rapid than that of other ecosystems. Similarly, the status of both freshwater and coastal wetland species is deteriorating faster than those of other ecosystems'' (Millennium Ecosystem Assessment 2000, p. ii).

Since 1989, the U.S. Environmental Protection Agency has had a policy of ''no net loss'' of wetlands, resulting in a quagmire of controversies about what counts as wetlands (a golf course lake with swampy shoreline?), wetland remediation, loss (of acres or function?) and gain (when does ''wet land'' become ''wetland''?). With wetland legislation, this has resulted in legal quarrels about what is a jurisdictional wetland, what permits may be required to dredge or fill them, or when a mitigation is successful—often destroying a wetland in one place and creating a substitute one elsewhere. A frequent judgment is that recreated wetlands are no match for the originals (Kaiser 2001). A National Research Council report was quite blunt: ''The goal of no net loss of wetlands is not being met for wetland functions by the mitigation process, despite progress in the last 20 years'' (National Research Council 2001, p. 2).

On international scales, the Convention on Wetlands of International Importance (commonly called the Ramsar Convention, from its first adoption at Ramsar, Iran, in 1971) has become increasingly important, with, since 1987, a permanent secretariat headquartered at the International Union for the Conservation of Nature and Natural Resources in Switzerland. By the turn of the twenty-first century, 117 nations had joined the convention and there were over a thousand wetland sites (Frazier 1999).

The wide varieties of wetlands and the varieties of peoples experiencing them over many centuries have generated a rich terminology: bogs; marshes; mires; muskegs; aapa peatlands, palsa bogs; fens; swamps; wetland moors; wetland prairies; tidal salt marshes; mangrove wetlands; river floodplains, deltas; wetland alluvial fans. Scientists have attempted more precision in classifying schemes (Cowardin et al. 1979; Gore 1983; National Research Council 1995; Mitsch and Gosselink 2000). The National Research Council report cautioned that certain types of wetlands (fens and bogs) are much more difficult to restore than others; some may be impossible to restore.

Human encounters with wetlands have distinctive dimensions (Vileisis 1997). Wetlands have been much misunderstood environments, perhaps the most misunderstood (Miller 1989). The contemporary term *wetlands* has been chosen partly to avoid classical terms such as *swamp, bog, mire*, which have negative connotations. A ''pleasant mire'' is almost a contradiction in terms. Swamps are damp, marshy, overgrown, rank, dismal, gloomy. They are uninviting places where one has to contend with insects while trying to keep from falling into the treacherous mud. Wetlands are often believed to be wastelands, best to be filled, drained, and converted into a useful resource.

Traditionally, there was an element of truth in such dislike. *Miasma,* from a Greek word for pollution, was poisonous air rising from the rotting bogs. *Malaria* means ''bad air,'' and the disease was more often caught by those who lived near wetlands, breathing this bad air. That the disease was carried by a protist in mosquitoes, breeding in stagnant or slow moving waters, was unknown until the 1890s.

Wetlands have economic uses and provide ecological services (Maltby 1986; Gore 1983; Richardson 1994; Mitsch and Gosselink 2000, Chapter 16). They provide habitats for fishing and for hunting waterfowl; they may contain timber that can be harvested. Rice, a staple grain for over half the world, is grown on managed agricultural wetlands. Peatlands provide fuel and energy. Coastal marshes are critical to the marine fishing, shellfish, and shrimp industries. Eighty percent of the commercial catch off the southeast U.S. coast is linked to salt marshes. There may be important biogeochemical transformations involving phosphates, nitrogen

Wetland Habitat in Wisconsin. *The term "wetland" refers to various transient features of a landscape, but essentially includes any area dominated by water. Wetlands may be one of the most threatened ecosystems, and because of their important economic and biological uses, recent efforts have been made in an attempt to preserve these landscapes. However, as in the United States, legal measures to retain a net amount of wetlands produces additional problems and controversy.* **PHOTO BY RYAN HAGERTY/U.S. FISH AND WILDLIFE SERVICE.**

compounds, sulfur compounds, and carbon. Wetlands serve for water storage and as filters for wastewater treatment. Wetlands provide flood control. In one notable example, damage in New Orleans from hurricane Katrina (2005) was much worse than it might have been, as a result of wetland losses. The four decades of wetlands loss before the turn of the twenty-first century increased storm surges about three feet (Stokstad 2005). The Millennium Ecosystem Assessment analysis also laments: "Many water resource developments undertaken to increase access to water have not given adequate consideration to harmful trade-offs with other services provided by wetlands" (Millennium Ecosystem Assessment 2000, p. ii).

Scientific understanding of wetlands has led to their better appreciation. The first misperception to be set aside is that wetlands are wastelands biologically. Wetlands can be high in biodiversity and biomass productivity, especially if open to hydrologic and nutrient fluxes. "Wetlands . . . are among the most fertile and productive ecosystems in the world" (Maltby 1986, p. 9). There is often less diversity in northern wetlands than in those in warmer regimes, but the fewer species there may be present in enormous numbers. In wetlands, obtaining nutrients and oxygen can be problematic, sometimes resulting in ingenious solutions to these stresses.

Wetlands offer unusual experiences of natural history (Rolston 2000). The slowed processes of decay underwater keep the evidences of former life close to the surface. The black ooze is a mixture of silt and partly decayed plants and animals that have gradually piled up on the bottom. The waterlogged remains are oxygen-starved, compared to terrestrial sites, and decay slowly: waterlogged logs, a soggy thatch of dead plants, or peat. The retreat of the glaciers left a Finnish landscape of lakes, scoured hollows, kettles, bogs, and mires. Many Finnish mires are thought to have existed continuously for 8,000 years (Ruuhijärvi 1983, p. 48). Studies of the pollen preserved therein record life in these wetlands, ongoing with vigor for eight millennia.

Wetland plants can tolerate extremes of moisture, nutrients, and oxygen in the soil. Insectivorous plants have adapted to the nitrogen-deficient soils of bogs by reversing the usual trophic pyramids, in which insects typically eat plants. Here plants eat insects, as with the sundews, pitcher plants, Venus flytraps, or bladderworts. Marshes and mires are remarkable places for adapted fit, complex networks connected in biotic community, as we learn when we try to recreate them.

Bird life in wetlands can be abundant, with distinctive adaptations to life in the wetlands. The ducks include mallards, pintails, shovelers, buffleheads, teal. There are also the blackbirds, coots, grebes, cormorants, pelicans, mergansers, gallinules, jacanas, herons, marsh hawks, cranes (Burt 2007). Perhaps the most celebrated of the northland waterbirds are the loons, ancient, deep-diving birds with their striking call.

In sum, wetlands are "biological supermarkets" for the diversity of life (Mitsch and Gosselink 2000, p. 4). Wetlands are especially demanding environments to understand and to conserve. Wetlands are challenging scientifically, economically, politically, socially, philosophically, ethically. Conserving them, we respect life; and, as the Millennium Ecosystem Report insists, the integrity of wetlands is closely linked to human well-being.

SEE ALSO *Biodiversity; Hurricane Katrina; Millennium Ecosystem Assessment; Rivers; U.S. Environmental Protection Agency; Water.*

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Holmes Rolston III

WHITE, LYNN, JR.
1907–1987

A leading historian of medieval technology, Lynn White Jr. was born on April 29, 1907, in San Francisco and died March 30, 1987. In his seminal paper "The Historical Roots of Our Ecologic Crisis" (1967), he argued that the Judeo-Christian worldview underlies the distinctively Western tendency to exploit nature through technology, and only a revision of that worldview can resolve our ecological problems. White's view that ecological problems are caused by Judeo-Christian values has been much debated by environmental philosophers, theologians, and others.

White maintains that while nineteenth- and twentieth-century attempts to dominate nature arose from the coalescence of science and technology in the industrial revolution, the attitudes underlying these practices are a millennium older, deriving from the conversion of Western Europe to Christianity. (Orthodox Christianity is exempted from these charges, although White's interpretations of Judeo-Christian scriptures make it implicitly subject to them as well.) Christianity, according to White, is the most anthropocentric religion of the world, because Christianity teaches that God desires humanity to exploit nature in its own interest, with indifference to other

creatures. In the early middle ages, these exploitative attitudes were apparent in the new technology of deep plowing (''Formerly man had been part of nature; now he was the exploiter of nature'' [White 1967, p. 1205]) and in new calendars representing man modifying nature (''Man and nature are two things, and man is master'' [White 1967, p. 1205]). Environmental problems cannot be solved unless the West changes religious values by turning to Zen Buddhism or, failing that, to Saint Francis's belief in the equality of all creatures.

Curiously, White elsewhere expressed admiration for Western medieval technology as a humane and liberating force (see 1962), besides stressing the long-term significance of such technology. Indeed, his staccato remarks about the changed relation of man and nature seem disproportionate to the alterations he actually describes. Did previous civilizations, including the Romans, really behave as ''part of nature''? Did deep plowing really betoken universal exploitation of nature or signify an end in the West to love and respect for land? Did symbols of farming in Frankish calendars exhibit a significantly greater sense of mastery than the works of (say) Hesiod or Vitruvius (fl. first century BCE)? Historical debates about White's thesis have also concerned methodology; Elspeth Whitney (1993), for example, questions the assumption that religious beliefs could drive technological change, rather than expressing changes driven by economic and social forces.

White's article also generated debates among biblical scholars, historians of ideas, and ecologically concerned theologians on the interpretation of the Old and New Testaments and the attitudes of Judaism and Christianity toward nature. John Passmore, for instance, rejects an anthropocentric interpretation of the Hebrew Bible and Judaism. Certainly passages such as Psalm 104 express God's concern for nonhuman creatures, while books such as Leviticus and Deuteronomy convey the idea that the land is not human property but God's, and is held subject to a range of ethical conditions, including concern for other creatures. Clarence Glacken interprets humanity's role in the Bible as that of steward of the natural kingdom, as do many ecologically concerned theologians (such as Paul Santmire) when expounding the teachings of Christianity.

Certainly, Old Testament passages affirming ''man's dominion'' (Genesis 1, Psalm 8) raise theological problems. But the Hebrew term *rada* may convey nothing more than governorship of a kind answerable to God (as James Barr and Michael Northcott argue). *Dominion*, with its Latin-derived overtones of mastery, is misleading enough; reinterpreting *rada* as meaning domination (disproportionate power) or domineering (oppressive exercise of power) is a distortion. Interpretations stressing responsible stewardship are thus preferable to White's reading of these texts as conveying monarchical and unconditional mastery. Not even the ''in the image of God'' teaching of Genesis (1:26–27) warrants such an interpretation.

Jesus's teaching about sparrows and lilies (Matthew 6) embodies a nonanthropocentric view of nature, and other New Testament passages suggest that the whole of nature has a place in God's plan of salvation (Romans 8, Colossians 1). Christianity has sometimes been interpreted as legitimizing human domination of nature yet has just as often offered prayers for beasts and encouraged humanity to adorn the world so as to complete God's creation. As for the widespread medieval use of Christian language to endorse technology, perhaps this just reflects,

EXCERPT FROM LYNN WHITE'S ''THE HISTORICAL ROOTS OF OUR ECOLOGIC CRISIS''

SOURCE: (from White, Lynn, Jr. 1967. ''The Historical Roots of Our Ecologic Crisis.'' *Science* 155: 1203–1207.)

as Whitney has suggested, "an age in which a religious perspective permeated every dimension of human life" (2005, p. 1736).

As Santmire shows, Christian writers' stances on the environment have been ambivalent. Some—such as Origen (185?–254?), Thomas Aquinas (1224/5–1274), and John Calvin (1509–1564)—adopted metaphysical forms of anthropocentrism, while others, such as Augustine (354–430) and René Descartes (1596–1650), without embracing the kind of anthropocentrism depicted by White, endorsed despotic interpretations. Yet many others—such as Irenaeus (c. 120/40–c. 200/3), Basil (c. 329–379), Ambrose (339–397), Cuthbert (635?–687), and Saint Francis (1181/2–1226)—adopted much gentler stances. Matthew Hale (1609–1676) explicitly viewed humanity as the steward of nature, and has had many modern successors.

The main historical significance of White's provocative paper has consisted not in his arguments but in the challenge it presented to theologians and philosophers worldwide to reappraise their attitudes toward the environment and the links of their thought with religion and culture. White expressly declares that reforming human behavior toward nature must be preceded by a reformed conception of the relationship between humanity and nature. Yet White's influence may unduly ascribe our environmental problems to culturally shared attitudes and values (Whitney 1993, pp. 168–169) and make their solution turn on a reform of worldview. Effectively solving such problems may require greater focus on reforming institutions, such as economic and political structures, rather than on reforming worldviews.

SEE ALSO *Buddhism; Christianity; Descartes, Rene; Ecotheology; Environmental Philosophy: II. Medieval Philosophy; Judaism; Passmore, John Arthur; St. Francis of Assisi; Stewardship; Technology.*

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Robin Attfield

WHITEHEAD, ALFRED NORTH

SEE *Process Philosophy.*

WILDERNESS

Throughout history wilderness has had many definitions and connotations. In the Book of Joel in the Bible the wilderness is characterized as a "desolate" place to put behind one and set in contrast to the "Garden of Eden" before one. For American transcendentalists such as John Muir wilderness was to be preserved because it was viewed as the handiwork of God. For Muir's father, Daniel, in contrast, wilderness was to be destroyed because it was the foothold of the Devil. Dictionary definitions range from the Middle English denotation of "a place of wild beasts," to a place "uncultivated," to a place "undisturbed" or "uninhabited" by human beings. Aldo Leopold referred to wilderness as "the raw material out of which man has hammered the artifact called civilization" and therefore considered it "a resource which can shrink but cannot grow" (1949, pp. 188, 199). For the historian Frederick Jackson Turner experience with the wilderness frontier shaped and has continued to influence the American character.

ORIGINS OF WILDERNESS PRESERVATION

Though wilderness is a variously defined and ancient concept, many environmentalists consider the preservation of wilderness one of the most important goals of environmentalism. The focus on wilderness preservation is perhaps

Hiking in the Arctic National Wildlife Refuge, Alaska. *The Arctic National Wildlife Refuge encompasses 19.2 million acres of Arctic and subartic habitat, 8 million acres of which are designated wilderness. Established in 1960, the refuge became a place of debate in the 1980s and onward because of the presence of (projectedly) billions of barrels of crude oil underneath its surface.* **U.S. FISH AND WILDLIFE SERVICE.**

the most characteristic component and contribution of North American environmentalism. The movement to preserve areas of wilderness in the United States, for instance, goes back to the early 1900s and can be seen as a reaction against a certain level of civilizing transformation and the despoliation of a presumably pristine landscape, whether the battle to save Hetch Hetchy Valley in the Yosemite from damming in the early 1900s or the early twenty-first-century battle over oil drilling in the Arctic National Wildlife Refuge.

Wilderness preservation has been the cause célèbre of a number of environmental groups. In late 1934 and early 1935 a group of American environmental leaders that included Benton MacKaye, Robert Marshall, Aldo Leopold, and Robert Sterling Yard founded the Wilderness Society, whose purpose is "to save from invasion … that extremely minor fraction of outdoor America which yet remains free from mechanical sights and sounds and smell." Other environmental groups, including the Wildlands Project and the Rewilding Institute, also focus their efforts on the preservation of wilderness, and groups such as the Sierra Club (founded by John Muir in 1892) see wilderness preservation as a significant dimension of their work. The uniqueness of North American ideas about wilderness is pointed out by the fact that although the preservation of "protected areas" has become a component of conservation efforts in other parts of the world, the term *wilderness* seldom is evoked in those places; when it is used, American ideas about the meaning of wilderness almost always are cited.

In the late 1980s and early 1990s a number of environmental historians and philosophers introduced a series of criticisms of the concept of wilderness. Those criticisms prompted defensive responses from other environmental scholars and activists. This "great new wilderness debate" continues to rage. The concept is "alleged" by its critics "to be ethnocentric, androcentic, phallogocentric, unscientific, unphilosophic, impolitic, outmoded, even genocidal" (Callicott and Nelson 1998, p. 2).

THE RECEIVED WILDERNESS IDEA

The legitimacy of such charges depends on the existence of a "received wilderness idea," or a conception of wilderness that is socially crafted and that infiltrates the collective consciousness of a specific community in an essentially uniform fashion. Thus, those who offer a critique of the concept of wilderness do so with the assumption that wilderness is a social construction and that even from an environmental standpoint it is flawed, counterproductive, and even dangerous. Many of those who consider themselves defenders of wilderness deny that there is a received wilderness idea, asserting instead a wilderness realism or the idea that wilderness has a reality beyond that which people socially construct for it. Others defend the concept of wilderness by agreeing that it is a social construction but argue that it is not the social construction that critics believe it to be.

Wilderness constructivists point out that the concept of wilderness has been defined variously and incommensurably over millennia, that the word *wilderness* does not appear in all languages, and that current ideas and laws about wilderness preservation reflect previous definitions of and justifications for wilderness preservation while ignoring others. Hence, when the most important piece of wilderness legislation, the Wilderness Act of 1964, was enacted in the United States, a wilderness area was defined in a way that reflected—and now codified as law—the dominant received wilderness idea: "in contrast with those areas where man and his own works dominate the landscape … an area where earth and its community of life are untrammeled by man, where man is a visitor who does not remain."

CRITICISMS BY WILDERNESS CONSTRUCTIVISTS

Constructivist critics suggest that even though variations in definition occur in characterizations of wilderness, all the definitions set wilderness in opposition to humans and human civilization (''visitors who do not remain''), make the presumed lack of human influence the measure of ''untrammeled,'' and generally consider wilderness areas to be places ''in contrast'' to human works. Further, critics argue that this characterization has a series of significant shortcomings.

First, the received wilderness idea is said to be ethnocentric to the point of being genocidal when transported outside North America. Wilderness critics suggest that the concept as constructed in its North American context is so specific to that context that it has negative human implications when exported to other countries. They point out that if one considers long-term human habitation as anathema to wilderness, if a country desires to create a wilderness area and there are aboriginal people living in that area, those people must be deported. To the degree that the identity of a people is embedded in its landscape, the forced removal of that people from that landscape may constitute a form of cultural genocide. Wilderness defenders sometimes deny this implication and sometimes admit it and openly opt for the preservation of the nonhuman over the preservation of specific human communities. Some historical work (Spence 1999, Burnham 2000) suggests that evicting native peoples from their homelands to establish national parks and other ''protected areas'' occurred in the United States in a number of instances.

Second, the received wilderness idea is said to be inappropriately andro- or phallogocentric. Former U.S. president Theodore Roosevelt touted the importance of wilderness experience because it ''promoted that lacking vigorous manliness,'' and the nature writer Sigurd Olson championed wilderness travel because it provided ''that virile, masculine type of experience men need today'' (quoted in Callicott and Nelson 1998). This hypermasculine image of wilderness is thought by some to be offensive and exclusionary.

Third, constructivists argue that wilderness (set in opposition to humanity) is viewed as the highest manifestation of nature. In light of the fact that the received wilderness idea evolved parallel to and was influenced directly by the development of the science of ecology and the fact that people often look to ecology to deliver the clearest images of the ontology of nature, ideas about wilderness and the preservation of wilderness reflect those early ecological paradigms. Whether portrayed as a collection of superorganisms by Frederick Clements or likened to a functioning economy by Charles Elton, the background reality of nature—and therefore wilderness—was thought to be harmonious and balanced, static and unchanging unless spoiled by human impact. Since the 1980s and drawing on ecological thought going back to the 1920s, however, the reigning ecological image of nature has been one of disturbance, flux, change, and discord. This background image of an ever-changing nature contrasts sharply and incommensurably with received ideas of wilderness as primeval, a place frozen in time, land as it was before human conquest. This rethought image of nature and wilderness affects people's corresponding assumptions about how they should interact with wilderness or what constitutes harm to wilderness. If wilderness is protected properly only when it remains static, any impact that alters wilderness also harms wilderness. However, if nature and wilderness are inherently dynamic, the idea of an untouched and unchanged wilderness as a properly treated wilderness has to be revised.

Fourth, critics of the received idea suggest that this view is unphilosophical and impolitic. The image of wilderness as land at the far end of the spectrum between the natural and the unnatural perpetuates a metaphysical bifurcation between humans and nature. Such an image also creates and enforces a value dualism in light of the positive value that wilderness advocates assign to wilderness and the corresponding and consistent negative value they are obligated to assign to humans and human activities. Wilderness critics point out that these dualisms are malignant. For instance, from them flows the inevitable condemnation of human interactions with nature, including not only oil spills and species eradication but also acts of ecological restoration. Moreover, because of the logic of these dualisms, wilderness advocacy has been criticized for being elitist and exclusionary in that nonwilderness areas are treated as places of lesser value, and the people who love them are by implication environmentalists of lesser worth.

Fifth, wilderness critics suggest that the received wilderness idea interferes with the acquisition of an inclusive environmental ethic, especially the land ethic of Aldo Leopold. That is seemingly the environmental ethic of many environmental activists, natural resource managers, and the environmentally literate public, and it promises to deliver direct moral standing to the nonhuman world. If Leopold is correct and an appropriate moral relationship between humans and land depends on people viewing themselves as fully and properly part of an inclusive biotic community, anything that conceptually separates people from land, even people's images of wilderness, stands in the way of an inclusive environmental ethic. According to this line of thought, to the degree that people's ideas about wilderness conceptually separate

humans from nature, wilderness destroys the ability to extend direct moral consideration to nature.

RESPONSES TO THE CRITICS

In response to these criticisms, wilderness defenders deny that wilderness is a received concept and attempt to refute these criticisms one by one or admit that wilderness is a received idea but suggest that wilderness critics have portrayed it in the wrong light or that it can and should be reconceived. Some wilderness critics agree that the concept of wilderness should be and can be reworked, whereas others have suggested that the idea is too burdened with past associations and should be jettisoned in favor of some other term and corresponding "protected area" strategy. J. Baird Callicott (Callicott and Nelson 1998, Nelson and Callicott 2008), for example, suggests that *biodiversity reserve* is a preferable label in that it clearly indicates that such set-asides are protected first and foremost for the good of biodiversity, not for the good of human recreational, scientific, or aesthetic interests.

Ideas about the nature of wilderness and prehuman conditions can affect ecological sciences in different ways. The effect of a prehuman or nonhuman landscape is not apparent in "pure" ecology or in ecological descriptions and modeling aimed at understanding how a specific system works; examples of this would be the answers to questions such as: Why are there so many species in an ecosystem? and Why do predator-prey systems seem more stable than theory suggests they should be? However, that effect is present in more normative "applied" ecology, in which the goal is to predict the future with an eye toward guiding people's actions. Various forms of applied ecology—from restoration to wildlife management—seem to evoke a kind of naturalism (equating the good with the natural) in which a wilderness or pre- or nonhuman condition is seen as good or desirable and constitutes the proper target of conservation efforts, whereas the humanized is thought of as a bad or undesirable state of affairs. The alternative interpretation in this context appears to be uncritically anthropocentric.

SEE ALSO *Bible; Callicott, J. Baird; Land Ethic; Leopold, Aldo; Muir, John; North America; Preservation; Roosevelt, Theodore; Sierra Club; Social Constructivism; Wilderness Act of 1964.*

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Michael P. Nelson

WILDERNESS ACT OF 1964

The Wilderness Act of 1964 was signed into law by President Lyndon Johnson on September 3 of that year. It is one of the most significant pieces of environmental legislation because of its continental scope and the idea of wilderness it contains. It was sent to President Johnson after eight years of rewriting and negotiations in Congress.

PURPOSE OF THE ACT AND DEFINITION OF WILDERNESS

The overall purpose of the act is to establish a National Wilderness Preservation System that identifies, protects, and administers areas designated as wilderness for the future recreational use of the American people. Proponents of the act believed that in its absence expanding population and development would leave no lands in their natural condition.

Some portions of the lands that came to be designated as wilderness under the act already were protected by various overlapping designations. Some of the lands were controlled by the federal agencies with jurisdiction, including the Forest Service, the National Parks Service, and the Bureau of Land Management. This was the source of an important controversy regarding the act. Conservationists and other protectors of wilderness believed that those agencies were open to manipulation by business interests and political groups. Proponents of the act cited cases of logging, mining, and dam building within lands already under some form of federal protection. They feared that wilderness areas might disappear through administrative neglect. Federal agencies, with the exception of U.S. Fish and Wildlife Service, saw the act as a challenge to their authority and expertise. Further, the Forest Service and other agencies were committed to a multiple-use doctrine by which all lands under their control should be used for more than wilderness recreation, whether logging or mining or hydroelectric power.

This set of issues is reflected in the concessions to existing federal agencies in the act: They would be allowed to continue to manage and have jurisdiction over the newly designated wilderness areas and further, the secretary of agriculture would have ten years after the act is signed to review and submit primitive areas as wilderness. Once areas are designated as wilderness by the act, their uses are limited with some exceptions. Deciding whether a specific primitive or roadless area is wilderness is still an agency decision, to be confirmed by the president, who then advises Congress.

OBJECTIONS

In addition to the initial opposition by some federal agencies, logging, mining, hydropower, motorized recreation, and tourist lodging interests opposed the passage of the act, arguing that it was not necessary, would impede economic development, was designed to benefit only an elite group, and undermined the wisdom of the multiple-use doctrine.

Those objections resulted in some important qualifications in the act. For instance, mining and prospecting as allowed by U.S. mining law were to continue with some restriction until 1983. Also, grazing and the use of motorboats and planes were allowed in areas where they already had been established. Those concessions did not eliminate opposition to the act but made it sufficiently palatable for senators and representatives in western states and congressional districts to vote for it.

Several people and groups played key roles in passing the act. Howard Zahniser became the leader of the Wilderness Society and the editor of its magazine in 1945. In the years from 1956 to 1964 Zahniser produced several dozen drafts of the act, continuously lobbied, and wrote and spoke for its passage. Although that eight-year battle culminated in the act becoming law, Zahniser did not live to see it; he died of a heart attack shortly before the signing.

Many other conservationists were involved in drafting and lobbying for the act. The Minnesota native Sigurd Olson, an acquaintance of Zahniser, advised Senator Hubert H. Humphrey to support the act after Zahniser solicited Humphrey's help. Largely on the basis of Olson's recommendation, Humphrey introduced the act in the Senate in 1956. Humphrey proved to be a crucial proponent of the act through the years of hearings, compromises, and rewriting. Besides Olson, David Brower worked on editing early versions of the act.

EFFECTS ON ENVIRONMENTAL ETHICS

The act has figured into environmental and philosophical thinking in several ways insofar as it provides a definition of wilderness that continues to draw sharp criticism. That definition says in part that wilderness is primeval and uninhabited and untrammeled by humans and also that it should provide opportunities for solitude and primitive recreation. One kind of criticism focuses on the relative vagueness of the terms used and the possibility of misunderstanding that may result. Other criticisms revolve around the inherent conflict involved in trying to satisfy both of those conditions for wilderness. For instance, it seems as if increases in the numbers of people wanting primitive recreation will have an adverse effect on the natural, primitive, and untrammeled character of wilderness areas, to say nothing of solitude. A final conceptual difficulty is that the definition of wilderness endorsed by the act insists on a sharp division between wilderness and humans that is subject to serious challenge because, for example, it seems to ignore the historical presence of aboriginal peoples in many of those areas and, when imitated in other countries, can result in the eviction and dispossession of indigenous peoples.

The act set aside some 9 million acres of land as wilderness, a number that has grown to over 100 million acres. Controversy was expected to continue and even intensify in light of increasing demands for resources.

SEE ALSO *Environmental Law; Environmental Policy; Forests; Mining: I. Overview; U.S. Forest Service; Wilderness.*

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Charles J. List

WILSON, EDWARD O.
1929–

Born on June 10, 1929, in Birmingham, Alabama, Edward Osborne Wilson, one of the twentieth century's exemplary individuals, started out as an ecological scientist and transitioned to applied conservationist and environmental ethicist. Early in his life, Wilson began to observe some of the smallest and most diverse organisms: insects, especially ants. "In 1942, when I was 13 years old," he remembers, "I was studying ants for a Boy Scout project. . ., and so I discovered a nest of red fire ants" (2006, p. 71), which was the first known colony of the invasive exotic species *Solenopsis invicta* in the United States. In his autobiography *Naturalist* (1994), Wilson recalls how his childhood years in the U.S. South imbued him with a curiosity for all aspects of natural history and provided the foundation of his scientific career. This boyhood fascination with ants eventually led to a Ph.D. and faculty career at Harvard University where he explored diverse topics and scales, ranging from chemical ecology to biogeography, from taxonomy to the evolution of social interactions. For *The Ants* (coauthored with Bert Hölldobler), he was awarded a Pulitzer Prize for nonfiction in 1990.

In the 1960s, ant-collecting expeditions to Pacific islands and the New World Tropics grounded Wilson's scientific work in basic natural history, which emphasized descriptions of species and their interactions. Then, however, he used firsthand experiences in observing small organisms as illustrations for addressing major ecological and evolutionary questions, in the process positing the taxon cycle (Wilson 1959, 1961) and island biogeography theory (MacArthur and Wilson 1967). Both hypotheses were major conceptual advances in explaining patterns of species richness from biogeographic and demographic principles. This body of work, resting on theoretical principles, was also rigorously shown in the field with whole island experiments in the Florida Keys. It has since proved to be not only a powerful current of thought in general ecological theory, but also in conservation, as the idea of island patches of suitable habitats for particular species can be used to manage vulnerable populations across the landscape matrix.

Wilson's investigation of ants also led to insights regarding their communication and colony organization. His seminal research in chemical ecology showed that ants use pheromone cues to coordinate their complex group superstructure. Such results eventually led to a path of inquiry regarding the biological basis of social interactions in general. With *Sociobiology: The New Synthesis* (1975), Wilson sought to explain behavioral traits within strictly biological confines—an idea that proved controversial, but also founded a new discipline and earned him his first Pulitzer Prize for nonfiction in 1978 for *On Human Nature*.

As a writer, Edward O. Wilson was able to transcend his academic discipline and link it with society by effectively communicating scientific understanding to a wider audience, often employing ground-breaking neologisms. For example, the term *biophilia* (humans' innate attraction to living systems) was coined by Erich Fromm in *The Heart of Man* (1964), but Wilson's homonymous book generated dynamic discussion about the concept in 1984. Likewise, in an academic symposium moderated by Wilson, Walter G. Rosen coined the term *biodiversity* in 1985, but Wilson's 1988 book of the same name introduced the term into our collective vocabulary and imagination and from there helped to coalesce the environmental movement and governmental policy around concern over the modern crisis of mass extinctions of species. In 2006 Wilson himself invented the term *Eremozoic Era* as a provocative depiction of the "Age of Loneliness" that will succeed the sixth mass extinction if humanity does not undertake immediate actions to protect the planet's biodiversity.

To perpetuate his legacy, the Edward O. Wilson Biodiversity Foundation was launched in 2007 to "preserve biological diversity in the living environment by inventing and implementing business and education strategies in the science of conservation." Its approach parallels Wilson's own development. The foundation attempts to maintain Wilson's traditional emphasis on the need to understand all biodiversity with a natural history-oriented program consisting of hands-on education and citizen science. Yet the organization also uses the experience of its cofounders and capital derived from the biotechnology industry to put forward a technology-based, capitalistic model for future research and conservation. This market-based approach to conservation and development—involving, for example, tapping genetic resources and creating win-win cooperative agreements with industry—coincides with Wilson's own strong belief in the power of science and technology to solve problems. This approach is ironic to some, as many conservation problems are in fact the result of science and technology.

As a scientist, Wilson has earned the highest professional recognition (e.g., the National Medal of Science, the Craaford Prize, and the Tyler Award), but unlike most academics he has also attained great social relevance. In both arenas, his popular and scientific work has significantly contributed to shedding light on the beauty and value of the diversity of insects and other inconspicuous organisms found in the living systems around us. Prestige, however, does not confer immunity from disapproval. By placing such a high value on technological and scientific solutions, Wilson has also been

the focus of criticism. In particular, his defense of sociobiology created a storm of rancorous debate, leading to a confrontation in which activists dumped a pitcher of water on Wilson's head at a conference. The current orientation of his foundation may also prove problematic for some conservationists. Nonetheless, Edward O. Wilson established himself as one of the most influential thinkers of his day precisely by working in the natural sciences and simultaneously at the interface of science and society.

SEE ALSO *Biodiversity; Biophilia; Conservation; Conservation Biology; Extinction.*

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WORDSWORTH, WILLIAM
1770–1850

William Wordsworth was born on April 7, 1770, in Cockermouth in Cumberland's Lake District and is considered one of England's finest nature poets. His poetry and critical works manifest a complex understanding of the relationship among the natural environment, language, and human passions. That complexity is apparent in his best-known critical essay, the Preface to *Lyrical Ballads* (Wordsworth and Coleridge 1969 [1800, 1802]), which was written to justify the experimental style of those poems. The Preface indicts the artificial diction of earlier poets and calls for a new way of describing and relating to the natural world that will honor the qualities most fundamental to human life: imagination and emotion. Wordsworth did not advocate a simple return to nature. Instead, he reminded his readers that the source of what is best in human manners, feelings, language, and community resides in a positive relationship to the natural world. Wordsworth died on April 23 in Rydal Mount, Westmorland, England.

POETRY AND THE BOND WITH NATURE

The bond of humanity with nature, Wordsworth suggested—though as indestructible as the deep, universal emotions that structure people's inner lives and influence their actions and relationships—was being attenuated in an increasingly urban Great Britain. The radical industrialization of English life and the tumultuous events connected with the French Revolution of 1789, he suggested, were "acting with a combined force to blunt the discriminating powers of the mind" (Wordsworth and Coleridge 1969, p. 160). That situation can be considered the predecessor of the contemporary information age, with its taste for news, novelty, and speed. The more city people's cravings for "extraordinary incident" (Wordsworth and Coleridge 1969, p. 160) are satisfied by tabloid-style accounts and the more their desire for racy or mawkish entertainment is satisfied by pandering artists, the more they tend toward a paradoxical, narcotized state of "savage torpor" (Wordsworth and Coleridge 1969, p. 160). Essentially, Wordsworth's complaint is about the hollowing out of emotion and experience until no feeling, event, or utterance seems authentic: Cheap spectacle replaces genuinely artistic representation, and quantity replaces quality in all areas of life.

In response to a development destructive to individual identity and genuine community, Wordsworth outlined a redemptive poetics. Because the corruption of language and sentiment lay at the heart of the problem, he considered it vital to have recourse to devise a better model in both areas: life in the English countryside. The Preface states that the main object of *Lyrical Ballads* was "to chuse incidents and situations from common life, and to relate or describe them, throughout, as far as was possible, in a selection of language really used by men" (Wordsworth and Coleridge 1969, p. 156). Readers are told, "Low and rustic life was generally chosen, because in that condition, the essential passions of the heart find a better soil in which they can attain their maturity, are less under restraint, and speak a plainer and more emphatic language ..." (Wordsworth and Coleridge 1969, p. 156). Country people are less distanced from their vital passions than are urban dwellers; they

express what they feel more readily to other members of the community and have not lost the emotional connection to nature that has been forfeited by the average Londoner. They also have not lost the ability to see what is in front of them in a meadow or a wood, in all its particularity as well as in its universal dimension among "the beautiful and permanent forms of nature" (Wordsworth and Coleridge 1969, p. 156).

What the pastoral citizen has achieved over a lifetime, the poet can accomplish by an initially more self-conscious effort involving careful selection from the chosen language model and by methods of composition best characterized as meditative. The latter quality underlies Wordsworth's famous definition: "Poetry is the spontaneous overflow of powerful feelings: it takes its origin from emotion recollected in tranquillity: the emotion is contemplated till by a species of reaction the tranquillity gradually disappears, and an emotion, kindred to that which was before the subject of contemplation, is gradually produced . . ." (Wordsworth and Coleridge 1969, p. 173). By this process, the lyricist will compose poems that help ordinary people recover the passion and sense of community from which city life bars them. The poet who can do this, Wordsworth declared, will have attained the status of a priest or prophet and will be "the rock of defence of human nature; an upholder and preserver, carrying every where with him relationship and love" (Wordsworth and Coleridge 1969, p. 168).

NATURE AND HUMANITY

In keeping with that ideal and in terms of descriptive quality and aesthetic appeal, Wordsworth's poetry is not timid about suffusing nature with human reference and spiritual significance. His reference in "I Wandered Lonely as a Cloud" to common meadow flowers transfigured into an almost biblical "host of golden daffodils" suggests this, as does his attention to what he calls in Book 11 of the 1805 *Prelude* "spots of time": moments in the presence of nature that form highly charged "renovating" memories to which people may repair in times of trouble. (The ode "Tintern Abbey" involves strong memories connected to a beautiful natural scene.) Many of Wordsworth's poems are not simply about nature; they are about the joys and travails of human beings in the presence of or in painful separation from nature. The *Prelude* traces the development of his own artistic and spiritual qualities even if those qualities owe almost everything to the natural environment in which he grew up and with which he sought to keep communion.

Wordsworth was the British poet laureate from 1843 to 1850, and his poetry and poetic theory are central to British romanticism. They also figure in the work of later authors, among them John Ruskin. Wordsworth's close attention to nature's particularities, insistence that the language of poetry should be the language of ordinary uncorrupted humanity, and impassioned argument that literary art can help people achieve both individual happiness and community have been used as points of departure by authors from his own time through the present.

SEE ALSO *Romantic Poetry, English; Romanticism; Ruskin, John; United Kingdom.*

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Alfred J. Drake

WORLD TRADE ORGANIZATION

The product of a decades-long global movement to ease trade barriers among nations, the World Trade Organization (WTO) was founded on January 1, 1995, to provide an international negotiating forum, enforcement agency, and dispute-resolution mechanism for countries seeking to benefit from liberalized trade policies. As of June 2008, 152 nations were members of the WTO.

The underlying principle of all WTO regulations is the most-favored-nation policy: Each member nation is obliged to grant to all members the most favorable trade terms that it grants to any other member, and members are required to give equal treatment to overseas and domestic suppliers of goods and services. Although the WTO has achieved substantial reductions in tariffs and other trade barriers since its founding, it has also generated storms of controversy and protest among various constituencies—chiefly trade unions, student groups, and environmental organizations—that contend that the WTO's basic orientation favors the commercial interests of transnational corporations at the expense of labor and environmental standards and that its rules and governance procedures constitute a threat to the institutions of civil society. Many environmental organizations share the basic view expressed by Greenpeace International: "The World Trade

Organisation (WTO) promotes free trade for the gain of private interests, over and above our health and the environment" (Greenpeace International 2008).

ORIGINS AND STRUCTURE

The WTO is the successor to the General Agreement on Tariffs and Trade (GATT). GATT was founded in 1947 to foster a worldwide reduction in tariffs, mainly on manufactured goods. The final Uruguay round of negotiations under GATT resulted in a pact that aimed to achieve an eventual one-third reduction in global tariffs and a gradual elimination of other hurdles to open trade among nations, especially in agricultural goods. This agreement also took unprecedented steps toward liberalizing international commerce in investments and services and bolstering international intellectual-property rights. These initiatives were carried over into the WTO, which was created to provide stronger enforcement and dispute-resolution capabilities for the agreements forged by GATT and to further lower hurdles to global trade.

The WTO is headquartered in Geneva, Switzerland. Its highest governing body is the Ministerial Conference, which is composed of all the members of the organization. A General Council carries out the decisions of the conference and is responsible for daily administrative tasks. The director-general, appointed by the Ministerial Conference, is the group's chief executive officer. Substantive trade negotiations take place in various rounds launched by the Ministerial Conference. The Doha Round was launched in 2001 in Doha, Qatar but stalled over disagreements between the industrialized countries and the nations of the third world, largely over agricultural subsidies in the European Union and the United States that many third-world governments believe force their countries to import cheaper agribusiness foodstuffs that were once grown locally, thereby placing their farmers at a competitive disadvantage and threatening the livelihoods of millions of farm families.

CONFLICTS AND CONTROVERSIES

The free-trade agenda of the WTO began to generate gales of protest and controversy in the late 1990s. The watershed event in this wave of anti-WTO sentiment was the series of mass demonstrations and street disruptions that greeted the WTO Ministerial Conference in Seattle, which began on November 30, 1999. These protests arose as part of a worldwide surge of "antiglobalization" sentiment in the opening decade of the twenty-first century. Many of the leaders of this movement deny that its intent is antiglobalist. They insist, rather, that they are opposed to what they term "corporate globalization"—the erosion of the sovereign powers of nation-states and the institutions of civil society in the face of institutions like the WTO that, they believe, reflect the interests of private transnational corporations rather than the public interests of the poor, the labor movement, and the environment.

Although some of this antiglobalist ire has been directed against other instruments of international commerce, such as the World Bank and the International Monetary Fund, the WTO has borne the brunt of the protests because of its aggressive agenda of dismantling barriers to transnational corporate investment. There are three main areas of controversy: governance and dispute-resolution procedures, labor standards, and environmental policies.

Governance and Dispute-Resolution Procedures The WTO prides itself on its democratic practice of according one vote to each country, regardless of its size or wealth. Yet, purportedly in the interests of avoiding conflict, the WTO has never taken a formal vote on trade proposals, preferring instead to rely on negotiation and consensus decision making to minimize conflicts and polarization. Critics have noted, however, that much of the real agenda setting and substantive negotiation in the WTO takes place among informal groups, the so-called miniministerials, consisting mostly of the most powerful members, so the interests of developing countries tend to be underrepresented in the final agreements. Even the WTO acknowledges, "It would be wrong to suggest that every country has the same bargaining power" (WTO 2008a).

The WTO's dispute-resolution procedures have also aroused considerable controversy. The member nations agree to avoid unilateral action and to rely instead on the WTO's multilateral system. If the contending parties cannot resolve their issues through mediation and negotiation, the complainant can request the convening of a special panel, the decisions of which are binding on all parties. These panels consist of three officials appointed by the WTO secretariat. Critics have raised a number of objections to these tribunals: The panelists are unelected and are under no obligation to disclose conflicts of interest; only the official national trade representatives of the contending parties can attend the proceedings—all other government officials are prohibited from attending; all proceedings, documents, and transcripts are secret; and the press is barred from the tribunals. Whether the closed, secretive nature of these panels vitiates the WTO's claims to be democratic and open to public concerns remains a topic of vigorous debate.

A matter of broader concern is the WTO's requirement that member nations' future laws conform to WTO rules, which some critics assert is bound to have a chilling effect on the law making of sovereign states. In

this view, transnational corporations looking for overseas investment opportunities will seek out the countries with the fewest impediments to low-cost production, including labor and environmental regulations, thus setting off an economic race to the bottom in workers' rights and environmental protection.

Labor and Workers' Rights On the labor front the WTO asserts that "all WTO member governments are committed to a narrower set of internationally recognized 'core standards' for labor," but it also acknowledges that there is "no work on this subject in the WTO's Councils and Committees," that "it is not easy for [member nations] to agree" on labor standards, that "the question of international enforcement is a minefield," and that "WTO agreements do not deal with labor standards as such" (WTO 2008b).

The pressure to minimize labor standards in WTO rules comes chiefly from two sources: the transnational corporations seeking low-wage production opportunities abroad and third-world governments desiring such investments. Both parties have characterized the quest for rigorous labor standards in trade agreements as a form of protectionism. In the words of the WTO's 1996 Singapore ministerial declaration on core labor standards, "We reject the use of labour standards for protectionist purposes, and agree that the comparative advantage of countries, particularly low-wage developing countries, must in no way be put into question" (WTO 2008b). Despite the WTO's pledge to work with the International Labor Organization on this issue, there was little progress as of 2008. Labor groups throughout the world regard this charge of "protectionism" as a guise for promoting flagrant exploitation in the interests of large corporations. Labor-movement representatives still decry the shift in investments from the highly unionized, high-wage countries of the developed world to third-world export-processing zones, areas specially designated for export-oriented manufacturing that are often exempt from national labor codes (Jauch 2002).

The WTO and the Environment The WTO states, "Sustainable development and protection and preservation of the environment are fundamental goals of the WTO." It further asserts, "The Doha Agenda includes specific negotiations on trade and environment and some tasks assigned to the regular Trade and Environment Committee" (WTO 2008c).

Critics claim that the reality belies this reassuring rhetoric. They note, for example, that WTO panels have consistently ruled that trade regulations cannot discriminate among products on the basis of their method of production or harvesting, so that, for example, preferring sustainably harvested wood to clear-cut timber from tropical forests would be considered a restraint of trade. Likewise, sustainably caught fish or products resulting from humane labor conditions or humane treatment of animals cannot be accorded preferential treatment under WTO rules. Critics further charge that the WTO's tariff policies on raw materials encourage the depletion of dwindling natural resources and put pressure on third-world countries to focus on extracting and exporting raw materials, often in partnership with giant transnational mining companies, rather than on sustainable industrial development.

The record of WTO rulings in environment-related disputes has not reassured critics or lent credibility to the WTO's claims of environmental sensitivity. The original General Agreement on Tariffs and Trade contained a provision, Article XX, that claimed to allow exceptions to trade rules based on domestic concerns about health, safety, and the environment. Nevertheless, nearly all the decisions of the WTO panel have ruled in favor of challenges to environmental protections. Of the nine cases that bear on the environment, three have aroused the most controversy:

- In 1997 Venezuela and Brazil challenged a U.S. policy that limited gasoline imports based on the chemical makeup of the product. The WTO's ruling in favor of the plaintiffs led the United States to comply with the ruling by weakening provisions of the Clean Air Act, downgrading cleanliness rules to allow imports that would result in a 5- to 7-percent increase in nitrous oxide emissions.
- The United States once banned shrimp imports from countries whose boats did not use turtle-excluder devices. In 1998 India, Malaysia, Pakistan, and Thailand challenged this U.S. ban on their shrimp as a restraint of trade. The WTO found in favor of the plaintiffs, obliging the United States to weaken that provision of the Endangered Species Act. It still restricts imports of shrimp to those brought in by ships with turtle-excluder nets, but with no requirement that those ships be verified as the ones that actually caught the fish.
- After years of Mexican threats of a trade challenge to a U.S. policy requiring that domestically sold tuna have a "dolphin-safe" label, the Bush administration in 2002 softened U.S. regulations to permit "dolphin-safe" labeling for tuna harvested with techniques that had previously been deemed dangerous to dolphins.

Another major area of environmental concern is the WTO's posture on trade in genetically modified organisms. In response to a formal complaint from three major growers of genetically modified crops—the United States, Canada, and Argentina—the WTO ruled in

May 2006 that the European Union's delays in coming up with a systematic regulatory policy regarding genetically modified organisms were a violation of WTO rules. The European Union policy in place in 2008 does require that genetically modified products be labeled, segregated, and traceable. The WTO has ruled, however, that outright national bans on specific genetically modified crops are illegal restraints of trade if the country's regulations are based on criteria stricter than those contained in the WTO's Sanitary and Phytosanitary Measures, which many environmental groups consider to be inadequate.

THE WTO AND POLITICAL AND SOCIAL PHILOSOPHY

The opponents in the controversies that swirl around the WTO fall broadly into two camps. The WTO's champions are, for the most part, proponents of a free-market liberalism—often dubbed neoliberalism in contemporary discourse—that regards the unfettered operation of free markets as the most efficient way to create wealth and to address social and economic ills. The WTO's critics—a disparate coalition that includes labor unions, antiglobalist student activists, displaced third-world farmers, and environmental organizations—typically regard the unregulated free market as a recipe for increasing inequality and exploitation of the environment and other humans. The WTO's supporters tend to be suspicious of the public sphere and the state, which they view as a brake on individual initiative and creativity. WTO opponents regard the public sphere as the domain of democracy, where citizens can deliberate about which policies best serve their interests as a cooperative community, not merely as an array of discrete, self-interested individuals. These WTO critics point to the irony that the antistatist free-traders seem all too ready to accept the dictates of a secretive, powerful, privately run de facto world government that enforces the interests of corporations while these same "neoliberals" resent and resist the incursions of governmental bodies that represent a broader public interest. This clash of the social and the individual, the public and the private, has been a long-standing theme in world politics and social theory. The WTO has become the latest, and in some respects the most prominent, lightning rod for these clashing views of how humans should relate to one another and their environment.

SEE ALSO *Genetically Modified Organisms and Biotechnology; Greenpeace; Sustainability.*

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William Kaufman

WORLD WIDE FUND FOR NATURE

Environmental and ecological degradation occurs worldwide, and international organizations have become major players in nature and environmental conservation. One of the leading organizations in this area is the World Wide Fund for Nature (WWF), whose founding was brought about by, among others, Sir Julian Huxley, then director-general of the United Nations Educational, Scientific and Cultural Organization (UNESCO). After visiting eastern Africa in 1960, he was shocked by the destruction of wildlife habitats and the rate of hunting and published his findings in the British newspaper *The Observer*. One of his readers, the businessman Victor Stolan, suggested establishing an international organization for fund-raising. Huxley interested conservationists and naturalists such as Max Nicholson, director of Britain's Nature Conservancy,

and Peter Scott, vice president of the International Union for the Conservation of Nature (IUCN), in the idea of establishing a fund-raising organization to support scientifically sound conservation projects of existing nongovernmental organizations (NGOs).

ESTABLISHMENT AND ACTIVITIES OF THE WWF

In September 1961 the new organization was established as the World Wildlife Fund with headquarters in Switzerland, later to be known as WWF International. Within six weeks independent WWF offices were set up in a number of other countries. According to the Deed of Foundation, the organization was created to ensure the "conservation of world fauna, flora, forests, landscape, water, soils and other natural resources by the acquisition and management of land, research and investigation, education at all levels, information and publicity, coordination of efforts, cooperation with other interested parties and all other appropriate means."

Although the Deed of Foundation expressed a broad agenda, the first twenty years of the WWF were characterized by the establishment of wildlife reserves and the protection of impressive animal species, often in developing countries. For example, whales, elephants, rhinoceroses, and tigers played an important role in public campaigns. Through contacts in higher social circles and appeals to the public, WWF raised large amounts of money in the subsequent years.

However, by the end of the 1970s WWF realized that it was not addressing the fact that entire ecosystems were under threat from socioeconomic and political developments. In collaboration with the IUCN and the United Nations Environment Programme (UNEP), the *World Conservation Strategy* was published in 1980, stressing the interrelationship between conservation and socioeconomic development. That document introduced the concept of sustainable development, which was elaborated further in 1987 in *Our Common Future* by the World Commission on Environment and Development. In line with those documents, IUCN, UNEP, and WWF published *Caring for the Earth: A Strategy for Sustainable Living* in 1991, a document that explored strategic perspectives on sustainable development.

Because of its broadening scope, in 1985 WWF decided to change its name to the World Wide Fund for Nature, although the U.S. and Canadian offices retained the old name. Beginning in the early 1990s, a new WWF mission statement expressed the changing perspectives: "To stop the degradation of the planet's natural environment and to build a future in which humans live in harmony with nature." Preserving biodiversity, ensuring the use of renewable natural resources, and reducing pollution and wasteful consumption became the main aim. Because it was recognized that many threatened ecosystems had been the homes of indigenous peoples for thousands of years, traditional knowledge and a respect for indigenous traditions became part of the conservation goals of WWF. That led to alliances with NGOs for indigenous people and to conservation guidelines announced by the IUCN, WPCA (World Commission on Protected Areas), and WWF in 1999.

To keep track of the state of the natural habitat and human pressure on the planet, in 1998 the WWF began to publish the biennial *Living Planet Report,* in which the living planet index, covering population trends in over 1,300 species, and the ecological footprint, measuring the area of the planet needed for sustainable use, were explored. Those reports showed that the planet was in an alarming state. The ecological footprint had tripled since 1960, and the living planet index had decreased by about one-third since 1970.

According to WWF, recognition of this worldwide environmental crisis called for larger geographical scales of conservation. To that end, the term *ecoregion* was coined. David M. Olson and Eric Dinerstein defined an ecoregion as "a large unit of land or water containing a geographically distinct assemblage of species, natural communities, and environmental conditions" (Olson and Dinerstein 1998, p. 502). Recognizing that resources had to be used effectively and efficiently, WWF announced the Global 200, a set of over 200 ecoregions prioritized for conservation (Olson and Dinerstein 1998).

In the same period WWF intensified its focus on economic issues. The organization took part in the establishment of the Forest Steward Council, an independent agency that certifies sustainable timber production. WWF also established the Marine Steward Council (MSC) in cooperation with Unilever, one of the world's largest producers of seafood. This alliance points to another development within WWF: cooperation with multinational companies to develop standards and practices for corporate responsibility in regard to social and conservation issues.

CRITICISMS AND RESPONSES

This globalizing aspect of the work of WWF has led to criticism. In 2004 the anthropologist Mac Chapin criticized WWF and other large international nature protection organizations for their domination of the conservation agenda, neglect of indigenous people in spite of agreements and documents, and increasing financial dependency on multinationals and governmental agencies. In their response in 2005 the WWF representatives

Carter S. Roberts and Chris Hails pointed out that they shared Chapin's broader concerns "in spite of exaggerations and inaccuracies" (Roberts and Hails 2005, p. 7).

Chapin's article and the many responses to it made clear that the relationship between the rights and interests of indigenous people and conservation in a globalizing world is complex, implying often painstaking decisions. In the first decade of the twenty-first century WWF had offices in over fifty countries and was active in more than a hundred, with nearly five million individual members and an annual budget of around $500 million. Established as an organization that primarily focused on animal species with great public appeal, it gradually came to include ecological, environmental, developmental, and economic issues in its mission. WWF became a powerful player in international civil society, bringing states, companies, and NGOs together. Balancing those different forces has been one of its main challenges.

SEE ALSO *Conservation; Consumption; Nongovernmental Organizations; Sustainability; Sustainable Development; United Nations Educational, Scientific and Cultural Organization; United Nations Environment Programme; Wilderness.*

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Jac. A. A. Swart

WRIGHT, FRANK LLOYD
1867–1959

Frank Lloyd Wright, who was born in Richland Center, Wisconsin, on June 8, 1867, is recognized as one of the most influential modern architects, the preeminent American architect of the late nineteenth and early twentieth centuries, and, along with Louis Sullivan, the inspiration for the Prairie School of architecture. After studying engineering at the University of Wisconsin, Wright spent his formative years as an architect under the tutelage of Joseph Lyman Silsbee and Sullivan. Sullivan's architectural maxim "form follows function" prompted Wright to develop a distinct approach called *organic architecture* that was driven by the maxim "form and function are one." That maxim was expressed in Wright's written works, especially "The Art and Craft of the Machine" (1992 [1901]), *An Organic Architecture* (1970 [1939]), *The Future of Architecture* (1953), *The Natural House* (1954), and *The Living City* (1963 [1958]), and in many of his over 500 completed designs, especially at Taliesin in Wisconsin, Falling Water in Pennsylvania, and Taliesin West in Arizona. Wright's significance for environmental ethics and philosophy lies in the commitment of his architectural ethos to organicism and openness through the use of the horizontal line.

Wright believed that architectural principles should be modeled after forms found in nature. Because forms have a quality of life that is the same as their function, they are formal declarations of function. The continuity Wright saw between architectural and natural forms drove his organic architecture, at the heart of which was the building that declares its purpose (function) without pretense and is enmeshed in and indeed is one with its urban or rural site.

Wright's organic architecture centered on projects that exemplified harmony with nature. To realize that harmony, architecture had to break down the nature-culture dualism that informed the creation of conceptually and architecturally situating human-made objects that stand in opposition to nature. Wright's strategy for breaking down that dualism included a focus on the horizontal over the vertical. When preference is given to the horizontal, more specifically the horizontal line (for

Fallingwater, Bear Run, Pennsylvania. *One of Frank Lloyd Wright's most recognizable works of architecture, Fallingwater was designed in 1936 as a summer home for Pittsburgh department store owner Edgar Kaufmann. The home is toured by over 70 thousand people each year.* **AP IMAGES.**

example, in Robie House in Illinois), buildings stand a better chance of expressing the openness and freedom of nature because deference to the horizontal leads to structures close to and guided by the forms and lines of the earth, starting with the horizon.

If one evaluates Wright's architectural ethos in terms of specific buildings or projects, one is likely to focus on Wright's success in developing a set of principles useful for guiding green architects as they work to bring about unity within buildings and in the way buildings fit into their sites in an unobtrusive and ecologically sensitive manner (Rogers 2004). On this level, a question can be asked about Wright's ethos that looks similar to a question that often comes up in relation to ecological design generally and biomimicry more specifically, namely is it justified to base norms and principles that are to guide human conduct on the perceived norms in and of nonhuman nature?

However, troubling philosophical issues arise with respect to the use of Wright's approach as an ecologically informed guide for planning and sustainability. Wright's commitment to openness through the horizontal line led him to develop a response to what he saw as the failures of urbanism. According to Wright, the artificial, constricted, and centralized industrial city demanded a response. In what can be seen as a precursor to the type of antiurbanism found in the work of later environmental ethicists, most notably Murray Bookchin (1974), Wright called for a decentralized and horizontal approach to human settlement. In his effort to make human settlements look more like natural organisms, Wright arrived at his "Broadacre City" concept, a precursor to later suburban development. Insofar as basic elements of the concept can be viewed as being related to environmental problems faced in the twenty-first century, Broadacre City delimits what is considered part of the ecological equation. For example, Wright's allowance of one acre per person attempts to honor a commitment to openness and freedom but ends up encouraging populations to spread out over vast distances and as a result contribute to a need for massive transportation infrastructure. Site and immediate surroundings are chosen over and at the expense of the ecological region, as well as wider ecological cycles and processes. It is paradoxical that Wright's ethos, which accomplishes so much in terms of ecological insight on the micro level, ultimately stands opposed to an ecological approach to architecture that recognizes the vital role of human-made structures in ecosystem operations on the macro level.

SEE ALSO *Bookchin, Murray; Space/Place; Sustainable Architecture and Engineering; Urban Environments.*

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Appendices

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Glossary

Acoustic ecology: The interdisciplinary field that studies the auditory relationship between living organisms and their environments. In urban and suburban settings acoustic ecologists investigate the sonic effects of constant sound and noise pollution. In oceans, national parks, and wilderness areas there is heated debate over the presence of jet skis, airplane overflights, off-road vehicles, and military monitoring systems that rely on high-intensity underwater sonar blasts. Acoustic ecologists generally advocate the value of listening, the quality of the soundscape, and more consciously choosing the sounds humans create.

Androcentrism: Literally "male-centered," the conscious or unconscious practice of emphasizing the male viewpoint and male interests over the female viewpoint and female interests. Feminist theory commonly criticizes androcentrism on the grounds that it assumes a universal human nature corresponding to male attitudes while female attitudes are considered deviant.

Animal law: The branch of law concerning all interactions with animals from the perspective of traditional statutory and case law. The subjects of animal law include wildlife, animals kept in captivity, companion animals, and animals used for various entertainment, research, and food purposes. In the United States animal laws exist at local, state, and national levels.

Anthropocentrism: Literally "man-centered," the conscious or unconscious practice of emphasizing the human viewpoint and human interests over nonhuman viewpoints and interests. Anthropocentrism is frequently justified on the grounds that, because humans are the most significant fact of the universe, they are the most important. See also *chauvinism, human*.

Anthropocosmism: An alternative to the dichotomy between anthropocentrism and nonanthropocentrism that seeks to encapsulate both humanity and the natural world without placing greater value on a particular center—anthropocentric, biocentric, ecocentric—and thereby excluding or marginalizing something of peripheral value. From the anthropocosmic perspective, the values of humans ("anthropoi") and the world ("cosmos") are not in opposition, but are intimately interwoven.

Autecology: The study of the relationship between an individual organism or an individual species and its physical environment. Contrast to *synecology*.

Behaviorism: A psychological theory and method of investigation that seeks to explain behavior solely in terms of observable and quantifiable responses to environmental stimuli. Behaviorism ignores conscious experience and subjective phenomena like desires, motives, and emotions.

Biocentric egalitarianism: See *egalitarianism*.

Biocide: Any chemical agent capable of destroying living organisms. Although biocides are commonly associated with pesticides (herbicides, fungicides, insecticides), antimicrobials (antibacterials, antivirals, antiparasites) are biocides as well. See also *persistent organic pollutant (POP)*.

Bioethics: The branch of ethics that investigates issues surrounding health care and the biological sciences. These include access to the allocation of limited resources (organs, treatment); the authority of the patient, the physician, and others; and the scope and limits of confidentiality. While bioethics has traditionally focused on abortion, euthanasia, surrogacy, in vitro fertilization, and

organ transplants, it is increasingly concerned with drug research, embryonic stem cell research, genetic engineering (cloning, screening, gene therapy), recent work in synthetic biology (biotechnology), and a wide spectrum of environmental concerns.

Biome: The largest, most comprehensive ecological community adapted to a climatic type. While biomes are often thought of in terms of vegetative communities, animals, fungi, and microbes also constitute biomes. The terrestrial biomes are tundra, desert, chaparral, coniferous (boreal) forest, temperate forest, temperate grassland, tropical rainforest, and tropical savanna and scrub. The two basic aquatic biomes, freshwater and marine, include reefs, marshes, swamps, estuaries, shoreline, flowing waters, the continental shelf, lakes and ponds, and the open ocean.

Biomimicry (bionics): Literally ''life imitation,'' a design strategy that takes nonhuman natural process as models to solve human problems. Velcro was inspired by burrs; glue-free tape by the Gecko lizard's sticky feet; and, to achieve passive air conditioning, Eastgate Center in Harare, Zimbabwe, was designed after the termite mound. Some of the underlying assumptions of the biomimetic approach are that ''nature knows best;'' natural things and processes work because they have been ''field-tested'' by evolution; and engineering projects based upon biomimetic principles will be conducive to life, or at least not be detrimental to it.

Biopiracy (bioprospecting): The unauthorized and uncompensated appropriation of biological material (plants, animals, genetic cell lines) or indigenous knowledge for the purposes of commercial development. Insofar as it promises to provide just compensation to aggrieved parties, the concept of biopiracy is attractive to indigenous rights advocates. Yet the concept has been criticized on the grounds that laws against biopiracy cannot provide adequate protection for all indigenous people—not every indigenous territory contains useful biological material—and it is unclear whether biological materials can and should be owned as a matter of natural right.

Bioregion: A territory defined in ecological units (watershed or ecosystem) with similar flora, fauna, and environmental conditions as opposed to a territory defined in political or administrative terms.

Bioregionalism: A loose-knit movement formed in the late 1970s, in response to the modern environmental crisis, which advocates transforming human societies to mirror naturally occurring bioregions. The hope is that if people live in accordance with and in awareness of these ecological units, they will live in a sustainable fashion.

Carbon sequestration: The process of removing and storing atmospheric carbon in forests, oceans, or fossil fuel reservoirs. Efforts are underway to develop technologies that can capture CO_2 emissions and sequester them under pressure underground where they cannot be reemitted into the atmosphere.

Carrying capacity: The maximum population size that a given environment can sustain without degradation.

Charismatic megafauna: See *flagship species*.

Chauvinism, human: The exaggerated belief in and devotion to the supremacy of the human species over all other species. See also *anthropocentrism*.

Coevolution: The biological process, sometimes called an evolutionary arms race, whereby two or more species evolve in response to one another. Such a process includes predator-prey relationships (robins and earthworms) and various mutualistic and parasitic relationships (legumes and nitrogen-fixing bacteria, wasps and caterpillars).

Communalism: An umbrella term centered on notions of the community, shared living, public ownership, and so on.

Consequentialism: Any ethical approach that understands the moral rightness of an action as determined solely by its results. Roughly, if the consequences of an act are good, the act is right; if they are bad, the act is wrong. For the consequentialist, the character and motives of an actor, as well as any formal characteristics of an act itself, are irrelevant to its moral status. The two chief consequentialist theories are ethical egoism and utilitarianism.

Constructivism, ethical: In metaethics, the antirealist view that moral facts exist insofar as they are the result of an actual or hypothetical constructive process. Hence, prior to the constructive process, there are no moral standards or moral facts.

Contractarianism (contractualism): Any theory that justifies moral principles or political arrangements by appealing to a voluntarily accepted social contract that is committed to under ideal conditions—no ignorance of relevant facts and no personal biases, power inequalities, or malicious ambitions.

Cornucopianism: The pro-technology view that material resources are less important than resources of the mind. Necessity, the mother of invention, will see to it that once a problem becomes sufficiently acute—be it pollution, resource depletion, or global climate change—creative minds, motivated by the promise of wealth, will find appropriate solutions. Such an approach implies that there is little reason to conserve resources as they will be replaced by alternatives, that toxic waste is an opportunity to develop waste disposal technologies, and so forth.

Cradle-to-cradle design: A burgeoning design and production approach that seeks not only to reduce but to eliminate all waste from the manufacturing process. Much like a food chain, the goal is for all products and byproducts to feed into production systems thereby wasting nothing. The cradle-to-cradle approach is generally pro-technology and pro-consumerist: sustainability is not about consuming less, but about consuming differently.

Cybernetics: The study of the control and communication processes in living organisms and artificial systems, especially the comparison between the two. A key feature of cybernetics is a system's use of feedback to steer it toward a goal: when the feedback causes changes in the system itself, it appears to be self-organizing.

Cyborg: Short for "cybernetic organism," a self-regulating organism, part-human and part-machine. The proportion of human qualities to machine qualities in cyborgs ranges from humans with synthetic implants (artificial hearts and pacemakers) to futuristic visions of sentient computers that can think thoughts and feel emotions.

Deconstruction: The view that language is a closed system of meanings with little direct reference to actual objects or relations among objects and thus that "reality" is "socially constructed"; deconstruction is the critical process of revealing and undermining the contingent way that the world is organized conceptually, including such binary categories as male/female, mind/body, and nature/culture.

Deontology: Literally the "science of duty," a general approach in ethics that sees the morality of an action in terms of motives for acting as well as the rightness and wrongness of the act itself regardless of consequences.

Distributive justice: Principles about the proper distribution of benefits (power, wealth, privilege) and burdens (taxes, environmental harms) among members of a society. Common bases for distribution are desert, needs, and entitlement.

Divine Command Theory: The theory that morality is grounded in God's will and that ethical principles are simply commandments of God. For many, God is required to make morality strong and firm. The fear is that without an ultimate guarantor of right and wrong, there will be only moral nihilism. The character Ivan Karamazov in Dostoevsky's *The Brothers Karamazov* famously sums up this fear: "If God doesn't exist, everything is permissible?"

Dualism, human/nature: The conscious or unconscious view that humanity and nature are fundamentally distinct, independent, and mutually exclusive. Some interpret the emphasis on the separation of humanity and nature as encouraging the belief that nature is to be controlled or dominated, or else simply a domain of facts to be studied—all hallmark attitudes of Renaissance humanism and contemporary Western science.

Dualism, substance: The view that the mind and the body are fundamentally different substances each with an independent existence and having a unique set of properties. Substance dualism is often used to support the view that, despite changes to the body, up to the point of death, the mental or spiritual substance abides unaffected.

Ecocentrism: In contrast to an *anthropocentrism*, an emphasis on the ecological point of view, frequently crediting ecological units of nature (rivers, species, communities, populations, ecosystems) with rights. Through metaphors like "the web of life," the ecocentric approach tends to view ecological interactions holistically.

Ecofascism: Primarily an inflammatory criticism of ecocentrism asserting that granting rights to ecological units of nature leads to the inappropriate sacrifice of the rights of the individual. As the term is an insult, the connection between ecocentrism and fascist societies—Nazi Germany in particular—is rarely explored. Rather, because supporters of German fascism exalted nature and the "Land" and the Nazi party tapped into this sentiment, or because Hitler was allegedly a vegetarian and animal lover who supported organic farming, any environmental cause or ecocentric approach is bound to be fascist.

Ecological anthropology: The study of how human culture mediates human-environment interactions. Not only does culture influence the character of human interactions with the environment (land, climate, species), but the environment shapes culture (beliefs, traditions, organizations). The principal subdisciplines of contemporary ecological anthropology include cultural ecology, historical ecology, political ecology, spiritual ecology, and environmental anthropology.

Ecological footprint: A spatial metaphor to communicate the total amount of resources required to produce and dispose of the goods and services of a particular lifestyle. An ecological footprint's size is determined by calculating the amount of land needed for food production, housing, transportation, consumer goods, services, and so forth.

Egalitarianism: The doctrine or belief in the equality of humankind—morally, politically, economically, and socially. *Biocentric egalitarianism* extends this notion to confer intrinsic value on all living entities, human and nonhuman, sentient and non-sentient.

Embodied knowledge: Knowledge derived from the subjective experience of one's own body as opposed to knowledge derived from objective, scientific understanding.

Emissions trading: A market-based response to pollution that allows polluters to select cost-effective solutions to achieve specific emissions goals. The open-market trading system allows a polluter to earn emission rights by reducing its emissions to levels below an established standard. In a cap-and-trade system, the government determines an acceptable level of pollution (the "cap") and then issues permits to pollute. Companies producing fewer emissions than allowed can sell or trade their excess capacity to others who might otherwise exceed the cap and incur a penalty.

Endangered species: Any species at risk of extinction throughout all or a significant portion of its range if existing pressures persist. Such pressures include pollution, habitat destruction, invasive species, and unsustainable exploitation. A related term, "threatened species," refers to any species liable to become endangered in the near future.

Enlightenment: Also known as the "Age of Reason," a European intellectual movement of the seventeenth and eighteenth centuries that emphasized the use of reason to critically inspect longstanding doctrines, traditions, and authorities of previous generations.

Environmental determinism: The largely discredited view that the physical environment, as opposed to social circumstances, wholly determines cultural characteristics. Environmental determinism has been associated with outdated racist theories that identify persons from tropical climates as inferior to those from northern climates: tropical climates purportedly cause laziness and promiscuity while variability of weather in northern latitudes purportedly determines a strong work ethic.

Environmental literature: A diffuse, quickly evolving literary genre that includes *nature writing*, oral storytelling, and ecological fiction, drama, and poetry. It is not necessarily concerned with conservationist causes nor is it simply trying to solve environmental problems. Rather, environmental literature is about fundamental human attitudes about the nonhuman natural world and our experience of it. While such explorations may be critical, they may also be celebratory, inquisitive, or downright humorous.

Environmental racism: Deliberate or unintentional racial discrimination in environmental policy making, enforcement of environmental regulations, the targeting of communities for the disposal of toxic wastes and siting of polluting industries, and the distribution of environmental amenities (parks, vistas, open spaces). *Environmental justice* is the movement to end environmental racism.

Ethnobotany: The study of the relationship between people and plants including plant lore, agricultural customs, and the use of plants in medicines and artifacts (houses, storage, modes of transportation).

Ethnocentrism: The conscious or unconscious practice of emphasizing the viewpoint of one's ethnic group and interests over the viewpoint of other cultures. Such bias can lead to the evaluation of other cultures in terms of one's own and perhaps even the belief that one's culture is superior to others.

Eutrophication: The process of nutrient enrichment (nitrogen and phosphorus), increased production of organic matter, and succeeding ecosystem degradation in a water body. In the United States nutrient enrichment is often the result of excess synthetic fertilizers on commercial farmland that gets into riverine systems and eventually into the ocean.

Existentialism: A broad philosophical movement emphasizing subjective choice over objective description, lived experience over abstract reasoning, individuality over mass culture, freedom over determinism, and authenticity over inauthenticity. Insofar as humans create value and meaning in an otherwise meaningless universe, existentialism may also stress one's emotional reaction to such a realization: sadness, dread, or feelings of absurdity about life.

Extinct in the wild: A species whose only living members are in captivity or live as a naturalized population outside of their traditional range. Examples of species extinct in the wild include the Barbary Lion, Spix's Macaw, the Hawaiian Crow, and the Wyoming Toad.

Extirpation: See *local extinction.*

Fact/value distinction: The assumption that facts and values are mutually exclusive. Facts represent what is while values describe what ought to be. The fact/value distinction has been criticized on the grounds that it is impossible to precisely distinguish facts from values as the two necessarily interpermeate.

Flagship species: Any species having broad public appeal and that can be used to promote conservation efforts. The hope is that, in protecting flagship species, entire biological communities and their associated ecosystems will also be protected. *Charismatic megafauna* are large animals belonging to flagship species including lions and tigers, bison and elephants, gorillas and orangutans, pandas and polar bears, and whales and sea turtles.

Fluorocarbon: See *perfluorinated compounds (PFCs).*

Fossil fuels: Any hydrocarbon deposit such as petroleum, coal, or natural gas that, when burned with air directly, produces heat or indirectly produces energy. All fossil fuels are the result of geologic processes acting on the fossilized remains of plants and animals that lived millions of years ago.

Gene bank: A facility that preserves genetic material for the ex situ conservation of individuals (seeds), tissues, and reproductive cells of plants or animals.

Genome, human: The complete set of genetic information or hereditary material in the chromosomes of each cell of a human being.

Green architecture: See *sustainable architecture*.

Green revolution: The intensification of industrial agriculture in the 1960s in the developing world. The green revolution led to a dramatic increase of crop yields per unit area of farmland. Practices supporting such an increase include turning large tracts of land over to monocultures of high-yield cereal crops (rice and wheat); the heavy use of irrigation, pesticides, and synthetic fertilizers; and sowing and harvesting on a single piece of land multiple times per season or per year. The green revolution has been criticized for its long-term deleterious ecological and social effects.

Green space: Open, undeveloped space frequently containing forests, gardens, or grass within or adjacent to a built-up area. Green spaces are often designated for parks, trails, gardens, preserves, playgrounds, or habitat restoration.

Greenhouse gas: Any gas contributing to the greenhouse effect by absorbing some of the outgoing terrestrial infrared radiation and re-emitting it back to the earth's surface. The most important greenhouse gases, in order of relative abundance, are water vapor, carbon dioxide (CO_2), methane (CH_4), nitrous oxide (N_2O), and the halocarbon gases.

Human ecology: The study of the interactions between humans, their communities, and the environment including responses to and effects on the environment.

Humanism: A nineteenth-century term for the values and ideals of the European Renaissance. Broadly speaking humanism centers on and assigns a positive role to the human individual as the ultimate source of value, and as capable of developing the moral, physical, spiritual, and rational faculties. The movement was originally sparked by the rediscovery of Greek and Roman literature in the twelfth century.

Hydrography: The study, measurement, and description of large bodies of water. The central goal of hydrography is to provide for safe navigation and protection of the marine environment through the creation of accurate nautical charts and related publications.

Idealism: The metaphysical theory that the external world is not physical but is in fact mental or psychical. The epistemological claim that reality is best explained in terms of psychic phenomena like minds, spirits, or ideas instead of in terms of matter. The ethical device of positing an action, person, political organization, or state of being that is free of all the imperfections that characterize actual actions, persons, political organizations, and states of being.

Individualism/holism debate: The debate over whether the individual or the whole is primary: ethically, semantically, ontologically, or epistemologically. For instance, the ontological individualist claims that individual elements are independent and self-existent whereas for the holist they are interdependent and constituted by the qualities of others. The ontological individualist claims, and the holist denies, that all complex phenomena are reducible; for the holist some qualities only emerge at the level of the whole.

Island biogeography: The study of the geographical distribution of plants and animals on islands or in isolated locales ("habitat islands"). According to the equilibrium theory of island biogeography, species richness on an island stems from a balance between the number of species added by immigration and the number lost to extirpation. First proposed by Edward O. Wilson and Robert H. MacArthur in 1963, the theory is increasingly important to conservation efforts—the creation of habitat islands represents one of the chief threats to biodiversity.

Kantianism: Any philosophical approach or theory that follows the work of Immanuel Kant and, perhaps, shares his interest in elevating philosophy to the level of science. In ethics, Kantianism refers to an emphasis on moral duty, the universalizability of moral commands, and the idea that humans, as rational beings, are ends unto themselves, never simply a means to an end.

Kyoto protocol: First drafted in 1997, the international agreement on global climate change to reduce the emissions by signatory nations of six greenhouse gases to levels below those in 1990. While the United States. has staunchly refused to ratify the protocol, it nevertheless came into effect in 2005 with Russia's ratification of it. By 2004 only the United Kingdom (closely followed by Germany) had met its reduction target while the United States, Canada, Italy, and Japan had all increased their greenhouse gas emissions.

Local extinction: The disappearance or elimination of a population or species in a particular locale but not from its entire range (global extinction). Also known as *extirpation*.

Materialism: The belief that only matter exists. Mind or consciousness is (somehow) reducible to matter, its properties, or interactions.

Mechanism: The view that all phenomena can be explained using the principles by which machines are explained: classical physics and chemistry, and mechanical science.

The seventeenth-century mechanists—Galileo, Boyle, Descartes, Hobbes, and Newton, among others—advanced the theory of mechanism to eliminate all non-observable and mathematically untreatable explanations, in particular vitalistic and teleological explanations. While mechanism has been extremely successful in terms of epistemological clarity and technical application, it has been criticized for unduly reducing the richness and complexity of life to a few basic entities and forces. Opposite of *organicism*.

Mendelian inheritance: As opposed to extrachromosomal inheritance, the pattern of gene inheritance, first described by Gregor Johann Mendel, in which one copy of a gene (allele) is inherited from each parent by an offspring.

Metaphysics: The philosophical study of the most general or abstract characteristics of reality: identity, existence, substance; permanence and change, time and space, cause and effect, difference and sameness, unity and variety, mind and matter, and so forth.

Microcosm/macrocosm: Literally "small-order"/"large-order," the very old and very common belief, found in both Western and Eastern cultures, that parts of the human body correspond to aspects of the universe, that every part mirrors the whole, or that the microcosm corresponds to the macrocosm. Variations on this theme include the analogies between the human being and society, and between society and the universe. Since the Renaissance, the microcosm/macrocosm analogy has largely been displaced by a mechanistic, ontologically materialistic model of the universe.

Naturalism: A broad concept including the notions that (a) the universe is wholly natural, not derived from or constituted by any nonnatural component (supernatural or transcendental); (b) empirical science in principle can explain all phenomena; (c) humans are no different in kind from the rest of the universe; and (d) values do not have a supernatural origin or sanction, but are either humanly constructed or grounded in natural phenomena.

Naturalistic fallacy: First identified by G. E. Moore, the practice of identifying goodness with a natural quality like pleasantness or beauty. For Moore moral goodness is a primitive, unanalyzable, and nonnatural concept that cannot be equated with or explained in terms of natural properties.

Nature writing: Literary nonfiction that intertwines careful, often scientifically oriented, personal observation of the natural world with spiritual, philosophical, and perhaps even political reflections. Nature writers are especially concerned with exploring epistemologies of place, encouraging an appreciation of sensual experience, and tracing the relationship between humans and the "more-than-human world." If nature writing can be said to have an overarching goal, it is to nudge Western culture toward a more sustainable relationship with the world. Nature writing is a subset of *environmental literature*.

Neo-colonialism: The control and management of a weaker nation by a stronger one through economic and cultural measures like trade agreements, the operations of transnational corporations, and particular business models.

Neo-Darwinism: The synthesis of Darwin's theory of evolution by natural selection with Gregor Mendel's theory of genetic inheritance by chance mutation and recombination. Also called the "modern synthesis" and "neo-Darwinianism."

North/South divide: A geographic division thought to reflect the socioeconomic and political divisions between the developed wealthy "northern" countries (Japan, Europe, United States) and the developing or least developed "southern" countries (southern Asia, Africa, Central and South America). As more and more countries in the South industrialize (Mexico and South Korea, for instance), the usefulness of the term will further diminish.

Old growth forest: The North American term for a late successional forest that has not been significantly altered by human activity and that contains numerous mature, dying, and fallen trees.

Organicism: In philosophy, any theory describing the universe as the analog of a living organism, especially in terms of development and organization. Opposite of *mechanism*.

Perennial polyculture: A biomimetic (see *biomimicry*) approach to agriculture in which numerous plantings are intercropped for three or more seasons in rows or mixed arrangements. Perennial polyculture is one response to the degradation and loss of topsoil in industrial monocultural farming with its heavy emphasis on annual crops, frequent plowing, and inputs of synthetic fertilizer and pesticides. Perennial polyculture emphasizes renewable natural resources and the self-regeneration of local ecosystems.

Perfluorinated compounds (PFCs): Also known as "fluorocarbons," human-made chemicals composed of only carbon and fluorine. PFCs are widely used in manufacturing, particularly in food packaging and Teflon products like nonstick cookware. They are a *persistent organic pollutant* and are found in the vast majority of people living in the industrialized world today. While PFCs do not harm the ozone layer, in a gaseous state they are a powerful greenhouse gas.

Persistent Organic Pollutant (POP): A toxic chemical substance persisting in the environment for an unreasonable amount of time, usually decades or more. POPs

also bioaccumulate in food chains and can travel long distances. DDT, PCBs, PFCs, Heptachlor, and Furans are examples of POPs.

Population viability analysis (PVA): Analysis predicting the likelihood that a population or species will persist or go extinct in an environment over a certain period of time. Such analysis includes estimating the minimum size required for a population to persist and the effects on endangered species of habitat loss, fragmentation, and deterioration.

Positivism: Developed by Auguste Comte, the philosophy that there exist three stages of thought—the theological, the metaphysical, and the positive—each having an economic and cultural correlate. The last and highest stage is "positive" insofar as human thought is limited only to facts, to what is positively given, while scrupulously avoiding any *a priori* speculation. Positivism is sanguine about science's ability to explain all phenomena as well as the advantages of a thoroughly scientific society.

Post-materialism: A cultural shift of focus from material affluence and physical security to quality-of-life concerns, including civil liberties, minority rights, and environmental protection. It is uncertain whether the United States has ever fully experienced a post-material revolution.

Postmodernism: In philosophy, the view that universal statements about value, progress, or historical causation are impossible because all knowledge is shaped by the conceptual framework of the knower. Everything we perceive and interpret is necessarily influenced by specific circumstances, including, for instance, sex, gender, class, culture, biology, and historical era. Thus, knowledge can never be universal, but must always be partial, situated, and embodied. Postmodernism has led to a proliferation of philosophical theories critical of grand narratives, most notably post-structuralism. See also *relativism, ethical.*

Precautionary principle: The principle that an action should not be undertaken until its effects are adequately understood and deemed safe. The precautionary principle requires that new technology be considered guilty until proven innocent.

Preservationism: Any movement that seeks to protect natural areas, historical sites, or endangered species from loss or danger due to human intervention.

Primatology: The interdisciplinary study of nonhuman primates. Today many primatologists work with conservation groups to preserve the habitats and populations of the species they study.

Progressivism: A period of economic and social reform in the United States that occurred roughly between 1900 and 1920. Progressives were composed of Democrats, Republicans, and nonpartisans, all of whom were distressed by the concentration of political and economic power, which they believed was contrary to equality and democracy. Progressives called for the government to be more active in reform and to eliminate inequities created by the rapid industrialization of America. Much of the Progressive agenda passed into law during the presidencies of Theodore Roosevelt, William Howard Taft, and Woodrow Wilson.

Reductionism (reductivism): Either the explanation of all fields of knowledge in terms of a single, simpler science (physics) or the metaphysical belief that all things, regardless of outward appearance, are really just one kind of thing. While reductionism was popular in the early days of analytic philosophy, the failure of philosophers to come up with satisfactory inter-theoretic reductions along with the recognition of emergent or supervenient properties has undermined enthusiasm about reductionism as a philosophical program. Nonetheless, as a general methodological tendency, reductionism still holds sway in most academic disciplines today.

Relativism, ethical: The doctrine that moral values are relative to particular persons or cultures and cannot be assessed apart from these criteria. If values are relative, no overarching standards exist according to which individuals and cultures can be judged—what is right in one place may be wrong in another simply because the only criteria for distinguishing right from wrong are the moral values of the society or individual. See also *postmodernism.*

Relativity theory: First proposed by Albert Einstein, the theory that time, space, and mass, rather than being absolutes, are relative to the observer and the observed.

Rights: A certain type of relationship between two parties, the rights holder and the rights observer. For the holder, a right is a permission to act; for the observer, it is an obligation to respect that permission. While rights of noninterference (negative rights) are widely accepted in the United States, rights that obligate others to take positive steps in helping a person exercise his or her right (positive rights)—such as Affirmative Action or basic health care—are controversial insofar as they may allow for an endless expansion of rights. Perhaps due to the ascendancy of individualism in Western society, rights talk is the commonest form of moral discourse today.

Scholasticism: The methods and teachings of academic philosophers and theologians of the Middle Ages beginning with St. Augustine in the fifth century and lasting up to the mid-seventeenth century with the birth of Renaissance humanism. A primary goal of scholasticism was to reconcile faith with reason, Christian theology

with the Greek philosophy of Aristotle (and to a lesser extent Plato). With the coming of the Renaissance, scholasticism's methods of deductive logic and dialectical reasoning were fiercely criticized and replaced by the methods of modern science as first articulated by Galileo Galilei, Francis Bacon, René Descartes, and Thomas Hobbes, among others.

Speciation: The biological process by which new species arise from pre-existing species. The main type of species development is allopatric speciation or development owing to the physical separation of populations over a geographic distance. A new species emerges when it can no longer interbreed with the population from which it was isolated. At this point each species embarks upon an independent evolutionary trajectory.

Supernaturalism: Belief in a domain of existence over and above the natural or material domain. Belief in ultimate forces or agencies that transcend the universe but somehow influence natural events in it.

Superorganism: A collection of individual yet interdependent organisms that behave as if they were a single organism. Examples of superorganisms include coral, insect colonies, and the Portuguese man-of-war. Frederick Clements argued that what later came to be called ecosystems were also superorganisms.

Synecology: The study of entire communities of organisms and interactions within them. Contrast to *autecology*.

Theocentrism: Literally "God-centered." In contrast to anthropocentrism, the belief that God's values, including the God-ordained goodness of creation, trump human values, including the way humans value nature.

Transcendentalism: A literary and philosophical movement of nineteenth-century American philosophers and writers who postulated the existence of a nonphysical, spiritual reality knowable only through intuition, the highest form of knowledge. They also emphasized humanity's essential goodness, God's immanence in nature, and the essential unity of creation; along with the values of individualism, self-reliance, and the rejection of authority. The central Transcendentalists were Ralph Waldo Emerson, Henry David Thoreau, Margaret Fuller, and Amos Bronson Alcott. The movement has influenced scores of American writers including Nathaniel Hawthorne, Herman Melville, and Walt Whitman.

List of Primary Sources

THE LAND ETHIC

SOURCE Leopold, Aldo. 1968 (1949). In *A Sand County Almanac and Sketches Here and There.* Oxford, U.K.: Oxford University Press.

INTRODUCTION *Aldo Leopold (1887–1948) worked for nineteen years in the U.S. Forest Service beginning in 1909. His writings have been extremely influential in conservation and in the development of the field of environmental ethics. Leopold begins the essay "The Land Ethic" by discussing the development of ethics, which historically has steadily extended outward to encompass more and more subjects. Ethics evolved as a means of social cohesion and developed correlatively to the development of societies or communities—from small bands of hunter-gatherers to the global village. Leopold argues for the necessity of taking the next step in the sequence of social-ethical evolution—an ethic dealing with our relationship to the land and nonhuman life. Ethics acknowledges the membership of an individual in a community, and Leopold urges ecologically broadening our understanding of community to include the land itself. A shift is required from humanity's role of conqueror over nature to "plain member and citizen of it." Embracing this shift would prevent approaching land-use issues purely out of self-interest. Bringing about such an ethic would require a change in conscience, leading individuals to feel a sense of personal obligation to the land. To explain this, Leopold characterizes the land pyramid to show that the land is something toward which we can and must act ethically, rather than basing our actions on what is economically expedient.*

A FABLE FOR TOMORROW

SOURCE Carson, Rachel. 1962. *Silent Spring.* Boston: Houghton Mifflin. Copyright renewed 1990 by Roger Christie. Reproduced by permission of Houghton Mifflin.

INTRODUCTION *Rachel Carson (1907–1964) was a marine biologist for the U.S. Bureau of Fisheries who later devoted herself full time to nature writing. Her concern about pesticides, in relation to conservation and environmental issues, led to the writing of* Silent Spring*, which is often cited as the book that launched the modern environmental movement. In "A Fable for Tomorrow," the book's first chapter, Carson traces the effects of the pesticide DDT on an imaginary town. She evokes a town once full of life, color, and voices, where human and nonhuman life mysteriously becomes sick and dies. An uncharacteristic stillness descends upon this town, the cause of which can be traced back to a "white granular powder." Who or what is responsible? It is the people of this town who have brought this unnatural stillness and death upon themselves. Carson closes with the claim that, while this is an imaginary town, these events were happening in real places around the country. Her book is an attempt to explain how and why.*

There was once a town in the heart of America where all life seemed to live in harmony with its surroundings. The town lay in the midst of a checkerboard of prosperous farms, with fields of grain and hillsides of orchards where, in spring, white clouds of bloom drifted above the green fields. In autumn, oak and maple and birch set up a blaze of color that flamed and flickered across a backdrop of pines. Then foxes barked in the hills and deer silently crossed the fields, half hidden in the mists of the fall mornings.

Along the roads, laurel, viburnum and alder, great ferns and wildflowers delighted the traveler's eye through much of the year. Even in winter the roadsides were places of beauty, where countless birds came to feed on the berries and on the seed heads of the dried weeds rising above the snow. The countryside was, in fact, famous for the abundance and variety of its bird life, and when the flood of migrants was pouring through in spring and fall people traveled from great distances to observe them. Others came to fish the streams, fish flowed clear and cold out of the hills and contained shady pools where trout lay. So it had been from the days many years ago when the first settlers raised their houses, sank their wells, and built their barns.

Then a strange blight crept over the area and everything began to change. Some evil spell had settled on the community: mysterious maladies swept the flocks of chickens; the cattle and sheep sickened and died. Everywhere was a shadow of death. The farmers spoke of much illness among their families. In the town the doctors had become more and more puzzled by new kinds of sickness appearing among their patients. There had been several sudden and unexplained deaths, not only among adults but even among children, who would be stricken suddenly while at play and die within a few hours.

There was a strange stillness. The birds, for example—where had they gone? Many people spoke of them, puzzled and disturbed. The feeding stations in the backyards were deserted. The few birds seen anywhere were moribund; they trembled violently and could not fly. It was spring without voices. On the mornings that had once throbbed with the dawn chorus of robins, catbirds, doves, jays, wrens, and scores of other bird voices there was now no sound; only silence lay over the fields and woods and marsh.

On the farms the hens brooded, but no chicks hatched. The farmers complained that they were unable to raise any pigs—the litters were small and the young survived only a few days. The apple trees were coming into bloom but no bees droned among the blossoms, so there was no pollination and there would be no fruit.

The roadsides, once so attractive, were now lined with browned and withered vegetation as though swept by fire. These, too, were silent, deserted by all living things. Even the streams were now lifeless. Anglers no longer visited them, for all the fish had died.

In the gutters under the eaves and between the shingles of the roofs, a white granular powder still showed a few patches; some weeks before it had fallen like snow upon the roofs and the lawns, the fields and streams.

No witchcraft, no enemy action had silenced the rebirth of new life in this stricken world. The people had done it themselves.

This town does not actually exist, but it might easily have a thousand counterparts in America or elsewhere in the world. I know of no community that has experienced all the misfortunes I describe. Yet every one of these disasters has actually happened somewhere, and many real communities have already suffered a substantial number of them. A grim specter has crept upon us almost unnoticed, and this imagined tragedy may easily become a stark reality we all shall know.

What has already silenced the voices of spring in countless towns in America? This book is an attempt to explain.

THE HISTORICAL ROOTS OF OUR ECOLOGIC CRISIS

SOURCE White Jr., Lynn. 1967. *Science.* 155 (March 10): 1203–1207. Reproduced by permission of AAAS.

INTRODUCTION *Lynn White Jr. (1907–1987) was professor of medieval history at the University of California, Los Angeles; he also taught at Princeton and Stanford and served as president of Mills College in Oakland, California, for fifteen years. "The Historical Roots of Our Ecologic Crisis" is a seminal piece in environmental ethics that often serves as the starting point for addressing environmental issues as they relate to philosophy. White argues that while all living things modify their environments, the ability of humanity to transform our environment radically changed when we married science to technology, which is the proximate cause of the current ecological crisis. White argues that science and technology are distinctively Western in provenance, born when Europe was dominated by the Christian worldview. He characterizes Christianity as anthropocentric and argues that it desanctifies nature, leaving it vulnerable to exploitation. Christianity thus bears significant blame for the ecological crisis. White does allow for an alternative Christian tradition that focuses on St. Francis of Assisi. Science and technology cannot solve our environmental problems, and indeed will only exacerbate them unless we address the fact that the crisis is largely conceptual in nature. Ultimately, White famously claims, we must either "find a new religion or rethink our old one." More generally, he claims that what we do in regard to the natural environment depends on what we think about it and about ourselves in relationship to it.*

A conversation with Aldous Huxley not infrequently put one at the receiving end of an unforgettable monologue. About a year before his lamented death he was discoursing on a favorite topic: Man's unnatural treatment of nature and its sad results. To illustrate his point he told how, during the previous summer, he had returned to a little valley in England where he had spent many happy months as a child. Once it had been composed of delightful grassy glades; now it was becoming overgrown with unsightly brush because the rabbits that formerly kept such growth under control had largely succumbed to a disease, myxomatosis, that was deliberately introduced by the local farmers to reduce the rabbits' destruction of crops. Being something of a Philistine, I could be silent no longer, even in the interests of great rhetoric. I interrupted to point out that the rabbit itself had been brought as a domestic animal to England in 1176, presumably to improve the protein diet of the peasantry.

All forms of life modify their contexts. The most spectacular and benign instance is doubtless the coral polyp. By serving its own ends, it has created a vast undersea world favorable to thousands of other kinds of animals and plants. Ever since man became a numerous species he has affected his environment notably. The hypothesis that his fire-drive method of hunting created the world's great grasslands and helped to exterminate the monster mammals of the Pleistocene from much of the globe is plausible, if not proved. For 6 millennia at least, the banks of the lower Nile have been a human artifact rather than the swampy African jungle which nature, apart from man, would have made it. The Aswan Dam, flooding 5000 square miles, is only the latest stage in a long process. In many regions terracing or irrigation, overgrazing, the cutting of forests by Romans to build ships to fight Carthaginians or by Crusaders to solve the logistics problems of their expeditions, have profoundly changed some ecologies. Observation that the French landscape falls into two basic types, the open fields of the north and the bocage of the south and west, inspired Marc Bloch to undertake his classic study of medieval agricultural methods. Quite unintentionally, changes in human ways often affect nonhuman nature. It has been noted, for example, that the advent of the automobile eliminated huge flocks of sparrows that once fed on the horse manure littering every street.

The history of ecologic change is still so rudimentary that we know little about what really happened, or what the results were. The extinction of the European aurochs as late as 1627 would seem to have been a simple case of overenthusiastic hunting. On more intricate matters it often is impossible to find solid information. For a thousand years or more the Frisians and Hollanders have been pushing back the North Sea, and the process is culminating in our own time in the reclamation of the Zuider Zee. What, if any, species of animals, birds, fish, shore life, or plants have died out in the process? In their epic combat with Neptune have the Netherlanders overlooked ecological values in such a way that the quality of human life in the Netherlands has suffered? I cannot discover that the questions have ever been asked, much less answered.

People, then, have often been a dynamic element in their own environment, but in the present state of historical scholarship we usually do not know exactly when, where, or with what effects man-induced changes came. As we enter the last third of the 20th century, however, concern for the problem of ecologic backlash is mounting feverishly. Natural science, conceived as the effort to understand the nature of things, had flourished in several eras and among several peoples. Similarly there had been an age-old accumulation of technological skills, sometimes growing rapidly, sometimes slowly. But it was not

until about four generations ago that Western Europe and North America arranged a marriage between science and technology, a union of the theoretical and the empirical approaches to our natural environment. The emergence in widespread practice of the Baconian creed that scientific knowledge means technological power over nature can scarcely be dated before about 1850, save in the chemical industries, where it is anticipated in the 18th century. Its acceptance as a normal pattern of action may mark the greatest event in human history since the invention of agriculture, and perhaps in nonhuman terrestrial history as well.

Almost at once the new situation forced the crystallization of the novel concept of ecology; indeed, the word ecology first appeared in the English language in 1873. Today, less than a century later, the impact of our race upon the environment has so increased in force that it has changed in essence. When the first cannons were fired, in the early 14th century, they affected ecology by sending workers scrambling to the forests and mountains for more potash, sulphur, iron ore, and charcoal, with some resulting erosion and deforestation. Hydrogen bombs are of a different order: a war fought with them might alter the genetics of all life on this planet. By 1285 London had a smog problem arising from the burning of soft coal, but our present combustion of fossil fuels threatens to change the chemistry of the globe's atmosphere as a whole, with consequences which we are only beginning to guess. With the population explosion, the carcinoma of planless urbanism, the now geological deposits of sewage and garbage, surely no creature other than man has ever managed to foul its nest in such short order.

There are many calls to action, but specific proposals, however worthy as individual items, seem too partial, palliative, negative: ban the bomb, tear down the billboards, give the Hindus contraceptives and tell them to eat their sacred cows. The simplest solution to any suspect change is, of course, to stop it, or better yet, to revert to a romanticized past: make those ugly gasoline stations look like Anne Hathaway's cottage or (in the Far West) like ghost-town saloons. The "wilderness area" mentality invariably advocates deep-freezing an ecology, whether San Gimignano or the High Sierra, as it was before the first Kleenex was dropped. But neither atavism nor prettification will cope with the ecologic crisis of our time.

What shall we do? No one yet knows. Unless we think about fundamentals, our specific measures may produce new backlashes more serious than those they are designed to remedy.

As a beginning we should try to clarify our thinking by looking, in some historical depth, at the presuppositions that underlie modern technology and science. Science was traditionally aristocratic, speculative, intellectual in intent; technology was lower-class, empirical, action-oriented. The quite sudden fusion of these two, towards the middle of the 19th century, is surely related to the slightly prior and contemporary democratic revolutions which, by reducing social barriers, tended to assert a functional unity of brain and hand. Our ecologic crisis is the product of an emerging, entirely novel, democratic culture. The issue is whether a democratized world can survive its own implications. Presumably we cannot unless we rethink our axioms.

THE WESTERN TRADITIONS OF TECHNOLOGY AND SCIENCE

One thing is so certain that it seems stupid to verbalize it: both modern technology and modern science are distinctively Occidental. Our technology has absorbed elements from all over the world, notably from China; yet everywhere today, whether in Japan or in Nigeria, successful technology is Western. Our science is the heir to all the sciences of the past, perhaps to the work of the great Islamic scientists of the Middle Ages, who so often outdid the ancient Greeks in skill and perspicacity: al-Razi in medicine, for example; or ibn-al-Haytham in optics; or Omar Khayyam in mathematics. Indeed, not a few works of such geniuses seem to have vanished in the original Arabic and to survive only in medieval Latin translations that helped to lay the foundations for later Western developments. Today, around the globe, all significant science is Western in style and method, whatever the pigmentation or language of the scientists.

A second pair of facts is less well recognized because they result from quite recent historical scholarship. The leadership of the West, both in technology and in science, is far older than the so-called Scientific Revolution of the 17th century or the so-called Industrial Revolution of the 18th century. These terms are in fact outmoded and obscure the true nature of what they try to describe—significant stages in two long and separate developments. By A.D. 1000 at the latest—and perhaps, feebly, as much as 200 years earlier—the West began to apply water power to industrial processes other than milling grain. This was followed in the late 12th century by the harnessing of wind power. From simple beginnings, but with remarkable consistency of style, the West rapidly expanded its skills in the development of power machinery, labor-saving devices, and automation. Those who doubt should contemplate that most monumental achievement in the history of automation: the weight-driven mechanical clock, which appeared in two forms in the early 14th century. Not in craftsmanship but in basic technological capacity, the Latin West of the later Middle Ages far outstripped its elaborate, sophisticated, and esthetically magnificent sister cultures, Byzantium and Islam. In 1444 a great Greek ecclesiastic, Bessarion,

who had gone to Italy, wrote a letter to a prince in Greece. He is amazed by the superiority of Western ships, arms, textiles, glass. But above all he is astonished by the spectacle of waterwheels sawing timbers and pumping the bellows of blast furnaces. Clearly, he had seen nothing of the sort in the Near East.

By the end of the 15th century the technological superiority of Europe was such that its small, mutually hostile nations could spill out over all the rest of the world, conquering, looting, and colonizing. The symbol of this technological superiority is the fact that Portugal, one of the weakest states of the Occident, was able to become, and to remain for a century, mistress of the East Indies. And we must remember that the technology of Vasco da Gama and Albuquerque was built by pure empiricism, drawing remarkably little support or inspiration from science.

In the present-day vernacular understanding, modern science is supposed to have begun in 1543, when both Copernicus and Vesalius published their great works. It is no derogation of their accomplishments, however, to point out that such structures as the Fabrica and the De revolutionibus do not appear overnight. The distinctive Western tradition of science, in fact, began in the late 11th century with a massive movement of translation of Arabic and Greek scientific works into Latin. A few notable books—Theophrastus, for example—escaped the West's avid new appetite for science, but within less than 200 years effectively the entire corpus of Greek and Muslim science was available in Latin, and was being eagerly read and criticized in the new European universities. Out of criticism arose new observation, speculation, and increasing distrust of ancient authorities. By the late 13th century Europe had seized global scientific leadership from the faltering hands of Islam. It would be as absurd to deny the profound originality of Newton, Galileo, or Copernicus as to deny that of the 14th century scholastic scientists like Buridan or Oresme on whose work they built. Before the 11th century, science scarcely existed in the Latin West, even in Roman times. From the 11th century onward, the scientific sector of Occidental culture has increased in a steady crescendo.

Since both our technological and our scientific movements got their start, acquired their character, and achieved world dominance in the Middle Ages, it would seem that we cannot understand their nature or their present impact upon ecology without examining fundamental medieval assumptions and developments.

MEDIEVAL VIEW OF MAN AND NATURE

Until recently, agriculture has been the chief occupation even in "advanced" societies; hence, any change in methods of tillage has much importance. Early plows, drawn by two oxen, did not normally turn the sod but merely scratched it. Thus, cross-plowing was needed and fields tended to be squarish. In the fairly light soils and semiarid climates of the Near East and Mediterranean, this worked well. But such a plow was inappropriate to the wet climate and often sticky soils of northern Europe. By the latter part of the 7th century after Christ, however, following obscure beginnings, certain northern peasants were using an entirely new kind of plow, equipped with a vertical knife to cut the line of the furrow, a horizontal share to slice under the sod, and a moldboard to turn it over. The friction of this plow with the soil was so great that it normally required not two but eight oxen. It attacked the land with such violence that cross-plowing was not needed, and fields tended to be shaped in long strips.

In the days of the scratch-plow, fields were distributed generally in units capable of supporting a single family. Subsistence farming was the presupposition. But no peasant owned eight oxen: to use the new and more efficient plow, peasants pooled their oxen to form large plow-teams, originally receiving (it would appear) plowed strips in proportion to their contribution. Thus, distribution of land was based no longer on the needs of a family but, rather, on the capacity of a power machine to till the earth. Man's relation to the soil was profoundly changed. Formerly man had been part of nature; now he was the exploiter of nature. Nowhere else in the world did farmers develop any analogous agricultural implement. Is it coincidence that modern technology, with its ruthlessness toward nature, has so largely been produced by descendants of these peasants of northern Europe?

This same exploitive attitude appears slightly before A.D. 830 in Western illustrated calendars. In older calendars the months were shown as passive personifications. The new Frankish calendars, which set the style for the Middle Ages, are very different: they show men coercing the world around them—plowing, harvesting, chopping trees, butchering pigs. Man and nature are two things, and man is master.

These novelties seem to be in harmony with larger intellectual patterns. What people do about their ecology depends on what they think about themselves in relation to things around them. Human ecology is deeply conditioned by beliefs about our nature and destiny—that is, by religion. To Western eyes this is very evident in, say, India or Ceylon. It is equally true of ourselves and of our medieval ancestors.

The victory of Christianity over paganism was the greatest psychic revolution in the history of our culture. It has become fashionable today to say that, for better or worse, we live in the "post-Christian age." Certainly the

forms of our thinking and language have largely ceased to be Christian, but to my eye the substance often remains amazingly akin to that of the past. Our daily habits of action, for example, are dominated by an implicit faith in perpetual progress which was unknown either to Greco-Roman antiquity or to the Orient. It is rooted in, and is indefensible apart from, Judeo-Christian theology. The fact that Communists share it merely helps to show what can be demonstrated on many other grounds: that Marxism, like Islam, is a Judeo-Christian heresy. We continue today to live, as we have lived for about 1700 years, very largely in a context of Christian axioms.

What did Christianity tell people about their relations with the environment? While many of the world's mythologies provide stories of creation, Greco-Roman mythology was singularly incoherent in this respect. Like Aristotle, the intellectuals of the ancient West denied that the visible world had a beginning. Indeed, the idea of a beginning was impossible in the framework of their cyclical notion of time. In sharp contrast, Christianity inherited from Judaism not only a concept of time as nonrepetitive and linear but also a striking story of creation. By gradual stages a loving and all-powerful God had created light and darkness, the heavenly bodies, the earth and all its plants, animals, birds, and fishes. Finally, God had created Adam and, as an afterthought, Eve to keep man from being lonely. Man named all the animals, thus establishing his dominance over them. God planned all of this explicitly for man's benefit and rule: no item in the physical creation had any purpose save to serve man's purposes. And, although man's body is made of clay, he is not simply part of nature: he is made in God's image.

Especially in its Western form, Christianity is the most anthropocentric religion the world has seen. As early as the 2nd century both Tertullian and Saint Irenaeus of Lyons were insisting that when God shaped Adam he was foreshadowing the image of the incarnate Christ, the Second Adam. Man shares, in great measure, God's transcendence of nature. Christianity, in absolute contrast to ancient paganism and Asia's religions (except, perhaps, Zorastrianism), not only established a dualism of man and nature but also insisted that it is God's will that man exploit nature for his proper ends.

At the level of the common people this worked out in an interesting way. In Antiquity every tree, every spring, every stream, every hill had its own genius loci, its guardian spirit. These spirits were accessible to men, but were very unlike men; centaurs, fauns, and mermaids show their ambivalence. Before one cut a tree, mined a mountain, or dammed a brook, it was important to placate the spirit in charge of that particular situation, and to keep it placated. By destroying pagan animism, Christianity made it possible to exploit nature in a mood of indifference to the feelings of natural objects.

It is often said that for animism the Church substituted the cult of saints. True; but the cult of saints is functionally quite different from animism. The saint is not in natural objects; he may have special shrines, but his citizenship is in heaven. Moreover, a saint is entirely a man; he can be approached in human terms. In addition to saints, Christianity of course also had angels and demons inherited from Judaism and perhaps, at one remove, from Zorastrianism. But these were all as mobile as the saints themselves. The spirits in natural objects, which formerly had protected nature from man, evaporated. Man's effective monopoly on spirit in this world was confirmed, and the old inhibitions to the exploitation of nature crumbled.

When one speaks in such sweeping terms, a note of caution is in order. Christianity is a complex faith, and its consequences differ in differing contexts. What I have said may well apply to the medieval West, where in fact technology made spectacular advances. But the Greek East, a highly civilized realm of equal Christian devotion, seems to have produced no marked technological innovation after the late 7th century, when Greek fire was invented. The key to the contrast may perhaps be found in a difference in the tonality of piety and thought which students of comparative theology find between the Greek and the Latin Churches. The Greeks believed that sin was intellectual blindness, and that salvation was found in illumination, orthodoxy—that is, clear thinking. The Latins, on the other hand, felt that sin was moral evil, and that salvation was to be found in right conduct. Eastern theology has been intellectualist. Western theology has been voluntarist. The Greek saint contemplates; the Western saint acts. The implications of Christianity for the conquest of nature would emerge more easily in the Western atmosphere.

The Christian dogma of creation, which is found in the first clause of all the Creeds, has another meaning for our comprehension of today's ecologic crisis. By revelation, God had given man the Bible, the Book of Scripture. But since God had made nature, nature also must reveal the divine mentality. The religious study of nature for the better understanding of God was known as natural theology. In the early Church, and always in the Greek East, nature was conceived primarily as a symbolic system through which God speaks to men: the ant is a sermon to sluggards; rising flames are the symbol of the soul's aspiration. The view of nature was essentially artistic rather than scientific. While Byzantium preserved and copied great numbers of ancient Greek scientific texts, science as we conceive it could scarcely flourish in such an ambience.

However, in the Latin West by the early 13th century natural theology was following a very different bent. It was ceasing to be the decoding of the physical symbols of

God's communication with man and was becoming the effort to understand God's mind by discovering how his creation operates. The rainbow was no longer simply a symbol of hope first sent to Noah after the Deluge: Robert Grosseteste, Friar Roger Bacon, and Theodoric of Freiberg produced startlingly sophisticated work on the optics of the rainbow, but they did it as a venture in religious understanding. From the 13th century onward, up to and including Leitnitz and Newton, every major scientist, in effect, explained his motivations in religious terms. Indeed, if Galileo had not been so expert an amateur theologian he would have got into far less trouble: the professionals resented his intrusion. And Newton seems to have regarded himself more as a theologian than as a scientist. It was not until the late 18th century that the hypothesis of God became unnecessary to many scientists.

It is often hard for the historian to judge, when men explain why they are doing what they want to do, whether they are offering real reasons or merely culturally acceptable reasons. The consistency with which scientists during the long formative centuries of Western science said that the task and the reward of the scientist was "to think God's thoughts after him" leads one to believe that this was their real motivation. If so, then modern Western science was cast in a matrix of Christian theology. The dynamism of religious devotion shaped by the Judeo-Christian dogma of creation, gave it impetus.

AN ALTERNATIVE CHRISTIAN VIEW

We would seem to be headed toward conclusions unpalatable to many Christians. Since both science and technology are blessed words in our contemporary vocabulary, some may be happy at the notions, first, that viewed historically, modern science is an extrapolation of natural theology and, second, that modern technology is at least partly to be explained as an Occidental, voluntarist realization of the Christian dogma of man's transcendence of, and rightful master over, nature. But, as we now recognize, somewhat over a century ago science and technology—hitherto quite separate activities—joined to give mankind powers which, to judge by many of the ecologic effects, are out of control. If so, Christianity bears a huge burden of guilt.

I personally doubt that disastrous ecologic backlash can be avoided simply by applying to our problems more science and more technology. Our science and technology have grown out of Christian attitudes toward man's relation to nature which are almost universally held not only by Christians and neo-Christians but also by those who fondly regard themselves as post-Christians. Despite Copernicus, all the cosmos rotates around our little globe. Despite Darwin, we are not, in our hearts, part of the natural process. We are superior to nature, contemptuous of it, willing to use it for our slightest whim. The newly elected Governor of California, like myself a churchman but less troubled than I, spoke for the Christian tradition when he said (as is alleged), "when you've seen one redwood tree, you've seen them all." To a Christian a tree can be no more than a physical fact. The whole concept of the sacred grove is alien to Christianity and to the ethos of the West. For nearly 2 millennia Christian missionaries have been chopping down sacred groves, which are idolatrous because they assume spirit in nature.

What we do about ecology depends on our ideas of the man-nature relationship. More science and more technology are not going to get us out of the present ecologic crisis until we find a new religion, or rethink our old one. The beatniks, who are the basic revolutionaries of our time, show a sound instinct in their affinity for Zen Buddhism, which conceives of the man-nature relationship as very nearly the mirror image of the Christian view. Zen, however, is as deeply conditioned by Asian history as Christianity is by the experience of the West, and I am dubious of its viability among us.

Possibly we should ponder the greatest radical in Christian history since Christ: Saint Francis of Assisi. The prime miracle of Saint Francis is the fact that he did not end at the stake, as many of his left-wing followers did. He was so clearly heretical that a General of the Franciscan Order, Saint Bonavlentura, a great and perceptive Christian, tried to suppress the early accounts of Franciscanism. The key to an understanding of Francis is his belief in the virtue of humility—not merely for the individual but for man as a species. Francis tried to depose man from his monarchy over creation and set up a democracy of all God's creatures. With him the ant is no longer simply a homily for the lazy, flames a sign of the thrust of the soul toward union with God; now they are Brother Ant and Sister Fire, praising the Creator in their own ways as Brother Man does in his.

Later commentators have said that Francis preached to the birds as a rebuke to men who would not listen. The records do not read so: he urged the little birds to praise God, and in spiritual ecstasy they flapped their wings and chirped rejoicing. Legends of saints, especially the Irish saints, had long told of their dealings with animals but always, I believe, to show their human dominance over creatures. With Francis it is different. The land around Gubbio in the Apennines was ravaged by a fierce wolf. Saint Francis, says the legend, talked to the wolf and persuaded him of the error of his ways. The wolf repented, died in the odor of sanctity, and was buried in consecrated ground.

What Sir Steven Ruciman calls "the Franciscan doctrine of the animal soul" was quickly stamped out. Quite possibly it was in part inspired, consciously or unconsciously, by the belief in reincarnation held by the Cathar heretics who at that time teemed in Italy and southern

France, and who presumably had got it originally from India. It is significant that at just the same moment, about 1200, traces of metempsychosis are found also in western Judaism, in the Provencal Cabbala. But Francis held neither to transmigration of souls nor to pantheism. His view of nature and of man rested on a unique sort of panpsychism of all things animate and inaminate, designed for the glorification of their transcendent Creator, who, in the ultimate gesture of cosmic humility, assumed flesh, lay helpless in a manger, and hung dying on a scaffold.

I am not suggesting that many contemporary Americans who are concerned about our ecologic crisis will be either able or willing to counsel with wolves or exhort birds. However, the present increasing disruption of the global environment is the product of a dynamic technology and science which were originating in the Western medieval world against which Saint Francis was rebelling in so original a way. Their growth cannot be understood historically apart from distinctive attitudes toward nature which are deeply grounded in Christian dogma. The fact that most people do not think of these attitudes as Christian is irrelevant. No new set of basic values has been accepted in our society to displace those of Christianity. Hence we shall continue to have a worsening ecologic crisis until we reject the Christian axiom that nature has no reason for existence save to serve man.

The greatest spiritual revolutionary in Western history, Saint Francis, proposed what he thought was an alternative Christian view of nature and man's relation to it; he tried to substitute the idea of the equality of all creatures, including man, for the idea of man's limitless rule of creation. He failed. Both our present science and our present technology are so tinctured with orthodox Christian arrogance toward nature that no solution for our ecologic crisis can be expected from them alone. Since the roots of our trouble are so largely religious, the remedy must also be essentially religious, whether we call it that or not. We must rethink and refeel our nature and destiny. The profoundly religious, but heretical, sense of the primitive Franciscans for the spiritual autonomy of all parts of nature may point a direction. I propose Francis as a patron saint for ecologists.

THE TRAGEDY OF THE COMMONS

SOURCE Hardin, Garrett. 1968. *Science* 162 (December 13): 1243–1248. Reproduced by permission of AAAS.

INTRODUCTION *Garrett Hardin (1915–2003) was for fifteen years professor of human ecology at the University of California, Santa Barbara. He begins his hugely influential "The Tragedy of the Commons" by drawing attention to the fact that there are some problems for which a technical solution does not exist. The "population problem" falls into this class of problems; failure to acknowledge this fact will lead to increased human suffering in a world of finite resources. Hardin argues that to adequately address the urgent population problem, we must reject Adam Smith's notion of the "invisible hand." He provides the now-famous example of herdsmen adding cattle to a pasture open to all, to disprove the operative assumption in Smith that an individual, pursuing his own good, will produce a collective good. In this imagined commons, a rational agent is compelled to seek his own benefit at the expense of the collective good, thus bringing ruin to all. Hardin argues that population growth (as well as a host of other problems) is a problem of the commons, and that we must abandon the idea of the unregulated freedom to breed if we wish to preserve other freedoms.*

ECOLOGY AND MAN—A VIEWPOINT

SOURCE Shepard, Paul. 1969. "Ecology and Man—a Viewpoint." *The Subversive Science.* Paul Shepard and Daniel McKinley, eds. Boston: Houghton Mifflin.

INTRODUCTION *Paul Shepard (1925–1996) was Avery Professor of natural philosophy and human ecology at Pitzer College and Claremont Graduate School, where he taught for twenty-one years. In the introduction to his influential collection of essays,* The Subversive Science: Essays Toward an Ecology of Man *(co-edited with Daniel McKinley), Shepard begins by criticizing the "web of life" metaphor in ecology for failing to accurately reflect the complexity of the natural world. Shepard urges that we revive a more ancient way of perceiving humanity in the world. To do so entails redefining the self as something not distinct from nature, but extended into nature, where we overcome the dualism that has dominated much recent human history. For Shepard, humanity and the environment are interdependent; the complexity of humanity is directly linked to the complexity of natural systems.*

Shepard insists that this fact be highlighted in a time where the diversity and complexity of systems are diminishing. Part of the role of ecology, as Shepard describes it, is to realize that the "ecological crisis" is partly a matter of shifting values, and ecology must strive to communicate our interconnectedness with, and likeness to, nonhuman nature.

Ecology is sometimes characterized as the study of a natural "web of life." It would follow that man is somewhere in the web or that he in fact manipulates its strands, exemplifying what Thomas Huxley called "man's place in nature." But the image of a web is too meager and simple for the reality. A web is flat and finished and has the mortal frailty of the individual spider. Although elastic, it has insufficient depth. However solid to the touch of the spider, for us it fails to denote the *eikos*—the habitation—and to suggest the enduring integration of the primitive Greek domicile with its sacred hearth, bonding the earth to all aspects of society.

Ecology deals with organisms in an environment and with the processes that link organism and place. But ecology as such cannot be studied, only organisms, earth, air, and sea can be studied. It is not a discipline: there is no body of thought and technique which frames an ecology of man.[1] It must be therefore a scope or a way of seeing. Such a *perspective* on the human situation is very old and has been part of philosophy and art for thousands of years. It badly needs attention and revival.

Man is in the world and his ecology is the nature of that *inness*. He is in the world as in a room, and in transience, as in the belly of a tiger or in love. What does he do there in nature? What does nature do there *in him*? What is the nature of the transaction? Biology tells us that the transaction is always circular, always a mutual feedback. Human ecology cannot be limited strictly to biological concepts, but it cannot ignore them. It cannot even transcend them. It emerges from biological reality and grows from the fact of interconnection as a general principle of life. It must take a long view of human life and nature as they form a mesh or pattern going beyond historical time and beyond the conceptual bounds of other humane studies. As a natural history of what it means to be human, ecology might proceed the same way one would define a stomach, for example, by attention to its nervous and circulatory connections as well as its entrance, exit, and muscular walls.

Many educated people today believe that only what is unique to the individual is important or creative, and turn away from talk of populations and species as they would from talk of the masses. I once knew a director of a wealthy conservation foundation who had misgivings about the approach of ecology to urgent environmental problems in America because its concepts of communities and systems seemed to discount the individual. Communities to him suggested only followers, gray masses without the tradition of the individual. He looked instead—or in reaction—to the profit motive and capitalistic formulas, in terms of efficiency, investment, and production. It seemed to me that he had missed a singular opportunity. He had shied from the very aspect of the world now beginning to interest industry, business, and technology as the biological basis of their—and our—affluence, and which his foundation could have shown to be the ultimate basis of all economics.

Individual man *has* his particular integrity, to be sure. Oak trees, even mountains, have selves or integrities too (a poor word for my meaning, but it will have to do). To our knowledge, those other forms are not troubled by seeing themselves in more than one way, as man is. In one aspect the self is an arrangement of organs, feelings, and thoughts—a "me"—surrounded by a hard body boundary: skin, clothes, and insular habits. This idea needs no defense. It is conferred on us by the whole history of our civilization. Its virtue is verified by our affluence. The alternative is a self as a center of organization, constantly drawing on and influencing the surroundings, whose skin and behavior are soft zones contacting the world instead of excluding it. Both views are real and their reciprocity significant. We need them both to have a healthy social and human maturity.

The second view—that of relatedness of the self—has been given short shrift. Attitudes toward ourselves do not change easily. The conventional image of a man, like that of the heraldic lion, is iconographic; its outlines are stylized to fit the fixed curves of our vision. We are hidden from ourselves by habits of perception. Because we learn to talk at the same time we learn to think, our language, for example, encourages us to see ourselves—or a plant or animal—as an isolated sack, a thing, a contained self. Ecological thinking, on the other hand, requires a kind of vision across boundaries. The epidermis of the skin is ecologically like a pond surface or a forest soil, not a shell so much as a delicate interpenetration. It reveals the self enobled and extended rather than threatened as part of the landscape and the ecosystem, because the beauty and complexity of nature are continuous with ourselves.

And so ecology as applied to man faces the task of renewing a balanced view where now there is man-centeredness, even pathology of isolation and fear. It implies that we must find room in "our" world for all plants and animals, even for their otherness and their opposition. It further implies exploration and openness across an inner boundary—an ego boundary—and appreciative understanding of the animal in ourselves which our heritage

of Platonism, Christian morbidity, duality, and mechanism have long held repellant and degrading. The older counter-currents—relics of pagan myth, the universal application of Christian compassion, philosophical naturalism, nature romanticism and pantheism—have been swept away, leaving only odd bits of wreckage. Now we find ourselves in a deteriorating environment which breeds aggressiveness and hostility toward ourselves and our world.

How simple our relationship to nature would be if we only had to choose between protecting our natural home and destroying it. Most of our efforts to provide for the natural in our philosophy have failed—run aground on their own determination to work out a peace at arm's length. Our harsh reaction against the peaceable kingdom of sentimental romanticism was evoked partly by the tone of its dulcet facade but also by the disillusion to which it led. Natural dependence and contingency suggest togetherness and emotional surrender to mass behavior and other lowest common denominators. The environmentalists matching culture and geography provoke outrage for their over-simple theories of cause and effect, against the sciences which sponsor them and even against a natural world in which the theories may or may not be true. Our historical disappointment in the nature of nature has created a cold climate for ecologists who assert once again that we are limited and obligated. Somehow they must manage in spite of the chill to reach the centers of humanism and technology, to convey there a sense of our place in a universal vascular system without depriving us of our self-esteem and confidence.

Their message is not, after all, all bad news. Our natural affiliations define and illumine freedom instead of denying it. They demonstrate it better than any dialectic. Being more enduring than we individuals, ecological patterns—spatial distributions, symbioses, the streams of energy and matter and communication—create among individuals the tensions and polarities so different from dichotomy and separateness. The responses, or what theologians call "the sensibilities" of creatures (including ourselves) to such arrangements grow in part from a healthy union of the two kinds of self already mentioned, one emphasizing integrity, the other relatedness. But it goes beyond that to something better known to 12th century Europeans or Paleolithic hunters than to ourselves. If nature is not a prison and earth a shoddy way-station, we must find the faith and force to affirm its metabolism as our own—or rather, our own as part of it. To do so means nothing less than a shift in our whole frame of reference and our attitude towards life itself, a wider perception of the landscape as a creative, harmonious being where relationships of things are as real as the things. Without losing our sense of a great human destiny and without intellectual surrender, we must affirm that the world is a being, a part of our own body.[2]

Such a being may be called an ecosystem or simply a forest or landscape. Its members are engaged in a kind of choreography of materials and energy and information, the creation of order and organization. (Analogy to corporate organization here is misleading, for the distinction between social (one species) and ecological (many species) is fundamental). The pond is an example. Its ecology includes all events: the conversion of sunlight to food and the food-chains within and around it, man drinking, bathing, fishing, plowing the slopes of the watershed, drawing a picture of it, and formulating theories about the world based on what he sees in the pond. He and all the other organisms at and in the pond act upon one another, engage the earth and atmosphere, and are linked to other ponds by a network of connections like the threads of protoplasm connecting cells in living tissues.

The elegance of such systems and delicacy of equilibrium are the outcome of a long evolution of interdependence. Even society, mind and culture are parts of that evolution. There is an essential relationship between them and the natural habitat: that is, between the emergence of higher primates and flowering plants, pollinating insects, seeds, humus, and arboreal life. It is unlikely that a manlike creature could arise by any other means than a long arboreal sojourn following and followed by a time of terrestriality. The fruit's complex construction and the mammalian brain are twin offspring of the maturing earth, impossible, even meaningless, without the deepening soil and the mutual development of savannas and their faunas in the last geological epoch. Internal complexity, as the mind of a primate, is an extension of natural complexity, measured by the variety of plants and animals and the variety of nerve cells—organic extensions of each other.

The exuberance of kinds as the setting in which a good mind could evolve (to deal with a complex world) was not only a past condition. Man did not arrive in the world as though disembarking from a train in the city. He continues to arrive, somewhat like the birth of art, a train in Roger Fry's definition, passing through many stations, none of which is wholly left behind. This idea of natural complexity as a counterpart to human intricacy is central to an ecology of man. The creation of order, of which man is an example, is realized also in the number of species and habitats, an abundance of landscapes lush and poor. Even deserts and tundras increase the planetary opulence. Curiously, only man and possibly a few birds can appreciate this opulence, being the world's travelers. Reduction of this variegation would, by extension then, be an amputation of man. To convert all "wastes"—all

deserts, estuaries, tundras, ice-fields, marshes, steppes and moors—into cultivated fields and cities would impoverish rather than enrich life esthetically as well as ecologically. By esthetically, I do not mean that weasel term connoting the pleasure of baubles. We have diverted ourselves with litterbug campaigns and greenbelts in the name of esthetics while the fabric of our very environment is unravelling. In the name of conservation, too, such things are done, so that conservation becomes ambiguous. Nature is a fundamental "resource" to be sustained for our own well-being. But it loses in the translation into usable energy and commodities. Ecology may testify as often against our uses of the world, even against conservation techniques of control and management for sustained yield, as it does for them. Although ecology may be treated as a science, its greater and overriding wisdom is universal.

That wisdom can be approached mathematically, chemically, or it can be danced or told as a myth. It has been embodied in widely scattered economically different cultures. It is manifest, for example, among pre-Classical Greeks, in Navajo religion and social orientation, in Romantic poetry of the 18th and 19th centuries, in Chinese landscape painting of the 11th century, in current Whiteheadian philosophy, in Zen Buddhism, in the world view of the cult of the Cretan Great Mother, in the ceremonials of Bushman hunters, and in the medieval Christian metaphysics of light. What is common among all of them is a deep sense of engagement with the landscape, with profound connections to surroundings and to natural processes central to all life.

It is difficult in our language even to describe that sense. English becomes imprecise or mystical—and therefore suspicious—as it struggles with "process" thought. Its noun and verb organization shapes a divided world of static doers separate from the doing. It belongs to an idiom of social hierarchy in which all nature is made to mimic man. The living world is perceived in that idiom as an upright ladder, a "great chain of being," an image which seems at first ecological but is basically rigid, linear, condescending, lacking humility and love of otherness.

We are all familiar from childhood with its classifications of everything on a scale from the lowest to the highest: inanimate matter/vegetative life/lower animals/higher animals/men/angels/gods. It ranks animals themselves in categories of increasing good: the vicious and lowly parasites, pathogens and predators/the filthy decay and scavenging organisms/indifferent wild or merely useless forms/good tame creatures/and virtuous beasts domesticated for human service. It shadows the great man-centered political scheme upon the world, derived from the ordered ascendency from parishioners to clerics to bishops to cardinals to popes, or in a secular form from criminals to proletarians to aldermen to mayors to senators to presidents.

And so is nature pigeonholed. The sardonic phrase, "the place of nature in man's world," offers, tongue-in-cheek, a clever footing for confronting a world made in man's image and conforming to words. It satirizes the prevailing philosophy of anti-nature and human omniscience. It is possible because of an attitude which—like ecology—has ancient roots, but whose modern form was shaped when Aquinas reconciled Aristotelian homocentrism with Judeo-Christian dogma. In a later setting of machine technology, puritanical capitalism, and an urban ethos it carves its own version of reality into the landscape like a schoolboy initialing a tree. For such a philosophy nothing in nature has inherent merit. As one professor recently put it, "The only reason anything is done on this earth is for people. Did the rivers, winds, animals, rocks, or dust ever consider my wishes or needs? Surely, we do all our acts in an earthly environment, but I have never had a tree, valley, mountain, or flower thank me for preserving it."[3] This view carries great force, epitomized in history by Bacon, Descartes, Hegel, Hobbes, and Marx.

Some other post-Renaissance thinkers are wrongly accused of undermining our assurance of natural order. The theories of the heliocentric solar system, of biological evolution, and of the unconscious mind are held to have deprived the universe of the beneficence and purpose to which man was a special heir and to have evoked feelings of separation, of antipathy towards a meaningless existence in a neutral cosmos. Modern despair, the arts of anxiety, the politics of pathological individualism and predatory socialism were not, however, the results of Copernicus, Darwin and Freud. If man was not the center of the universe, was not created by a single stroke of Providence, and is not ruled solely by rational intelligence, it does not follow therefore that nature is defective where we thought it perfect. The astronomer, biologist and psychiatrist each achieved for mankind corrections in sensibility. Each showed the interpenetration of human life and the universe to be richer and more mysterious than had been thought.

Darwin's theory of evolution has been crucial to ecology. Indeed, it might have helped rather than aggravated the growing sense of human alienation had its interpreters emphasized predation and competition less (and, for this reason, one is tempted to add, had Thomas Huxley, Herbert Spencer, Samuel Butler and G. B. Shaw had less to say about it). Its bases of universal kinship and common bonds of function, experience and value among organisms were obscured by pre-existing ideas of animal depravity. Evolutionary theory was exploited to justify

the worst in men and was misused in defense of social and economic injustice. Nor was it better used by humanitarians. They opposed the degradation of men in the service of industrial progress, the slaughter of American Indians, and child labor, because each treated men "like animals." That is to say, men were not animals, and the temper of social reform was to find good only in attributes separating men from animals. Kindness both towards and among animals was still a rare idea in the 19th century, so that using men as animals could mean only cruelty.

Since Thomas Huxley's day the non-animal forces have developed a more subtle dictum to the effect that, "Man may be an animal, but he is more than an animal, too!" The *more* is really what is important. This appealing aphorism is a kind of anesthetic. The truth is that we are ignorant of what it is like or what it means to be any other kind of creature than we are. If we are unable to truly define the animal's experience of life or "being an animal" how can we isolate our animal part?

The rejection of animality is a rejection of nature as a whole. As a teacher, I see students develop in their humanities studies a proper distrust of science and technology. What concerns me is that the stigma spreads to the natural world itself. C. P. Snow's "Two Cultures," setting the sciences against the humanities, can be misunderstood as placing nature against art. The idea that the current destruction of people and environment is scientific and would be corrected by more communication with the arts neglects the hatred for this world carried by our whole culture. Yet science as it is now taught does not promote a respect for nature. Western civilization breeds no more ecology in Western science than in Western philosophy. Snow's two cultures cannot explain the antithesis that splits the world, nor is the division ideological, economic or political in the strict sense. The antidote he proposes is roughly equivalent to a liberal education, the traditional prescription for making broad and well-rounded men. Unfortunately, there is little even in the liberal education of ecology-and-man. Nature is usually synonymous with either natural resources or scenery, the great stereotypes in the minds of middle class, college-educated Americans.

One might suppose that the study of biology would mitigate the humanistic—largely literary—confusion between materialism and a concern for nature. But biology made the mistake at the end of the 17th century of adopting a *modus operandi* or life style from physics, in which the question why was not to be asked, only the question how. Biology succumbed to its own image as an esoteric prologue to technics and encouraged the whole society to mistrust naturalists. When scholars realized what the sciences were about it is not surprising that they threw out the babies with the bathwater: the information content and naturalistic lore with the rest of it. This is the setting in which academia and intellectual America undertook the single-minded pursuit of human uniqueness, and uncovered a great mass of pseudo distinctions such as language, tradition, culture, love, consciousness, history and awe of the supernatural. Only men were found to be capable of escape from predictability, determinism, environmental control, instincts and other mechanisms which "imprison" other life. Even biologists, such as Julian Huxley, announced that the purpose of the world was to produce man, whose social evolution excused him forever from biological evolution. Such a view incorporated three important presumptions: that nature is a power structure shaped after human political hierarchies; that man has a monopoly of immortal souls; and omnipotence will come through technology. It seems to me that all of these foster a failure of responsible behavior in what Paul Sears calls "the living landscape" except within the limits of immediate self-interest.

What ecology must communicate to the humanities—indeed, as a humanity—is that such an image of the world and the society so conceived are incomplete. There is overwhelming evidence of likeness, from molecular to mental, between men and animals. But the dispersal of this information is not necessarily a solution. The Two Culture idea that the problem is an information bottleneck is only partly true; advances in biochemistry, genetics, ethology, paleoanthropology, comparative physiology and psychobiology are not self-evidently unifying. They need a unifying principle not found in any of them, a wisdom in the sense that Walter B. Cannon used the word in his book *Wisdom of the Body*,[4] about the community of self-regulating systems within the organism. If the ecological extension of that perspective is correct, societies and ecosystems as well as cells have a physiology, and insight into it is built into organisms, including man. What was intuitively apparent last year—whether aesthetically or romantically—is a find of this year's inductive analysis. It seems apparent to me that there is an ecological instinct which probes deeper and more comprehensively than science, and which anticipates every scientific confirmation of the natural history of man.

It is not surprising, therefore, to find substantial ecological insight in art. Of course there is nothing wrong with a poem or dance which is ecologically neutral; its merit may have nothing to do with the transaction of man and nature. It is my impression, however, that students of the arts no longer feel that the subject of a work of art—what it "represents"—is without importance, as was said about 40 years ago. But there are poems and dances as there are prayers and laws attending to ecology. Some are more than mere comments on it. Such creations become part of all life. Essays on nature are an element of a functional or feedback system influencing men's reactions to their environment, messages

projected by men to themselves through some act of design, the manipulation of paints or written words. They are natural objects, like bird nests. The essay is as real a part of the community—in both the one-species sociological and many-species ecological senses—as are the songs of choirs or crickets. An essay is an Orphic sound, words that make knowing possible, for it was Orpheus as Adam who named and thus made intelligible all creatures.

What is the conflict of Two Cultures if it is not between science and art or between national ideologies? The distinction rather divides science and art within themselves. An example within science was the controversy over the atmospheric testing of nuclear bombs and the effect of radioactive fallout from the explosions. Opposing views were widely published and personified when Linus Pauling, a biochemist, and Edward Teller, a physicist, disagreed. Teller, one of the ''fathers'' of the bomb, pictured the fallout as a small factor in a world-wide struggle, the possible damage to life in tiny fractions of a percent, and even noted that evolutionary progress comes from mutations. Pauling, an expert on the hereditary material, knowing that most mutations are detrimental, argued that a large absolute number of people might be injured, as well as other life in the world's biosphere.

The humanness of ecology is that the dilemma of our emerging world ecological crises (over-population, environmental pollution, etc.) is at least in part a matter of values and ideas. It does not divide men as much by their trades as by the complex of personality and experience shaping their feelings towards other people and the world at large. I have mentioned the disillusion generated by the collapse of unsound nature philosophies. The anti-nature position today is often associated with the focusing of general fears and hostilities on the natural world. It can be seen in the behavior of control-obsessed engineers, corporation people selling consumption itself, academic superhumanists and media professionals fixated on political and economic crisis; neurotics working out psychic problems in the realm of power over men or nature, artistic symbol-manipulators disgusted by anything organic. It includes many normal, earnest people who are unconsciously defending themselves or their families against a vaguely threatening universe. The dangerous eruption of humanity in a deteriorating environment does not show itself as such in the daily experience of most people, but is felt as general tension and anxiety. We feel the pressure of events not as direct causes but more like omens. A kind of madness arises from the prevailing nature-conquering, nature-hating and self- and world-denial. Although in many ways most Americans live comfortable, satiated lives, there is a nameless frustration born of an increasing nullity. The aseptic home and society are progressively cut off from direct organic sources of health and increasingly isolated from the means of altering the course of events. Success, where its price is the misuse of landscapes, the deterioration of air and water and the loss of wild things, becomes a pointless glut, experience one-sided, time on our hands an unlocalized ache.

The unrest can be exploited to perpetuate itself. One familiar prescription for our sick society and its loss of environmental equilibrium is an increase in the intangible Good Things: more Culture, more Security and more Escape from pressures and tempo. The ''search for identity'' is not only a social but an ecological problem having to do with a sense of place and time in the context of all life. The pain of that search can be cleverly manipulated to keep the *status quo* by urging that what we need is only improved forms and more energetic expressions of what now occupy us: engrossment with ideological struggle and military power, with productivity and consumption as public and private goals, with commerce and urban growth, with amusements, with fixation on one's navel, with those tokens of escape or success already belabored by so many idealists and social critics so ineffectually.

To come back to those Good Things: the need for culture, security and escape are just near enough to the truth to take us in. But the real cultural deficiency is the absence of a true *cultus* with its significant ceremony, relevant mythical cosmos, and artifacts. The real failure in security is the disappearance from our personal lives of the small human group as the functional unit of society and the web of other creatures, domestic and wild, which are part of our humanity. As for escape, the idea of simple remission and avoidance fails to provide for the value of solitude, to integrate leisure and natural encounter. Instead of these, what are foisted on the puzzled and troubled soul as Culture, Security and Escape are more art museums, more psychiatry, and more automobiles.

The ideological status of ecology is that of a resistance movement. Its Rachel Carsons and Aldo Leopolds are subversive (as Sears recently called ecology itself[5]). They challenge the public or private right to pollute the environment, to systematically destroy predatory animals, to spread chemical pesticides indiscriminately, to meddle chemically with food and water, to appropriate without hindrance space and surface for technological and military ends; they oppose the uninhibited growth of human populations, some forms of ''aid'' to ''underdeveloped'' peoples, the needless addition of radioactivity to the landscape, the extinction of species of plants and animals, the domestication of all wild places, large-scale manipulation of the atmosphere or the sea, and most other purely engineering solutions to problems of and intrusions into the organic world.

If naturalists seem always to be *against* something it is because they feel a responsibility to share their

understanding, and their opposition constitutes a defense of the natural systems to which man is committed as an organic being. Sometimes naturalists propose projects too, but the project approach is itself partly the fault, the need for projects a consequence of linear, compartmental thinking, of machine-like units to be controlled and manipulated. If the ecological crisis were merely a matter of alternative techniques, the issue would belong among the technicians and developers (where most schools and departments of conservation have put it).

Truly ecological thinking need not be incompatible with our place and time. It does have an element of humility which is foreign to our thought, which moves us to silent wonder and glad affirmation. But it offers an essential factor, like a necessary vitamin, to all our engineering and social planning, to our poetry and our understanding. There is only one ecology, not a human ecology on one hand and another for the subhuman. No one school or theory or project or agency controls it. For us it means seeing the world mosaic from the human vantage without being man-fanatic. We must use it to confront the great philosophical problems of man—transience, meaning, and limitation—without fear. Affirmation of its own organic essence will be the ultimate test of the human mind.

ENDNOTES

1. There is a branch of sociology called Human Ecology, but it is mostly about urban geography.

2. See Alan Watts, ''The World is Your Body,'' in *The Book on the Taboo Against Knowing Who You Are*. New York: Pantheon Books, 1966.

3. Clare A. Gunn in *Landscape Architecture*, July 1966, p. 260.

4. New York: W. W. Norton, 1932.

5. Paul B. Sears, ''Ecology—a subversive subject,'' *BioScience*, 14(7):11, July 1964.

SHOULD TREES HAVE STANDING?—TOWARD LEGAL RIGHTS FOR NATURAL OBJECTS

SOURCE *Stone, Christopher D. 1972. *Southern California Law Review* 45: 450–457. Reproduced by permission.

INTRODUCTION *In 2008 Christopher D. Stone (1937–) was J. Thomas McCarthy Trustee Chair in law at the University of Southern California. "Should Trees Have Standing?" is a highly influential essay that weaves together environmental philosophy and law. Stone begins by stating that a parallel phenomenon to moral extensionism is observable in the history of the law—the class of rights bearers has grown through history. Once unthinkable, inanimate things such as trusts and corporations are now possessors of rights. Stone argues for giving legal rights to natural objects, and the natural environment as a whole. He qualifies what it might mean for the environment to be a holder of rights, advocating a "guardianship approach" whereby an appointed guardian represents the interests of natural objects themselves, not as their degradation impacts human interests, and where monetary remedies would run to the benefit of the natural objects directly. Stone also argues that a change in our "environmental consciousness" is necessary, but may not be sufficient to address environmental problems. Nonetheless, he proposes that the law may be instrumental in creating a "new theory or myth" for humanity's relationship to nature, and that the courts, by conferring rights on nature, might help bring about a necessary shift in popular consciousness.*

INTRODUCTION: THE UNTHINKABLE

In *Descent of Man*, Darwin observes that the history of man's moral development has been a continual extension in the objects of his ''social instincts and sympathies.'' Originally each man had regard only for himself and those of a very narrow circle about him; later, he came to regard more and more ''not only the welfare, but the happiness of all his fellowmen''; then ''his sympathies became more tender and widely diffused, extending to men of all races, to the imbecile, maimed, and other useless members of society, and finally to the lower animals. . . .''[1]

The history of the law suggests a parallel development. Perhaps there never was a pure Hobbesian state of nature, in which no ''rights'' existed except in the vacant sense of each man's ''right to self-defense.'' But it is not unlikely that so far as the earliest ''families'' (including extended kinship groups and clans) were concerned, everyone outside the family was suspect, alien, rightless.[2] And even within the family, persons we presently regard as the natural holders of at least some rights had none. Take, for example, children. We know something of the early rights-status of children from the widespread practice of infanticide—especially of the deformed and female.[3] (Senicide,[4] as among the North American Indians, was the corresponding rightlessness of the aged).[5] Maine tells us that as late as the Patria Potestas of the Romans, the father had *jus vitae necisque*—the power of life and death—over his children. A fortiori, Maine writes, he had power of ''uncontrolled corporal chastisement; he can modify their personal condition at pleasure; he can give a wife to his son; he can give his daughter in marriage; he can divorce his children of either sex; he can transfer them to another family by

adoption; and he can sell them.'' The child was less than a person: an object, a thing.[6]

The legal rights of children have long since been recognized in principle, and are still expanding in practice. Witness, just within recent time, *In re Gault*,[7] guaranteeing basic constitutional protections to juvenile defendants, and the Voting Rights Act of 1970.[8] We have been making persons of children although they were not, in law, always so. And we have done the same, albeit imperfectly some would say, with prisoners,[9] aliens, women (especially of the married variety), the insane,[10] Blacks, foetuses,[11] and Indians.

Nor is it only matter in human form that has come to be recognized as the possessor of rights. The world of the lawyer is peopled with inanimate right-holders: trusts, corporations, joint ventures, municipalities, Subchapter R partnerships,[12] and nation-states, to mention just a few. Ships, still referred to by courts in the feminine gender, have long had an independent jural life, often with striking consequences.[13] We have become so accustomed to the idea of a corporation having ''its'' own rights, and being a ''person'' and ''citizen'' for so many statutory and constitutional purposes, that we forget how jarring the notion was to early jurists. ''That invisible, intangible and artificial being, that mere legal entity'' Chief Justice Marshall wrote of the corporation in *Bank of the United States v. Deveaux*[14]—could a suit be brought in its name? Ten years later, in the *Dartmouth College* case,[15] he was still refusing to let pass unnoticed the wonder of an entity ''existing only in contemplation of law.''[16] Yet, long before Marshall worried over the personifying of the modern corporation, the best medieval legal scholars had spent hundreds of years struggling with the notion of the legal nature of those great public ''corporate bodies,'' the Church and the State. How could they exist in law, as entities transcending the living Pope and King? It was clear how a king could bind *himself*—on his honor—by a treaty. But when the king died, what was it that was burdened with the obligations of, and claimed the rights under, the treaty *his* tangible hand had signed? The medieval mind saw (what we have lost our capacity to see)[17] how *unthinkable* it was, and worked out the most elaborate conceits and fallacies to serve as anthropomorphic flesh for the Universal Church and the Universal Empire.[18]

It is this note of the *unthinkable* that I want to dwell upon for a moment. Throughout legal history, each successive extension of rights to some new entity has been, theretofore, a bit unthinkable. We are inclined to suppose the rightlessness of rightless ''things'' to be a decree of Nature, not a legal convention acting in support of some status quo. It is thus that we defer considering the choices involved in all their moral, social, and economic dimensions. And so the United States Supreme Court could straight-facedly tell us in *Dred Scott* that Blacks had been denied the rights of citizenship ''as a subordinate and inferior class of beings, who had been subjugated by the dominant race. . . .''[19] In the nineteenth century, the highest court in California explained that Chinese had not the right to testify against white men in criminal matters because they were ''a race of people whom nature has marked as inferior, and who are incapable of progress or intellectual development beyond a certain point . . . between whom and ourselves nature has placed an impassable difference.[20] The popular conception of the Jew in the 13th Century contributed to a law which treated them as ''men *ferae naturae*, protected by a quasi-forest law. Like the roe and the deer, they form an order apart.''[21] Recall, too, that it was not so long ago that the foetus was ''like the roe and the deer.'' In an early suit attempting to establish a wrongful death action on behalf of a negligently killed foetus (now widely accepted practice), Holmes, then on the Massachusetts Supreme Court, seems to have thought it simply inconceivable ''that a man might owe a civil duty and incur a conditional prospective liability in tort to one not yet in being.''[22] The first woman in Wisconsin who thought she might have a right to practice law was told that she did not, in the following terms:

> The law of nature destines and qualifies the female sex for the bearing and nurture of the children of our race and for the custody of the homes of the world . . . . [A]ll life-long callings of women, inconsistent with these radical and sacred duties of their sex, as is the profession of the law, are departures from the order of nature; and when voluntary, treason against it . . . . The peculiar qualities of womanhood, its gentle graces, its quick sensibility, its tender susceptibility, its purity, its delicacy, its emotional impulses, its subordination of hard reason to sympathetic feeling, are surely not qualifications for forensic strife. Nature has tempered woman as little for the juridical conflicts of the court room, as for the physical conflicts of the battle field . . . .[23]

The fact is, that each time there is a movement to confer rights onto some new ''entity,'' the proposal is bound to sound odd or frightening or laughable.[23a] This is partly because until the rightless thing receives its rights, we cannot see it as anything but a *thing* for the use of ''us''—those who are holding rights at the time.[24] In this vein, what is striking about the Wisconsin case above is that the court, for all its talk about women, so clearly was never able to see women as they are (and might become). All it could see was the popular ''idealized'' version of *an object it needed*. Such is the way the slave South looked upon the Black.[25] There is something of a seamless web involved: there will be resistance to giving the thing ''rights'' until it can be seen and valued for itself; yet, it is hard to see it and

value it for itself until we can bring ourselves to give it "rights"—which is almost inevitably going to sound inconceivable to a large group of people.

The reason for this little discourse on the unthinkable, the reader must know by now, if only from the title of the paper. I am quite seriously proposing that we give legal rights to forests, oceans, rivers and other so-called "natural objects" in the environment—indeed, to the natural environment as a whole.[26]

As strange as such a notion may sound, it is neither fanciful nor devoid of operational content. In fact, I do not think it would be a misdescription of recent developments in the law to say that we are already on the verge of assigning some such rights, although we have not faced up to what we are doing in those particular terms.[27] We should do so now, and begin to explore the implications such a notion would hold.

TOWARD RIGHTS FOR THE ENVIRONMENT

Now, to say that the natural environment should have rights is not to say anything as silly as that no one should be allowed to cut down a tree. We say human beings have rights, but—at least as of the time of this writing—they can be executed.[28] Corporations have rights, but they cannot plead the fifth amendment[29]; *In re Gault* gave 15-year-olds certain rights in juvenile proceedings, but it did not give them the right to vote. Thus, to say that the environment should have rights is not to say that it should have every right we can imagine, or even the same body of rights as human beings have. Nor is it to say that everything in the environment should have the same rights as every other thing in the environment.

What the granting of rights does involve has two sides to it. The first involves what might be called the legal-operational aspects; the second, the psychic and socio-psychic aspects. I shall deal with these aspects in turn.

THE LEGAL-OPERATIONAL ASPECTS

What it Means to be a Holder of Legal Rights

There is, so far as I know, no generally accepted standard for how one ought to use the term "legal rights." Let me indicate how I shall be using it in this piece.

First and most obviously, if the term is to have any content at all, an entity cannot be said to hold a legal right unless and until *some public authoritative body* is prepared to give *some amount of review* to actions that are colorably inconsistent with that "right." For example, if a student can be expelled from a university and cannot get any public official, even a judge or administrative agent at the lowest level, either (i) to require the university to justify its actions (if only to the extent of filling out an affidavit alleging that the expulsion "was not wholly arbitrary and capricious") or (ii) to compel the university to accord the student some procedural safeguards (a hearing, right to counsel, right to have notice of charges), then the minimum requirements for saying that the student has a legal right to his education do not exist.[30]

But for a thing to be *a holder of legal rights*, something more is needed than that some authoritative body will review the actions and processes of those who threaten it. As I shall use the term, "holder of legal rights," each of three additional criteria must be satisfied. All three, one will observe, go towards making a thing *count* jurally—to have a legally recognized worth and dignity in its own right, and not merely to serve as a means to benefit "us" (whoever the contemporary group of rights-holders may be). They are, first, that the thing can institute legal actions *at its behest*; second, that in determining the granting of legal relief, the court must take *injury to it* into account; and, third, that relief must run to the *benefit* of it.

To illustrate, even as between two societies that condone slavery there is a fundamental difference between S_1, in which a master can (if he chooses), go to court and collect reduced chattel value damages from someone who has beaten his slave, and S_2, in which the slave can institute the proceedings *himself*, for *his* own recovery, damages being measured by, say, *his* pain and suffering. Notice that neither society is so structured as to leave wholly unprotected the slave's interests in not being beaten. But in S_2 as opposed to S_1 there are three operationally significant advantages that the slave has, and these make the slave in S_2, albeit a slave, a holder of rights. Or, again, compare two societies, S_1, in which pre-natal injury to a live-born child gives a right of action against the tortfeasor at the mother's instance, for the mother's benefit, on the basis of the mother's mental anguish, and S_2, which gives the child a suit in its own name (through a guardian *ad litem*) for its own recovery, for damages to it.

When I say, then, that at common law "natural objects" are not holders of legal rights, I am not simply remarking what we would all accept as obvious. I mean to emphasize three specific legal-operational advantages that the environment lacks, leaving it in the position of the slave and the foetus in S_1, rather than the slave and foetus of S_2.

The Rightlessness of Natural Objects at Common Law

Consider, for example, the common law's posture toward the pollution of a stream. True, courts have always been able, in some circumstances, to issue orders that will stop the pollution—just as the legal system in S_1 is so structured as incidentally to discourage beating slaves and being reckless around pregnant women. But the stream itself is fundamentally rightless, with implications that deserve careful reconsideration.

The first sense in which the stream is not a rights-holder has to do with standing. The stream itself has none. So far as the common law is concerned, there is in general no way to challenge the polluter's actions save at the behest of a lower riparian—another human being—able to show an invasion of *his* rights. This conception of the riparian as the holder of the right to bring suit has more than theoretical interest. The lower riparians may simply not care about the pollution. They themselves may be polluting, and not wish to stir up legal waters. They may be economically dependent on their polluting neighbor.[31] And, of course, when they discount the value of winning by the costs of bringing suit and the chances of success, the action may not seem worth undertaking. Consider, for example, that while the polluter might be injuring 100 downstream riparians $10,000 a year *in the aggregate*, each riparian separately might be suffering injury only to the extent of $100—possibly not enough for any one of them to want to press suit by himself, or even to go to the trouble and cost of securing co-plaintiffs to make it worth everyone's while. This hesitance will be especially likely when the potential plaintiffs consider the burdens the law puts in their way:[32] proving, *e.g.*, specific damages, the "unreasonableness" of defendant's use of the water, the fact that practicable means of abatement exist, and overcoming difficulties raised by issues such as joint causality, right to pollute by prescription, and so forth. Even in states which, like California, sought to overcome these difficulties by empowering the attorney-general to sue for abatement of pollution in limited instances, the power has been sparingly invoked and, when invoked, narrowly construed by the courts.[33]

The second sense in which the common law denies "rights" to natural objects has to do with the way in which the merits are decided in those cases in which someone is competent and willing to establish standing. At its more primitive levels, the system protected the "rights" of the property owning human with minimal weighing of any values: "*Cujus est solum, ejus est usque ad coelum et ad infernos.*"[34] Today we have come more and more to make balances—but only such as will adjust the economic best interests of identifiable humans. For example, continuing with the case of streams, there are commentators who speak of a "general rule" that "a riparian owner is legally entitled to have the stream flow by his land with its quality unimpaired" and observe that "an upper owner has, prima facie, no right to pollute the water."[35] Such a doctrine, if strictly invoked, would protect the stream absolutely whenever a suit was brought; but obviously, to look around us, the law does not work that way. Almost everywhere there are doctrinal qualifications on riparian "rights" to an unpolluted stream.[36] Although these rules vary from jurisdiction to jurisdiction, and upon whether one is suing for an equitable injunction or for damages, what they all have in common is some sort of balancing. Whether under language of "reasonable use," "reasonable methods of use," "balance of convenience" or "the public interest doctrine,"[37] what the courts are balancing, with varying degrees of directness, are the economic hardships on the upper riparian (or dependent community) of abating the pollution vis-à-vis the economic hardships of continued pollution on the lower riparians. What does not weigh in the balance is the damage to the stream, its fish and turtles and "lower" life. So long as the natural environment itself is rightless, these are not matters for judicial cognizance. Thus, we find the highest court of Pennsylvania refusing to stop a coal company from discharging polluted mine water into a tributary of the Lackawana River because a plaintiff's "grievance is for a mere personal inconvenience; and ... mere private personal inconveniences ... must yield to the necessities of a great public industry, which although in the hands of a private corporation, subserves a great public interest."[38] The stream itself is lost sight of in "a quantitative compromise between *two* conflicting interests."[39]

The third way in which the common law makes natural objects rightless has to do with who is regarded as the beneficiary of a favorable judgment. Here, too, it makes a considerable difference that it is not the natural object that counts in its own right. To illustrate this point, let me begin by observing that it makes perfectly good sense to speak of, and ascertain, the legal damage to a natural object, if only in the sense of "making it whole" with respect to the most obvious factors.[40] The costs of making a forest whole, for example, would include the costs of reseeding, repairing watersheds, restocking wildlife—the sorts of costs the Forest Service undergoes after a fire. Making a polluted stream whole would include the costs of restocking with fish, water-fowl, and other animal and vegetable life, dredging, washing out impurities, establishing natural and/or artificial aerating agents, and so forth. Now, what is important to note is that, under our present system, even if a plaintiff riparian wins a water pollution suit for damages, no money goes to the benefit of the stream itself to repair *its* damages.[41] This omission has the further effect that, at most, the law confronts a polluter with what it takes to make the plaintiff riparians whole; this may be far less than the damages to the stream,[42] but not so much as to force the polluter to desist. For example, it is easy to imagine a polluter whose activities damage a stream to the extent of $10,000 annually, although the aggregate damage to all the riparian plaintiffs who come into the suit is only $3000. If $3000 is less than the cost to the polluter of shutting down, or making the requisite technological changes, he might prefer to pay off the damages (*i.e.*,

the legally cognizable damages) and continue to pollute the stream. Similarly, even if the jurisdiction issues an injunction at the plaintiffs' behest (rather than to order payment of damages), there is nothing to stop the plaintiffs from "selling out" the stream, *i.e.*, agreeing to dissolve or not enforce the injunction at some price (in the example above, somewhere between plaintiffs' damages—$3000—and defendant's next best economic alternative). Indeed, I take it this is exactly what Learned Hand had in mind in an opinion in which, after issuing an anti-pollution injunction, he suggests that the defendant "make its peace with the plaintiff as best it can."[43] What is meant is a peace between *them*, and not amongst them and the river.

I ought to make clear at this point that the common law as it affects streams and rivers, which I have been using as an example so far, is not exactly the same as the law affecting other environmental objects. Indeed, one would be hard pressed to say that there was a "typical" environmental object, so far as its treatment at the hands of the law is concerned. There are some differences in the law applicable to all the various resources that are held in common: rivers, lakes, oceans, dunes, air, streams (surface and subterranean), beaches, and so forth.[44] And there is an even greater difference as between these traditional communal resources on the one hand, and natural objects on traditionally private land, *e.g.*, the pond on the farmer's field, or the stand of trees on the suburbanite's lawn.

On the other hand, although there be these differences which would make it fatuous to generalize about a law of the natural environment, most of these differences simply underscore the points made in the instance of rivers and streams. None of the natural objects, whether held in common or situated on private land, has any of the three criteria of a rights-holder. They have no standing in their own right; their unique damages do not count in determining outcome; and they are not the beneficiaries of awards. In such fashion, these objects have traditionally been regarded by the common law, and even by all but the most recent legislation, as objects for man to conquer and master and use—in such a way as the law once looked upon "man's" relationships to African Negroes. Even where special measures have been taken to conserve them, as by seasons on game and limits on timber cutting, the dominant motive has been to conserve them *for us*—for the greatest good of the greatest number of human beings. Conservationists, so far as I am aware, are generally reluctant to maintain otherwise.[45] As the name implies, they want to conserve and guarantee *our* consumption and *our* enjoyment of these other living things. In their own right, natural objects have counted for little, in law as in popular movements.

As I mentioned at the outset, however, the rightlessness of the natural environment can and should change; it already shows some signs of doing so.

Toward Having Standing in its Own Right

It is not inevitable, nor is it wise, that natural objects should have no rights to seek redress in their own behalf. It is no answer to say that streams and forests cannot have standing because streams and forests cannot speak. Corporations cannot speak either; nor can states, estates, infants, incompetents, muncipalities or universities. Lawyers speak for them, as they customarily do for the ordinary citizen with legal problems. One ought, I think, to handle the legal problems of natural objects as one does the problems of legal incompetents—human beings who have become vegetable. If a human being shows signs of becoming senile and has affairs that he is de jure incompetent to manage, those concerned with his well being make such a showing to the court, and someone is designated by the court with the authority to manage the incompetent's affairs. The guardian[46] (or "conservator"[47] or "committee"[48]—the terminology varies) then represents the incompetent in his legal affairs. Courts make similar appointments when a corporation has become "incompetent"—they appoint a trustee in bankruptcy or reorganization to oversee its affairs and speak for it in court when that becomes necessary.

On a parity of reasoning, we should have a system in which, when a friend of a natural object perceives it to be endangered, he can apply to a court for the creation of a guardianship.[49] Perhaps we already have the machinery to do so. California law, for example, defines an incompetent as "any person, whether insane or not, who by reason of old age, disease, weakness of mind, or other cause, is unable, unassisted, properly to manage and take care of himself or his property, and by reason thereof is likely to be deceived or imposed upon by artful or designing persons."[50] Of course, to urge a court that an endangered river is "a person" under this provision will call for lawyers as bold and imaginative as those who convinced the Supreme Court that a railroad corporation was a "person" under the fourteenth amendment, a constitutional provision theretofore generally thought of as designed to secure the rights of freedmen.[51] (As this article was going to press, Professor Byrn of Fordham petitioned the New York Supreme Court to appoint him legal guardian for an unrelated foetus scheduled for abortion so as to enable him to bring a class action on behalf of all foetuses similarly situated in New York City's 18 municipal hospitals. Judge Holtzman granted the petition of guardianship.[52]) If such an argument based on present statutes should fail, special environmental legislation could be enacted along traditional guardianship lines. Such provisions could provide for guardianship

both in the instance of public natural objects and also, perhaps with slightly different standards, in the instance of natural objects on "private" land.[53]

The potential "friends" that such a statutory scheme would require will hardly be lacking. The Sierra Club, Environmental Defense Fund, Friends of the Earth, Natural Resources Defense Counsel, and the Izaak Walton League are just some of the many groups which have manifested unflagging dedication to the environment and which are becoming increasingly capable of marshalling the requisite technical experts and lawyers. If, for example, the Environmental Defense Fund should have reason to believe that some company's strip mining operations might be irreparably destroying the ecological balance of large tracts of land, it could, under this procedure, apply to the court in which the lands were situated to be appointed guardian.[54] As guardian, it might be given rights of inspection (or visitation) to determine and bring to the court's attention a fuller finding on the land's condition. If there were indications that under the substantive law some redress might be available on the land's behalf, then the guardian would be entitled to raise the land's rights in the land's name, *i.e.*, without having to make the roundabout and often unavailing demonstration, discussed below, that the "rights" of the club's members were being invaded. Guardians would also be looked to for a host of other protective tasks, *e.g.*, monitoring effluents (and/or monitoring the monitors), and representing their "wards" at legislative and administrative hearings on such matters as the setting of state water quality standards. Procedures exist, and can be strengthened, to move a court for the removal and substitution of guardians, for conflicts of interest or for other reasons,[55] as well as for the termination of the guardianship.[56]

In point of fact, there is a movement in the law toward giving the environment the benefits of standing, although not in a manner as satisfactory as the guardianship approach. What I am referring to is the marked liberalization of traditional standing requirements in recent cases in which environmental action groups have challenged federal government action. *Scenic Hudson Preservation Conference v. FPC*[57] is a good example of this development. There, the Federal Power Commission had granted New York's Consolidated Edison a license to construct a hydroelectric project on the Hudson River at Storm King Mountain. The grant of license had been opposed by conservation interests on the grounds that the transmission lines would be unsightly, fish would be destroyed, and nature trails would be inundated. Two of these conservation groups, united under the name Scenic Hudson Preservation Conference, petitioned the Second Circuit to set aside the grant. Despite the claim that Scenic Hudson had no standing because it had not made the traditional claim "of any personal economic injury resulting from the Commission's actions,"[58] the petitions were heard, and the case sent back to the Commission. On the standing point, the court noted that Section 313(b) of the Federal Power Act gave a right of instituting review to any party "aggrieved by an order issued by the Commission"[59]; it thereupon read "aggrieved by" as not limited to those alleging the traditional personal economic injury, but as broad enough to include "those who by their activities and conduct have exhibited a special interest" in "the aesthetic, conservational, and recreational aspects of power development. . . ."[60] A similar reasoning has swayed other circuits to allow proposed actions by the Federal Power Commission, the Department of Interior, and the Department of Health, Education and Welfare to be challenged by environmental action groups on the basis of, *e.g.*, recreational and esthetic interests of members, in lieu of direct economic injury.[61] Only the Ninth Circuit has balked, and one of these cases, involving the Sierra Club's attempt to challenge a Walt Disney development in the Sequoia National Forest, is at the time of this writing awaiting decision by the United States Supreme Court.[62]

Even if the Supreme Court should reverse the Ninth Circuit in the Walt Disney-Sequoia National Forest matter, thereby encouraging the circuits to continue their trend toward liberalized standing in this area, there are significant reasons to press for the guardianship approach notwithstanding. For one thing, the cases of this sort have extended standing on the basis of interpretations of specific federal statutes—the Federal Power Commission Act,[63] the Administrative Procedure Act,[64] the Federal Insecticide, Fungicide and Rodenticide Act,[65] and others. Such a basis supports environmental suits only where acts of federal agencies are involved; and even there, perhaps, only when there is some special statutory language, such as "aggrieved by" in the Federal Power Act, on which the action groups can rely. Witness, for example, *Bass Angler Sportsman Society v. United States Steel Corp.*[66] There, plaintiffs sued 175 corporate defendants located throughout Alabama, relying on 33 U.S.C. § 407 (1970), which provides:

> It shall not be lawful to throw, discharge, or deposit . . . any refuse matter . . . into any navigable water of the United States, or into any tributary of any navigable water from which the same shall float or be washed into such navigable water. . . .[67]

Another section of the Act provides that one-half the fines shall be paid to the person or persons giving information which shall lead to a conviction.[68] Relying on this latter provision, the plaintiff designated his action a *qui tam* action[69] and sought to enforce the Act by injunction and fine. The District Court ruled that, in the absence of

express language to the contrary, no one outside the Department of Justice had standing to sue under a criminal act and refused to reach the question of whether violations were occurring.[70]

Unlike the liberalized standing approach, the guardianship approach would secure an effective voice for the environment even where federal administrative action and public-lands and waters were not involved. It would also allay one of the fears courts—such as the Ninth Circuit—have about the extended standing concept: if any ad hoc group can spring up overnight, invoke some "right" as universally claimable as the esthetic and recreational interests of its members and thereby get into court, how can a flood of litigation be prevented?[71] If an ad hoc committee loses a suit brought *sub nom.* Committee to Preserve our Trees, what happens when its very same members reorganize two years later and sue *sub nom.* the Massapequa Sylvan Protection League? Is the new group bound by res judicata? Class action law may be capable of ameliorating some of the more obvious problems. But even so, court economy might be better served by simply designating the guardian de jure representative of the natural object, with rights of discretionary intervention by others, but with the understanding that the natural object is "bound" by an adverse judgment.[72] The guardian concept, too, would provide the endangered natural object with what the trustee in bankruptcy provides the endangered corporation: a continuous supervision over a period of time, with a consequent deeper understanding of a broad range of the ward's problems, not just the problems present in one particular piece of litigation. It would thus assure the courts that the plaintiff has the expertise and genuine adversity in pressing a claim which are the prerequisites of a true "case or controversy."

The guardianship approach, however, is apt to raise two objections, neither of which seems to me to have much force. The first is that a committee or guardian could not judge the needs of the river or forest in its charge; indeed, the very concept of "needs," it might be said, could be used here only in the most metaphorical way. The second objection is that such a system would not be much different from what we now have: is not the Department of Interior already such a guardian for public lands, and do not most states have legislation empowering their attorneys general to seek relief—in a sort of *parens patriae* way—for such injuries as a guardian might concern himself with?

As for the first objection, natural objects *can* communicate their wants (needs) to us, and in ways that are not terribly ambiguous. I am sure I can judge with more certainty and meaningfulness whether and when my lawn wants (needs) water, than the Attorney General can judge whether and when the United States wants (needs) to take an appeal from an adverse judgment by a lower court. The lawn tells me that it wants water by a certain dryness of the blades and soil—immediately obvious to the touch—the appearance of bald spots, yellowing, and a lack of springiness after being walked on; how does "the United States" communicate to the Attorney General? For similar reasons, the guardian-attorney for a smog-endangered stand of pines could venture with more confidence that his client wants the smog stopped, than the directors of a corporation can assert that "the corporation" wants dividends declared. We make decisions on behalf of, and in the purported interests of, others every day; these "others" are often creatures whose wants are far less verifiable, and even far more metaphysical in conception, than the wants of rivers, trees, and land.[73]

As for the second objection, one can indeed find evidence that the Department of Interior was conceived as a sort of guardian of the public lands.[74] But there are two points to keep in mind. First, insofar as the Department already is an adequate guardian it is only with respect to the federal public lands as per Article IV, section 3 of the Constitution.[75] Its guardianship includes neither local public lands nor private lands. Second, to judge from the environmentalist literature and from the cases environmental action groups have been bringing, the Department is itself one of the bogeys of the environmental movement. (One thinks of the uneasy peace between the Indians and the Bureau of Indian Affairs.) Whether the various charges be right or wrong, one cannot help but observe that the Department has been charged with several institutional goals (never an easy burden), and is currently looked to for action by quite a variety of interest groups, only one of which is the environmentalists. In this context, a guardian outside the institution becomes especially valuable. Besides, what a person wants, fully to secure his rights, is the ability to retain independent counsel even when, and perhaps especially when, the government is acting "for him" in a beneficent way. I have no reason to doubt, for example, that the Social Security System is being managed "for me"; but I would not want to abdicate my right to challenge its actions as they affect me, should the need arise.[76] I would not ask more trust of national forests, vis-à-vis the Department of Interior. The same considerations apply in the instance of local agencies, such as regional water pollution boards, whose members' expertise in pollution matters is often all too credible.[77]

The objection regarding the availability of attorneys-general as protectors of the environment within the existing structure is somewhat the same. Their statutory powers are limited and sometimes unclear. As political creatures, they must exercise the discretion they have with an eye toward advancing and reconciling a broad variety

of important social goals, from preserving morality to increasing their jurisdiction's tax base. The present state of our environment, and the history of cautious application and development of environmental protection laws long on the books,[78] testifies that the burdens of an attorney-general's broad responsibility have apparently not left much manpower for the protection of nature. (*Cf. Bass Anglers*, above.) No doubt, strengthening interest in the environment will increase the zest of public attorneys even where, as will often be the case, well-represented corporate pollutors are the quarry. Indeed, the United States Attorney General has stepped up anti-pollution activity, and ought to be further encouraged in this direction.[79] The statutory powers of the attorneys-general should be enlarged, and they should be armed with criminal penalties made at least commensurate with the likely economic benefits of violating the law.[80] On the other hand, one cannot ignore the fact that there is increased pressure on public law-enforcement offices to give more attention to a host of other problems, from crime "on the streets" (why don't we say "in the rivers"?) to consumerism and school bussing. If the environment is not to get lost in the shuffle, we would do well, I think, to adopt the guardianship approach as an additional safeguard, conceptualizing major natural objects as holders of their own rights, raisable by the court-appointed guardian.

Toward Recognition of its Own Injuries

As far as adjudicating the merits of a controversy is concerned, there is also a good case to be made for taking into account harm to the environment—in its own right. As indicated above, the traditional way of deciding whether to issue injunctions in law suits affecting the environment, at least where communal property is involved, has been to strike some sort of balance regarding the economic hardships *on human beings*. Even recently, Mr. Justice Douglas, our jurist most closely associated with conservation sympathies in his private life, was deciding the propriety of a new dam on the basis of, among other things, anticipated lost profits from fish catches, some $12,000,000 annually.[81] Although he decided to delay the project pending further findings, the reasoning seems unnecessarily incomplete and compromising. Why should the environment be of importance only indirectly, as lost profits to someone else? Why not throw into the balance the cost *to the environment*?

The argument for "personifying" the environment, from the point of damage calculations, can best be demonstrated from the welfare economics position. Every well-working legal-economic system should be so structured as to confront each of us with the full costs that our activities are imposing on society.[82] Ideally, a paper-mill, in deciding what to produce—and where, and by what methods—ought to be forced to take into account not only the lumber, acid and labor that its production "takes" from other uses in the society, but also what costs alternative production plans will impose on society through pollution. The legal system, through the law of contracts and the criminal law, for example, makes the mill confront the costs of the first group of demands. When, for example, the company's purchasing agent orders 1000 drums of acid from the *Z* Company, the *Z* Company can bind the mill to pay for them, and thereby reimburse the society for what the mill is removing from alternative uses.

Unfortunately, so far as the pollution costs are concerned, the allocative ideal begins to break down, because the traditional legal institutions have a more difficult time "catching" and confronting us with the full social costs of our activities. In the lakeside mill example, major riparian interests might bring an action, forcing a court to weigh *their* aggregate losses against the costs to the mill of installing the anti-pollution device. But many other interests—and I am speaking for the moment of recognized homocentric interests—are too fragmented and perhaps "too remote" causally to warrant securing representation and pressing for recovery: the people who own summer homes and motels, the man who sells fishing tackle and bait, the man who rents rowboats. There is no reason not to allow the lake to prove damages to them as the prima facie measure of damages to it. *By doing so, we in effect make the natural object, through its guardian, a jural entity competent to gather up these fragmented and otherwise unrepresented damage claims, and press them before the court even where, for legal or practical reasons, they are not going to be pressed by traditional class action plaintiffs.*[83] Indeed, one way—the homocentric way—to view what I am proposing so far, is to view the guardian of the natural object as the guardian of unborn generations, as well as of the otherwise unrepresented, but distantly injured, contemporary humans.[84] By making the lake itself the focus of these damages, and "incorporating" it so to speak, the legal system can effectively take proof upon, and confront the mill with, a larger and more representative measure of the damages its pollution causes.

So far, I do not suppose that my economist friends (unremittent human chauvanists, every one of them!) will have any large quarrel in principle with the concept. Many will view it as a *trompe l'oeil* that comes down, at best, to effectuate the goals of the paragon class action, or the paragon water pollution control district. Where we are apt to part company is here—I propose going beyond gathering up the loose ends of what most people would presently recognize as economically valid damages. The guardian would urge before the court injuries not presently cognizable—the death of eagles and inedible crabs, the suffering of sea lions, the loss from the face of the

earth of species of commercially valueless birds, the disappearance of a wilderness area. One might, of course, speak of the damages involved as "damages" to us humans, and indeed, the widespread growth of environmental groups shows that human beings do feel these losses. But they are not, at present, economically measurable losses: how can they have a monetary value for the guardian to prove in court?

The answer for me is simple. Wherever it carves out "property" rights, the legal system is engaged in the process of *creating* monetary worth. One's literary works would have minimal monetary value if anyone could copy them at will. Their economic value to the author is a product of the law of copyright; the person who copies a copyrighted book has to bear a cost to the copyright-holder because the law says he must. Similarly, it is through the law of torts that we have made a "right" of—and guaranteed an economically meaningful value to—privacy. (The value we place on gold—a yellow inanimate dirt—is not simply a function of supply and demand—wilderness areas are scarce and pretty too—, but results from the actions of the legal systems of the world, which have institutionalized that value; they have even done a remarkable job of stabilizing the price). I am proposing we do the same with eagles and wilderness areas as we do with copyrighted works, patented inventions, and privacy: *make* the violation of rights in them to be a cost by declaring the "pirating" of them to be the invasion of a property interest.[85] If we do so, the net social costs the polluter would be confronted with would include not only the extended homocentric costs of his pollution (explained above) but also costs to the environment *per se*.

How, though, would these costs be calculated? When we protect an invention, we can at least speak of a fair market value for it, by reference to which damages can be computed. But the lost environmental "values" of which we are now speaking are by definition over and above those that the market is prepared to bid for: they are priceless.

One possible measure of damages, suggested earlier, would be the cost of making the environment whole, just as, when a man is injured in an automobile accident, we impose upon the responsible party the injured man's medical expenses. Comparable expenses to a polluted river would be the costs of dredging, restocking with fish, and so forth. It is on the basis of such costs as these, I assume, that we get the figure of $1 billion as the cost of saving Lake Erie.[86] As an ideal, I think this is a good guide applicable in many environmental situations. It is by no means free from difficulties, however.

One problem with computing damages on the basis of making the environment whole is that, if understood most literally, it is tantamount to asking for a "freeze" on environmental quality, even at the costs (and there will be costs) of preserving "useless" objects.[87] Such a "freeze" is not inconceivable to me as a general goal, especially considering that, even by the most immediately discernible homocentric interests, in so many areas we ought to be cleaning up and not merely preserving the environmental status quo. In fact, there is presently strong sentiment in the Congress for a total elimination of all river pollutants by 1985,[88] notwithstanding that such a decision would impose quite large direct and indirect costs on us all. Here one is inclined to recall the instructions of Judge Hays, in remanding Consolidated Edison's Storm King application to the Federal Power Commission in *Scenic Hudson*:

> The Commission's renewed proceedings must include as a basic concern the preservation of natural beauty and of natural historic shrines, keeping in mind that, in our affluent society, the cost of a project is only one of several factors to be considered.[89]

Nevertheless, whatever the merits of such a goal in principle, there are many cases in which the social price tag of putting it into effect are going to seem too high to accept. Consider, for example, an oceanside nuclear generator that could produce low cost electricity for a million homes at a savings of $1 a year per home, spare us the air pollution that comes of burning fossil fuels, but which through a slight heating effect threatened to kill off a rare species of temperature-sensitive sea urchins; suppose further that technological improvements adequate to reduce the temperature to present environmental quality would expend the entire one million dollars in anticipated fuel savings. Are we prepared to tax ourselves $1,000,000 a year on behalf of the sea urchins? In comparable problems under the present law of damages, we work out practicable compromises by abandoning restoration costs and calling upon fair market value. For example, if an automobile is so severely damaged that the cost of bringing the car to its original state by repair is greater than the fair market value, we would allow the responsible tortfeasor to pay the fair market value only. Or if a human being suffers the loss of an arm (as we might conceive of the ocean having irreparably lost the sea urchins), we can fall back on the capitalization of reduced earning power (and pain and suffering) to measure the damages. But what is the fair market value of sea urchins? How can we capitalize their loss to the ocean, independent of any commercial value they may have to someone else?

One answer is that the problem can sometimes be sidestepped quite satisfactorily. In the sea urchin example, one compromise solution would be to impose on the nuclear generator the costs of making the ocean whole somewhere else, in some other way, *e.g.*, reestablishing a

sea urchin colony elsewhere, or making a somehow comparable contribution.[90] In the debate over the laying of the trans-Alaskan pipeline, the builders are apparently prepared to meet conservationists' objections half-way by re-establishing wildlife away from the pipeline, so far as is feasible.[91]

But even if damage calculations have to be made, one ought to recognize that the measurement of damages is rarely a simple report of economic facts about "the market," whether we are valuing the loss of a foot, a foetus, or a work of fine art. Decisions of this sort are always hard, but not impossible. We have increasingly taken (human) pain and suffering into account in reckoning damages, not because we think we can ascertain them as objective "facts" about the universe, but because, even in view of all the room for disagreement, we come up with a better society by making rude estimates of them than by ignoring them.[92] We can make such estimates in regard to environmental losses fully aware that what we are really doing is making implicit normative judgments (as with pain and suffering)—laying down rules as to what the society is going to "value" rather than reporting market evaluations. In making such normative estimates decision-makers would not go wrong if they estimated on the "high side," putting the burden of trimming the figure down on the immediate human interests present. All burdens of proof should reflect common experience; our experience in environmental matters has been a continual discovery that our acts have caused more long-range damage than we were able to appreciate at the outset.

To what extent the decision-maker should factor in costs such as the pain and suffering of animals and other sentient natural objects, I cannot say; although I am prepared to do so in principle.[93] Given the conjectural nature of the "estimates" in all events, and the roughness of the "balance of conveniences" procedure where that is involved, the practice would be of more interest from the socio-psychic point of view, discussed below, than from the legal-operational.

Toward Being a Beneficiary in its Own Right

As suggested above, one reason for making the environment itself the beneficiary of a judgment is to prevent it from being "sold out" in a negotiation among private litigants who agree not to enforce rights that have been established among themselves.[94] Protection from this will be advanced by making the natural object a party to an injunctive settlement. Even more importantly, we should make it a beneficiary of money awards. If, in making the balance requisite to issuing an injunction, a court decides *not* to enjoin a lake polluter who is causing injury to the extent of $50,000 annually, then the owners and the lake ought both to be awarded damages. The natural object's portion could be put into a trust fund to be administered by the object's guardian, as per the guardianship recommendation set forth above. So far as the damages are proved, as suggested in the previous section, by allowing the natural object to cumulate damages to others as prima facie evidence of damages to it, there will, of course, be problems of distribution. But even if the object is simply construed as representing a class of plaintiffs under the applicable civil rules,[95] there is often likely to be a sizeable amount of recovery attributable to members of the class who will not put in a claim for distribution (because their pro rata share would be so small, or because of their interest in the environment). Not only should damages go into these funds, but where criminal fines are applied (as against water polluters) it seems to me that the monies (less prosecutorial expenses, perhaps) ought sensibly to go to the fund rather than to the general treasuries. Guardians fees, including legal fees, would then come out of this fund. More importantly, the fund would be available to preserve the natural object as close as possible to its condition at the time the environment was made a rights-holder.[96]

The idea of assessing damages as best we can and placing them in a trust fund is far more realistic than a hope that a total "freeze" can be put on the environmental status quo. Nature is a continuous theatre in which things and species (eventually man) are destined to enter and exit.[97] In the meantime, co-existence of man and his environment means that *each* is going to have to compromise for the better of both. Some pollution of streams, for example, will probably be inevitable for some time. Instead of setting an unrealizable goal of enjoining absolutely the discharge of all such pollutants, the trust fund concept would (a) help assure that pollution would occur only in those instances where the social need for the pollutant's product (via his present method of production) was so high as to enable the polluter to cover *all* homocentric costs, plus some estimated costs to the environment *per se*, and (b) would be a corpus for preserving monies, if necessary, while the technology developed to a point where repairing the damaged portion of the environment was feasible. Such a fund might even finance the requisite research and development.

(Incidentally, if "rights" are to be granted to the environment, then for many of the same reasons it might bear "liabilities" as well—as inanimate objects did anciently.[98] Rivers drown people, and flood over and destroy crops; forests burn, setting fire to contiguous communities. Where trust funds had been established, they could be available for the satisfaction of judgments against the environment, making it bear the costs of some of the harms it imposes on other right holders. In effect, we would be narrowing the claim of Acts of God. The ontological problem would be troublesome here, however; when the Nile

overflows, is it the ''responsibility'' of the river? the mountains? the snow? the hydrologic cycle?[99])

Toward Rights in Substance

So far we have been looking at the characteristics of being a *holder of rights*, and exploring some of the implications that making the environment a holder of rights would entail. Natural objects would have standing in their own right, through a guardian; damage to and through them would be ascertained and considered as an independent factor; and they would be the beneficiaries of legal awards. But these considerations only give us the skeleton of what a meaningful rights-holding would involve. To flesh out the ''rights'' of the environment demands that we provide it with a significant body of rights for it to invoke when it gets to court.

In this regard, the lawyer is constantly aware that a right is not, as the layman may think, some strange substance that one either has or has not. One's life, one's right to vote, one's property, can all be taken away. But those who would infringe on them must go through certain procedures to do so; these procedures are a measure of what we value as a society. Some of the most important questions of ''right'' thus turn into questions of degree: how much review, and of which sort, will which agencies of state accord us when we claim our ''right'' is being infringed?

We do not have an absolute right either to our lives or to our driver's licenses. But we have a greater right to our lives because, if even the state wants to deprive us of that ''right,'' there are authoritative bodies that will demand that the state make a very strong showing before it does so, and it will have to justify its actions before a grand jury, petit jury (convincing them ''beyond a reasonable doubt''), sentencing jury, and, most likely, levels of appellate courts. The carving out of students ''rights'' to their education is being made up of this sort of procedural fabric. No one, I think, is maintaining that in no circumstances ought a student to be expelled from school. The battle for student ''rights'' involves shifting the answers to questions like: before a student is expelled, does he have to be given a hearing; does he have to have prior notice of the hearing, and notice of charges; may he bring counsel, (need the state provide counsel if he cannot?); need there be a transcript; need the school carry the burden of proving the charges; may he confront witnesses; if he is expelled, can he get review by a civil court; if he can get such review, need the school show its actions were ''reasonable,'' or merely ''not unreasonable,'' and so forth?[100]

In this vein, to bring the environment into the society as a rights-holder would not stand it on a better footing than the rest of us mere mortals, who every day suffer injuries that are *damnum absque injuria*. What the environment must look for is that its interests be taken into account in subtler, more procedural ways.

The National Environmental Policy Act is a splendid example of this sort of rights-making through the elaboration of procedural safeguards. Among its many provisions, it establishes that every federal agency must:

> (C) include in every recommendation or report on proposals for legislation and other major Federal actions significantly affecting the quality of the human environment, a detailed statement by the responsible official on—
>
> (i) the environmental impact of the proposed action,
>
> (ii) any adverse environmental effects which cannot be avoided should the proposal be implemented,
>
> (iii) alternatives to the proposed action,
>
> (iv) the relationship between local short-term uses of man's environment and the maintenance and enhancement of long-term productivity, and
>
> (v) any irreversible and irretrievable commitments of resources which would be involved in the proposed action should it be implemented.

Prior to making any detailed statement, the responsible Federal official shall consult with and obtain the comments of any Federal agency which has jurisdiction by law or special expertise with respect to any environmental impact involved. Copies of such statement and the comments and views of the appropriate Federal, State, and local agencies, which are authorized to develop and enforce environmental standards, shall be made available to the President, the Council on Environmental Quality and to the public as provided by section 552 of title 5, United States Code, and shall accompany the proposal through the existing agency review processes;

> (D) study, develop, and describe appropriate alternatives to recommended courses of action in any proposal which involves unresolved conflicts concerning alternative uses of available resources;
>
> (E) recognize the worldwide and long-range character of environmental problems and, where consistent with the foreign policy of the United States, lend appropriate support to initiatives, resolutions, and programs designed to maximize international cooperation in anticipating and preventing a decline in the quality of mankind's environment;
>
> (F) make available to States, counties, municipalities, institutions, and individuals, advice and information useful in restoring, maintaining, and enhancing the quality of the environment ….[101]

These procedural protections have already begun paying off in the courts. For example, it was on the basis of the Federal Power Commission's failure to make adequate inquiry into "alternatives" (as per subsection (iii)) in *Scenic Hudson*, and the Atomic Energy Commission's failure to make adequate findings, apparently as per subsections (i) and (ii), in connection with the Amchitka Island underground test explosion,[102] that Federal Courts delayed the implementation of environment-threatening schemes.

Although this sort of control (remanding a cause to an agency for further findings) may seem to the layman ineffectual, or only a stalling of the inevitable, the lawyer and the systems analyst know that these demands for further findings can make a difference. It may encourage the institution whose actions threaten the environment to really *think about* what it is doing, and that is neither an ineffectual nor a small feat. Indeed, I would extend the principle beyond federal agencies. Much of the environment is threatened not by them, but by private corporations. Surely the constitutional power would not be lacking to mandate that all private corporations whose actions may have significant adverse affect on the environment make findings of the sort now mandated for federal agencies. Further, there should be requirements that these findings and reports be channeled to the Board of Directors; if the directors are not charged with the knowledge of what their corporation is doing to the environment, it will be all too easy for lower level management to prevent such reports from getting to a policy-making level. We might make it grounds for a guardian to enjoin a private corporation's actions if such procedures had not been carried out.

The rights of the environment could be enlarged by borrowing yet another page from the Environmental Protection Act and mandating comparable provisions for "private governments." The Act sets up within the Executive Office of the President a Council on Environmental Quality "to be conscious of and responsive to the scientific, economic, social, esthetic, and cultural needs of the Nation; and to formulate and recommend national policies to promote the improvement of the quality of the environment."[103] The Council is to become a focal point, within our biggest "corporation"—the State—to gather and evaluate environmental information which it is to pass on to our chief executive officer, the President. Rather than being ineffectual, this may be a highly sophisticated way of steering organizational behavior. Corporations—especially recidivist polluters and land despoilers—should have to establish comparable internal reorganization, *e.g.*, to set up a Vice-President for Ecological Affairs. The author is not offering this suggestion as a cure-all, by any means, but I do not doubt that this sort of control over internal corporate organization would be an effective supplement to the traditional mechanisms of civil suits, licensing, administrative agencies, and fines.[104]

Similarly, courts, in making rulings that may affect the environment, should be compelled to make findings with respect to environmental harm—showing how they calculated it and how heavily it was weighed—even in matters outside the present Environmental Protection Act. This would have at least two important consequences. First, it would shift somewhat the focus of court-room testimony and concern; second, the appellate courts, through their review and reversals for "insufficient findings," would give content to, and build up a body of, environmental rights, much as content and body has been given, over the years, to terms like "Due Process of Law."

Beyond these procedural safeguards, would there be any rights of the environment that might be deemed "absolute," at least to the extent of, say, Free Speech? Here, the doctrine of irreparable injury comes to mind. There has long been equitable support for an attorney-general's enjoining injury to communal property if he can prove it to be "irreparable." In other words, while repairable damage to the environment might be balanced and weighed, irreparable damage could be enjoined absolutely. There are several reasons why this doctrine has not been used effectively (witness Lake Erie).[105] Undoubtedly, political pressures (in the broadest sense) have had an influence. So, too, has the failure of all of us to understand just how delicate the environmental balance is; this failure has made us unaware of how early "irreparable" injury might be occurring, and, if aware, unable to prove it in court. But most important I think, is that the doctrine simply is not practical as a rule of universal application. For one thing, there are too many cases like the sea urchin example above, where the marginal costs of abating the damage seem too clearly to exceed the marginal benefits, even if the damage to the environment itself is liberally estimated. For another, there is a large problem in how one defines "irreparable." Certainly the great bulk of the environment in civilized parts of the world has been injured "irreparably" in the sense of "irreversably"; we are not likely to return it to its medieval quality. Despite the scientific ring to the term, judgments concerning "irreparable injury" are going to have to subsume questions both of degree of damage and of value—to all of "us" including the environment, *i.e.*, to "spaceship earth"—of the damaged object. Thus, if we are going to revitalize the "irreparable damages" doctrine, and expect it to be taken seriously, we have to recognize that what will be said to constitute "irreparable damage" to the ionosphere, because of its importance to all life, or to the Grand Canyon, because of its uniqueness, is going to rest upon normative judgments that ought to be made explicit.

This suggests that some (relatively) absolute rights be defined for the environment by setting up a constitutional list of "preferred objects," just as some of our Justices feel there are "preferred rights" where humans are concerned.[106] Any threatened injury to these most jealously-to-be-protected objects should be reviewed with the highest level of scrutiny at all levels of government, including our "counter-majoritarian" branch, the court system. Their "Constitutional rights" should be implemented, legislatively and administratively, by, *e.g.*, the setting of environmental quality standards.

I do not doubt that other senses in which the environment might have rights will come to mind, and, as I explain more fully below, would be more apt to come to mind if only we should speak in terms of their having rights, albeit vaguely at first. "Rights" might well lie in unanticipated areas. It would seem, for example, that Chief Justice Warren was only stating the obvious when he observed in *Reynolds v. Sims* that "legislators represent people, not trees or acres." Yet, could not a case be made for a system of apportionment which *did* take into account the wildlife of an area?[107] It strikes me as a poor idea that Alaska should have no more congressmen than Rhode Island primarily *because there are in Alaska all those trees and acres, those waterfalls and forests*.[108] I am not saying anything as silly as that we ought to overrule *Baker v. Carr* and retreat from one man-one vote to a system of one man-or-tree one vote. Nor am I even taking the position that we ought to count each acre, as we once counted each slave, as three-fifths of a man. But I am suggesting that there is nothing unthinkable about, and there might on balance even be a prevailing case to be made for, an electoral apportionment that made some systematic effort to allow for the representative "rights" of non-human life. And if a case can be made for that, which I offer here mainly for purpose of illustration, I suspect that a society that grew concerned enough about the environment to make it a holder of rights would be able to find quite a number of "rights" to have waiting for it when it got to court.

Do We Really Have to Put it that Way?

At this point, one might well ask whether much of what has been written could not have been expressed without introducing the notion of trees, rivers, and so forth "having rights." One could simply and straightforwardly say, for example, that (R_1) "the class of persons competent to challenge the pollution of rivers ought to be extended beyond that of persons who can show an immediate adverse economic impact on themselves," and that (R_2), "judges, in weighing competing claims to a wilderness area, ought to think beyond the economic and even esthetic impact on man, and put into the balance a concern for the threatened environment as such." And it is true, indeed, that to say trees and rivers have "rights" is not in itself a stroke of any operational significance—no more than to say "people have rights." To solve any concrete case, one is always forced to more precise and particularized statements, in which the word "right" might just as well be dropped from the elocution.

But this is not the same as to suggest that introducing the notion of the "rights" of trees and rivers would accomplish nothing beyond the introduction of a set of particular rules like (R_1) and (R_2), above. I think it is quite misleading to say that "*A* has a right to . . ." can be fully explicated in terms of a certain set of specific legal rules, and the manner in which conclusions are drawn from them in a legal system. That is only part of the truth. Introducing the notion of something having a "right" (simply *speaking* that way), brings into the legal system a flexibility and open-endedness that no series of specifically stated legal rules like R_1, R_2, R_3, . . . R_n can capture. Part of the reason is that "right" (and other so-called "legal terms" like "infant," "corporation," "reasonable time") have meaning—vague but forceful—in the ordinary language, and the force of these meanings, inevitably infused with our thought, becomes part of the context against which the "legal language" of our contemporary "legal rules" is interpreted.[109] Consider, for example, the "rules" that govern the question, on whom, and at what stages of litigation, is the burden of proof going to lie? Professor Krier has demonstrated how terribly significant these decisions are in the trial of environmental cases, and yet, also, how much discretion judges have under them.[110] In the case of such vague rules, it is *context*—senses of direction, of value and purpose—that determines how the rules will be understood, every bit as much as their supposed "plain meaning." In a system which spoke of the environment "having legal rights," judges would, I suspect, be inclined to interpret rules such as those of burden of proof far more liberally from the point of the environment. There is, too, the fact that the vocabulary and expressions that are available to us influence and even steer our thought. Consider the effect that was had by introducing into the law terms like "motive," "intent," and "due process." These terms work a subtle shift into the rhetoric of explanation available to judges; with them, new ways of thinking and new insights come to be explored and developed.[111] In such fashion, judges who could unabashedly refer to the "legal rights of the environment" would be encouraged to develop a viable body of law—in part simply through the availability and force of the expression. Besides, such a manner of speaking by courts would contribute to popular notions, and a society that spoke of the "legal rights of the environment" would be inclined to legislate more environment-protecting rules by formal enactment.

If my sense of these influences is correct, then a society in which it is stated, however vaguely, that "rivers have legal rights" would evolve a different legal system than one which did not employ that expression, even if the two of them had, at the start, the very same "legal rules" in other respects.

THE PSYCHIC AND SOCIO-PSYCHIC ASPECTS

There are, as we have seen, a number of developments in the law that may reflect a shift from the view that nature exists *for men*. These range from increasingly favorable procedural rulings for environmental action groups—as regards standing and burden of proof requirements, for example—to the enactment of comprehensive legislation such as the National Environmental Policy Act and the thoughtful Michigan Environmental Protection Act of 1970. Of such developments one may say, however, that it is not the environment *per se* that we are prepared to take into account, but that man's increased awareness of possible long range effects on himself militate in the direction of stopping environmental harm in its incipiency. And this is part of the truth, of course. Even the far-reaching National Environmental Policy Act, in its preambulatory "Declaration of National Environmental Policy," comes out both for "restoring and maintaining environmental quality *to the overall welfare and development of man*" as well as for creating and maintaining "conditions under which *man and nature can exist in productive harmony*."[112] Because the health and well-being of mankind depend upon the health of the environment, these goals will often be so mutually supportive that one can avoid deciding whether our rationale is to advance "us" or a new "us" that includes the environment. For example, consider the Federal Insecticide, Fungicide, and Rodenticide Act (FIFRA) which insists that, *e.g.*, pesticides, include a warning "adequate to prevent injury to living man and other vertebrate animals, vegetation, and useful invertebrate animals."[113] Such a provision undoubtedly reflects the sensible notion that the protection of humans is best accomplished by preventing dangerous accumulations in the food chain. Its enactment does not necessarily augur far-reaching changes in, nor even call into question, fundamental matters of consciousness.

But the time is already upon us when we may have to consider subordinating some human claims to those of the environment *per se*. Consider, for example, the disputes over protecting wilderness areas from development that would make them accessible to greater numbers of people. I myself feel disingenuous rationalizing the environmental protectionist's position in terms of a utilitarian calculus, even one that takes future generations into account, and plays fast and loose with its definition of "good." Those who favor development have the stronger argument—they at least hold the protectionist to a standstill—from the point of advancing the greatest good of the greatest number of people. And the same is true regarding arguments to preserve useless species of animals, as in the sea urchin hypothetical. One *can* say that we never know what is going to prove useful at some future time. In order to protect ourselves, therefore, we ought to be conservative now in our treatment of nature. I agree. But when conservationists argue this way to the exclusion of other arguments, or find themselves speaking in terms of "recreational interests" so continuously as to play up to, and reinforce, homocentrist perspectives, there is something sad about the spectacle. One feels that the arguments lack even their proponent's convictions. I expect they want to say something less egotistic and more emphatic but the prevailing and sanctioned modes of explanation in our society are not quite ready for it. In this vein, there must have been abolitonists who put their case in terms of getting more work out of the Blacks. Holdsworth says of the early English Jew that while he was "regarded as a species of res nullius ... [H]e was valuable for his acquisitive capacity; and for that reason the crown took him under its protection."[114] (Even today, businessmen are put in the position of insisting that their decent but probably profitless acts will "help our company's reputation and be good for profits."[115])

For my part, I would prefer a frank avowal that even making adjustments for esthetic improvemens, what I am proposing is going to cost "us," *i.e.*, reduce our standard of living as measured in terms of our present values.

Yet, this frankness breeds a frank response—one which I hear from my colleagues and which must occur to many a reader. Insofar as the proposal is not just an elaborate legal fiction, but really comes down in the last analysis to a compromise of *our* interests for *theirs*, why should we adopt it? "What is in it for 'us'?"

This is a question I am prepared to answer, but only after permitting myself some observations about how *odd* the question is. It asks for me to justify my position in the very anthropocentric hedonist terms that I am proposing we modify. One is inclined to respond by a counter: "couldn't you (as a white) raise the same questions about compromising your preferred rights-status with Blacks?"; or "couldn't you (as a man) raise the same question about compromising your preferred rights-status with women?" Such counters, unfortunately, seem no more responsive than the question itself. (They have a nagging ring of "yours too" about them.) What the exchange actually points up is a fundamental problem regarding the nature of philosophical argument. Recall that Socrates, whom we remember as an opponent of hedonistic thought, confutes Thrasymachus by arguing

that immorality makes one miserably unhappy! Kant, whose moral philosophy was based upon the categorical imperative ("Woe to him who creeps through the serpent windings of Utilitarianism"[116]) finds himself justifying, *e.g.*, promise keeping and truth telling, on the most prudential—one might almost say, commercial—grounds.[117] This "philosophic irony" (as Professor Engel calls it) may owe to there being something unique about ethical argument.[118] "Ethics cannot be put into words", Wittgenstein puts it; such matters "make themselves "manifest."[119] On the other hand, perhaps the truth is that in any argument which aims at persuading a human being to action (on ethical or any other bases), "logic" is only an instrument for illuminating positions, at best, and in the last analysis it is psycho-logical appeals to the listener's self-interest that hold sway, however "principled" the rhetoric may be.

With this reservation as to the peculiar task of the argument that follows, let me stress that the strongest case can be made from the perspective of human advantage for conferring rights on the environment. Scientists have been warning of the crises the earth and all humans on it face if we do not change our ways—radically—and these crises make the lost "recreational use" of rivers seem absolutely trivial. The earth's very atmosphere is threatened with frightening possibilities: absorption of sunlight, upon which the entire life cycle depends, may be diminished; the oceans may warm (increasing the "greenhouse effect" of the atmosphere), melting the polar ice caps, and destroying our great coastal cities; the portion of the atmosphere that shields us from dangerous radiation may be destroyed. Testifying before Congress, sea explorer Jacques Cousteau predicted that the oceans (to which we dreamily look to feed our booming populations) are headed toward their own death: "The cycle of life is intricately tied up with the cycle of water ... the water system has to remain alive if we are to remain alive on earth."[120] We are depleting our energy and our food sources at a rate that takes little account of the needs even of humans now living.

These problems will not be solved easily; they very likely can be solved, if at all, only through a willingness to suspend the rate of increase in the standard of living (by present values) of the earth's "advanced" nations, and by stabilizing the total human population. For some of us this will involve forfeiting material comforts; for others it will involve abandoning the hope someday to obtain comforts long envied. For all of us it will involve giving up the right to have as many offspring as we might wish. Such a program is not impossible of realization, however. Many of our so-called "material comforts" are not only in excess of, but are probably in opposition to, basic biological needs. Further, the "costs" to the advanced nations is not as large as would appear from Gross National Product figures. G.N.P. reflects social gain (of a sort) without discounting for the social *cost* of that gain, *e.g.*, the losses through depletion of resources, pollution, and so forth. As has well been shown, as societies become more and more "advanced," their real marginal gains become less and less for each additional dollar of G.N.P.[121] Thus, to give up "human progress" would not be as costly as might appear on first blush.

Nonetheless, such far-reaching social changes are going to involve us in a serious reconsideration of our consciousness towards the environment. I say this knowing full well that there is something more than a trifle obscure in the claim: is popular consciousness a meaningful notion, to begin with? If so, what is our present consciousness regarding the environment? Has it been causally responsible for our material state of affairs? Ought we to shift our consciousness (and if so, to what exactly, and on what grounds)? How, if at all, would a shift in consciousness be translated into tangible institutional reform? Not one of these questions can be answered to everyone's satisfactions, certainly not to the author's.

It is commonly being said today, for example, that our present state of affairs—at least in the West—can be traced to the view that Nature is the dominion of Man, and that this attitude, in turn, derives from our religious traditions.

> Whatever the origins, the text is quite clear in Judaism, was absorbed all but unchanged into Christianity, and was inflated in Humanism to become the implicit attitude of Western man to Nature and the environment. Man is exclusively divine, all other creatures and things occupy lower and generally inconsequential stature; man is given dominion over all creatures and things; he is enjoined to subdue the earth.... This environment was created by the man who believes that the cosmos is a pyramid erected to support man on its pinnacle, that reality exists only because man can perceive it, that God is made in the image of man, and that the world consists solely of a dialogue between men. Surely this is an infantalism which is unendurable. It is a residue from a past of inconsequence when a few puny men cried of their supremacy to an unhearing and uncaring world. One longs for a psychiatrist who can assure man that his deep seated cultural inferiority is no longer necessary or appropriate.... It is not really necessary to destroy nature in order to gain God's favor or even his undivided attention.[122]

Surely this is forcibly put, but it is not entirely convincing as an explanation for how we got to where we are. For one thing, so far as intellectual influences are to be held responsible for our present state of affairs, one might as fairly turn on Darwin as the Bible. It was, after all,

Darwin's views—in part through the prism of Spencer—that gave moral approbation to struggle, conquest, and domination; indeed, by emphasizing man's development as a product of chance happenings, Darwin also had the effect—intended or not—of reducing our awareness of the mutual interdependency of everything in Nature. And besides, as Professor Murphy points out, the spiritual beliefs of the Chinese and Indians "in the unity between man and nature had no greater effect than the contrary beliefs in Europe in producing a balance between man and his environment"; he claims that in China, *tao* notwithstanding, "ruthless deforestation has been continuous.[123] I am under the impression, too, that notwithstanding the vaunted "harmony" between the American Plains Indians and Nature, once they had equipped themselves with rifles their pursuit of the buffalo expanded to fill the technological potential.[124] The fact is, that "consciousness" explanations pass too quickly over the less negative but simpler view of the situation: there are an increasing number of humans, with increasing wants, and there has been an increasing technology to satisfy them at "cost" to the rest of nature. Thus, we ought not to place too much hope that a changed environmental consciousness will in and of itself reverse present trends. Furthermore, societies have long since passed the point where a change in human consciousness on any matter will rescue us from our problems. More then ever before we are in the hands of institutions. These institutions are not "mere legal fictions" moreover—they have wills, minds, purposes, and inertias that are in very important ways their own, *i.e.*, that can transcend and survive changes in the consciousnesses of the individual humans who supposedly comprise them, and whom they supposedly serve. (It is more and more the individual human being, with his consciousness, that is the legal fiction.[125])

For these reasons, it is far too pat to suppose that a western "environmental consciousness" is solely or even primarily responsible for our environmental crisis. On the other hand, it is not so extravagant to claim that it has dulled our resentment and our determination to respond. For this reason, whether we will be able to bring about the requisite institutional and population growth changes depends in part upon effecting a radical shift in our feelings about "our" place in the rest of Nature.

A radical new conception of man's relationship to the rest of nature would not only be a step towards solving the material planetary problems; there are strong reasons for such a changed consciousness from the point of making us far better humans. If we only stop for a moment and look at the underlying human qualities that our present attitudes toward property and nature draw upon and reinforce, we have to be struck by how stultifying of our own personal growth and satisfaction they can become when they take rein of us. Hegel, in "justifying" private property, unwittingly reflects the tone and quality of some of the needs that are played upon:

> A person has as his substantive end the right of putting his will into any and every thing and thereby making it his, because it has no such end in itself and derives its destiny and soul from his will. This is the absolute right of appropriation which man has over all "things."[126]

What is it within us that gives us this need not just to satisfy basic biological wants, but to extend our wills over things, to object-ify them, to make them ours, to manipulate them, to keep them at a psychic distance? Can it all be explained on "rational" bases? Should we not be suspect of such needs within us, cautious as to why we wish to gratify them? When I first read that passage of Hegel, I immediately thought not only of the emotional contrast with Spinoza, but of the passage in Carson McCullers' *A Tree, A Rock, A Cloud*, in which an old derelict has collared a twelve year old boy in a streetcar cafe. The old man asks whether the boy knows "how love should be begun?"

> The old man leaned closer and whispered:
>
> "A tree. A rock. A cloud."
>
> . . .
>
> "The weather was like this in Portland," he said. "At the time my science was begun. I meditated and I started very cautious. I would pick up something from the street and take it home with me. I bought a goldfish and I concentrated on the goldfish and I loved it. I graduated from one thing to another. Day by day I was getting this technique.. . .
>
> . . .
>
> . . . "For six years now I have gone around by myself and built up my science. And now I am a master. Son. I can love anything. No longer do I have to think about it even. I see a street full of people and a beautiful light comes in me. I watch a bird in the sky. Or I meet a traveler on the road. Everything, Son. And anybody. All stranger and all loved! Do you realize what a science like mine can mean?"[127]

To be able to get away from the view that Nature is a collection of useful senseless objects is, as McCullers' "madman" suggests, deeply involved in the development of our abilities to love—or, if that is putting it too strongly, to be able to reach a heightened awareness of our own, and others' capacities in their mutual interplay. To do so, we have to give up some psychic investment in our sense of separateness and specialness in the universe. And this, in turn, is hard giving indeed, because it involves us in a flight backwards, into earlier stages of civilization and childhood in which we had to trust (and perhaps fear) our environment, for we had not then the power to master it. Yet, in doing so, we—as

persons—gradually free ourselves of needs for supportive illusions. Is not this one of the triumphs for "us" of our giving legal rights to (or acknowledging the legal rights of) the Blacks and women?[128]

Changes in this sort of consciousness are already developing, for the betterment of the planet and us. There is now federal legislation which "establishes by law"[129]

> the humane ethic that animals should be accorded the basic creature comforts of adequate housing, ample food and water, reasonable handling, decent sanitation, sufficient ventilation, shelter from extremes of weather and temperature, and adequate veterinary care including the appropriate use of pain-killing drugs.. . .[130]

The Vietnam war has contributed to this movement, as it has to others. Five years ago a Los Angeles mother turned out a poster which read "War is not Healthy for children and other living things."[131] It caught on tremendously—at first, I suspect, because it sounded like another clever protest against the war, *i.e.*, another angle. But as people say such things, and think about them, the possibilities of what they have stumbled upon become manifest—in its suit against the Secretary of Agriculture to cancel the registration of D.D.T., Environmental Defense Fund alleged "biological injury to man and other living things."[132] A few years ago the pollution of streams was thought of only as a problem of smelly, unsightly, unpotable water *i.e.*, to us. Now we are beginning to discover that pollution is a process that destroys wondrously subtle balances of life within the water, and as between the water and its banks. This heightened awareness enlarges our sense of the dangers to us. But it also enlarges our empathy. We are not only developing the scientific capacity, but we are cultivating the personal capacities *within us* to recognize more and more the ways in which nature—like the woman, the Black, the Indian and the Alien—is like us (and we will also become more able realistically to define, confront, live with and admire the ways in which we are all different).[133]

The time may be on hand when these sentiments, and the early stirrings of the law, can be coalesced into a radical new theory or myth—felt as well as intellectualized—of man's relationships to the rest of nature. I do not mean "myth" in a demeaning sense of the term, but in the sense in which, at different times in history, our social "facts" and relationships have been comprehended and integrated by reference to the "myths" that we are co-signers of a social contract, that the Pope is God's agent, and that all men are created equal. Pantheism, Shinto and Tao all have myths to offer. But they are all, each in its own fashion, quaint, primitive and archaic. What is needed is a myth that can fit our growing body of knowledge of geophysics, biology and the cosmos. In this vein, I do not think it too remote that we may come to regard the Earth, as some have suggested, as one organism, of which Mankind is a functional part—the mind, perhaps: different from the rest of nature, but different as a man's brain is from his lungs.

> Ever since the first Geophysical Year, international scientific studies have shown irrefutably that the Earth as a whole is an organized system of most closely interrelated and indeed interdependent activities. It is, in the broadest sense of the term, an "organism." The so-called life-kingdoms and the many vegetable and animal species are dependent upon each other for survival in a balanced condition of planet-wide existence; and they depend on their environment, conditioned by oceanic and atmospheric currents, and even more by the protective action of the ionosphere and many other factors which have definite rhythms of operation. Mankind is part of this organic planetary whole; and there can be no truly new global society, and perhaps in the present state of affairs no society at all, as long as man will not recognize, accept and enjoy the fact that mankind has a definite function to perform within this planetary organism of which it is an active part.
>
> In order to give a constructive meaning to the activities of human societies all over the globe, these activities—physical and mental—should be understood and given basic value with reference to the wholesome functioning of the entire Earth, and we may add of the entire solar system. This cannot be done (1) if man insists on considering himself an alien Soul compelled to incarnate on this sorrowful planet, and (2) if we can see in the planet, Earth, nothing but a mass of material substances moved by mechanical laws, and in "life" nothing but a chance combination of molecular aggregations.
>
> . . . As I see it, the Earth is only one organized "field" of activities—and so is the *human person*—but these activities take place at various levels, in different "spheres" of being and realms of consciousness. The lithosphere is not the biosphere, and the latter not the . . . ionosphere. The Earth is not *only* a material mass. Consciousness is not only "human"; it exists at animal and vegetable levels, and most likely must be latent, or operating in some form, in the molecule and the atom; and all these diverse and in a sense hierarchical modes of activity and consciousness should be seen integrated in and perhaps transcended by an all-encompassing and "eonic" planetary Consciousness.
>
> . . . .
>
> Mankind's function within the Earth-organism is to extract from the activities of all other operative systems within this organism the type of consciousness which we call "reflective" or "self"-consciousness—or, we may also say to *mentalize*

> and give meaning, value, and "name" to all that takes place anywhere within the Earth-field. . . .
>
> This "mentalization" process operates through what we call culture. To each region of, and living condition in the total field of the Earth-organism a definite type of culture inherently corresponds. Each region is the "womb" out of which a specific type of human mentality and culture can and sooner or later will emerge. All these cultures—past, present and future—and their complex interrelationships and interactions are the collective builders of the Mind of humanity; and this means of the *conscious Mind of the Earth*.[134]

As radical as such a consciousness may sound today, all the dominant changes we see about us point in its direction. Consider just the impact of space travel, of world-wide mass media, of increasing scientific discoveries about the interrelatedness of all life processes. Is it any wonder that the term "spaceship earth" has so captured the popular imagination? The problems we have to confront are increasingly the world-wide crises of a global organism: not pollution of a stream, but pollution of the atmosphere and of the ocean. Increasingly, the death that occupies each human's imagination is not his own, but that of the entire life cycle of the planet earth, to which each of us is as but a cell to a body.

To shift from such a lofty fancy as the planetarization of consciousness to the operation of our municipal legal system is to come down to earth hard. Before the forces that are at work, our highest court is but a frail and feeble—a distinctly human—institution. Yet, the Court may be at its best not in its work of handing down decrees, but at the very task that is called for: of summoning up from the human spirit the kindest and most generous and worthy ideas that abound there, giving them shape and reality and legitimacy.[135] Witness the School Desegregation Cases which, more importantly than to integrate the schools (assuming they did), awakened us to moral needs which, when made visible, could not be denied. And so here, too, in the case of the environment, the Supreme Court may find itself in a position to award "rights" in a way that will contribute to a change in popular consciousness. It would be a modest move, to be sure, but one in furtherance of a large goal: the future of the planet as we know it.

How far we are from such a state of affairs, where the law treats "environmental objects" as holders of legal rights, I cannot say. But there is certainly intriguing language in one of Justice Black's last dissents, regarding the Texas Highway Department's plan to run a six-lane expressway through a San Antonio Park. [136] Complaining of the Court's refusal to stay the plan, Black observed that "after today's decision, the people of San Antonio and the birds and animals that make their home in the park will share their quiet retreat with an ugly, smelly stream of traffic. . . . Trees, shrubs, and flowers will be mown down."[137] Elsewhere he speaks of the "burial of public parks," of segments of a highway which "devour parkland," and of the park's heartland.[138] Was he, at the end of his great career, on the verge of saying—just saying—that "nature has 'rights' on its own account"? Would it be so hard to do?

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1. C. DARWIN, DESCENT OF MAN 119, 120–21 (2d ed. 1874). *See also* R. WAELDER, PROGRESS AND REVOLUTION 39 *et seq.* (1967).

2. *See* DARWIN, *supra* note 1, at 113–14:

> . . . No tribe could hold together if murder, robbery, treachery, etc., were common; consequently such crimes within the limits of the same tribe "are branded with everlasting infamy"; but excite no such sentiment beyond these limits. A North-American Indian is well pleased with himself, and is honored by others, when he scalps a man of another tribe; and a Dyak cuts off the head of an unoffending person, and dries it as a trophy . . . It has been recorded that an Indian Thug conscientiously regretted that he had not robbed and strangled as many travelers as did his father before him. In a rude state of civilization the robbery of strangers is, indeed, generally considered as honorable.

See also Service, *Forms of Kinship* in MAN IN ADAPTATION 112 (Y. Cohen ed. 1968).

3. *See* DARWIN, *supra* note 1, at 113. *See also* E. WESTERMARCK, 1 THE ORIGIN AND DEVELOPMENT OF THE MORAL IDEAS 406–12 (1912).

The practice of allowing sickly children to die has not been entirely abandoned, apparently, even at our most distinguished hospitals. *See Hospital Let Retarded Baby Die, Film Shows*, L. A. Times, Oct. 17, 1971, § A, at 9, col. 1.

4. There does not appear to be a word "gericide" or "geronticide" to designate the killing of the aged. "Senicide" is as close as the Oxford English Dictionary comes, although, as it indicates, the word is rare. 9 OXFORD ENGLISH DICTIONARY 454 (1933).

5. *See* DARWIN, *supra* note 1, at 386–93. WESTERMARCK, *supra* note 3, at 387–89, observes that where the killing of the aged and infirm is practiced, it is often supported by humanitarian justification; this, however, is a far cry from saying that the killing is *requested* by the victim as his right.

6. H. MAINE, ANCIENT LAW 153 (Pollock ed. 1930). Maine claimed that these powers of the father extended to all regions of private law, although not to the Jus Publicum, under which a son, notwithstanding his subjection in private life, might vote alongside his father *Id.* at 152. WESTERMARCK, *supra* note 3, at 393–94, was skeptical that the arbitrary power of the father over the children extended as late as into early Roman law.

7. 387 U.S. 1 (1967).

8. 42 U.S.C. §§ 1973 *et seq.* (1970).

9. *See* Landman v. Royster, 40 U.S.L.W. 2256 (E.D. Va., Oct. 30, 1971) (eighth amendment and due process clause of the fourteenth amendment require federal injunctive relief, including compelling the drafting of new prison rules, for Virginia prisoners against prison conduct prohibited by vague rules or no rules, without disciplinary proceedings embodying rudiments of procedural due process, and by various penalties that constitute cruel and unusual punishment). *See* Note, *Courts, Corrections and the Eighth Amendment: Encouraging Prison Reform by Releasing Inmates*, 44 S. CAL. L. REV. 1060 (1971).

10. *But see* T. SZASZ, LAW, LIBERTY AND PSYCHIATRY (1963).

11. *See* notes 22, 52 and accompanying text *infra.* The trend toward liberalized abortion can be seen either as a legislative tendency back in the direction of rightlessness for the foetus—or toward increasing rights of women. This inconsistency is not unique in the law of course; it is simply support for Hohfeld's scheme that the "jural opposite" of someone's right is someone else's "no-right." W. HOHFELD, FUNDAMENTAL LEGAL CONCEPTIONS (1923).

Consider in this regard a New York case in which a settlor *S* established a trust on behalf of a number of named beneficiaries and "lives in being." Desiring to amend the deed of trust, the grantor took steps pursuant to statute to obtain "the written consent of all persons beneficially interested in [the] trust." At the time the grantor was pregnant and the trustee Chase Bank advised it would not recognize the proposed amendment because the child *en ventre sa mere* might be deemed a person beneficially interested in the trust. The court allowed the amendment to stand, holding that birth rather than conception is the controlling factor in ascertaining whether a person is beneficially interested in the trust which the grantor seeks to amend. *In re* Peabody, 5 N.Y.2d 541, 158 N.E.2d 841 (1959).

The California Supreme Court has recently refused to allow the deliberate killing of a foetus (in a non-abortion situation) to support a murder prosecution. The court ruled foetuses not to be denoted by the words "human being" within the statute defining murder. Keeler v. Superior Court, 2 Cal. 3d 619, 87 Cal. Rptr. 481, 470 P.2d 617 (1970). But see note 52 and accompanying text *infra.*

Some jurisdictions have statutes defining a crime of "feticide"—deliberately causing the death of an unborn child. The absence of such a specific feticide provision in the California case was one basis for the ruling in *Keeler*. *See* 2 Cal. 3d at 633 n.16, 87 Cal. Rptr. at 489 n.16, 470 P.2d at 625 n.16.

12. INT. REV. CODE of 1954, § 1361 (repealed by Pub. L. No. 89-389, effective Jan. 1, 1969).

13. For example, *see* United States v. Cargo of the Brig Malek Adhel, 43 U.S. (2 How.) 210 (1844). There, a ship had been seized and used by pirates. All this was done without the knowledge or consent of the owners of the ship. After the ship had been captured, the United States condemned and sold the "offending vessel." The owners objected. In denying release to the owners, Justice Story cited Chief Justice Marshall from an earlier case: "This is not a proceeding against the owner; it is a proceeding against the vessel for an offense committed by the vessel; which is not the less an offense . . . because it was committed without the authority and against the will of the owner." 43 U.S. at 234, quoting from United States v. Schooner Little Charles, 26 F. Cas. 979 (No. 15,612) (C.C.D. Va. 1818).

14. 9 U.S. (5 Cranch) 61, 86 (1809).

15. Trustees of Darmouth College v. Woodward, 17 U.S. (4 Wheat.) 518 (1819).

16. *Id.* at 636.

17. Consider, for example, that the claim of the United States to the naval station at Guantanamo Bay, at $2000-a-year rental, is based upon a treaty signed in 1903 by José Montes for the President of Cuba and a minister representing Theodore Roosevelt; it was subsequently ratified by two-thirds of a Senate no member of which is living today. Lease [from Cuba] of Certain Areas for Naval or Coaling Stations, July 2, 1903, T.S. No. 426; C. BEVANS, 6 TREATIES AND OTHER INTERNATIONAL AGREEMENTS OF THE UNITED STATES 1776–1949, at 1120 (U.S. Dep't of State Pub. 8549, 1971).

18. O. GIERKE, POLITICAL THEORIES OF THE MIDDLE AGE (Maitland transl. 1927), especially at 22–30. The reader may be tempted to suggest that the "corporate" examples in the text are distinguishable from environmental objects in that the former are comprised by and serve humans. On the contrary, I think that the more we learn about the sociology of the firm—and the realpolitik of our society—the more we discover the ultimate reality of these institutions, and the increasingly legal fictiveness of the individual human being. *See* note 125 and accompanying text *infra.*

19. Dred Scott v. Sandford, 60 U.S. (19 How.) 396, 404–05 (1856). In Bailey v. Poindexter's Ex'r, 56 Va. (14 Gratt.) 132, 142–43 (1858) a provision in a will that testator's slaves could choose between emancipation and public sale was held void on the ground that slaves have no legal capacity to choose:

> These decisions are legal conclusions flowing naturally and necessarily from the one clear, simple, fundamental idea of chattel slavery. That fundamental idea is, that, in the eye of the law, so far certainly as civil rights and relations are concerned, the slave is not a person, but a thing. The investiture of a chattel with civil rights or legal capacity is indeed a legal solecism and absurdity. The attribution of legal personality to a chattel slave,—legal conscience, legal intellect, legal freedom, or liberty and power of free choice and action, and corresponding legal obligations growing out of such qualities, faculties and action—implies a palpable contradiction in terms.

20. People v. Hall, 4 Cal. 399, 405 (1854). The statute there under interpretation provided that "no Black or Mulatto person, or Indian shall be allowed to give evidence in favor of, or against a white man," but was silent as to Chinese. The "policy" analysis by which the court brings Chinese under "Black . . . or Indian" is a fascinating illustration of the relationship between a "policy" decision and a "just" decision, especially in light of the exchange between Hart, *Positivism and the Separation of Law and Morals*, 71 HARV. L. REV. 593 (1958) and Fuller, *Positivism and Fidelity to Law—A Reply to Professor Hart, id.* at 630.

21. Schechter, *The Rightlessness of Mediaeval English Jewry*, 45 JEWISH Q. REV. 121, 135 (1954) quoting from M. BATESON, MEDIEVAL ENGLAND 139 (1904). Schechter also quotes Henry de

Bracton to the effect that "a Jew cannot have anything of his own, because whatever he acquires he acquires not for himself but for the king...." *Id.* at 128.

22. Dietrich v. Inhabitants of Northampton, 138 Mass. 14, 16 (1884).

23. *In re* Goddell, 39 Wisc. 232, 245 (1875). The court continued with the following "clincher":

> And when counsel was arguing for this lady that the word, person, in sec. 32. ch. 119 [respecting those qualified to practice law], necessarily includes females, her presence made it impossible to suggest to him as *reductio ad absurdum* of his position, that the same construction of the same word ... would subject woman to prosecution for the paternity of a bastard, and ... prosecution for rape.

Id. at 246.

The relationship between our attitudes toward woman, on the one hand, and, on the other, the more central concern of this article—land—is captured in an unguarded aside of our colleague, Curt Berger. "... after all, land, like woman, was meant to be possessed...." LAND OWNERSHIP AND USE 139 (1968).

23a. Recently, a group of prison inmates in Suffolk County tamed a mouse that they discovered, giving him the name Morris. Discovering Morris, a jailer flushed him down the toilet. The prisoners brought a proceeding against the Warden complaining, *inter alia*, that Morris was subjected to discriminatory discharge and was otherwise unequally treated. The action was unsuccessful, on grounds that the inmates themselves were "guilty of imprisoning Morris without a charge, without a trial, and without bail," and that other mice at the prison were not treated more favorably. "As to the true victim the Court can only offer again the sympathy first proffered to his ancestors by Robert Burns...." The Judge proceeded to quote from Burns' "To a Mouse." Morabito v. Cyrta, 9 CRIM. L. REP. 2472 (N.Y. Sup. Ct. Suffolk Co. Aug. 26, 1971).

The whole matter seems humorous, of course. But what we need to know more of is the function of humor in the unfolding of a culture, and the ways in which it is involved with the social growing pains to which it is testimony. Why do people make jokes about the Women's Liberation Movement? Is it not on account of—rather than in spite of—the underlying validity of the protests, and the uneasy awareness that a recognition of them is inevitable? A. Koestler rightly begins his study of the human mind, ACT OF CREATION (1964), with an analysis of humor, entitled "The Logic of Laughter." And *cf.* Freud, *Jokes and the Unconscious*, 8 STANDARD EDITION OF THE COMPLETE PSYCHOLOGICAL WORKS OF SIGMUND FREUD (J. Strachey transl. 1905). (Query too: what is the relationship between the conferring of proper *names, e.g.*, Morris, and the conferring of social and legal *rights?*)

24. Thus it was that the Founding Fathers could speak of the inalienable rights of all men, and yet maintain a society that was, by modern standards, without the most basic rights for Blacks, Indians, children and women. There was no hypocrisy; emotionally, no one *felt* that these other things were men.

25. The second thought streaming from ... the older South [is] the sincere and passionate belief that somewhere between men and cattle, God created a *tertium quid*, and called it a Negro—a clownish, simple creature, at times even lovable within its limitations, but straitly foreordained to walk within the Veil.

W. E. B. DUBOIS, THE SOULS OF BLACK FOLK 89 (1924).

26. In this article I essentially limit myself to a discussion of non-animal but natural objects. I trust that the reader will be able to discern where the analysis is appropriate to advancing our understanding of what would be involved in giving "rights" to other objects not presently endowed with rights—for example, not only animals (some of which already have rights in some senses) but also humanoids, computers, and so forth. *Cf.* the National Register for Historic Places, 16 U.S.C. § 470 (1970), discussed in Ely v. Velde, 321 F. Supp. 1088 (E.D. Va. 1971).

As the reader will discover, there are large problems involved in defining the boundaries of the "natural object." For example, from time to time one will wish to speak of that portion of a river that runs through a recognized jurisdiction; at other times, one may be concerned with the entire river, or the hydrologic cycle—or the whole of nature. One's ontological choices will have a strong influence on the shape of the legal system, and the choices involved are not easy. *See* notes 49, 73 and accompanying text *infra*.

On the other hand, the problems of selecting an appropriate ontology are problems of all language—not merely of the language of legal concepts, but of ordinary language as well. Consider, for example, the concept of a "person" in legal *or* in everyday speech. Is each *person* a fixed bundle of relationships, persisting unaltered through time? Do our molecules and cells not change at every moment? Our hypostatizations always have a pragmatic quality to them. *See* D. HUME, *Of Personal Identity*, in TREATISE OF HUMAN NATURE bk. 1, pt. IV, § VI, in THE PHILOSOPHICAL WORKS OF DAVID HUME 310–18, 324 (1854); T. MURTI, THE CENTRAL PHILOSOPHY OF BUDDHISM 70–73 (1955). In LOVES BODY 146–47 (1966) Norman O. Brown observes:

> The existence of the "let's pretend" boundary does not prevent the continuance of the real traffic across it. Projection and introjection, the process whereby the self as distinct from the other is constituted, is not past history, an event in childhood, but a present process of continuous creation. The dualism of self and external world is built up by a constant process of reciprocal exchange between the two. The self as a stable substance enduring through time, an identity, is maintained by constantly absorbing good parts (or people) from the outside world and expelling bad parts from the inner world. "There is a continual 'unconscious' wandering of other personalities into ourselves."
>
> Every person, then, is many persons; a multitude made into one person; a corporate body; incorporated, a corporation. A "corporation sole"; every man a parson-person. The unity of the person is as real, or unreal, as the unity of the corporation.

See generally, W. BISHIN & C. STONE, LAW, LANGUAGE AND ETHICS Ch. 5 (1972).

In different legal systems at different times, there have been many shifts in the entity deemed "responsible" for harmful acts: an entire clan was held responsible for a crime before the notion

of individual responsibility emerged; in some societies the offending hand, rather than an entire body, may be "responsible." Even today, we treat father and son as separate jural entities for some purposes, but as a single jural entity for others. I do not see why, in principle, the task of working out a legal ontology of natural objects (and "qualities." *e.g.*, climatic warmth) should be any more unmanageable. Perhaps someday all mankind shall be, for some purposes, one jurally recognized "natural object."

27. The statement in text is not quite true; *cf.* Murphy, *Has Nature Any Right to Life?*, 22 HAST. L.J. 467 (1971). An Irish court, passing upon the validity of a testamentary trust to the benefit of someone's dogs, observed in dictum that "'lives' means lives of human beings, not of animals or trees in California." Kelly v. Dillon, 1932 Ir. R. 255, 261. (The intended gift over on the death of the last surviving dog was held void for remoteness, the court refusing "to enter into the question of a dog's expectation of life," although prepared to observe that "in point of fact neighbor's [sic] dogs and cats are unpleasantly long-lived...." *Id.* at 260–61).

28. Four cases dealing with the Constitutionality of the death penalty under the eighth and fourteenth amendments are pending before the United States Supreme Court. Branch v. Texas, 447 S.W.2d 932 (Tex. 1969), *cert. granted*, 91 S. Ct. 2287 (1970); Aikens v. California, 70 Cal. 2d 369, 74 Cal. Rptr. 882, 450 P.2d 258 (1969). *cert. granted*, 91 S. Ct. 2280 (1970); Furman v. Georgia, 225 Ga. 253, 167 S.E.2d 628 (1969), *cert. granted*, 91 S. Ct. 2282 (1970); Jackson v. Georgia, 225 Ga. 790, 171 S.E.2d 501 (1969), *cert. granted*, 91 S. Ct. 2287 (1970).

29. *See* George Campbell Painting Corp. v. Reid, 392 U.S. 286 (1968); Oklahoma Press Pub. Co. v. Walling, 327 U.S. 186 (1946); Baltimore & O.R.R. v. ICC, 221 U.S. 612 (1911); Wilson v. United States, 221 U.S. 361 (1911); Hale v. Henkel, 201 U.S. 43 (1906).

30. *See* Dixon v. Alabama State Bd. of Educ., 294 F.2d 150 (5th Cir.), *cert. denied*, 368 U.S. 930 (1961).

31. For example, *see* People *ex rel.* Ricks Water Co. v. Elk River Mill & Lumber Co., 107 Cal. 221, 40 Pac. 531 (1895) (refusing to enjoin pollution by a upper riparian at the instance of the Attorney General on the grounds that the lower riparian owners, most of whom were dependent on the lumbering business of the polluting mill, did not complain).

32. The law in a suit for injunctive relief is commonly easier on the plaintiff than in a suit for damages. *See* J. GOULD, LAW OF WATERS § 206 (1883).

33. However, in 1970 California amended its Water Quality Act to make it easier for the Attorney General to obtain relief, *e.g.*, one must no longer allege irreparable injury in a suit for an injunction. CAL. WATER CODE § 13350(b) (West 1971).

34. To whomsoever the soil belongs, he owns also to the sky and to the depths. *See* W. BLACKSTONE, 2 COMMENTARIES *18.

At early common law, the owner of land could use all that was found under his land "at his free will and pleasure" without regard to any "inconvenience to his neighbour." Acton v. Blundell, 12 Meeson & Welsburg 324, 354, 152 Eng. Rep. 1223, 1235 (1843). "He [the landowner] may waste or despoil the land as he pleases...." R. MECARRY & H. WADE, THE LAW OF REAL PROPERTY 70 (3d ed. 1966). *See* R. POWELL, 5 THE LAW OF REAL PROPERTY 725 (1971).

35. *See* Note, *Statutory Treatment of Industrial Stream Pollution*, 24 GEO. WASH. L. REV. 302, 306 (1955); H. FARNHAM, 2 LAW OF WATERS AND WATER RIGHTS § 461 (1904); GOULD, *supra* note 32, at § 204.

36. For example, courts have upheld a right to pollute by prescription. Mississippi Mills Co. v. Smith, 69 Miss. 299, 11 So. 26 (1882), and by easement, Luama v. Bunker Hill & Sullivan Mining & Concentrating Co., 41 F.2d 358 (9th Cir. 1930).

37. *See* Red River Roller Mills v. Wright, 30 Minn. 249, 15 N.W. 167 (1883) (enjoyment of stream by riparian may be modified or abrogated by reasonable use of stream by others); Townsend v. Bell, 167 N.Y. 462, 60 N.E. 757 (1901) (riparian owner not entitled to maintain action for pollution of stream by factory where he could not show use of water was unreasonable); Smith v. Staso Milling Co., 18 F.2d 736 (2d Cir. 1927) (in suit for injunction, right on which injured lower riparian stands is a quantitative compromise between two conflicting interests); Clifton Iron Co. v. Dye, 87 Ala. 468, 6 So. 192 (1889) (in determining whether to grant injunction to lower riparian, court must weigh interest of public as against injury to one or the other party). *See also* Montgomery Limestone Co. v. Bearder, 256 Ala. 269, 54 So. 2d 571 (1951).

38. Pennsylvania Coal Co. v. Sanderson, 113 Pa. 126, 149, 6 A. 453, 459 (1886).

39. Hand, J. in Smith v. Staso Milling Co., 18 F.2d 736, 738 (2d Cir. 1927) (emphasis added). *See also* Harrisonville v. Dickey Clay Co., 289 U.S. 334 (1933) (Brandeis, J.).

40. Measuring plantiff's damages by "making him whole" has several limitations; these and the matter of measuring damages in this area generally are discussed more fully at notes 83–93 and accompanying text *infra.*

41. Here, again, an analogy to corporation law might be profitable. Suppose that in the instance of negligent corporate management by the directors, there were no institution of the stockholder derivative suit to force the directors to make *the corporation* whole, and the only actions provided for were direct actions by stockholders to collect for damages *to themselves qua* stockholders. Theoretically and practically, the damages might come out differently in the two cases, and not merely because the creditors' looses are not aggregated in the stockholders' direct actions.

42. And even far less than the damages to all human economic interests derivately through the stream; *see* text accompanying notes 83–84, 120 *infra.*

43. Smith v. Staso, 18 F.2d, 736, 738 (2d Cir. 1927).

44. Some of these public properties are subject to the "public trust doctrine," which, while ill-defined, might be developed in such fashion as to achieve fairly broad-ranging environmental protection. *See* Gould v. Greylock Reservation Comm'n, 350 Mass. 410, 215 N.E.2d 114 (1966), discussed in Sax, *The Public Trust Doctrine in Natural Resource Law: Effective Judicial Intervention*, 68 MICH. L. REV. 471, 492–509 (1970).

45. By contrast, for example, with humane societies.

46. *See, e.g.*, Cal. Prob. Code §§ 1460–62 (West Supp. 1971).

47. CAL PROB. CODE § 1751 (West Supp. 1971) provides for the appointment of a "conservator."

48. In New York the Supreme Court and county courts outside New York City have jurisdiction to appoint a committee of the person and/or a committee of the property for a person "incompetent to manage himself or his affairs." N.Y. MENTAL HYGIENE LAW § 100 (McKinney 1971).

49. This is a situation in which the ontological problems discussed in note 26 *supra* become acute. One can conceive a situation in which a guardian would be appointed by a county court with respect to a stream, bring a suit against alleged polluters, and lose. Suppose now that a federal court were to appoint a guardian with respect to the larger river system of which the stream were a part, and that the federally appointed guardian subsequently were to bring suit against the same defendants in state court, now on behalf of the river, rather than the stream. (Is it possible to bring a still subsequent suit, if the one above fails, on behalf of the entire hydrologic cycle, by a guardian appointed by an international court?)

While such problems are difficult, they are not impossible to solve. For one thing, pre-trial hearings and rights of intervention can go far toward their amelioration. Further, courts have been dealing with the matter of potentially inconsistent judgments for years, as when one state appears on the verge of handing down a divorce decree inconsistent with the judgment of another state's courts. Kempson v. Kempson, 58 N.J. Eg. 94, 43 A. 97 (Ch. Ct. 1899). Courts could, and of course would, retain some natural objects in the res nullius classification to help stave off the problem. Then, too, where (as is always the case) several "objects" are interrelated, several guardians could all be involved, with procedures for removal to the appropriate court—probably that of the guadian of the most encompassing "ward" to be acutely threatened. And in some cases subsequent suit by the guardian of more encompassing ward, not guilty of laches, might be appropriate. The problems are at least no more complex than the corresponding problems that the law has dealt with for years in the class action area.

50. CAL. PROB. CODE § 1460 (West Supp. 1971). The N.Y. MENTAL HYGIENE LAW (McKinney 1971) provides for jurisdiction "over the custody of a person and his property if he is incompetent to manage himself or his affairs by reason of age, drunkenness, mental illness or other cause. . . ."

51. Santa Clara County v. Southern Pac. R.R., 118 U.S. 394 (1886). Justice Black would have denied corporations the rights of "persons" under the fourteenth amendment. *See* Connecticut Gen. Life Ins. Co. v. Johnson, 303 U.S. 77, 87 (1938) (Black, J. dissenting): "Corporations have neither race nor color."

52. *In re* Byrn, L. A. Times, Dec. 5, 1971, § 1, at 16, col. 1. A preliminary injunction was subsequently granted, and defendant's cross-motion to vacate the guardianship was denied. Civ. 13113/71 (Sup. Ct. Queens Co., Jan. 4, 1972) (Smith, J.). Appeals are pending. Granting a guardianship in these circumstances would seem to be a more radical advance in the law than granting a guardianship over communal natural objects like lakes. In the former case there is a traditionally recognized guardian for the object—the mother—and her decision has been in favor of aborting the foetus.

53. The laws regarding the various communal resources had to develop along their own lines, not only because so many different persons' "rights" to consumption and usage were continually and contemporaneously involved, but also because no one had to bear the costs of his consumption of public resources in the way in which the owner of resources on private land has to bear the costs of what he does. For example, if the landowner strips his land of trees, and puts nothing in their stead, he confronts the costs of what he has done in the form of reduced value of his land: but the river polluter's actions are costless, so far as he is concerned—except insofar as the legal system can somehow force him to internalize them. The result has been that the private landowner's power over natural objects on his land is far less restrained by law (as opposed to economics) than his power over the public resources that he can get his hands on. If this state of affairs is to be changed, the standard for interceding in the interests of natural objects on traditionally recognized "private" land might well parallel the rules that guide courts in the matter of people's children whose upbringing (or lack thereof) poses social threat. The courts can, for example, make a child "dependent of the court" where the child's "home is an unfit place for him by reason of neglect, cruelty, or depravity of either of his parents. . . ." CAL. WELF. & INST. CODE § 600(b) (West 1966). *See also id* at § 601: any child "who from any cause is in danger of leading an idle, dissolute, lewd, or immoral life [may be adjudged] a ward of the court."

54. *See* note 53 *supra.* The present way of handling such problems on "private" property is to try to enact legislation of general application under the police power, *see* Pennsylvania Coal Co. v. Mahon, 260 U.S. 393 (1922), rather than to institute civil litigation which, though a piecemeal process, can be tailored to individual situations.

55. CAL. PROB. CODE § 1580 (West Supp. 1971) lists specific causes for which a guardian may, after notice and a hearing, be removed.

Despite these protections, the problem of overseeing the guardian is particularly acute where, as here, there are no immediately identifiable human beneficiaries whose self-interests will encourage them to keep a close watch on the guardian. To ameliorate this problem, a page might well be borrowed from the law of ordinary charitable trusts, which are commonly placed under the supervision of the Attorney General. *See* CAL. PROB. CODE §§ 9505, 10207 (West 1955).

56. *See* CAL. PROB. CODE § 1472, 1590 (West 1956 and Supp. 1971).

57. 354 F.2d 608 (2d Cir. 1965), *cert. denied*, Consolidated Edison Co. v. Scenic Hudson Preservation Conf., 384 U.S. 941 (1966).

58. 354 F.2d 608, 615 (2d Cir. 1965).

59. Act of Aug. 26, 1935, ch. 687, Title II, § 213, 49 Stat. 860 (*codified in* 16 U.S.C. § 8251(b) (1970).

60. 354 F.2d 608, 616 (2d Cir. 1965). The court might have felt that because the New York-New Jersey Trial Conference, one of the two conservation groups that organized Scenic Hudson, had some 17 miles of trailways in the area of Storm King Mountain, it therefore had sufficient economic interest to establish standing; Judge Hays' opinion does not seem to so rely, however.

61. Road Review League v. Boyd, 270 F. Supp. 650 (S.D.N.Y. 1967). Plaintiffs who included the Town of Bedford and the Road Review League, a non-profit association concerned with community problems, brought an action to review and set

aside a determination of the Federal Highway Administrator concerning the alignment of an interstate highway. Plaintiffs claimed that the proposed road would have an adverse effect upon local wildlife sanctuaries, pollute a local lake, and be inconsistent with local needs and planning. Plaintiffs relied upon the section of the Administrative Procedure Act, 5 U.S.C. § 702 (1970), which entitles persons "aggrieved by agency action within the meaning of a relevant statute" to obtain judicial review. The court held that plaintiffs had standing to obtain judicial review of proposed alignment of the road:

> I see no reason why the word "aggrieved" should have different meaning in the Administrative Procedure Act from the meaning given it under the Federal Power Act.... The "relevant statute," i.e., the Federal Highways Act, contains language which seems even stronger than that of the Federal Power Act, as far as local and conservation interests are concerned.

Id. at 661.

In Citizens Comm. for the Hudson Valley v. Volpe, 425 F.2d 97 (2d Cir. 1970), plaintiffs were held to have standing to challenge the construction of a dike and causeway adjacent to the Hudson Valley. The Sierra Club and the Village of Tarrytown based their challenge upon the provisions of the Rivers and Harbors Act of 1899. While the Rivers and Harbors Act does not provide for judicial review as does the Federal Power Act, the court stated that the plaintiffs were "aggrieved" under the Department of Transportation Act, the Hudson River Basin Compact Act, and a regulation under which the Corps of Engineers issued a permit, all of which contain broad provisions mentioning recreational and environmental resources and the need to preserve the same. Citing the *Road Review League* decision, the court held that as "aggrieved" parties under the Administrative Procedure Act, plaintiffs similarly had standing. Other decisions in which the court's grant of standing was based upon the Administrative Procedure Act include: West Virginia Highlands Conservancy v. Island Creek Coal Co., 441 F.2d 231 (4th Cir. 1971); Environmental Defense Fund, Inc. v. Hardin, 428 F.2d 1093 (D.C. Cir. 1970); Allen v. Hickel, 424 F.2d 944 (D.C. Cir. 1970); Brooks v. Volpe, 329 F. Supp. 118 (W.D. Wash. 1971); Delaware v. Pennsylvania N.Y. Cent. Transp. Co., 323 F. Supp. 487 (D. Del. 1971); Izaak Walton League of America v. St. Clair, 313 F. Supp. 1312 (D. Minn. 1970); Pennsylvania Environmental Council, Inc. v. Bartlett, 315 F. Supp. 238 (M.D. Pa. 1970).

62. Sierra Club v. Hickel, 433 F.2d 24 (9th Cir. 1970), *cert. granted sub nom*. Sierra Club v. Morton, 401 U.S. 907 (1971) (No. 70-34). The Sierra Club, a non-profit California corporation concerned with environmental protection, claimed that its interest in the conservation and sound management of natural parks would be adversely affected by an Interior permit allowing Walt Disney to construct the Mineral King Resort in Sequoia National Forest. The court held that because of the Sierra Club's failure to assert a direct legal interest, that organization lacked standing to sue. The court stated that the Sierra Club had claimed an interest only in the sense that the proposed course of action was displeasing to its members. The court purported to distinguish *Scenic Hudson* on the grounds that the plaintiff's claim of standing there was aided by the "aggrieved party" language of the Federal Power Act.

63. 16 U.S.C. §§ 791(a) *et seq.* (1970). *See* note 59 and accompanying text *supra.*

64. 5 U.S.C. §§ 551 *et seq.* (1970). Decisions relying upon 5 U.S.C. § 702 are listed in note 56 *supra.*

65. 7 U.S.C. §§ 135 *et seq.* (1970). Section 135b(d) affords a right of judicial review to anyone "adversely affected" by an order under the Act. *See* Environmental Defense Fund, Inc. v. Hardin, 428 F.2d 1093, 1096 (D.C. Cir. 1970).

66. 324 F. Supp. 412 (N.D., M.D. & S.D. Ala. 1970), *aff'd mem., sub nom.* Bass Anglers Sportsman Soc'y of America, Inc. v. Koppers Co., 447 F.2d 1304 (5th Cir. 1971).

67. Section 13 of Rivers and Harbors Appropriation Act of 1899.

68. 33 U.S.C. § 411 (1970) reads:

> Every person and every corporation that shall violate, or that shall knowingly aid, abet, authorize, or instigate a violation of the provisions of sections 407, 408, and 409 of the title shall ... be punished by a fine ... or by imprisonment ... in the discretion of the court, one-half of said fine to be paid to the person or persons giving information which shall lead to conviction.

69. This is from the latin, "who brings the action as well for the King as for himself," referring to an action brought by a citizen for the state as well as for himself.

70. These sections create a criminal liability. No civil action lies to enforce it; criminal statutes can only be enforced by the government. A qui tam action lies only when expressly or impliedly authorized by statute to enforce a penalty by civil action, not a criminal fine.

324 F. Supp. 412, 415–16 (ND., M.D. & S.D. Ala. 1970). Other *qui tam* actions brought by the Bass Angler Sportsman Society have been similarly unsuccessful. *See* Bass Anglers Sportsman Soc'y of America v. Scholze Tannery, 329 F. Supp. 339 (E.D. Tenn. 1971); Bass Anglers Sportsman's Soc'y of America v. United States Plywood-Champion Papers, Inc., 324 F. Supp. 302 (S.D. Tex. 1971).

71. Concern over an anticipated flood of litigation initiated by environmental organizations is evident in Judge Trask's opinion in Alameda Conservation Ass'n v. California, 437 F.2d 1087 (9th Cir.), *cert. denied*, Leslie Salt Co. v. Alameda Conservation Ass'n, 402 U.S. 908 (1971), where a non-profit corporation having as a primary purpose protection of the public's interest in San Francisco Bay was denied standing to seek an injunction prohibiting a land exchange that would allegedly destroy wildlife, fisheries and the Bay's unique flushing characteristics:

> Standing is not established by suit initiated by this association simply because it has as one of its purposes the protection of the "public interest" in the waters of the San Francisco Bay. However well intentioned the members may be, they may not by uniting create for themselves a super-administrative agency or a *parens patriae* official status with the capability of over-seeing and of challenging the action of the appointed and elected officials of the

> state government. Although recent decisions have considerably broadened the concept of standing, we do not find that they go this far. [Citation.]
>
> Were it otherwise the various clubs, political, economic and social now or yet to be organized, could wreak havoc with the administration of government, both federal and state. There are other forums where their voices and their views may be effectively presented, but to have standing to submit a "case or controversy" to a federal court, something more must be shown.

437 F.2d at 1090.

72. *See* note 49 *supra.*

73. Here, too, we are dogged by the ontological problem discussed in note 26 *supra.* It is easier to say that the smog-endangered stand of pines "wants" the smog stopped (assuming that to be a jurally significant entity) then it is to venture that the mountain, or the planet earth, or the cosmos, is concerned about whether the pines stand or fall. The more encompassing the entity of concern, the less certain we can be in venturing judgments as to the "wants" of any particular substance, quality, or species within the universe. Does the cosmos care if we humans persist or not? "Heaven and earth . . . regard all things as insignificant, as though they were playthings made of straw." LAO-TZU, TAO TEH KING 13 (D. Goddard transl. 1919).

74. *See* Knight v. United States Land Ass'n, 142 U.S. 161, 181 (1891).

75. Clause 2 gives Congress the power "to dispose of and make all needful Rules and Regulations respecting the Territory or other Property belonging to the United States."

76. *See* Flemming v. Nestor, 363 U.S. 603 (1960).

77. *See* the L. A. Times editorial *Water: Public vs. Polluters* criticizing:

> . . . the ridiculous built-in conflict of interests on Regional Water Quality Control Board. By law, five of the seven seats are given to spokesmen for industrial, governmental, agricultural or utility users. Only one representative of the public at large is authorized, along with a delegate from fish and game interests.

Feb. 12, 1969, Part II, at 8, cols. 1–2.

78. The Federal Refuse Act is over 70 years old. Refuse Act of 1899, 33 U.S.C. § 407 (1970).

79. *See* Hall, *Refuse Act of 1899 and the Permit Program*, 1 NAT'L RES. DEFENSE COUNCIL NEWSLETTER 1 (1971).

80. To be effective as a deterrent, the sanction ought to be high enough to bring about an internal reorganization of the corporate structure which minimizes the chances of future violations. Because the corporation is not necessarily a profit-maximizing "rationally economic man," there is no reason to believe that setting the fine as high as—but no higher than—anticipated profits from the violation of the law, will bring the illegal behavior to an end.

81. Udall v. FPC, 387 U.S. 428, 437 n.6 (1967). *See also* Holmes, J. in New Jersey v. New York, 283 U.S. 336, 342 (1931): "A river is more than an amenity, it is a treasure. It offers a necessity of life that must be rationed among those who have power over it."

82. To simplify the description, I am using here an ordinary language sense of causality, *i.e.*, assuming that the pollution causes harm to the river. As Professor Coase has pointed out in *The Problem of Social Cost*, 3 J. LAW & ECON. 1 (1960), harm-causing can be viewed as a reciprocal problem, *i.e.*, in the terms of the text, the mill wants to harm the river, and the river—if we assume it "wants" to maintain its present environmental quality—"wants" to harm the mill. Coase rightly points out that at least in theory (if we had the data) we ought to be comparing the alternative social product of different social arrangements, and not simply imposing full costs on the party who would popularly be identified as the harm-causer.

83. I am assuming that one of the considerations that goes into a judgment of "remoteness" is a desire to discourage burdensome amounts of petty litigation. This is one of the reasons why a court would be inclined to say—to use the example in the text—that the man who sells fishing tackle and bait has not been "proximately" injured by the polluter. Using proximate cause in this manner, the courts can protect themselves from a flood of litigation. But once the guardian were in court anyway, this consideration would not obtain as strongly, and courts might be more inclined to allow proof on the damages to remotely injured humans (although the proof itself is an added burden of sorts).

84. *Cf.* Golding, *Ethical Issues in Biological Engineering*, 15 U.C.L.A.L. REV. 443, 451–63 (1968).

85. Of course, in the instance of copyright and patent protection, the creation of the "property right" can be more directly justified on homocentric grounds.

86. *See* Schrag, *Life on a Dying Lake*, in THE POLITICS OF NEGLECT 167, at 173 (R. Meek & J. Straayer eds. 1971).

87. One ought to observe, too, that in terms of real effect on marginal welfare, the poor quite possibly will bear the brunt of the compromises. They may lack the wherewithal to get out to the countryside—and probably want an increase in material goods more acutely than those who now have riches.

88. On November 2, 1971, the Senate, by a vote of 86–0, passed and sent to the House the proposed Federal Water Pollution Control Act Amendments of 1971, 117 CONG. REC. S17464 (daily ed. Nov. 2, 1971). Sections 101(a) and (a)(1) of the bill declare it to be "national policy that, consistent with the provisions of this Act—(1) the discharge of pollutants into the navigable waters be eliminated by 1985." S.2770, 92d Cong., 1st Sess., 117 CONG. REC. S17464 (daily ed. Nov. 2, 1971).

89. 354 F.2d 608, 624 (2d Cir. 1965).

90. Again, there is a problem involving what we conceive to be the injured entity. *See* notes 26, 73 *supra.*

91. N.Y. Times, Jan. 14, 1971, § 1, col. 2, and at 74, col. 7.

92. Courts have not been reluctant to award damages for the destruction of heirlooms, literary manuscripts or other property having no ascertainable market value. In Willard v. Valley Gas Fuel Co., 171 Cal. 9, 151 Pac. 286 (1915), it was held that the measure of damages for the negligent destruction of a rare old book written by one of plaintiff's ancestors was the amount which would compensate the owner for all detriment including

sentimental loss proximately caused by such destruction. The court, at 171 Cal. 15, 151 Pac. 289, quoted approvingly from Southern Express Co. v. Owens, 146 Ala. 412, 426, 41 S. 752, 755 (1906):

> Ordinarily, where property has a market value that can be shown, such value is the criterion by which actual damages for its destruction or loss may be fixed. But it may be that property destroyed or lost has no market value. In such state of the case, while it may be that no rule which will be absolutely certain to do justice between the parties can be laid down, it does not follow from this, nor is it the law, that the plaintiff must be turned out of court with nominal damages merely. Where the article or thing is so unusual in its character that market value cannot be predicated of it, its value, or plaintiff's damages, must be ascertained in some other rational way and from such elements as are attainable.

Similarly, courts award damages in wrongful death actions despite the impossibility of precisely appraising the damages in such cases. In affirming a judgment in favor of the administrator of the estate of a child killed by defendant's automobile, the Oregon Supreme Court, in Lane v. Hatfield, 173 Or. 79, 88–89, 143 P.2d 230, 234 (1943), acknowledged the speculative nature of the measure of damages:

> No one knows or can know when, if at all, a seven year old girl will attain her majority, for her marriage may take place before she has become twenty-one years of age.... Moreover, there is much uncertainty with respect to the length of time anyone may live. A similar uncertainty veils the future of a minor's earning capacity or habit of saving. Illness or a non-fatal accident may reduce an otherwise valuable and lucrative life to a burden and liability.
>
> The rule, that the measure of recovery by a personal representative for the wrongful death of his decedent is the value of the life of such decedent, if he had not come to such an untimely end, has been termed vague, uncertain and speculative if not, conjectural. It is, however, the best that judicial wisdom has been able to formulate.

93. It is not easy to dismiss the idea of "lower" life having consciousness and feeling pain, especially since it is so difficult to know what these terms mean even as applied to humans. *See* Austin, *Other Minds*, in *Logic and Language* 342 (S. Flew ed. 1965); Schopenhauer, *On the Will in Nature*, in TWO ESSAYS BY ARTHUR SCHOPENHAUER 193, 281–304 (1889). Some experiments on plant sensitivity—of varying degrees of extravagance in their claims—include Lawrence, *Plants Have Feelings, Too* . . ., ORGANIC GARDENING & FARMING 64 (April 1971); Woodlief, Royster & Huang, *Effect of Random Noise on Plant Growth*, 46 J. ACOUSTICAL SOC. AM. 481 (1969); Backster, *Evidence of a Primary Perception in Plant Life*, 10 INT'L J. PARAPSYCHOLOGY 250 (1968).

94. *See* note 39 *supra*, and Coase, note 82 *supra*.

95. *See* FED. R. CIV. P. 23 and note 49 *supra.*

96. This is an ideal, of course—like the ideal that no human being ought to interfere with any other human being. *See* Dyke, *Freedom, Consent and the Costs of Interaction*, and Stone, *Comment*, in IS LAW DEAD? 134–67 (E. Rostow ed. 1971). Some damages would inevitably be *damnum absque injuria. See* note 93 *supra.*

97. The inevitability of some form of evolution is not inconsistent with the establishment of a legal system that attempts to interfere with or ameliorate the process: is the same not true of the human law we now have, *e.g.*, the laws against murder?

98. Holmes, *Early Forms of Liability*, in THE COMMON LAW (1881), discusses the liability of animals and inanimate objects in early Greek, early Roman and some later law. Alfred's Laws (A.D. 871–901) provided, for example, that a tree by which a man was killed should "be given to the kindred, and let them have it off the land within 30 nights." *Id.* at 19. In Edward I's time, if a man fell from a tree the tree was deodand. *Id.* at 24. Perhaps the liability of non-human matter is, in the history of things, part of a paranoid, defensive phase in man's development; as humans become more abundant, both from the point of material wealth and iternally, they may be willing to allow an advance to the stage where non-human matter has rights.

99. *See* note 26 *supra*. In the event that a person built his house near the edge of a river that flooded, would "assumption of the risk" be available on the river's behalf?

100. *See* Dixon v. Alabama State Bd. of Educ., 294 F.2d 150 (5th Cir.), *cert. denied*, 368 U.S. 930 (1961); Comment, *Private Government on the Campus—Judicial Review of University Expulsions*, 72 YALE L.J. 1362 (1963).

101. National Environmental Policy Act. 92 U.S.C. § 4332 (1970).

102. *See* Committee for Nuclear Responsibility Inc. v. Schlesinger, 40 U.S.L.W. 3214 (Nov. 5, 1971) (Douglas, J. dissent to denial of application for injunction in aid of jurisdiction).

103. 42 U.S.C. § 4342 (1970).

104. As an indication of what lower-level management is apt to do, *see* Ehrenreich & Ehrenreich, *Conscience of a Steel Worker*, 213 THE NATION 268 (1971). One steel company's "major concession [toward obedience to the 1899 Refuse Act, note 78 *supra*] was to order the workers to confine oil dumping to the night shift. 'During the day the Coast Guard patrols. But at night, the water's black, the oil's black; no one can tell.'" An effective corporation law would assure that the internal information channels within a corporation were capable of forcing such matters to the attention of high-level officials. Even then, there is no guarantee that the law will be obeyed—but we may have improved the odds.

105. In the case of Lake Erie, in addition to the considerations that follow in the text, there were possibly additional factors such as that no one polluter's acts could be characterized as inflicting irreparable injury.

106. *See* for example Justice Reed's opinion for the Court in Kovacs v. Cooper, 336 U.S. 77 (1949) (*but see* Mr. Justice Frankfurter's concurring opinion, 336 U.S. at 89–96), and United States v. Carolene Products, 304 U.S. 144, 152 n.4 (1938).

107. Note that in the discussion that follows I am referring to legislative apportionment, not voting proper.

108. In point of fact, there is no reason to suppose that an increase of Congressmen for Alaska would be a benefit to the environment; the reality of the political situation might just as likely result in the election of additional Congressmen with closer ties to oil companies and other developers.

109. *See* Simpson, *The Analysis of Legal Concepts*, 80 LAW Q. REV. 535 (1964).

110. Krier, *Environmental Litigation and the Burden of Proof*, in LAW AND THE ENVIRONMENT 105 (M. Baldwin & J. Page eds. 1970). *See* Texas East Trans. Corp. v. Wildlife Preserves, 48 N.J. 261, 225 A.2d 130 (1966). There, where a corporation set up to maintain a wildlife preserve resisted condemnation for the construction of plaintiff's pipe line, the court ruled that "... the *quantum* of proof required of this defendant to show arbitrariness against it would not be as substantial as that to be assumed by the ordinary property owner who devotes his land to conventional uses." 225 A.2d at 137.

111. See Stone, *Existential Humanism and the Law*, in EXISTENTIAL HUMANISTIC PSYCHOLOGY 151 (T. Greening ed. 1971).

112. National Environmental Policy Act, 42 U.S.C. §§ 4321–47 (1970).

113. *See* note 65 *supra.*

114. W. HOLDSWORTH, HISTORY OF ENGLISH LAW 45 (5th ed. 1931).

115. Note that it is in no small way the law that imposes this manner of speech on businessmen. *See* Dodge v. Ford Motor Co., 204 Mich. 459, 499–505, 170 N.W. 668, 682–83 (1919) (holding that Henry Ford, as dominant stockholder in Ford Motor Co., could not withhold dividends in the interests of operating the company "as a semi-elecmosynary institution and not as a business institution").

116. I. KANT, PHILOSOPHY OF LAW 195 (Hastle Transl. 1887).

117. I. KANT, *The Metaphysics of Morality*, in THE PHILOSOPHY OF KANT § 1 at 230–31 (J. Watson transl. 1908).

118. Engel, *Reasons, Morals and Philosophic Irony*, in LANGUAGE AND ILLUMINATION 60 (1969).

119. L. WITTGENSTEIN, TRACTATUS LOGICO-PHILOSOPHICUS §§ 6.421, 6.522 (D. Pears & B. McGuinness transl. 1961).

120. Cousteau, *The Oceans: No Time to Lose*, L.A. Times. Oct. 24, 1971, § (opinion), at 1, col. 4.

121. *See* J. HARTE & R. SOCOLOW, PATIENT EARTH (1971).

122. McHarg, *Values, Process and Form*, in THE FITNESS OF MAN'S ENVIRONMENT 213–14 (1968).

123. Murphy, *supra* note 27, at 477.

124. On the other hand, the statement in text, and the previous one of Professor Murphy, may be a bit severe. One could as easily claim that Christianity has had no influence on overt human behavior in light of the killings that have been carried out by professed Christians, often in its name. *Feng shui* has, on all accounts I am familiar with, influenced the development of land in China *See* Freedman, *Geomancy*, 1968 PROCEEDINGS OF THE ROYAL ANTHROPOLOGICAL INSTITUTE OF GREAT BRITAIN AND IRELAND 5; March, *An Appreciation of Chinese Geomancy*, 27 J. ASIAN STUDIES 253 (1968).

125. The legal system does the best it can to maintain the illusion of the reality of the individual human being. Consider, for example, how many constitutional cases, brought in the name of some handy individual, represent a power struggle between institutions—the NAACP and a school board, the Catholic Church and a school board, the ACLU and the Army, and so forth. Are the individual human plaintiffs the real moving causes of these cases—or an afterthought?

When we recognize that our problems are increasingly institutional, we would see that the solution, if there is one, must involve coming to grips with how the "corporate" (in the broadest sense) entity is directed, and we must alter our views of "property" in the fashion that is needed to regulate organizations successfully. For example, instead of ineffectual, after-the-fact criminal fines we should have more preventive in-plant inspections, notwithstanding the protests of "invasion of [corporate] privacy."

In-plant inspection of production facilities and records is presently allowed only in a narrow range of areas, *e.g.*, in federal law, under the Federal Food, Drug, and Cosmetic Act, 21 U.S.C. § 374 *et seq.* (1970), and provisions for meat inspection, 21 U.S.C. § 608 (1970). Similarly, under local building codes we do not wait for a building to collapse before authoritative sources inquire into the materials and procedures that are being used in the construction; inspectors typically come on site to check the progress at every critical stage. A sensible preventive legal system calls for extending the ambit of industries covered by comparable "privacy invading" systems of inspection.

126. G. HEGEL, HEGEL'S PHILOSOPHY OF RIGHT 41 (T. Knox transl. 1945).

127. C. MCCULLERS, THE BALLAD OF THE SAD CAFE AND OTHER STORIES 150–51 (1958).

128. Consider what Schopenhauer was writing "Of Women," about the time the Wisconsin Supreme Court was explaining why women were unfit to practice law, note 23 *supra:*

> You need only look at the way in which she is formed, to see that woman is not meant to undergo great labour, whether of the mind or of the body. She pays the debt of life not by what she does, but by what she suffers; by the pains of childbearing and care for the child, and by submission to her husband, to whom she should be a patient and cheering companion. The keenest sorrows and joys are not for her, nor is she called upon to display a great deal of strength. The current of her life should be more gentle, peaceful and trivial than man's, without being essentially happier or unhappier.
>
> Women are directly fitted for acting as the nurses and teachers of our early childhood by the fact that they are themselves childish, frivolous and short-sighted; in a word, they are big children all their life long—a kind of intermediate stage between the child and the full-grown man, who is man in the strict sense of the word. . . .
>
> However many disadvantages all this may involve, there is at least this to be said in its favour: that the woman lives more in the present than the man, and that, if the present is at all tolerable, she enjoys it more eagerly. This is the source of that cheerfulness

> which is peculiar to woman, fitting her to amuse man in his hours of recreation, and, in case of need, to console him when he is borne down by the weight of his cares.
>
> ...
>
> ... [I]t will be found that the fundamental fault of the female character is that it has *no sense of justice.* This is mainly due to the fact, already mentioned, that women are defective in the powers of reasoning and deliberation; but it is also traceable to the position which Nature has assigned to them as the weaker sex. They are dependent, not upon strength, but upon craft; and hence their instinctive capacity for cunning, and their ineradicable tendency to say what is not true. ***For as lions are provided with claws and teeth, and elephants and boars with tusks, bulls with horns, and the cuttle fish with its cloud of inky fluid, so Nature has equipped woman, for her defense and protection, with the arts of dissimulation; and all the power which Nature has conferred upon man in the shape of physical strength and reason, has been bestowed upon women in this form. Hence, dissimulation is innate in woman, and almost as much a quality of the stupid as of the clever.. . .

A. SCHOPENHAUER, *On Women*, in STUDIES IN PESSIMISM 105–10 (T. B. Saunders transl. 1893).

If a man should write such insensitive drivel today, we would suspect him of being morally and emotionally blind. Will the future judge us otherwise, for venting rather than examining the needs that impel us to treat the environment as a senseless object—to blast to pieces some small atoll to find out whether an atomic weapon works?

129. Of course, the phase one looks toward is a time in which such sentiments need not be prescribed *by law.*

130. The "Purpose of the Legislation" in H.R. Rep. No. 91-1651, 91st Cong., 2d Sess. to the "[Animal] Welfare Act of 1970," 3 U.S. CODE CONG. & ADMIN. NEWS 5103, 5104 (1970). Some of the West Publishing Co. typesetters may not be quite ready for this yet; they printed out the title as "Annual Welfare Act of 1970."

131. *See* MCCALL'S May, 1971, at 44.

132. Environmental Defense Fund, Inc. v. Hardin, 428 F.2d 1093, 1096 (D.C. Cir. 1970). Plaintiffs would thus seem to have urged a broader than literal reading of the statute, 7 U.S.C. § 135(z) (2) (d) (1970), which refers to "... living man and other vertebrate animals, vegetation, and useful invertebrate animals."

E.D.F. was joined as petitioners by the National Audubon Society, the Sierra Club, and the West Michigan Environmental Action Council, 428 F.2d at 1094–95 n.5.

133. In the case of the bestowal of rights on other humans, the action also helps the recipient to discover new personal depths and possibilities—new dignity—within himself. I do not want to make much of the possibility that this effect would be relevant in the case of bestowing rights on the environment. But I would not dismiss it out of hand, either. How, after all, do we judge that a man is, say, "flourishing with a new sense of pride and dignity?" What we mean by such statements, and the nature of the evidence upon which we rely in support of them, is quite complex. *See* Austin, note 93 *supra.* A tree treated in a "rightful" manner would respond in a manner that, when described, would sound much like the response of a person accorded "new dignity." *See also* note 93 *supra.*

134. D. RUDHYAR, DIRECTIVES FOR NEW LIFE 21–23 (1971).

135. *See* Stone, note 111 *supra*.

136. San Antonio Conservation Soc'y v. Texas Highway Dep't, *cert. denied*, 400 U.S. 968 (1970) (Black, J. dissenting to denial of certiorari).

137. *Id.* at 969.

138. *Id.* at 971.

IS THERE A NEED FOR A NEW, AN ENVIRONMENTAL, ETHIC?

SOURCE Sylvan (Routley), Richard. 2001 (1973). In *Environmental Philosophy,* 2nd edition, 17–25. Michael E. Zimmerman, J. Baird Callicott, et al. Saddle River, NJ: Prentice-Hall. Reprinted with permission of the author.

INTRODUCTION *Richard Sylvan (formerly Routley) (1935–1996) taught at the University of Sydney, University of New England, and Monash University. For twenty-five years he was a fellow in the Research School of Social Sciences at the Australian National University. "Is There a Need for a New, an Environmental, Ethic?" was originally published in the 1973* Proceedings of the XV World Congress of Philosophy. *Sylvan begins by questioning whether we need a new ethic regulating human interaction with the natural environment. The dominant ethical systems do address environmental concerns, but only in an unsatisfactory, anthropocentric manner. The question is, do we need to extend or modify our ethics to include the natural world, or create a new one? Sylvan identifies three approaches to the environment in prevailing Western ethics—dominance, stewardship, and cooperation. He argues that all three are inconsistent with an adequate environmental ethic, and thus that we need a new—a distinctly environmental—ethic. Sylvan demonstrates his point by identifying a core principle of Western ethical systems*—basic (human) chauvinism—*and shows how it is inconsistent with a true environmental ethic. He then provides a series of counter-examples to this principle, such as the famous* last man *example, which supposes a sole survivor of a major collapse who would be free, according to the dominant Western ethical paradigm, to exterminate all life around him. Sylvan argues that our intuition is that he would still be acting unethically to do so—thus pointing up the need for a new, an environmental ethic.*

1

It is increasingly said that civilization, Western civilization at least, stands in need of a new ethic (and derivatively of a new economics) setting out people's relations to the natural environment, in Leopold's words "an ethic dealing with man's relation to land and to the animals and plants which grow upon it."[1] It is not of course that old and prevailing ethics do not deal with man's relation to nature; they do, and on the prevailing view man is free to deal with nature as he pleases, i.e., his relations with nature, insofar at least as they do not affect others, are not subject to moral censure. Thus assertions such as "Crusoe ought not to be mutilating those trees" are significant and morally determinate but, inasmuch at least as Crusoe's actions do not interfere with others, they are false or do not hold—and trees are not, in a good sense, moral objects.[2] It is to this, to the values and evaluations of the prevailing ethics, that Leopold and others in fact take exception. Leopold regards as subject to moral criticism, as wrong, behaviour that on prevailing views is morally permissible. But it is not, as Leopold seems to think, that such behavior is beyond the scope of the prevailing ethics and that an extension of traditional morality is required to cover such cases, to fill a moral void. If Leopold is right in his criticism of prevailing conduct what is required is a change in the ethics, in attitudes, values and evaluations. For as matters stand, as he himself explains, men do not feel morally ashamed if they interfere with a wilderness, if they maltreat the land, extract from it whatever it will yield, and then move on; and such conduct is not taken to interfere with and does not rouse the moral indignation of others. "A farmer who clears the woods off a 75% slope, turns his cows into the clearing, and dumps its rainfall, rocks, and soil into the community creek, is still (if otherwise decent) a respected member of society."[3] Under what we shall call an *environmental ethic* such traditionally permissible conduct would be accounted morally wrong, and the farmer subject to proper moral criticism.

Let us grant such evaluations for the purpose of the argument. What is not so clear is that a new ethic is required even for such radical judgments. For one thing it is none too clear what is going to count as a new ethic, much as it is often unclear whether a new development in physics counts as a new physics or just as a modification or extension of the old. For, notoriously, ethics are not clearly articulated or at all well worked out, so that the application of identity criteria for ethics may remain obscure.[4] Furthermore we tend to cluster a family of ethical systems which do not differ on core or fundamental principles together as one ethic; e.g. the Christian ethic, which is an umbrella notion covering a cluster of differing and even competing systems. In fact then there are two other possibilities, apart from a new environmental ethic, which might cater for the evaluations, namely that of an extension or modification of the prevailing ethics or that of the development of principles that are already encompassed or latent within the prevailing ethic. The second possibility, that environmental evaluations can be incorporated within (and ecological problems solved within) the framework of prevailing Western ethics, is open because there isn't a single ethical system uniquely assumed in Western civilization: on many issues, and especially on controversial issues such as infanticide, women's rights, and drugs, there are competing sets of principles. Talk of a new ethic and prevailing ethics tends to suggest a sort of monolithic structure, a uniformity, that prevailing ethics, and even a single ethic, need not have.

Indeed Passmore has mapped out three important traditions in Western ethical views concerning man's relation to nature; a dominant tradition, the despotic position, with man as despot (or tyrant), and two lesser traditions, the stewardship position, with man as custodian, and the co-operative position with man as perfecter.[5] Nor are these the only traditions; primitivism is another, and both romanticism and mysticism have influenced Western views.

The dominant Western view is simply inconsistent with an environmental ethic; for according to it nature is the dominion of man and he is free to deal with it as he pleases (since—at least on the mainstream Stoic-Augustine view—it exists only for his sake), whereas on an environmental ethic man is not so free to do as he pleases. But it is not quite so obvious that an environmental ethic cannot be coupled with one of the lesser traditions. Part of the problem is that the lesser traditions are by no means adequately characterized anywhere, especially when the religious backdrop is removed, e.g. *who* is man steward for and responsible to? However both traditions are inconsistent with an environmental ethic because they imply policies of complete interference, whereas on an environmental ethic some worthwhile parts of the earth's surface should be preserved from substantial human interference, whether of the "improving" sort or not. Both traditions would in fact prefer to see the earth's land surfaces reshaped along the lines of the tame and comfortable north-European small farm and village landscape. According to the co-operative position man's proper role is to develop, cultivate and perfect nature—all nature eventually—by bringing out its potentialities, the test of perfection being primarily usefulness for human purposes; while on the stewardship view man's role, like that of a farm manager, is to make nature productive by his efforts though not by means that will deliberately degrade its resources. Although these positions both depart from the dominant position in a way which enables the incorporation of some evaluations of an environmental ethic, e.g. some of those concerning the

irresponsible farmer, they do not go far enough: for in the present situation of expanding populations confined to finite natural areas, they will lead to, and enjoin, the perfecting, farming and utilizing of all natural areas. Indeed these lesser traditions lead to, what a thoroughgoing environmental ethic would reject, a principle of total use, implying that every natural area should be cultivated or otherwise used for human ends, ''humanized.''[6]

As the important Western traditions exclude an environmental ethic, it would appear that such an ethic, not primitive, mystical or romantic, would be new all right. The matter is not so straightforward; for the dominant ethic has been substantially qualified by the rider that one is not always entitled to do as one pleases where this physically interferes with others. Maybe some such proviso was implicit all along (despite evidence to the contrary), and it was simply assumed that doing what one pleased with natural items would not affect others (the non-interference assumption). Be this as it may, the *modified* dominant position appears, at least for many thinkers, to have supplanted the dominant position; and the modified position can undoubtedly go much further towards an environmental ethic. For example, the farmer's polluting of a community stream may be ruled immoral on the grounds that it physically interferes with others who use or would use the streams. Likewise business enterprises which destroy the natural environment for no satisfactory returns or which cause pollution deleterious to the health of future humans, can be criticized on the sort of welfare basis (e.g. that of Barkley and Seckler) that blends with the modified position; and so on.[7] The position may even serve to restrict the sort of family size one is entitled to have since in a finite situation excessive population levels will interfere with future people. Nonetheless neither the modified dominant position nor its Western variants, obtained by combining it with the lesser traditions, is adequate as an environmental ethic, as I shall try to show. A new ethic is wanted.

2

As we noticed (an) *ethic* is ambiguous, as between a specific ethical system, a *specific* ethic, and a more generic notion, a super ethic, under which specific ethics cluster.[8] An ethical system S is, near enough, a propositional system (i.e. a structured set of propositions) or theory which includes (like individuals of a theory) a set of values and (like postulates of a theory) a set of general evaluative judgments concerning conduct, typically of what is obligatory, permissible and wrong, of what are rights, what is valued, and so forth. A general or lawlike proposition of a system is a principle; and certainly if systems S_1 and S_2 contain different principles, then they are different systems. It follows that any environmental ethic differs from the important traditional ethics outlined. Moreover if environmental ethics differ from Western ethical systems on some core principle embedded in Western systems, then these systems differ from the Western super ethic (assuming, what seems to be so, that it can be uniquely characterized)—in which case if an environmental ethic is needed then a new ethic is wanted. It suffices then to locate a core principle and to provide environmental counter examples to it.

It is commonly assumed that there are what amount to core principles of Western ethical systems, principles that will accordingly belong to the super ethic. The fairness principle inscribed in the Golden Rule provides one example. Directly relevant here, as a good stab at a core principle, is the commonly formulated liberal principle of the modified dominance position. A recent formulation runs as follows:

> ''The liberal philosophy of the Western world holds that one should be able to do what lie wishes, providing (1) that he does not harm others and (2) that he is not likely to harm himself irreparably.''[9]

Let us call this principle *basic (human) chauvinism*—because under it humans, or people, come first and everything else a bad last—though sometimes the principle is hailed as a *freedom* principle because it gives permission to perform a wide range of actions (including actions which mess up the environment and natural things) providing they do not harm others. In fact it tends to cunningly shift the onus of proof to others. It is worth remarking that *harming others* in the restriction is narrower than a restriction to the (usual) interests of others; it is not enough that it is in my interests, because I detest you, that you stop breathing; you are free to breathe, for the time being anyway, because it does not harm me. There remains a problem however as to exactly what counts as harm or interference. Moreover the width of the principle is so far obscure because ''other'' may be filled out in significantly different ways: it makes a difference to the extent, and privilege, of the chauvinism whether ''other'' expands to ''other human''—which is too restrictive—or to ''other person'' or to ''other sentient being''; and it makes a difference to the adequacy of the principle, and inversely to its economic applicability, to which class of others it is intended to apply, whether to future as well as to present others, whether to remote future others or only to non-discountable future others and whether to possible others. The latter would make the principle completely unworkable, and it is generally assumed that it applies at most to present and future others.

It is taken for granted in designing counter examples to basic chauvinist principles, that a semantic analysis of

permissibility and obligation statements stretches out over ideal situations (which may be incomplete or even inconsistent), so that what is permissible holds in some ideal situation, what is obligatory in every ideal situation, and what is wrong is excluded in every ideal situation. But the main point to grasp for the counter examples that follow, is that ethical principles if correct are universal and are assessed over the class of ideal situations.

> (i) The *last man* example. The last man (or person) surviving the collapse of the world system lays about him, eliminating, as far as he can, every living thing, animal or plant (but painlessly if you like, as at the best abattoirs). What he does is quite permissible according to basic chauvinism, but on environmental grounds what he does is wrong. Moreover one does not have to be committed to esoteric values to regard Mr. Last Man as behaving badly (the reason being perhaps that radical thinking and values have shifted in an environmental direction in advance of corresponding shifts in the formulation of fundamental evaluative principles).
>
> (ii) The *last people* example. The last man example can be broadened to the last people example. We can assume that they know they are the last people, e.g. because they are aware that radiation effects have blocked any chance of reproduction. One considers the last people in order to rule out the possibility that what these people do harms or somehow physically interferes with later people. Otherwise one could as well consider science fiction cases where people arrive at a new planet and destroy its ecosystems, whether with good intentions such as perfecting the planet for their ends and making it more fruitful or, forgetting the lesser traditions, just for the hell of it.

Let us assume that the last people are very numerous. They humanely exterminate every wild animal and they eliminate the fish of the seas, they put all arable land under intensive cultivation, and all remaining forests disappear in favour of quarries or plantations, and so on. They may give various familiar reasons for this, e.g. they believe it is the way to salvation or to perfection, or they are simply satisfying reasonable needs, or even that it is needed to keep the last people employed or occupied so that they do not worry too much about their impending extinction. On an environmental ethic the last people have behaved badly; they have simplified and largely destroyed all the natural ecosystems, and with their demise the world will soon be an ugly and largely wrecked place. But this conduct may conform with the basic chauvinist principle, and as well with the principles enjoined by the lesser traditions. Indeed the main point of elaborating this example is because, as the last man example reveals, basic chauvinism may conflict with stewardship or co-operation principles. The conflict may be removed it seems by conjoining a further proviso to the basic principle, the effect (3) that he does not willfully destroy natural resources. But as the last people do not destroy resources willfully, but perhaps "for the best of reasons," the variant is still environmentally inadequate.

> (iii) The *great entrepreneur* example. The last man example can be adjusted so as to not fall foul of clause (3). The last man is an industrialist; he runs a giant complex of automated factories and farms which he proceeds to extend. He produces automobiles among other things, from renewable and recyclable resources of course, only he dumps and recycles these shortly after manufacture and sale to a dummy buyer instead of putting them on the road for a short time as we do. Of course he has the best of reasons for his activity, e.g. he is increasing gross world product, or he is improving output to fulfill some plan, and he will be increasing his own and general welfare since he much prefers increased output and productivity. The entrepreneur's behavior is on the Western ethic quite permissible; indeed his conduct is commonly thought to be quite fine and may even meet Pareto optimality requirements given prevailing notions of being "better off."

Just as we can extend the last man example to a class of last people, so we can extend this example to the *industrial society* example: the society looks rather like ours.

> (iv) The *vanishing species* example. Consider the blue whale, a mixed good on the economic picture. The blue whale is on the verge of extinction because of his qualities as a private good, as a source of valuable oil and meat. The catching and marketing of blue whales does not harm the whalers; it does not harm or physically interfere with others in any good sense, though it may upset them and they may be prepared to compensate the whalers if they desist; nor need whale hunting be willful destruction. (Slightly different examples which eliminate the hunting aspect of the blue whale example are provided by cases where a species is eliminated or threatened through destruction of its habitat by man's activity or the activities of animals he has introduced, e.g. many plains-dwelling Australian marsupials and the Arabian oryx.) The behavior of the whalers in eliminating this magnificent species of whale is accordingly quite permissible—at least according to basic chauvinism. But on an environmental ethic it is not. However, the free-market mechanism will not cease allocating whales to commercial uses, as a satisfactory environmental economics would; instead the market model will grind inexorably along the private demand curve until the blue whale population is no longer viable—if that point has not already been passed.[10]

In sum, the class of permissible actions that rebound on the environment is more narrowly circumscribed on an environmental ethic than it is in the Western super ethic. But aren't environmentalists going too far in claiming that these people, those of the examples and respected industrialists, fishermen and farmers are behaving, when engaging in environmentally degrading activities of the sort described, in a morally impermissible way? No, what these people do is to a greater or lesser extent evil, and hence in serious cases morally impermissible. For example, insofar as the killing or forced displacement of primitive peoples who stand in the way of an industrial development is morally indefensible and impermissible, so also is the slaughter of the last remaining blue whales for private profit. But how to reformulate basic chauvinism as a satisfactory freedom principle is a more difficult matter. A tentative, but none too adequate beginning might be made by extending (2) to include harm to or interference with others who would be so affected by the action in question were they placed in the environment and (3) to exclude speciecide. It may be preferable, in view of the way the freedom principle sets the onus of proof, simply to scrap it altogether, and instead to specify classes of rights and permissible conduct, as in a bill of rights.

3

A radical change in a theory sometimes forces changes in the meta-theory; e.g. a logic which rejects the Reference Theory in a thoroughgoing way requires a modification of the usual meta-theory which also accepts the Reference Theory and indeed which is tailored to cater only for logics which do conform. A somewhat similar phenomenon seems to occur in the case of a meta-ethic adequate for an environmental ethic. Quite apart from introducing several environmentally important notions, such as *conservation, pollution, growth* and *preservation*, for meta-ethical analysis, an environmental ethic compels re-examination and modified analyses of such characteristic actions as *natural right, ground* of right, and of the relations of obligation and permissibility to rights; it may well require re-assessment of traditional analyses of such notions as *value* and *right*, especially where these are based on chauvinist assumptions; and it forces the rejection of many of the more prominent meta-ethical positions. These points are illustrated by a very brief examination of accounts of *natural right* and then by a sketch of the species bias of some major positions.[11]

Hart accepts, subject to defeating conditions which are here irrelevant, the classical doctrine of natural rights according to which, among other things, "any adult human ... capable of choice is at liberty to do (i.e. is under no obligation to abstain from) any action which is not one coercing or restraining or designed to injure other persons."[12] But this sufficient condition for a human natural right depends on accepting the very human chauvinist principle an environmental ethic rejects, since if a person has a natural right he has a right; so too the *definition* of a natural right adopted by classical theorists and accepted with minor qualifications by Hart presupposes the same defective principle. Accordingly an environmental ethic would have to amend the classical notion of a natural right, a far from straightforward matter now that human rights with respect to animals and the natural environment are, like those with respect to slaves not all that long ago, undergoing major re-evaluation.

An environmental ethic does not commit one to the view that natural objects such as trees have rights (though such a view is occasionally held, e.g. by pantheists. But pantheism is false since artefacts are not alive). For moral prohibitions forbidding certain actions with respect to an object do not award that object a correlative right. That it would be wrong to mutilate a given tree or piece of property does not entail that the tree or piece of property has a correlative right not to be mutilated (without seriously stretching the notion of a right). Environmental views can stick with mainstream theses according to which rights are coupled with corresponding responsibilities and so with bearing obligations, and with corresponding interests and concern; i.e. at least, whatever has a right also has responsibilities and therefore obligations, and whatever has a right has interests. Thus although any person may have a right by no means every living thing can (significantly) have rights, and arguably most sentient objects other than persons cannot have rights. But persons can relate morally, through obligations, prohibitions and so forth, to practically anything at all.

The species bias of certain ethical and economic positions which aim to make principles of conduct or reasonable economic behavior calculable is easily brought out. These positions typically employ a single criterion p, such as preference or happiness, as a *summum bonnum*; characteristically each individual of some base class, almost always humans, but perhaps including future humans, is supposed to have an ordinal p ranking of the states in question (e.g. of affairs, of the economy); then some principle is supplied to determine a collective p ranking of these states in terms of individual p rankings, and what is best or ought to be done is determined either directly, as in act-utilitarianism under the Greatest Happiness principle, or indirectly, as in rule-utilitarianism, in terms of some optimization principle applied to the collective ranking. The species bias is transparent from the selection of the base class. And even if the base class is extended to embrace persons, or even some animals (at the cost, like that of including remotely future humans,

of losing testability), the positions are open to familiar criticism, namely that the whole of the base class may be prejudiced in a way which leads to unjust principles. For example if every member of the base class detests dingoes, on the basis of mistaken data as to dingoes' behavior, then by the Pareto ranking test the collective ranking will rank states where dingoes are exterminated very highly, from which it will generally be concluded that dingoes ought to be exterminated (the evaluation of most Australian farmers anyway). Likewise it would just be a happy accident, it seems, if collective demand (horizontally ed from individual demand) for a state of the economy with blue whales as a mixed good, were to succeed in outweighing private whaling demands; for if no one in the base class happened to know that blue whales exist or cared a jot that thesummy do then "rational" economic decision-making would do nothing to prevent their extinction. Whether the blue whale survives should not have to depend on what humans know or what they see on television. Human interests and preferences are far too parochial to provide a satisfactory basis for deciding on what is environmentally desirable.

These ethical and economic theories are not alone in their species chauvinism; much the same applies to most going meta-ethical theories which, unlike intuitionistic theories, try to offer some rationale for their basic principles. For instance, on social contract positions obligations are a matter of mutual agreements between individuals of the base class; on a social justice picture rights and obligations spring from the application of symmetrical fairness principles to members of the base class, usually a rather special class of persons, while on a Kantian position which has some vague obligations somehow arise from respect for members of the base class persons. In each case if members of the base class happen to be ill-disposed to items outside the base class then that is too bad for them: that is (rough) justice.

NOTES

1. Aldo Leopold, *A Sand County Almanac with Essays on Conservation from Round River* (New York: Ballantine, 1966), p. 238.

2. A view occasionally tempered by the idea that trees house spirits.

3. Leopold, *Sand County*, p. 245.

4. To the consternation no doubt of Quineans. But the fact is that we can talk perfectly well about inchoate and fragmentary systems the identity of which may be indeterminate.

5. John Passmore, *Man's Responsibility for Nature: Ecological Problems and Western Traditions* (New York: Scribner's, 1974).

6. If "use" is extended, somewhat illicitly, to include use for preservation, this total use principle is rendered innocuous at least as regards its actual effects. Note that the total use principle is tied to the resource view of nature.

7. P. W. Barkley and D. W. Seckler, *Economic Growth and Environmental Decay: The Solution Becomes the Problem* (New York: Harcourt, Brace, Jovanovich, 1972).

8. A *meta-ethic* is, as usual, a theory about ethics, super ethics, their features and fundamental notions.

9. Barkley and Seckler, *Economic Growth and Environmental Decay*, p. 58. A related principle is that (modified) free enterprise can operate within similar limits.

10. For the tragedy of the commons type reasons well explained in Barkley and Seckler, *Economic Growth and Environmental Decay.*

11. Some of these points are developed by those protesting about human maltreatment of animals; see especially the essays collected in S. and R. Godlovitch and J. Harris, eds., *Animals, Men and Morals: An Enquiry into the Maltreatment of Non-humans* (New York: Grove Press, 1971).

12. H. L. A. Hart, "Are There any Natural Rights?" reprinted in A. Quinton, ed., *Political Philosophy* (London: Oxford University Press, 1967).

THE SHALLOW AND THE DEEP

SOURCE Naess, Arne. 1973. *Inquiry Magazine (Oslo)* 16: 95–100. Reproduced by permission of the author.

INTRODUCTION *Arne Naess (1912–) was for thirty years professor of philosophy at the University of Olso. He continues to practice philosophy and environmental activism from his home in Norway. Naess is generally considered to be the founder of Deep Ecology. In "The Shallow and the Deep," Naess claims there are two movements in ecology: the shallow ecology movement, which focuses on environmental concerns such as pollution solely in regards to their impact on human welfare, particularly humans in developed countries; and the deep ecology movement, which includes concerns about pollution, but only as one of seven points, with six others to be considered, according to Naess' summary. He makes the further claim that an "ethics of responsibility" requires that environmentalists join the deep ecological movement, not the shallow. These principles of Deep Ecology are suggested by ecology, says Naess, but not derived from ecology; they are philosophical principles, or rather, as Naess says, they are "ecophilosophical." Naess states that these principles provide the framework for the creation of an "ecosophical" worldview.*

The emergence of ecologists from their former relative obscurity marks a turning point in our scientific communities. But their message is twisted and misused. A shallow, but presently rather powerful movement, and a deep, but less influential movement, compete for our attention. I shall make an effort to characterize the two.

I. THE SHALLOW ECOLOGY MOVEMENT:

Fight against pollution and resource depletion.

Central objective: the health and affluence of people in the developed countries.

II. THE DEEP ECOLOGY MOVEMENT:

1. Rejection of the man-in-environment image in favor the relational, total-field image. Organisms as knots in the biospherical net or field of intrinsic relations. An intrinsic relation between two things A and B is such that the relation belongs to the definitions of basic constitutions of A and B, so that without the relation, A and B are no longer the same things. The total-field dissolves not on the man-in-environment concept, but every compact thing-in-milieu concept-except when talking at a superficial or preliminary level of communication.

2. Biospherical egalitarianism-in principle. The ''in principle'' clause is inserted because any realistic praxis necessitates some killing, exploitation, and suppression. The ecological field-worker acquires a deep-seated respect, or even veneration, for ways and forms of life. He reaches an understanding from within, a kind of understanding that others reserve for fellow men and for a narrow section of ways and forms of life. To the ecological field-worker, the equal right to live and blossom is an intuitively clear and obvious value axiom. Its restriction to humans is an anthropocentrism with detrimental effects upon the life quality of humans themselves. The quality depends in part upon the deep pleasure and satisfaction we receive from close partnership with other forms of life. The attempt to ignore our dependence and to establish a master-slave role has contributed to the alienation of man from himself. Ecological egalitarianism implies the reinterpretation of the future-research variable, ''level of crowding,'' so that general mammalian crowding and loss of life-equality is taken seriously, not only human crowding. (Research on the high requirements of free space of certain mammals has, incidentally, suggested that theorists of human urbanism have largely underestimated human life-space requirements. Behavioral crowding symptoms, such as neuroses, aggressiveness, loss of traditions, are largely the same among mammals.)

3. Principles of diversity and of symbiosis. Diversity enhances the potentialities of survival, the chances of new modes of life, the richness of forms. And the so-called struggle for life, and survival of the fittest, should be interpreted in the sense of the ability to coexist and cooperate in complex relationships, rather than the ability to kill, exploit, and suppress. ''Live and let live'' is a more powerful ecological principle than ''Either you or me.'' The latter tends to reduce the multiplicity of kinds of forms of life, and also to create destruction within the communities of the same species. Ecologically inspired attitudes therefore favor diversity of human ways of life, of cultures, of occupations, of economies. They support the fight against economic and cultural, as much as military, invasion and domination, and they are opposed to the annihilation of seals and whales as much as to that of human tribes and cultures.

4. Anti-class posture. Diversity of human ways of life is in part due to (intended or unintended) exploitation and suppression on the part of certain groups. The exploiter lives differently from the exploited, but both are adversely affected in their potentialities of self-realization. The principle of diversity does not cover differences due merely to certain attitudes or behaviors forcibly blocked or restrained. The principles of ecological egalitarianism and of symbiosis support the same anti-class posture. The ecological attitude favors the extension of all three principles to any group conflicts, including those of today between developing and developed nations. The three principles also favor extreme caution toward any over-all plans for the future, except those consistent with wide and widening classless diversity.

5. Fight against pollution and resource depletion. In this fight ecologists have found powerful supporters, but sometimes to the detriment of their total stand. This happens when attention is focused on pollution and resource depletion rather than on the other points, or when projects are implemented which reduce pollution but increase evils of other kinds. Thus, if prices of life necessities increase because of the installation of anti-pollution devices, class differences increase too. An ethics of responsibility implies that ecologists do not serve the shallow, but the deep ecological movement. That is, not only point five, but all seven points must be considered together.

Ecologists are irreplaceable informants in any society, whatever their political color. If well organized, they have the power to reject jobs in which they submit themselves to institutions or to planners with limited ecological objectives. As it is now, ecologists sometimes serve masters who deliberately ignore the wider perspectives.

6. Complexity, not complication. The theory of ecosystems contains an important distinction between what is complicated without any Gestalt or unifying principles—we may think of finding our way through a chaotic city—and what is complex. A multiplicity of more or less lawful, interacting factors may operate together to form a unity, a system. We make a shoe or use a map or integrate a variety of activities into a workaday pattern. Organisms, ways of life, and interactions in the biosphere in general, exhibit complexity of such an astoundingly high level as to color the general outlook of ecologists. Such complexity makes thinking in terms of vast systems inevitable. It also makes for a keen, steady perception of the profound human

ignorance of biospherical relationships and therefore of the effect of disturbances.

Applied to humans, the complexity-not-complication principle favors division of labor, not fragmentation of labor. It favors integrated actions in which the whole person is active, not mere reactions. It favors complex economies, an integrated variety of means of living. (Combinations of industrial and agricultural activity, of intellectual and manual work, of specialized and nonspecialized occupations, of urban and non-urban activity, of work in city and recreation in nature with recreation in city and work in nature. . .)

It favors soft technique and "soft future-research," less prognosis, more clarification of possibilities. More sensitivity toward continuity and live traditions, and more importantly, towards our state of ignorance.

The implementation of ecologically responsible policies requires in this century an exponential growth of technical skill and invention—but in new directions, directions which today are not consistently and liberally supported by the research policy organs of our nation states.

7. Local autonomy and decentralization. The vulnerability of a form of life is roughly proportional to the weight of influences from afar, from outside the local region in which that form has obtained an ecological equilibrium. This lends support to our efforts to strengthen local self-government and material and mental self-sufficiency. But these efforts presuppose an impetus towards decentralization. Pollution problems, including those of thermal pollution and recirculation of materials, also lead us in this direction, because increased local autonomy, if we are able to keep other factors constant, reduces energy consumption. (Compare an approximately self-sufficient locality with one requiring the importation of foodstuff, materials for house construction, fuel and skilled labor from other continents. The former may use only five percent of the energy used by the latter.)

Local autonomy is strengthened by a reduction in the number of links in the hierarchical chains of decision. (For example a chain consisting of a local board, municipal council, highest sub-national decision-maker, a state-wide institution in a state federation, a federal national government institution, a coalition of nations, and of institutions, e.g., E. E. C. top levels, and a global institution, can be reduced to one made up of a local board, nation-wide institution, and global institution.) Even if a decision follows majority rule at each step, many local interests may be dropped along the line, if it is too long.

Summing up then, it should, first of all, be borne in mind that the norms and tendencies of the Deep Ecology movement are not derived from ecology by logic or induction. Ecological knowledge and the life style of the ecological field-worker have suggested, inspired, and fortified the perspectives of the Deep Ecology movement. Many of the formulations in the above seven-point survey are rather vague generalizations, only tenable if made more precise in certain directions. But all over the world the inspiration from ecology has shown remarkable convergences. The survey does not pretend to be more than one of the possible condensed codifications of these convergences.

Secondly, it should be fully appreciated that the significant tenets of the Deep Ecology movement are clearly and forcefully normative. They express a value priority system only in part based on results (or lack of results, cf. point six) of scientific research. Today, ecologists try to influence policy-making bodies largely through threats, through predictions concerning pollutants and resource depletion, knowing that policy-makers accept at least certain minimum norms concerning health. But it is clear that there is a vast number of people in all countries, and even a considerable number of people in power, who accept as valid the wider norms and values characteristic of the Deep Ecology movement. There are political potentials in this movement which should not be overlooked and which have little to do with pollution and resource depletion. In plotting possible futures, the norms should be freely used and elaborated. Thirdly, insofar as ecology movements deserve our attention, they are ecophilosophical rather than ecological. Ecology is a limited science which makes use of scientific methods. Philosophy is the most general forum of debate on fundamentals, descriptive as well as prescriptive, and political philosophy is one of its subsections. By an ecosophy I mean a philosophy of ecological harmony or equilibrium. A philosophy is a kind of sophia wisdom, is openly normative, it contains both norms, rules, postulates, value priority announcements and hypotheses concerning the state of affairs in our universe. Wisdom is policy wisdom, prescription, not only scientific description and prediction.

The details of an ecosophy will show many variations due to significant differences concerning not only "facts" of pollution, resources, population, etc., but also value priorities. Today, however, the seven points listed provide one unified framework for ecosophical systems.

In general systems theory, systems are mostly conceived in terms of causally or functionally interacting or interrelated items. An ecosophy, however, is more like a system of the kind constructed by Aristotle or Spinoza. It is expressed verbally as a set of sentences with a variety of functions, descriptive and prescriptive. The basic relation is that between subsets of premises and subsets of conclusions, that is, the relation of derivability. The relevant notions of derivability may be classed according to rigor, with logical and mathematical deductions topping the list, but also according to how much is implicitly taken for granted. An

exposition of an ecosophy must necessarily be only moderately precise considering the vast scope of relevant ecological and normative (social, political, ethical) material. At the moment, ecosophy might profitably use models of systems, rough approximations of global systematizations. It is the global character, not preciseness in detail, which distinguishes an ecosophy. It articulates and integrates the efforts of an ideal ecological team, a team comprising not only scientists from an extreme variety of disciplines, but also students of politics and active policy-makers.

Under the name of ecologism, various deviations from the deep movement have been championed-primarily with a one-sided stress on pollution and resource depletion, but also with a neglect of the great differences between underand over-developed countries in favor of a vague global approach. The global approach is essential, but regional differences must largely determine policies in the coming years.

IS THERE AN ECOLOGICAL ETHIC?

SOURCE Rolston III, Holmes. 1975. *Ethics* 85(2): 93–109. Reproduced with permission.

INTRODUCTION *Holmes Rolston III (1932–) taught philosophy for nearly fifty years at Colorado State University, retiring in 2008 as University Distinguished Professor. His writings have been central to the development of environmental ethics. In "Is There an Ecological Ethic?" Rolston questions first whether an ecological ethic would only be* about *the environment, or whether it would rather be formed* by *the environment, that is, by ecology. Interested in this relationship between science and morality, facts and values, Rolston states that traditionally facts fall under the domain of the sciences while values fall under ethics; but in the case of an environmental ethic, such distinctions prove complex if not artificial. Rolston distinguishes between two possible types of an environmental ethic. The first he claims is primarily anthropological and only secondarily ecological, in that humans become interested in an ecological ethic for the purpose of protecting their own interests and only secondarily the interests of nature. The second blurs these distinctions uniting the ultimate good on humanity* and *the environment in the realization that maximizing the one is the same as maximizing the other. In the latter sense, which is primarily ecological, humanity may construct value, but only in obedience to ecosystemic principles; we do not derive, but rather we discover, moral imperatives in nature. Facts and values are found simultaneously existing in nature.*

THE EARTH CHARTER

SOURCE 2000. *Earth Charter Commission, 2000.* Reprinted with the permission of Earth Charter International Secretariat.

INTRODUCTION *The origins of the Earth Charter lie in the 1987 World Commission on Environment and Development's call for a new set of principles to encourage and guide sustainable development. From that point until its completion and launch in 2000, it was developed and supported by a diverse group of individuals and institutions. The charter claims that humanity is at a critical point in its history and is in need of fundamental changes to our "values, institutions, and ways of living." It attempts to outline a code of ethics to guide us into a future just and sustainable world. The Earth Charter consists of a total of sixteen principles, organized under the four headings of Respect and Care for the Community of Life; Ecological Integrity; Social and Economic Justice; and Democracy, Nonviolence, and Peace. It claims that these principles are interdependent, and that the global community must realize its own internal interdependence with the planet. The Earth Charter expresses the hope that it will serve as a foundation for a "new beginning," inspiring new policies toward the achievement of a "sustainable global society founded on respect for nature, universal human rights, economic justice, and a culture of peace."*

PREAMBLE

We stand at a critical moment in Earth's history, a time when humanity must choose its future. As the world becomes increasingly interdependent and fragile, the future at once holds great peril and great promise. To move forward we must recognize that in the midst of a magnificent diversity of cultures and life forms we are one human family and one Earth community with a common destiny. We must join together to bring forth a sustainable global society founded on respect for nature, universal human rights, economic justice, and a culture of peace. Towards this end, it is imperative that we, the peoples of Earth, declare our responsibility to one another, to the greater community of life, and to future generations.

Earth, Our Home

Humanity is part of a vast evolving universe. Earth, our home, is alive with a unique community of life. The forces of nature make existence a demanding and uncertain adventure, but Earth has provided the conditions essential to life's evolution. The resilience of the community of life and the

well-being of humanity depend upon preserving a healthy biosphere with all its ecological systems, a rich variety of plants and animals, fertile soils, pure waters, and clean air. The global environment with its finite resources is a common concern of all peoples. The protection of Earth's vitality, diversity, and beauty is a sacred trust.

The Global Situation

The dominant patterns of production and consumption are causing environmental devastation, the depletion of resources, and a massive extinction of species. Communities are being undermined. The benefits of development are not shared equitably and the gap between rich and poor is widening. Injustice, poverty, ignorance, and violent conflict are widespread and the cause of great suffering. An unprecedented rise in human population has overburdened ecological and social systems. The foundations of global security are threatened. These trends are perilous—but not inevitable.

The Challenges Ahead

The choice is ours: form a global partnership to care for Earth and one another or risk the destruction of ourselves and the diversity of life. Fundamental changes are needed in our values, institutions, and ways of living. We must realize that when basic needs have been met, human development is primarily about being more, not having more. We have the knowledge and technology to provide for all and to reduce our impacts on the environment. The emergence of a global civil society is creating new opportunities to build a democratic and humane world. Our environmental, economic, political, social, and spiritual challenges are interconnected, and together we can forge inclusive solutions.

Universal Responsibility

To realize these aspirations, we must decide to live with a sense of universal responsibility, identifying ourselves with the whole Earth community as well as our local communities. We are at once citizens of different nations and of one world in which the local and global are linked. Everyone shares responsibility for the present and future well-being of the human family and the larger living world. The spirit of human solidarity and kinship with all life is strengthened when we live with reverence for the mystery of being, gratitude for the gift of life, and humility regarding the human place in nature.

We urgently need a shared vision of basic values to provide an ethical foundation for the emerging world community. Therefore, together in hope we affirm the following interdependent principles for a sustainable way of life as a common standard by which the conduct of all individuals, organizations, businesses, governments, and transnational institutions is to be guided and assessed.

PRINCIPLES

I. RESPECT AND CARE FOR THE COMMUNITY OF LIFE

1. Respect Earth and life in all its diversity.

a. Recognize that all beings are interdependent and every form of life has value regardless of its worth to human beings.

b. Affirm faith in the inherent dignity of all human beings and in the intellectual, artistic, ethical, and spiritual potential of humanity.

2. Care for the community of life with understanding, compassion, and love.

a. Accept that with the right to own, manage, and use natural resources comes the duty to prevent environmental harm and to protect the rights of people.

b. Affirm that with increased freedom, knowledge, and power comes increased responsibility to promote the common good.

3. Build democratic societies that are just, participatory, sustainable, and peaceful.

a. Ensure that communities at all levels guarantee human rights and fundamental freedoms and provide everyone an opportunity to realize his or her full potential.

b. Promote social and economic justice, enabling all to achieve a secure and meaningful livelihood that is ecologically responsible.

4. Secure Earth's bounty and beauty for present and future generations.

a. Recognize that the freedom of action of each generation is qualified by the needs of future generations.

b. Transmit to future generations values, traditions, and institutions that support the long-term flourishing of Earth's human and ecological communities. In order to fulfill these four broad commitments, it is necessary to:

II. ECOLOGICAL INTEGRITY

5. Protect and restore the integrity of Earth's ecological systems, with special concern for biological diversity and the natural processes that sustain life.

a. Adopt at all levels sustainable development plans and regulations that make environmental conservation and rehabilitation integral to all development initiatives.

b. Establish and safeguard viable nature and biosphere reserves, including wild lands and marine areas, to protect Earth's life support systems, maintain biodiversity, and preserve our natural heritage.

c. Promote the recovery of endangered species and ecosystems.

d. Control and eradicate non-native or genetically modified organisms harmful to native species and the environment, and prevent introduction of such harmful organisms.

e. Manage the use of renewable resources such as water, soil, forest products, and marine life in ways that do not exceed rates of regeneration and that protect the health of ecosystems.

f. Manage the extraction and use of non-renewable resources such as minerals and fossil fuels in ways that minimize depletion and cause no serious environmental damage.

6. Prevent harm as the best method of environmental protection and, when knowledge is limited, apply a precautionary approach.

a. Take action to avoid the possibility of serious or irreversible environmental harm even when scientific knowledge is incomplete or inconclusive.

b. Place the burden of proof on those who argue that a proposed activity will not cause significant harm, and make the responsible parties liable for environmental harm.

c. Ensure that decision making addresses the cumulative, long-term, indirect, long distance, and global consequences of human activities.

d. Prevent pollution of any part of the environment and allow no build-up of radioactive, toxic, or other hazardous substances.

e. Avoid military activities damaging to the environment.

7. Adopt patterns of production, consumption, and reproduction that safeguard Earth's regenerative capacities, human rights, and community well-being.

a. Reduce, reuse, and recycle the materials used in production and consumption systems, and ensure that residual waste can be assimilated by ecological systems.

b. Act with restraint and efficiency when using energy, and rely increasingly on renewable energy sources such as solar and wind.

c. Promote the development, adoption, and equitable transfer of environmentally sound technologies.

d. Internalize the full environmental and social costs of goods and services in the selling price, and enable consumers to identify products that meet the highest social and environmental standards.

e. Ensure universal access to health care that fosters reproductive health and responsible reproduction.

f. Adopt lifestyles that emphasize the quality of life and material sufficiency in a finite world.

8. Advance the study of ecological sustainability and promote the open exchange and wide application of the knowledge acquired.

a. Support international scientific and technical cooperation on sustainability, with special attention to the needs of developing nations.

b. Recognize and preserve the traditional knowledge and spiritual wisdom in all cultures that contribute to environmental protection and human well-being.

c. Ensure that information of vital importance to human health and environmental protection, including genetic information, remains available in the public domain.

III. SOCIAL AND ECONOMIC JUSTICE

9. Eradicate poverty as an ethical, social, and environmental imperative.

a. Guarantee the right to potable water, clean air, food security, uncontaminated soil, shelter, and safe sanitation, allocating the national and international resources required.

b. Empower every human being with the education and resources to secure a sustainable livelihood, and provide social security and safety nets for those who are unable to support themselves.

c. Recognize the ignored, protect the vulnerable, serve those who suffer, and enable them to develop their capacities and to pursue their aspirations.

10. Ensure that economic activities and institutions at all levels promote human development in an equitable and sustainable manner.

a. Promote the equitable distribution of wealth within nations and among nations.

b. Enhance the intellectual, financial, technical, and social resources of developing nations, and relieve them of onerous international debt.

c. Ensure that all trade supports sustainable resource use, environmental protection, and progressive labor standards.

d. Require multinational corporations and international financial organizations to act transparently in the public good, and hold them accountable for the consequences of their activities.

11. Affirm gender equality and equity as prerequisites to sustainable development and ensure universal access to education, health care, and economic opportunity.

a. Secure the human rights of women and girls and end all violence against them.

b. Promote the active participation of women in all aspects of economic, political, civil, social, and cultural life as full and equal partners, decision makers, leaders, and beneficiaries.

c. Strengthen families and ensure the safety and loving nurture of all family members.

12. Uphold the right of all, without discrimination, to a natural and social environment supportive of human dignity, bodily health, and spiritual well-being, with special attention to the rights of indigenous peoples and minorities.

a. Eliminate discrimination in all its forms, such as that based on race, color, sex, sexual orientation, religion, language, and national, ethnic or social origin.

b. Affirm the right of indigenous peoples to their spirituality, knowledge, lands and resources and to their related practice of sustainable livelihoods.

c. Honor and support the young people of our communities, enabling them to fulfill their essential role in creating sustainable societies.

d. Protect and restore outstanding places of cultural and spiritual significance.

IV. DEMOCRACY, NONVIOLENCE, AND PEACE

13. Strengthen democratic institutions at all levels, and provide transparency and accountability in governance, inclusive participation in decision making, and access to justice.

a. Uphold the right of everyone to receive clear and timely information on environmental matters and all development plans and activities which are likely to affect them or in which they have an interest.

b. Support local, regional and global civil society, and promote the meaningful participation of all interested individuals and organizations in decision making.

c. Protect the rights to freedom of opinion, expression, peaceful assembly, association, and dissent.

d. Institute effective and efficient access to administrative and independent judicial procedures, including remedies and redress for environmental harm and the threat of such harm.

e. Eliminate corruption in all public and private institutions.

f. Strengthen local communities, enabling them to care for their environments, and assign environmental responsibilities to the levels of government where they can be carried out most effectively.

14. Integrate into formal education and life-long learning the knowledge, values, and skills needed for a sustainable way of life.

a. Provide all, especially children and youth, with educational opportunities that empower them to contribute actively to sustainable development.

b. Promote the contribution of the arts and humanities as well as the sciences in sustainability education.

c. Enhance the role of the mass media in raising awareness of ecological and social challenges.

d. Recognize the importance of moral and spiritual education for sustainable living.

15. Treat all living beings with respect and consideration.

a. Prevent cruelty to animals kept in human societies and protect them from suffering.

b. Protect wild animals from methods of hunting, trapping, and fishing that cause extreme, prolonged, or avoidable suffering.

c. Avoid or eliminate to the full extent possible the taking or destruction of non-targeted species.

16. Promote a culture of tolerance, nonviolence, and peace.

a. Encourage and support mutual understanding, solidarity, and cooperation among all peoples and within and among nations.

b. Implement comprehensive strategies to prevent violent conflict and use collaborative problem solving to manage and resolve environmental conflicts and other disputes.

c. Demilitarize national security systems to the level of a non-provocative defense posture, and convert military resources to peaceful purposes, including ecological restoration.

d. Eliminate nuclear, biological, and toxic weapons and other weapons of mass destruction.

e. Ensure that the use of orbital and outer space supports environmental protection and peace.

f. Recognize that peace is the wholeness created by right relationships with oneself, other persons, other cultures, other life, Earth, and the larger whole of which all are a part.

THE WAY FORWARD

As never before in history, common destiny beckons us to seek a new beginning. Such renewal is the promise of these Earth Charter principles. To fulfill this promise, we must commit ourselves to adopt and promote the values and objectives of the Charter.

This requires a change of mind and heart. It requires a new sense of global interdependence and universal responsibility. We must imaginatively develop and apply the vision of a sustainable way of life locally, nationally, regionally, and globally. Our cultural diversity is a precious heritage and different cultures will find their own distinctive ways to realize the vision. We must deepen and expand the global dialogue that generated the Earth Charter, for we have much to learn from the ongoing collaborative search for truth and wisdom.

Life often involves tensions between important values. This can mean difficult choices. However, we must find ways to harmonize diversity with unity, the exercise of freedom with the common good, short-term objectives with long-term goals. Every individual, family, organization, and community has a vital role to play. The arts, sciences, religions, educational institutions, media, businesses, nongovernmental organizations, and governments are all called to offer creative leadership. The partnership of government, civil society, and business is essential for effective governance.

In order to build a sustainable global community, the nations of the world must renew their commitment to the United Nations, fulfill their obligations under existing international agreements, and support the implementation of Earth Charter principles with an international legally binding instrument on environment and development.

Let ours be a time remembered for the awakening of a new reverence for life, the firm resolve to achieve sustainability, the quickening of the struggle for justice and peace, and the joyful celebration of life.

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Compiled by Holmes Rolston III

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Rolston III, Holmes. 1986. *Philosophy Gone Wild*. Buffalo, NY: Prometheus Books. *A collection of fifteen essays articulating and justifying values in nature, generally progressing from the more theoretical to the more personal. Values in nature, following nature, subjective versus objective values, endangered species, nature and human emotions; immediate personal experience of nature.*

Sagoff, Mark. 1988. *The Economy of the Earth: Philosophy, Law, and the Environment*. New York: Cambridge University Press. *In this collection of his previously published essays, Sagoff concentrates on the interconnections between environmental policy, law, economics, and environmental ethics. There is a systematic attack on the basic assumptions of welfare economics and cost-benefit analysis as a basis for environmental policy. Values are community-based, intersubjective goals that evolve throughout the history of the community, state, or nation and cannot be reduced to consumer preferences.*

Sagoff, Mark. 2004. *Price, Principle, and the Environment*. New York: Cambridge University Press. *A collection of nine previously published essays further developing his critique of a purely economic approach to environmental concerns, particularly the claim that all values are preferences subject to expression in a monetary metric.*

4. ANTHOLOGY OVERVIEWS, COLLECTED ESSAYS BY MULTIPLE AUTHORS, TEXTBOOKS

Armstrong, Susan J., and Richard G. Botzler, eds. 2003. *Environmental Ethics: Divergence and Convergence*. 3rd edition. New York: McGraw-Hill. *Third edition of an anthology that has proven a classic anthology in previous editions. More than sixty articles. Comprehensive, but coverage is often limited.*

Attfield, Robin, and Andrew Belsey, eds. 1994. *Philosophy and the Natural Environment*. Cambridge, UK: Cambridge University Press. *Values in nature, restoration, awe in nature, order and disorder in nature, global environmental justice, genetic engineering, persons in nature, anthropocentrism, and more. This collection originated from the Royal Institute of Philosophy Conference, "Philosophy and the Natural Environment," held at the University of Wales in Cardiff in 1993.*

Chappell, Timothy D. J., ed. 1997. *Respecting Nature: Environmental Thinking in the Light of Philosophical Theory.* New York: Columbia University Press. *Features theory in environmental ethics in relation to classical philosophy. Plato and environmental ethics, nature as a social construct, aesthetics of environment, sustainability, animal welfare, whaling, zoos.*

Elliot, Robert, ed. *Environmental Ethics*. 1995. New York: Oxford University Press. *This collection focuses on philosophically seminal articles rather than seeking more comprehensive coverage by incorporating extracts from several dozen articles. Values in nature, anthropocentrism in environmental ethics, animal welfare, restoration, stability in natural systems, ecofeminism.*

Foltz, Bruce V., and Robert Frodeman, eds. 2004. *Rethinking Nature: Essays in Environmental Philosophy*. Bloomington: Indiana University Press. *Emphasizes continental philosophy. Aesthetics, ontology, phenomenology, gender and the environment, and the role of science and technology in forming knowledge about the natural world.*

Frodeman, Robert, ed. 2000. *Earth Matters: The Earth Sciences, Philosophy, and the Claims of Community*. Upper Saddle River, NJ: Prentice-Hall. *Brings together fifteen essays on environmental matters from a multidisciplinary group of authors, including scientists, policy analysts, and philosophers*.

Gruen, Lori, and Dale Jamieson, eds. 1994. *Reflecting on Nature: Readings in Environmental Philosophy.* Oxford. *Highlights the problems of environmental justice and sustainable development from a multicultural perspective; features feminist and minority scholars and scholars from developing countries. Biodiversity loss, the significance of wilderness, population and overconsumption, and the human use of animals*.

Light, Andrew, and Rolston III, Holmes, eds. 2003. *Environmental Ethics: An Anthology*. Oxford: Blackwell. *Forty classic and recent full-length articles in environmental ethics organized for classroom use. What is environmental ethics? Who counts morally? Intrinsic value in nature, environmental pluralism, Deep Ecology, ecofeminism, restoration, wilderness, sustainability, social choices, and environmental values*.

List, Peter C., ed. 1993. *Radical Environmentalism: Philosophy and Tactics*. Belmont, CA: Wadsworth. *Radical activism in environmental ethics critically examined*. The Monkey Wrench Gang *(Edward Abbey). Greenpeace; Earth First!; the Sea Shepard Society (Paul Watson); civil disobedience and tree spiking; activist protests against the destruction and pollution of natural systems*.

List, Peter, ed. 2000. *Environmental Ethics and Forestry*: *A Reader*. Philadelphia: Temple University Press. *Both forestry and philosophy have been rethinking their foundations; each needs the other. John Muir versus Gifford Pinchot; Leopold's land ethic; values in forests, both instrumental and intrinsic; aesthetic experience in forests; global forests; foresters as advocates. A particular feature is examination of codes of ethics as formulated by foresters*.

Pierce, Christine, and Donald VanDeVeer, eds. 1995. *People, Penguins, and Plastic Trees*. 2nd edition. Belmont, CA: Wadsworth. *Long a best-selling text, first published in 1986 and widely regarded as the easiest text to use with freshmen and sophomores. Ecofeminism, Deep Ecology, Native American land ethics, critiques of industrialized nations by those in less-industrialized nations, environmental racism, sustainability, biocentric views, intrinsic value, biodiversity, animal liberation, land ethics*.

Pojman, Louis, P., and Paul Pojman, eds. 2008. *Environmental Ethics: Readings in Theory and Application.* 5th edition. Belmont, CA: Thomson/Wadsworth. *A perennially popular anthology that has gone through five editions since 1994. The Pojmans include articles on both sides of issues. The historical roots of our ecological crisis, animal rights, biocentrism, the land ethic, Deep Ecology, intrinsic natural value, ecofeminism, the Gaia hypothesis, biodiversity, obligations to future generations, Asian concepts of nature, world population, hunger, sustainable development*.

Schmidtz, David, and Elizabeth Willott, eds. 2002. *Environmental Ethics: What Really Matters, What Really Works.* New York: Oxford University Press. *Sixty-two selections, addressing the principal areas of inquiry in the field. Value in nature, the land ethic, animal liberation, environmental holism, rights in nature, wilderness, biodiversity, sustainability, poverty, cost-benefit analysis, and more*.

VanDeVeer, Donald, and Christine Pierce, eds. 2003. *The Environmental Ethics and Policy Book: Philosophy, Ecology, Economics.* 3rd edition. *Environmental ethics with a focus on how it affects public policy. Future generations, sustainability, corporate responsibility, population, consumption, marine environmental ethics, genetically modified foods, transgenic organisms, the impact of fast food production, patenting life. Jewish, Christian environmental ethics, aboriginal ecological knowledge. One feature is an Internet environmental resources section*.

Weston, Anthony, ed. 1999. *An Invitation to Environmental Philosophy*. New York: Oxford University Press. *Offered as an alternative to heavy academic anthologies, this compact anthology features five original essays by prominent environmental philosophers; intended as a first invitation to environmental philosophy*.

Zimmerman, Michael E., et al., eds. 2005. *Environmental Philosophy: From Animal Rights to Radical Ecology*. 4th edition. Upper Saddle River, NJ: Pearson/Prentice Hall. *Fourth edition of a time-tested and popular anthology. Animal welfare, biocentrism, the land ethic, ecofeminism, continental environmental philosophy, ecophenomenology, ecofascism, free-market versus political environmentalism, sustainability, social ecology*.

5. CASE STUDIES

Derr, Patrick G., and Edward M. McNamara. 2003. *Case Studies in Environmental Ethics*. Lanham, MD: Rowman and Littlefield. *More than forty cases, typically three or four pages each: includes Hawaiian feral pigs, oil and the Arctic National Wildlife Refuge (ANWR), golden rice, Bhopal, monkeywrenching, great apes, the Delhi Sands fly, and a host of other topics*.

Gudorf, Christine E., James E. Huchingson. 2003. *Boundaries: A Casebook in Environmental Ethics*. Washington, DC: Georgetown University Press. *The Everglades, Java forests, endangered ecosystems and endangered cultures in Madagascar, nuclear waste, coral reefs, hydropower versus free-flowing rivers, genetically modified foods, hunting in India, xenotransplants*.

Newton, Lisa H., and Catherine K. Dillingham, eds. 1997. *Watersheds: Classic Cases in Environmental Ethics.* 2nd edition. Belmont, CA: Wadsworth. *Impressive detail and documentation of dozens of specific cases in environmental ethics combined with insightful ethical analysis*.

6. ANIMALS AND ENVIRONMENTAL ETHICS

Hargrove, Eugene C. 1992. *The Animal Rights/ Environmental Ethics Debate: The Environmental Perspective*. Albany: State University of New York Press. *A collection of essays by a number of environmental philosophers offering criticism of and various alternatives to nonanthropocentric ethics limited to animals and excluding other nonhuman natural entities such as plants; higher levels of biological organization, such as species and ecosystems; and nature as a whole*.

Regan, Tom. 2004. *The Case for Animal Rights*. Berkeley: University of California Press. *A philosophically rigorous argument that animals have rights. First published in 1983, this book complemented Peter Singer's utilitarian* Animal Liberation*; these were the two most influential books concerned with animal ethics in the second half of the last century*.

Singer, Peter. 2002. *Animal Liberation*. 2nd edition. New York: Ecco (HarperCollins). *The book that launched contemporary ethical concern for animals, first published in 1975. Singer argues from a utilitarian viewpoint that humans are morally obligated to minimize animal suffering*.

Sterba, James P., ed. 1995. *Earth Ethics: Environmental Ethics, Animal Rights, and Practical Applications*. Upper Saddle River, NJ: Prentice-Hall. *Three dozen contributors analyze animal liberation, animal rights, their reconciliation with environmental ethics, anthropocentrism versus nonanthropocentrism, Deep Ecology, ecofeminism, biodiversity, climate change, economics, and environmental quality*.

Waldau, Paul, and Kimberley C. Patton, eds. 2006. *A Communion of Subjects: Animals in Religion, Science, and Ethics.* New York: Columbia University Press. *Animals are subjects who experience the world and have been pervasively incorporated into human belief systems, myths, and rituals, traditions that can serve as a basis for contemporary respect and conservation*.

7. BIODIVERSITY, WILDERNESS, RESTORATION, AESTHETICS

Callicott, J. Baird, and Michael P. Nelson, eds. 1998. *The Great New Wilderness Debate*. Athens: University of Georgia Press. *A large anthology on wilderness, covering the spectrum of views about the character and importance of wilderness conservation. Some contributors argue that wilderness is a European and North American idea, socially constructed. Others argue that indigenous peoples had so managed wilderness that primeval nature seldom continues in present wilderness landscapes. Others find substantial tracts of spontaneous wild nature, where ecosystemic processes are the dominant determinants, and the effect of humans is minimal*.

Carlson, Allen, and Sheila Lintott. 2008. *Nature, Aesthetics, and Environmentalism: From Beauty to Duty*. New York: Columbia University Press. *This collection combines the most important historical essays on nature appreciation and the best contemporary research in the field. Aesthetic of nature in relation to art and science; positive aesthetics, the view that all wild landscapes are beautiful; moral duties deriving from the aesthetics of nature*.

Elliot, Robert. 1997. *Faking Nature: The Ethics of Environmental Restoration*. London and New York: Routledge. *Natural value cannot be restored because original naturalness is a basis for intrinsic value in nature. Restored nature, however desirable, is second best because uninterrupted historical genesis cannot be restored; it is a faked nature because of this lost value*.

Nash, Roderick. 2002. *Wilderness and the American Mind*. 4th edition. New Haven, CT: Yale University Press. *A classic study, first published in 1967, by an environmental historian of changing ideas about wilderness in American thought*.

Nelson, Michael P., and J. Baird Callicott, eds. 2008. *The Wilderness Debate Rages On*. Athens: University of Georgia Press. *Organized into four parts, the first of which documents a little-known history of wilderness-preservation advocacy by ecologists that, had it been able to influence national policy, would have resulted in a very different system of wilderness preserves, focused nonanthropocentrically on critical habitat for threatened species and representative ecosystem types rather than on anthropocentric recreation. Also includes more non-European and liminal critiques of the wilderness idea, philosophical debate about the wilderness idea, and alternatives to the wilderness idea*.

Norton, Bryan G., ed. 1986. *Preservation of Species: The Value of Biological Diversity.* Princeton, NJ: Princeton University Press. *Scientific and social dimensions of extinction, management decisions regarding species*

preservation, ethical justification of species preservation, instrumental (such as economic) reasons versus the intrinsic value of species, aesthetic values in species preservation.

Oelschlaeger, Max. 1991. *The Idea of Wilderness from Prehistory to the Present*. New Haven, CT: Yale University Press. *An intellectual history drawing on evidence from philosophy, anthropology, theology, literature, ecology, cultural geography, and archaeology.*

Rolston III, Holmes. 1985. "Duties to Endangered Species." *BioScience* 35: 718–726. *Duties to humans concerning endangered species, although important, must be complemented by duties directly to species. This requires an account, biologically, of what species are, and, ethically, of why species are morally considerable. Species are dynamic natural kinds, historical life lineages, that humans ought to respect. Another author in this special issue of* BioScience *is Edward O. Wilson.*

Throop, William, ed. 2000. *Environmental Restoration: Ethics, Theory, and Practice*. Amherst, NY: Humanity Books/Prometheus Press. *This anthology examines whether restoring nature is viable, legitimate, and practical.*

Willers, William B., ed. 1999. *Unmanaged Landscapes: Voices for Untamed Nature*. Washington, DC: Island Press. *Unmanaged landscapes are the focus of the struggle to protect and restore wildness, the autonomy of nature, and to allow for its preservation and return on a grand scale.*

8. ENVIRONMENTAL JUSTICE, ENVIRONMENTAL VIRTUE ETHICS

Attfield, Robin, and Barry Wilkins, eds. 1992. *International Justice and the Third World: Essays in the Philosophy of Development*. London: Routledge. *The contributors ask about justice among societies of unequal power and worry that development efforts, resulting in indebtedness of the developing world, are often exploitative. What are the relations between just development and environmental conservation?*

Bullard, Robert D., ed. 2005. *The Quest for Environmental Justice: Human Rights and the Politics of Pollution.* San Francisco: Sierra Club Books. *An anthology by a sociologist, one of the first people to become deeply concerned about the way in which the poor disproportionately bear the burdens of environmental degradation.*

Sandler, Ronald. 2007. *Character and Environment: A Virtue-Oriented Approach to Environmental Ethics*. New York: Columbia University Press. *Any ethic of character can and should be informed by many environmental considerations. A pluralist, virtue-oriented environmental ethic accommodates the richness and complexity of human relationships with the natural environment and provides effective and nuanced guidance on environmental issues.*

Sandler, Ronald, and Philip Cafaro, eds. 2005. *Environmental Virtue Ethics*. Lanham, MD: Rowman and Littlefield. *Contributors discuss the role that virtue and character have traditionally played in environmental discourse and reflect upon the role that it should play in the future. Environmental virtue ethics theory, particular environmental virtues and vices, and applying environmental virtue ethics to particular environmental issues.*

Shrader-Frechette, Kristin. 2002. *Environmental Justice: Creating Equity, Reclaiming Democracy*. New York: Oxford University Press. *Fundamental ethical concepts such as equality, property rights, procedural justice, free informed consent, intergenerational equity, and just compensation have been compromised for a large segment of the global population, among them Appalachians, African Americans, workers in hazardous jobs, and indigenous people in developing nations. Burdens like pollution and resource depletion need to be apportioned more equally.*

Wenz, Peter S. 1988. *Environmental Justice*. Albany, NY: SUNY Press. *Competing principles of distributive justice as they might guide environmental decisions: libertarian theory, laissez-faire economics, human rights, utilitarian theory, cost-benefit analysis, virtue ethics, John Rawls's theory of justice. Wenz offers concentric-circle theory of environmental justice.*

Westra, Laura, and Peter S. Wenz, eds. 1995. *Faces of Environmental Racism: Confronting Issues of Global Justice*. Lanham, MD: Rowman and Littlefield. *Racial minorities in the United States are disproportionately exposed to toxic wastes and other environmental hazards. Internationally, wealthy countries of the north increasingly ship hazardous wastes to poorer countries of the south. These authors argue that environmentalism and concern for human beings and justice can be entirely compatible.*

9. RELIGION AND NATURE

Foltz, Richard C., ed. 2003. *Worldviews, Religion, and the Environment: A Global Anthology*. Belmont, CA: Wadsworth/Thomson Learning. *First peoples, Buddhism, Chinese traditions, Japanese traditions, Judaism, new cosmologies, globalization, ecojustice. More than sixty contributors.*

Gottlieb, Roger S. 2006. *A Greener Faith: Religious Environmentalism and Our Planet's Future*. New York: Oxford University Press. *Theologians are recovering nature-honoring elements of traditional religions and*

forging bold new theologies connecting devotion to God and spiritual truth with love for God's creation and care for the earth.

Northcott, Michael S. 1996. *The Environment and Christian Ethics*. Cambridge, UK: Cambridge University Press. *Environmental ethics from a perspective of Christian ethics, written by a theological ethicist with a thorough familiarity with the philosophical literature. The resolution of the environmental crisis requires the rediscovery of value and moral significance in the nonhuman natural world, an independence located in divine beneficence. Christians have often been the cause of environmental degradation, but the primal Hebrew vision and early Christians both had great respect for creation*.

Oelschlaeger, Max. 1994. *Caring for Creation: An Ecumenical Approach to the Environmental Crisis.* New Haven, CT: Yale University Press. *Only the churches, as the repository of moral values that lie outside the economic paradigm, can provide the social and political leadership and power to move our society to ecological sustainability. All faiths have an emphasis on caring for creation on which we can draw, and religion is necessary if we are to solve the environmental crisis politically*.

Rasmussen, Larry L. 1996. *Earth Community Earth Ethics*. Maryknoll, NY: Orbis. *An insightful analysis, from a theological perspective, of social justice and ecological concerns. Underlying themes are "justice, peace, and the integrity of creation" (World Council of Churches), areas in which Rasmussen has been influential. Humans have sought arrogant dominion over nature, denying the wholeness of creation. There is need now for symbols that effect a reenchantment of the world*.

Taylor, Bron, ed. 2005. *Encyclopedia of Religion and Nature*. 2 vols. London: Thoemmes Continuum. *An encyclopedia that is chronologically, geographically, and theoretically comprehensive, with a thousand entries from more than 500 contributors*.

Tucker, Mary Evelyn, and John Grim, eds. 1997–2002. *Religions of the World and Ecology*. 10 vols. Cambridge, MA: Harvard University Press. *Ten volumes, each on a major world religion*.

10. ECOFEMINISM

Clayton, Patti H. 1998. *Connection on the Ice: Environmental Ethics in Theory and Practice*. Philadelphia: Temple University Press. *Ecofeminist environmental ethics compared with other major types of environmental philosophy, taking as a critical case the rescue of three whales trapped in ice in Alaska. The real world displays quite multifaceted human-nonhuman relationships*.

Plumwood, Val. 2002. *Environmental Culture*. New York: Routledge. *A detailed and passionate argument for forms of culture that are logically and pragmatically superior to those cultures built on the rationalism, idealism, and empiricism that encourage moral distance. Humans are dependent on nature, men are dependent on women, and those with economic and decision-making power are dependent on the disempowerment of others. Sustainable cultures must care for creation*.

Ruether, Rosemary Radford. 1994. *Gaia and God: An Ecofeminist Theology of Earth Healing*. San Francisco: HarperOne. *European and North American theology often has a patriarchal tradition of dominance, but the classical Christian traditions also struggled with injustice and sin and sought to create just and loving relations between people in their relations with the living earth (Gaia). Christians today can use this heritage, enlarging it for a better vision of an abundant life on a sustainable earth*.

Warren, Karen, ed. 1994. *Ecological Feminism*. New York: Routledge. *The conceptual underpinnings of women-nature connections and the importance of seeing sexism and the exploitation of the environment as parallel forms of domination. Ecofeminism and the reconstruction of environmental ethics.*

Warren, Karen J. 2000. *Ecofeminist Philosophy: A Western Perspective on What It Is and Why It Matters*. Lanham, MD: Rowman and Littlefield. *Ecofeminism and animal welfare, vegetarianism, ecosystem ecology, Leopold's land ethic, ecojustice, patriarchy, spirituality*.

11. SUSTAINABILITY, FUTURE GENERATIONS

Burkhardt, Jeffrey. 1989. "The Morality behind Sustainability." *Journal of Agricultural Ethics* 2: 113–128. *Obligations to future generations entail more than sustaining sufficient food production or an adequate resource base; they extend to a continuing tradition of care and community*.

Daly, Herman E., and John B. Cobb Jr. 1999. *For the Common Good: Redirecting the Economy toward Community, the Environment, and a Sustainable Future*. 2nd edition. Boston: Beacon Press. *A steady-state economist and a theologian combine for a searching evaluation of whether and how far the global economy contributes to the common good, both social and environmental*.

Millennium Ecosystem Assessment. 2005. *Living Beyond Our Means: Natural Assets and Human Well-Being: Statement from the Board*. Available from *http://www.millenniumassessment.org/en/index.aspx. This is a summary document of a huge project sponsored by the United Nations and a host of organizations and*

corporations and involving more than 1,300 experts worldwide. There are multiple volumes, both in print and online. The focus is scientific, but there is a sustained effort to apply these results toward a humane environmental policy.

National Commission on the Environment. 1993. *Choosing a Sustainable Future: The Report of the National Commission on the Environment*. Washington, DC: Island Press. *A private-sector initiative convened by the World Wildlife Fund that concludes that the natural processes that support life on earth are increasingly at risk.*

Norton, Bryan G. 2005. *Sustainability: A Philosophy of Adaptive Ecosystem Management*. Chicago: University of Chicago Press. *Sustainability ought to be the cornerstone of environmental policy and requires shared, multidisciplinary deliberation over environmental goals and policy. Such communication is now fragmented by disciplines and ideologies. Norton offers a vision of a nonideological vocabulary that can accommodate the scientific and evaluative environmental discourse.*

Partridge, Ernest, ed. 1981. *Responsibilities to Future Generations: Environmental Ethics*. Buffalo, NY. *What do humans owe to posterity? Two dozen contributors seek an answer. Concern for future generations is a vital dimension of the ecological crisis, essential to sustainability. Although humans' ability to affect the future is immense, their ability to foresee the result of their environmental interventions is incomplete. This poses challenging moral questions and novel responsibilities.*

12. GLOBAL ENVIRONMENTAL ETHICS, CLIMATE CHANGE

Adger, W. Neil, Jouni Paavola, Seleemul Huq, and M. J. Mace, eds. 2006. *Fairness in Adaptation to Climate Change*. Cambridge, MA: The MIT Press. *All countries will be endangered by climate-change risks from flood, drought, and other extreme weather events, but developing countries are more dependent on climate-sensitive livelihoods such as farming and fishing and hence are more vulnerable. Nevertheless, the concerns of developing countries are marginalized in climate-policy decisions.*

Attfield, Robin. 2003. *Environmental Ethics: An Overview for the Twenty-First Century*. Cambridge, UK: Polity Press. *A survey and synthesis of the enormous range of challenging issues: local and global environmental problems; theories of value, stewardship, anthropocentrism and biocentrism; sustainable development; population; global citizenship. Attfield advocates what he calls biocentric consequentialism.*

Dallmeyer, Dorinda, and Albert Ike, eds. 1998. *Environmental Ethics and the Global Marketplace*. Athens: University of Georgia Press. *Contributors present arguments for creating global business practices that work in harmony with the environment; discussions of free trade, private ownership, sustainability, environmental justice.*

Engel, J. Ronald, and Joan Gibb Engel, eds. 1990. *Ethics of Environment and Development: Global Challenge and International Response*. Tucson: University of Arizona Press. *This anthology, published in association with the International Union for the Conservation of Nature and Natural Resources, contains more than twenty articles with an international focus on forms of development that are compatible with wildlife conservation.*

Northcott, Michael S. 2007. *A Moral Climate: The Ethics of Global Warming*. London: Darton, Longman and Todd. *Response to the challenge of global warming requires learning to put the common good ahead of selfish interests, weaving together the physical climate and the moral climate. Relieving climate change opens opportunities for solving other problems: world poverty, the rich/poor divide, the overuse of resources, and the appreciation and conservation of nonhuman creation.*

Pojman, Louis P. 2000. *Global Environmental Ethics*. Mountain View, CA: Mayfield. *Classical ethical theories are challenged by both the global scale and the environmental dimensions of contemporary problems. Discussions of greenhouse effects, ozone depletion, population, world hunger, energy use, animal welfare, endangered species, wilderness, sustainability.*

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The field of environmental ethics is a new but now well-established sub-discipline of philosophy. Emerging in the mid-1970s, the field coalesced with the inaugural volume of the journal *Environmental Ethics* in 1979 and developed rapidly. By the turn of the century, most colleges and universities offered courses, if not major programs of study, in this important discipline.

The *Encyclopedia of Environmental Ethics and Philosophy* addresses the needs of upper high school students and undergraduates, researchers, teachers, and professors, as well as general readers, by examining the philosophical and ethical issues underlying contemporary and historical environmental issues, policies, and debates. The encyclopedia covers concepts, institutions, topics, events and people, including global climate change, animal rights, environmental movements, alternative energy, green chemistry, ecology, and ecosabotage.

The *Encyclopedia of Environmental Ethics and Philosophy* was guided by an editorial board of scholars, who worked with more than 250 contributors from the world's leading universities. Each of the more than 300 articles contains a bibliography for further reading. More than 200 photographs, illustrations, and sidebars augment the text. Appendices include an annotated bibliography, a glossary, and a collection of classic articles and documents. The text is fully indexed for ease of research, and a thematic outline categorizes entries under broad subject areas for an alternative access path.

J. Baird Callicott, Regents Professor and chair of the Department of Philosophy and Religion Studies at the University of North Texas, is one of the founders of academic environmental philosophy, having taught the first environmental ethics course in the United States in 1971, at the University of Wisconsin-Stevens Point. His Ph.D. in Philosophy is from Syracuse University (1971). Dr. Callicott is a contributor to many journals including *Conservation Biology* and *Environmental Ethics*. His books include *In Defense of the Land Ethic: Essays in Environmental Philosophy* (1989) and *Beyond the Land Ethic: More Essays in Environmental Philosophy* (1999). He is co-editor of the book *The Wilderness Debate Rages On: Continuing the Great New Wilderness Debate* (2008).

Robert Frodeman is former chair of the Department of Philosophy and Religion Studies at the University of North Texas. He specializes in environmental philosophy and science policy. His Ph.D. in Philosophy is from Pennsylvania State University (1988). He is Director of UNT's Center for the Study of Interdisciplinarity, which seeks to develop the theory and practice of interdisciplinary research and education. Dr. Frodeman is editor of *Earth Matters: the Earth Sciences, Philosophy, and the Claims of Community* (2000), co-editor of *Rethinking Nature* (2004), and author of *Geo-Logic: Breaking Ground between Philosophy and the Earth Sciences* (2003).

The *Encyclopedia of Environmental Ethics and Philosophy* joins the suite of other Macmillan applied ethics titles: *Encyclopedia of Bioethics* and the *Encyclopedia of Science, Technology, and Ethics*.

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