The Welfare of Animals

Animal Welfare

VOLUME 8

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The Welfare of Animals

The Silent Majority

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Springer

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ISBN: 978-1-4020-9218-3 e-ISBN: 978-1-4020-9219-0

DOI: 10.1007/978-1-4020-9219-0

Library of Congress Control Number: 2008935890

Printed on acid-free paper

9 8 7 6 5 4 3 2 1

springer.com

To my late father, Michael Phillips

Foreword

The Welfare of Animals is an exciting book that will stimulate and provoke its readers. It describes many problems faced by animals – those we use for food, for pleasure or in research, and those simply but harshly affected by shrinking habitats in the face of the ever-growing human population. And yet it is not a depressing read. It focuses not only on the difficulties that animals face, but on their capacity for free-choice, for joy and excitement, and on the possible ways in which the planet can be shared between species if only we take the time and trouble to think more carefully about the impact of our actions.

Clive Phillips moved from the United Kingdom to take up a Foundation Chair in Animal Welfare at the University of Queensland, becoming Australia's first Professor of Animal Welfare in 2003. This cultural leap, combined with his travels in countries like Malaysia and Borneo, permits him the unique and broad perspective that forms the backbone of this book. Eschewing the normal territory patrolled by the animal scientist (explaining the physiological basis of the stress response or causation of abnormal behaviour), Clive ventures into jungles and deserts, city centres and tribal homelands, and presents a book that remarkably and successfully combines travel-diary, nature notes, social and cultural history. By some sleight of hand, Clive throws all of these disparate elements into the air and emerges with an insightful analysis of how political, economic, religious and psychological truths impact on the animals whose planet we share. The portrayal of animals in art and religion, for example, is integrated with a consideration of how such depictions are associated with shifting perceptions about the place of animals within a moral framework. Parts of the book remind me of meditative passages in the Snow Leopard, written by Peter Matthiessen, as he accompanied the zoologist George Schaller through Nepal to study the behaviour of the blue sheep found in the Himalayas. Other sections remind me of the lectures given by the semi-fictional character Elizabeth Costello (created by the Nobel-prize winning author J.M. Coetzee) as she agonises over our catastrophic and industrial-scale disregard for animals, or of the art book *Animals and Men* by Kenneth Clark. The difference is that Clive's forays into history, art, religion or culture are always informed by his deep knowledge of the biology and psychology of the animals he is writing about.

This book provides readers with a vast array of original material. As such it will form a vitally important resource and text book for students and members of the public with an interest in animals from almost any perspective. The scale and intensity of animal use across the world is documented, and the rise of animal welfare and animal rights organisations is charted and analysed. In addition, the growth of animal welfare as a scientific discipline is given a place as a piece of modern cultural history in its own right. The political context in which animal welfare is considered in different countries is compared. Funding from industry or charitable sources is hugely important in advancing the field, but sometimes conflicts of interest can arise. It is therefore crucial that at least some animal welfare funding comes from government research councils whose primary interest is the promotion of good science. I do hope that Clive's exposition of the politics of animal welfare funding acts as a spur to governments worldwide to invest more in animal welfare science, even if this threatens the position of my own University as the top publisher in the field (Table 8.3)!

Clive Phillips has gathered some unpalatable facts and presented them at a crucial time. The human population has risen to 6.8 billion (www.optimumpopulation.org). The development of livestock agriculture is seen as a route out of poverty and towards increased resilience for some of the world's poorest people (UN World Food Programme) at the same time as demand for animal produce shoots up amongst increasingly wealthy urban populations. Clive estimates that, on average, each one of us is responsible for the life (or death) of some 18 animals per year. Generally, as humans, we acknowledge responsibility for the dog that shares our hearth and, gradually, this concept of responsibility is being extended to the animals we farm, or use in scientific procedures. But billions more sentient creatures remain truly forgotten: the wild-caught fish, the animals killed by our cars (and the offspring they will never return to), those forced out of their habitats, or killed by our own pet cats. Each and every one of these creatures is impacted by the way we choose to live our lives. The importance of this book is that it presents some new ways of thinking about how we can manage these problems without totally disregarding the feelings of our fellow species. This book matters. Thank you, Clive, for writing it.

Bristol, UK Christine Nicol

Animal Welfare Series Preface

Animal welfare is attracting increasing interest worldwide, especially in developed countries where the knowledge and resources are available to provide better management systems for farm animals, as well as companion, zoo and laboratory animals. The key requirements for adequate food, water, a suitable environment, companionship and health are important for animals kept for all of these purposes.

There has been increased attention given to farm animal welfare in the West in recent years. This derives largely from the fact that the relentless pursuit of financial reward and efficiency, to satisfy market demands, has led to the development of intensive animal production systems that challenge the conscience of many consumers in those countries.

In developing countries, human survival is still a daily uncertainty, so that provision for animal welfare has to be balanced against human welfare. Animal welfare is usually a priority only if it supports the output of the animal, be it food, work, clothing, sport or companionship. In principle the welfare needs of both humans and animals can be provided for, in both developing and developed countries, if resources are properly husbanded. In reality, however, the inequitable division of the world's riches creates physical and psychological poverty for humans and animals alike in many parts of the world. Livestock are the world's biggest land users (FAO, 2002) and the farmed animal population is increasing rapidly to meet the needs of an expanding human population. This results in a tendency to allocate fewer resources to each animal and to value individual animals less, particularly in the case of farmed pigs where herds of several thousand are not uncommon. In these circumstances, the importance of each individual's welfare is diminished.

Increased attention to welfare issues is just as evident for companion, laboratory, wild and zoo animals. Of increasing importance is the ethical management of breeding programmes, since genetic manipulation is more feasible, but there is less public tolerance of the deliberate breeding of animals with genetic abnormalities. However, the quest for producing novel genotypes has fascinated breeders for centuries. Dog and cat breeders have produced a variety of extreme forms with adverse effects on their welfare, but nowadays the quest is pursued in the laboratory, where the mouse is genetically manipulated with equally profound effects.

The intimate connection between animals and humans that was once so essential in husbandry is rare nowadays, having been superseded by technologically efficient production systems where animals on farms and in laboratories are tended by increasingly few humans in the drive to enhance labour efficiency. With today's busy lifestyle, companion animals too may suffer from reduced contact with humans, although their value in providing companionship, particularly for groups such as the elderly, is increasingly recognised. Consumers also rarely have any contact with the animals that produce their food.

In this estranged, efficient world, people struggle to find the moral imperatives to determine the level of welfare that they should afford to animals within their charge. Some, in particular many companion animal owners, aim for what they believe to be the highest levels of welfare provision, while others, deliberately or through ignorance, keep animals in impoverished conditions where their health and wellbeing is severely compromised. Today's multiplicity of moral codes for animal care and use are derived from a broad range of cultural influences, including media reports of animal abuse, guidelines on ethical consumption and campaigning and lobbying groups.

This series has been designed to help contribute towards a culture of respect for animals and their welfare by producing academic texts discussing the provision for the welfare of the major animal species that are managed and cared for by humans. They are not detailed blue-prints for the management of each species, rather they describe and consider the major welfare concerns, often in relation to the wild progenitors of the managed animals. Welfare is considered in relation to the animal's needs, concentrating on nutrition, behaviour, reproduction and the physical and social environment. Economic effects of animal welfare provision are also considered where relevant, as are key areas where further research is required.

With the growing pace of knowledge in this new area of research, it is hoped that this series will provide a timely and much-needed set of texts for researchers, lecturers, practitioners, and students. My thanks are particularly due to the publishers for their support, and to the authors and editors for their hard work in producing the texts on time and in good order.

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Reference

Food and Agriculture Organisation (2002). http://www.fao.org/ag/aga/index_en.htm

Preface

Like most people, I learnt about caring for animals when I was young. My experiences shaped my views on animal welfare, and this book is an attempt to share these views. My earliest animal experiences were mostly of pets, and I laughed with them, played with them and cried when they died like most of you, and it was in my early years that I was taught a sense of respect for wild animals. Once a week I visited my grandparents' house and garden, where a chaffinch regularly flew onto their lounge window sill and entered the room to take some nuts which had been put out for him. Whenever it appeared at the windowsill there was an immediate call for the children to be quiet in order that it could enter and get his reward without fear. For those precious few seconds we sat motionless and enjoyed the presence of that bird. In that one small action of crossing the windowsill, the bird had bridged that great divide, from being a totally wild bird, to entering into a 'contract' with humans, that could have been the first step on the way to domestication. One year the bird no longer came to the window, which made us sad, but I had received an early lesson on respect for wild animals and the joy that they can give us.

Now, after some years as a student of animals, and the ways that they behave, feed, reproduce and interact with humans, this book offers some thoughts on their welfare. Many people are working tirelessly to improve animal welfare with little thanks or praise and it is hoped that this will provide them with inspiration. Some work in animal industries, others in charity organizations, shelters, wildlife parks and educational establishments. Working *for* animals, as opposed to *with* animals, requires courage and those involved often face criticisms from those who seek to get the maximum from their animals for the smallest input. Many whose livelihoods depend on using animals are averse to any change that will affect the short-term profitability of their enterprise, although by improving animal welfare they are guaranteeing their future markets and the ethical acceptability of their business in the long-term.

Animal welfare scientists are few in number, and their work may not be accepted as well as those working in traditional animal disciplines, such as zoology, animal production science and agriculture. Some in the animal production sciences may believe that showing kindness to animals is a sign of weakness. Animal welfare may not be regarded as a rigorous scientific

discipline, and this is in part because simple measurements are often most effective in any relatively new science, including animal welfare. It would not be good use of research funds to engage in detailed reductionist analysis of just a few problems when simple measurements are lacking in most branches of the science. For example, we could go to great lengths to find criteria that prove when an animal is malnourished, but is this really useful when animals are dying in drought conditions? Another issue relates to the type of measurements taken, and how an animal behaves is a key indicator of welfare, yet behaviour measurements are regarded by many scientists as lacking rigour and not as scientific as physiological or anatomical measurements. However, few could doubt that animal welfare science often requires more careful thought than other disciplines in framing the paradigm that is to be tested.

Animal welfare science is different because the beneficiaries are animals not humans. Most related fields – animal, crop, food and soil sciences, and even sometimes veterinary medicine – aim to improve the efficiency, and hence profitability, of the industry for the benefit of humans. Animal welfare science, however, aims to improve an animal's quality of life, which is an ambitious goal since we can often only guess at the impact on the animal's welfare. Such an intangible goal is too obscure for many traditional scientists, but those involved in animal welfare must have faith that their work is valuable to the animals. They must believe that addressing the animal welfare problems in the world today is a necessity for the future moral health of society, and they will require the courage of their convictions to pursue this goal. Furthermore, the significant advances in animal welfare science made in the last quarter of a century should encourage new scientists to take up this challenge – to provide the information necessary to meet the public demand for improved animal welfare. If scientists fail to provide this information, the politicians will have only opinions on which to base the improved standards that the public require. Most codes of practice for the welfare of animals are currently based on unproven beliefs, and they often lack credibility with those directly involved in the animal industries as a result. For every expert with one opinion there is another with a counter argument. Basing standards on whim or fancy will ensure that they will be challenged forcefully and this will hinder animal welfare reform.

Politicians must recognize that science cannot solve all of the animal welfare problems quickly. Patience will be required in building the research base with which to tackle welfare issues, since in many countries there are few, if any, scientists devoted to this topic. In addition we must recognize that for many closely involved in the animal industries, providing for animal welfare is as much an art as a science – an art that has been handed down over the centuries and which is closely connected with the different religious and philosophical approaches to animals that are possessed by the various cultures. As Gandhi said, "there should be no science without humanity" (Gandhi, 1948). Many different types of people have responsibility for animal welfare and we must understand and recognize the importance of all of their views. For those directly

involved, stockmanship – the art of looking after animals – is commonly recognized as a more important influence on welfare than where they are kept, what they are fed etc. (AWC, 2002; Cross et al., 2008a). The art of providing for animal welfare is the cement that binds the scientific building blocks together, that enables scientific advances to be implemented with the support of society.

What does the future hold for animal welfare movements worldwide? We live in an increasingly egalitarian age, when the rights of animals and women, as well as the mentally retarded, racial minorities, gay and disabled people are recognized as having been too often ignored in the past. Sometimes there are concerns, especially amongst the elders in the community, that the pace of change and development is too rapid, faster than humankind can cope with in social terms. Hence there is concern that traditions are being eroded, that there are undetected dangers facing those embracing modern technologies. However, it is this rapid pace of technological change that has allowed us to progress from being concerned primarily about survival of the human race to our being able to control the survival and welfare of all the species on earth. Adequate welfare provision for all is within our sights and this rapid change in emphasis is now essential, because focusing only on human welfare, when we have developed such powerful tools to manipulate and potentially benefit animal and plant life, would be a certain means of rapid destruction of both humans and animals. Hence improving animal welfare is not just a desirable option, it is essential for the wellbeing of future societies.

I hope this book will encourage us all to reflect on animal welfare – how it was in the past, how it is changing and how we want it to change in the future. Remembering that animal welfare is not just a scientific discipline, but has a strong humanitarian component as well, we must allow our approach to animal welfare to recognize cultural, gender and social differences. Reflection is what separates us out as a species, the power of rational thought that has served us so well in the past. We have overcome dictators, with ambitions to conquer the world, diseases that threaten to wipe out our species, and we are now tackling both environmental change, that theatens to erode our standard of living everywhere, and poverty that threatens the existence of the poor and needy in the world today. We will overcome these challenges with ingenuity, correct actions and careful planning. But we often forget our biggest responsibility: to recognize that our actions have a major impact on the welfare of animals. Increasingly humans are cognizant of this fact and are taking action to improve animal welfare throughout the globe. After social movements to prevent the abuse of children, racial minorities, disabled people and homosexuals, to be in the midst of a social revolution that recognizes the need to improve animal welfare is truly a privilege.

These are ethical issues which need debating, but most welfare problems are easy for all to see. 'So far as the animals are concerned it matters not what we think or feel but what we do' (Webster, 1995). If we do not act, it is not just the animals that will suffer; our lives will be impoverished because the human-animal

bond is crucial to our existence. It is incumbent on all of us to do everything in our power to improve the welfare of animals, so that future generations cannot say that we stood idly by whilst animals were exploited at the expense of their welfare.

Brisbane, QLD Clive Phillips

Acknowledgements

A preliminary version of part of Chapter 7 was published as follows: Phillips, C.J.C. 2005. How animal welfare science assists in defining cruelty to animals. *Proceedings of the 2005 RSPCA Australia Scientific Seminar*, Canberra, 22 February 2005, pp 29–37. http://www.rspca.org.au/events/seminars05_proc.PDF. It was also published in Veterinaria.org (URL: http://veterinaria.org/revistas/redvet and http://www.veterinaria.org). A preliminary version of the section on pain and cruelty in Chapter 6 was published in the Proceedings of the Animal Welfare Science Summit – Pain and Pain Management (http://www.daff.gov.au/animal-plant-health/welfare/aaws/summit) and will be published in a forthcoming volume in the OIE Technical Series.[1] The section on animal welfare in veterinary education in this chapter was initially presented to a conference on Humane Education at Griffiths University, Brisbane, the proceedings of which will be published electronically.

I am grateful to the Australian Animal Welfare Strategy for cover photography, to the late David Piggins for helpful discussions on the chapter on Empathy, Martin Phillips for a tour of London art galleries, Donald Broom for the opportunity to spend time in his research group during the preparation of the book and for information on the early history of the International Society for Applied Ethology, Jia Meng for data on companion animal populations, Andrew Tribe for information on zoo animal populations, Zainal Zafari for assistance with my visit to Krau Wildlife Reserve, Malaysia, Humrawali Khan and Shokri Jusoh for assisting with my visit to Borneo. I acknowledge the Department of Agriculture, Fisheries and Forestry, Adrianne Yzerman and Kerrie Rubie for photographs used on the front cover. The views expressed in the book are entirely my own.

[1] OIE Technical Series, Vol. 10, 2009, "Scientific assessment and management of animal pain"

Contents

Chapter 1
Definitions and Concepts of Animal Welfare

Defining animal welfare, coping with the environment, feelings and experiences – a variable scale for experiences – accounting good and bad experiences – naturalness of an animal's environment – animal needs and desires.

Introduction

Managing animal welfare is one of the most contentious societal issues of today, so it is important to be clear what is understood by the term. However, in choosing a definition that best encapsulates our interest in the topic, we need to be aware of who we are defining it for. Lawyers may need a more precise definition than the general public, who need a definition in terms that can easily be understood. Scientists require a definition in terms that can be measured, and animal managers or keepers require one that is practically relevant and can be easily applied to their animals.

The word 'welfare' comes from the Old Norse word *velferth*, derived from the words meaning *good* (val in Old Norse) and *travel* (fara in Old Norse). A similar word, *wohlfahrt*, is used today in the German language. A commutation of this concept is the popular English word used when people part – farewell. In the Romantic languages the concept is rather different, being based on 'being good' (bienestar in Spanish, bien-être in French and bemestar in Portuguese). This variation is now supported in the United States, where the word 'well-being' is predominantly used, rather than 'welfare', because of potential confusion with the welfare state for people. Thus the Northern European concept is one of the 'state whilst travelling', indicating an assessment over a period of time, whereas the Southern European, and now American, concept is one of an assessment at one point in time. Some people in Europe and Australia now advocate using 'well-being' rather than 'welfare' because of the supposedly negative connotations associated with 'welfare'. This is a similar problem to that of finding a suitable word to represent negroid people in predominantly white societies, and the solution is not to regularly change to new words when the conventional ones begin to be used in a derogatory fashion

C. Phillips, *The Welfare of Animals*, Animal Welfare 8,
DOI 10.1007/978-1-4020-9219-0_1, © Springer Science+Business Media B.V. 2009

by some members of society, but to ensure that the word is clearly and openly defined for all.

In defining the welfare of any animal, we are essentially trying to answer the question, 'How good is an animal's state in its environment?' This has several components, first, the animal's environment; second, the animal's awareness of its environment; third, the animal's internal state, based on its genetics and past and present experiences; and fourth, the animal's awareness of its internal state.

Coping with the Environment

The most widely quoted definition of animal welfare is also one of the oldest – 'the state of an animal with regard to its ability to cope with its environment' (Broom, 1986). This adequately addresses at least the first of these four components, and probably the second (depending on what constitutes a 'state'). However, the response to internal influences, such as the presence of a tumour, which will reduce the animal's welfare, is not addressed, and neither is the animal's awareness of its internal state. Another problem in relation to Donald Broom's definition is that 'coping' is an emotive word which suggests a negative overall attitude in the animal, whereas it should be positive or at least neutral. 'Coping' accords well with the view that life is difficult, miserable or laden with original sin, which is a view favoured by religious leaders and was probably proposed in an attempt to persuade people to behave more altruistically, so that they can have increased happiness or a better afterlife. The ability to thrive, rather than cope, is a better description of an animal's response to their environment.

Broom's definition focuses on dealing with unpleasant experiences, and an outside observer could be forgiven for believing that 'all of creation groans with pain', a sentiment expressed by the apostle Paul (Paul, 1994). The concept is perpetuated elsewhere – four of the Five Freedoms advocated by many as a good description of welfare needs (Webster, 1995) are freedoms from unpleasant experiences (1. hunger/thirst, 2. discomfort, 3. pain/injury/disease, 4. fear/distress), and only one addresses positive welfare (freedom to perform normal behaviour). In reality animal welfare should be a construct of both positive and negative affect.[1] Pain and other negative affects evolved to guard us from danger, and equally important are the positive affects that attract us to things that will improve our lives. The primary affects are probably common to all higher animals and humans. Negative affects include pain, fear, terror, hatred, distress, dissmell,[2] anguish and disgust (Tomkins, 1963; 1991) and positive affects includes interest, excitement, strength, enthusiasm, pride, alertness, inspiration, determination, attentiveness and activity.

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[1] An affect is a brief biological, innate, instinctive response to a stimulus

[2] The negative affect of experiencing noxious odours

Animal's Feelings

Many consider that welfare relates principally to an animal's feelings (e.g. Duncan and Fraser, 1997). Under this hypothesis, an animal that is not sentient cannot experience poor welfare. Therefore an animal which is not consciously aware and responds purely automatically, i.e. without recourse to reason, learned responses or experiences, cannot be said to have any degree of well-being (Piggins and Phillips, 1998). This definition favours animals with advanced reasoning, such as ourselves, which have developed these abilities because of the way in which we function in the environment. However, it is important to realise that most of our behaviour, and that of other 'higher' animals, is automatic.

In a 'feelings' approach to welfare, it is reasonable to propose that the gradations of sentience that exist in animals should be taken into account by providing gradations of welfare standards, according to the sentience level of the species. This is very different from Broom's definition, proposing that welfare is the animal's state in respect to its coping with the environment, in which case it matters not whether the animal is sentient or not. The animal may not perceive that it is in a poor state if it is not sentient, but in terms of man's provision of reasonable standards for all animals that he manages, it should not matter whether the animal perceives the standards or not. The perception will not affect the major goal of animal life, to thrive in an environment and to be able to continue existing there through reproduction (hence the suggestion that 'thriving' is a better description than 'coping' above). Focusing on just an animal's feelings implies that just one mechanism for the pursuit of this goal[3] – stimuli perception and processing – is dominant over any others, such as reproduction, autonomic responses to stimuli or the destruction of competitive species in that environment. All of these will contribute to the animal's welfare, not just the feelings.

Although defining welfare by an animal's feelings is more related to psychological affect, we do not know, and may never know, much about what it actually feels like to be an animal. Longuet-Higgins (1994) has commented that "in practice Westerners attribute consciousness to other species only when they can imagine 'what it feels like' to be" that species. Therefore, in assessing animal welfare we tend to rely on psychological affects that we know are supported by several of the usual welfare indicators – behaviour, physiology, animal choices, longevity, production and reproduction.

Another problem with defining welfare from feelings or sentience is that it is almost impossible to measure an animal's feelings with any degree of accuracy, and this is likely to be the case for at least the foreseeable future. I am usually, but not always, aware of my own feelings, I recognise that others claim to have similar feelings and therefore probably theirs are similar to mine. However,

[3] A goal that can simply be described as of the preservation of life in a specific environment

I can only occasionally impute the existence of feelings in other animals and have little confidence in describing them. People may agree on the feelings that they believe animals are displaying (Wemelsfelder et al., 2001), but it does not mean that they are correct, because the species barrier between humans and animals may contribute a systematic error in their assessment. Indeed Griffin (1976) has argued that ..... 'It is not necessary to assume that such mental experiences (of animals) are at all similar to those which a person might have under analogous circumstances'. We have little reason to suspect that an animal's feelings may be accurately inferred from our own experiences, their sensory apparatus is usually very different from our own and their processing capacities equally so. For example, as humans, we use almost one fifth of our energy intake supporting the activities of our brain (Kurpad et al., 1994), but it would be maladaptive for other animals to devote such a large proportion of the nutrients purely for processing if this was not required for their occupation of their particular ecological niche. Therefore to base assessment of welfare purely on an animal's feelings is speciesist, since it favours animals such as us with well-developed cognitive capacity. Longuet-Higgins (1994) believed that this argument even invalidated any "scientific explanation of consciousness", which "is a logical absurdity because it would entail explaining the existence of observers in terms of their own observations".

Feelings are transient and relate primarily to short-term considerations of animal well-being and not long-term welfare assessment. For example, an animal may select food items that are desirable in the short-term, especially if they are carbohydrate-rich, because they provide a pleasurable feeling and adaptive advantage in the short-term (Matsuno and Thibault, 1995), but in the long-term exclusive selection of these items may reduce its welfare by causing disease, such as dental decay or obesity. Some events, which may damage an animal's welfare, such as removal of a limb under anaesthetics, will not result in any adverse feelings at the time but may damage an animal's welfare in the long-term. However, it is evident that a long-term summation of feelings could give, in an ideal world, a useful measure of just one component of welfare.

With our current knowledge, we can only rely on expert opinion or folk knowledge for an estimation of the relative feelings of different animals. For example, a survey of nearly 500 students has shown that animals are perceived as having the following hierarchy of sentience: monkey > dog > newborn baby > fox > pig > chicken > rat > fish (Phillips and McCulloch, 2005). However even this does not provide an objective assessment of sentience levels, since there were marked differences between students of different nationalities in their attribution of sentience to different species, demonstrating that human perception is inaccurate. When the questions were classified as providing information on the students' attitudes towards suffering during life, which is more concerned with animal welfare, or reverence for life, which is more concerned with an animal's rights, it was clear that Asian students had less concern for animal suffering during life than the European students, although

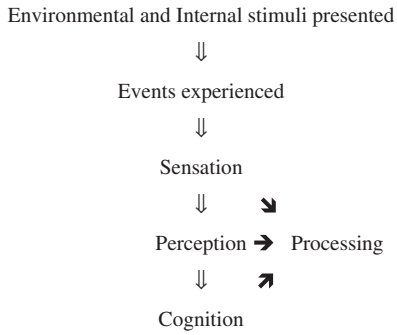
both had similar reverence for animal life. Our views on animal's feelings are therefore not constant, but determined by experience and culture.

When assessing the welfare of an animal, we develop a hierarchy of similarities. For example, I understand my behaviour better than your behaviour, which I understand better than another primate's behaviour, which I understand better than that of a fish. To produce this hierarchy we have to make simple comparisons in our mind, in this case (1) Your behaviour is more similar to mine than another primate's, (2) a primate's behaviour is more similar to mine than a fish, (3) Your behaviour is more similar to mine than a fish. The hierarchy therefore in terms of understanding feelings is my behaviour> another person's behaviour>another primate's behaviour>a fish's behaviour.

Experiences

A third possible definition of an animal's welfare is its 'state with respect to the quality and quantity of its experiences'. This has been considered recently (Bracke et al., 1999), although experiences were dismissed as too difficult to measure. However, an experience can be considered to be 'an event or a series of events participated in or lived through' and does not include attributed mental states. The difference between experiences and feelings is shown by a simple situation where a man hits a dog. The dog experiences being hit, it feels pain. The experiences can be accurately described, for example the number of times that it happened and the severity. The feelings cannot be accurately described, they may be inferred from behavioural responses, or even physiological, but we have little certainty that we know what the dog feels.

The sequence of human interpretation of stimuli are as follows:



Defining welfare as the animal's state with regard to its responses to the environment includes some processing, as does the approach of defining welfare by 'feelings'. However, if we define welfare by experiences, we omit processing and can be sure that at least some are definable and measurable with a reasonable

degree of accuracy. Whether such experiences contribute positively to animal welfare can be determined experimentally, by offering animals choices or by monitoring their responses to specific imposed situations, or by soliciting expert or even public opinion. The approach will vary with the situation.

The introduction of stimulus processing into experience assessment is difficult, but a scale of increasing complexity for human stimulus reception and processing has been proposed by Young (1994):

1) *Phenomenal awareness*: the experience of seeing, hearing, touching and so on.
2) *Access awareness*: where stored information is brought to mind
3) *Monitoring:* including awareness of our own actions and their effects, and monitoring perceptual information for discrepancies with current plans and hypotheses.
4) *Executive awareness:* awareness of our goals and intentions

However, although we can be certain that animals possess phenomenal and access awareness, we cannot be sure of the extent of their monitoring awareness, and even whether they have any executive awareness at all. Griffin (1976) also attempted to produce an awareness processing scale, this time for animals, and again progressing from the simple to the complex forms of processing (Table 1.1).

It is possible to combine Young and Griffin's awareness scales in relation to visual stimuli (Piggins and Phillips, 1998, Table 1.2). This demonstrates that the boundaries between sensation, perception and cognition are not as fixed as traditionally assumed. Some of the research necessary to determine the visual

Table 1.1 An awareness processing scale (Griffin, 1976)

Processing by animal	Complexity
Pattern recognition	Simple
Neural template formation	
Search image	
Develop affect	↓
Expectancy	
Covert verbal behaviour	
Develop internal image	
Conceptualisation	↓
Understanding	
Intention	
Feeling	
Mental experience	↓
Thought	
Choice	
Free will	
Consciousness	Complex

Table 1.2 Scheme for visual awareness assessment based on Young (1994) and Griffin (1976) with examples (Piggins and Phillips, 1998)

Basis of assessment			Purpose	Examples
Sensation/ Perception/ Cognition	Young (1994)	Griffin (1976)		
Sensation	Phenomenal awareness	–	Detection	Reflexive Absolute threshold Simple Reaction Time Motion Sensory memory Colour vision Brightness Contrast Sensitivity
Sensation/ perception	Access awareness	–	Discrimination	Acuity Complex reaction time Optic flow Difference threshold Imagery
			Depth	Binocular Monocular Size constancy (perceptual) Perspective (perceptual) Motion parrallax (sensory)
Perception/ Cognition 'Intelligent perception'	Monitoring awareness	Pattern recognition	Recognition organisation	Gestalts Pattern Form Object Short term, working memory Events Location (Ego centrality) Hallucination Mental rotation
Cognition	Monitoring Executive	–	Evaluation	Imagery Long term memory and stored knowledge Experience

Table 1.2 (continued)

Basis of assessment			Purpose	Examples
Sensation/ Perception/ Cognition	Young (1994)	Griffin (1976)		
				Problem solving (e.g. tool use)
				Decision making
				Stroop effort
				Mental representation
			Meaning	Volition, Intent
				Self awareness and that of others
				Mental states
				Creativity

experiences of some animals has been attempted, most notably for their sensory capacities, but much remains to be undertaken. Visual awareness is one of the better understood forms of awareness (Lomas et al., 1998), other forms of awareness such as auditory (Heffner, 1998), dietary (Forbes, 1998) and olfactory (Sommerville and Broom, 1998) awareness are much less well understood.

Quantifying Experiences – An Accounting Perspective

Animal welfare should be considered over as long a time frame as possible. If the immediate effects of, for example, invasive procedures are considered, the wrong conclusions about their impact on welfare can be gained if they are performed to safeguard the animal's longterm welfare. So for example, the removal of skin from the hindquarters of sheep in the mulesing operation, although appearing inhumane, may actually improve welfare by preventing the sheep from being attached by flies. Veterinary operations are therefore often painful but may improve an animal's welfare in the long term. It is important to consider an animal's life as comprised of many experiences, which can simplistically be considered good or bad. If only the quality of experiences is considered, then an animal with just one good experience and no bad experiences would have the same welfare as an animal with many good experiences (at the same level) and no bad experiences. Thus the *number* of each type of experience is important as well as its quality. This can be expressed mathematically by a simple formula for animal welfare, as the sum of different good and bad experiences. To arrive at this formula, we must first imagine that every animal undergoes different types of good and bad experiences, which can be labeled G_1, G_2 and up to the almost innumerable type of experiences, which can be called G_n, and also B_1, B_2, B_n etc. Each type of experience has to be

qualified by the number of times that it happens, which mathematically can be described by the coefficient of G_n, we can call this g_1 for experience G_1, g_2 for G_2 and g_n for G_n etc.

So, the equation for animal welfare becomes:

$$W = g_1G_1 + g_2G_2.....g_nG_n - b_1B_1 - b_2B_2.....b_nB_n$$

Where

W = welfare of an animal
G_n = type of good experience
g_n = the number of G_n good experiences
B_n = type of bad experience
b_n = the number of B_n bad experiences
n = number 1 to ∞

This equation can be summarized as:

$$W = \sum_{n=1}^{\infty} g_nG_n - \sum_{n=1}^{\infty} b_nB_n$$

Information on the impact of experiences on welfare is limited, especially in the long term, and if necessary the animal's lifetime. However, if we accept that human responsibility to animals includes a positive welfare provision, the above approach can be used to enumerate the relative impact of good and bad experiences in the animal's lifetime. Human responsibilities in this respect are considered in Chapters 4 and 6. Using this method, we can develop the tools to determine lifetime welfare, for example does an animal that has good free range conditions for most of its life and then travels a long way to slaughter have better welfare than an animal that has intensive housing conditions for most of its life but only a short journey to slaughter? Can high welfare during rearing be offset by poor welfare at slaughter? A potential flaw with this approach is that exposure to some bad experiences may be beneficial for young animals as it prepares them to deal with potentially worse experiences in later life, or similar experiences at times when their behaviour is less malleable and they are less able to cope than in infancy. Another potential issue is that members of the public usually have certain standards below which a practice is unacceptable.

The different welfare experiences cannot be added unless the animal's perception of the experience can be quantified. Welfare is therefore not absolute but affected by the animal's response to the experiences. Welfare perception by the animal is not probably the same as welfare perception by the human. Like humans, animals make decisions to optimise their welfare over time (Abeyesinghe et al., 2005), even though their ability to do this is probably not as accurate as in humans. For example, chickens can show restraint and delay taking a food reward if it is larger than an immediate reward (e.g. Abeyesinghe et al., 2005). However, the increase in size of the reward has to be substantial and the delay short. If offered the choice of a slightly increased reward size after

a significant delay, animals become impulsive and take the smaller reward. Although direct comparisons have not been made, humans, and especially adults would be expected to show more restraint.

The total welfare perception 'P' by the animal at a particular time is a function of the sum (Σ) of these good and bad experiences, taking into account the influence of past experiences. This can be incorporated by adding another coefficient, *x* for good experiences and *y* for bad experiences:

$$P = \sum_{n=1}^{\infty} x_n g_n G_n - \sum_{n=1}^{\infty} y_n b_n B_n$$

Where x_n = influence of past good experiences on perceived welfare
And y_n = influence of past bad experiences on perceived welfare

In many cases x_n and $y_n < 1$, so the perception of individual good and bad experiences diminishes with repetition, i.e. the animal habituates. However, there may be situations where x and $y > 1$, i.e. individual past experiences potentiate the perceived welfare impact of any individual experience to a greater-than-normal response. For example, the impact of sticking spears into cattle during a bullfight is probably incremental until the animal is worn down and the matedor can get close enough to kill the animal with a sword. The adverse effect of each successive spear will reduce welfare in ever increasing amounts. Thus the marginal response is likely to depend on the previous level of experience. The physiology of pain potentiation of this nature is beginning to be understood (McKenna and Melzack, 2001).

Under this model, our contract with animals could be to provide a certain ratio of good to bad experiences, presumably greater than 1:1, for a predetermined period of time. Thus premature slaughter would be not only an ethical issue, but a welfare issue too, because the total number of good experiences would be reduced. This model of animal welfare accords with public sentiment, who believe that killing an animal reduces its welfare.

The direction of change in the quality of the experiences over a lifetime may be influential in determining welfare perception by the animal. An animal that starts off life with bad experiences that gradually progress to good experiences may perceive its welfare to be better overall than one which starts off life with good experiences but these gradually worsen over time. Many animals naturally experience a worsening of their experiences over time, as their bodily functions and capabilities for sentience, repair and activity decline with age. Others experience a reduction in welfare because of the way we manage them, for example, beef cattle are often raised on rangeland, where there is plentiful space, nutrition from their mother and freedom to perform most natural behaviours. Then for the final few months of their short lives they are transferred to feedlots, where there is limited space, often hot conditions and a novel social structure quite different to the natural matriarchal grouping that they

experienced on the rangeland. There are further complications, for although most lay people perceive that the provision of grazing for cattle is good for their welfare (Hemsworth et al., 1995), expert opinion suggests that the risk of parasitism on rangeland in some regions is a significant problem (Cross et al., 2008b). An alternative system would remove calves from their mothers and rear them intensively, a process called early weaning. This may reduce welfare because the calves lose the assistance of their mother, which for many young mammals cushions them from the realities and responsibilities of self-determination during suckling period. The intensification of agriculture in the late 20th C led to a trend for early weaning in calves, at least in the dairy sector, for economic expediency (Heleski et al., 2006a). Recently, in Nordic countries in particular, where animal welfare is a high priority, there have been attempts to develop systems where nurse cows take over the milking cow's responsibilities for rearing the calf (Vaarst et al., 2001). In most developing countries, the advantages of keeping the cow and calf together are well understood, and it even improves the health of both, providing the calf gets adequate milk (Margerison et al., 2002; Phillips and Sorensen, 1993).

Naturalness

A fourth way of defining animal welfare, which is closest to the position held by many members of the general public (Lassen et al., 2006), is that the key element is whether animals are living in a natural environment and in particular whether they have the ability to perform natural behaviour. Many people have a strong respect for, and affinity with, nature (Kellert and Wilson, 1984), and this may have conferred an adaptive advantage in the past and even today. Over the period of our evolution, humans that understood nature better would have had an improved ability to find the best food and the location of safe refuge away from predators and would have been generally better adapted to their environment. This relationship with nature is explored in the next chapter.

Animal Needs and Desires

Animals have both 'needs', that are essential for life to be sustained in the long term, and 'desires', the satisfaction of which will improve the quality of life, but they are not essential. 'Needs' relate to both life preservation and reproduction (Bracke et al., 1999). For life preservation, an adequate supply of food and water and a good health status are most likely to be limiting. For reproduction, the total environment must be suitable for it to be worthwhile for the animal to expend resources. Thus factors such as temperature stress, social stress etc may limit reproduction but are not necessarily life threatening in the short term, but may threaten the maintenance of the species in that environment. Animal

welfare can be estimated using an Animal Needs Index that has been created by Italian researchers (Napolitano et al., 2007).

Animal's desires include such resources as companionship, space, and probably variety in the diet. There is a tendency for scientists to anthropomorphically concentrate on the 'desires', perhaps because this is a major pre-occupation for humans, whose needs are nearly always adequately met without thinking about them. For example, humans are rarely sufficiently hungry or thirsty that their survival or ability to reproduce is threatened. Animals' needs are not often adequately considered, for example, the availability and quality of the food and water supply receives little attention from a welfare standpoint (see Chapter 7), whereas adequate space is usually considered one of the most important influences on welfare. Another reason that 'needs' are not considered so much for animals is because they seriously impact on the profitability of keeping animals; 'desires' are unlikely to have such a major effect. The economic impacts of different nutritional strategies and some health factors are major and well known. Desires, such as a suitable stocking density, can still have some impact on profitability, for example if dairy cow cleanliness is affected, as somatic cell counts may increase at high stocking densities in buildings (Arave et al., 1974). However, overall the economic impact of desires is likely to be less than needs.

Chapter 2
Mankind's Relationship to Animals in Nature

Animals in art and prose – changing attitudes to animals – benefits of a close connection with the natural world – comparing the behaviour and welfare of animals kept in captivity and the wild – observing the behaviour of animals in the Malaysian jungle

Introduction

Man's relationship to nature is of fundamental importance to the well-being of both individuals and society. Many people relate to nature more closely than to fellow humans or the artificial products of human civilisations. Who has not marvelled at natural wonders, admired the awesome power displayed by nature's forces, such as a waterfall in full flood, and felt inspired by the beauty of the animals and plants that inhabit our natural environment? As technological advances have diminished human reliance on the natural world, we have adapted our relationship with animals to concentrate more on the mental benefits of close contact with animals and plants, for example from ownership of companion animals, with less reliance on the physical benefits. Even the group of physicists, mathematicians and chemists that designed the first atom bomb took strong support from nature and were inspired by it (Fiege, 2007). Man's relationship with animals is still one of the most important components of moral behaviour, and to understand man's current position it is important to see how this has developed over the centuries. Nowhere is this better illustrated than in art, prose and religious beliefs, which provide us with a permanent record of the way in which man has changed his attitudes to animals over time. The following section chronologically charts man's changing attitude to animals through these media.

Changes in Attitude to Animals Over Time

Palaeolithic Period

The earliest evidence that we have of man's relationship with animals in nature comes from the prehistoric art of the Palaeolithic period. These show that man

C. Phillips, *The Welfare of Animals*, Animal Welfare 8,
DOI 10.1007/978-1-4020-9219-0_2, © Springer Science+Business Media B.V. 2009

was reliant on animals and probably in awe of them. Cave paintings were discovered recently in caves at Chauvet Pont d'Arc in the Ardeche region of France that date from about 29,500 B.C., when modern *Homo sapiens* was just emerging as a successful world coloniser, and Neanderthal man was in decline (Valladas et al., 2001). Like many later cave paintings (Garfinkel, 2006), these are deep inside the cave labyrinth, out of reach of natural light, in a part of the cave complex that was not inhabited, suggesting that they were not used for decoration of living quarters but for magical or religious purposes (Lewis-Williams, 1997). Because the paintings are layered on top of each other, it appears that it was the act of drawing them, rather than the end product that was the main purpose. The animal profiles depicted at Chauvet include bison, rhinoceros, panther, bears, horse, deer, lions and an owl. Many abstract symbols were also drawn but the significance of these is unclear (Anon, 2007c). Paintings of similar antiquity have been found in aboriginal Australia, again layered on top of each other and commonly depicting food animals so that hunting techniques could be improved.

The palaeolithic cave paintings have a sense of nobility (Lorblanchet, 2007), and although killing is often depicted, no sense of hatred is evident. In the Chauvet paintings, about 60% of the animals are those that would have been dangerous to man, if mammoths are included. Because men hunted as a pack and were reliant on others to help them kill animals that were individually much stronger than each human, the outcome must have been far from certain. The actions and behaviour of the hunted animals were unpredictable and the hunt would only be successful if the men acted in unison, with clear thinking, self assurance and calmness. This would have encouraged a respect, even reverence, for the animals, so that by supplications to the animal gods before the hunt the hunters could build up their confidence for an audacious attack. Group activities, such as chanting, may have assisted the bonding process to ensure cohesion in the hunt (Thackeray, 2005). We can picture the scene before the hunt. The men in the tribe had learned of the whereabouts of a herd of mammoths, they withdrew to an inner part of the caves, away from the distractions of the women and children. They carried a torch to light their way. Then deep in the cave system, they sat and watched as the artist of the group drew a huge mammoth, with symbols to represent aspects of the hunt that did not need to be drawn in detail, perhaps the position of people, or the approach route. Then they chanted songs about the hunt that they were planning for the next day, focusing on the dangerous activities ahead, and they danced in unison to bond together. Later groups may have used hallucinogenic drugs to enhance the spiritual nature of the process, but it is not clear whether the early hunters had the necessary botanical knowledge.

There is little evidence of any transition in the European cave paintings over time, except where there were changes in the flora and fauna. Australian cave paintings progressed from the Bradshaw human figures, which are similar to many early African paintings, to more complex drawings of animal outlines with hatched shading to allow a solid image to be depicted without using too

much paint. If an accurate depiction of the painter's subject was the desired aim, one would expect a transition from crude paintings in early periods to more sophisticated ones later. This is not generally apparent, except perhaps in Australia, which supports the contention that it was the act of drawing them that was their purpose. These paintings are to be found in almost all parts of the world, and apart from differences in the animals depicted due to geographical variation, they are remarkably similar in form, shape and size. It appears that prehistoric man had a sense of reverence for at least the large mammals that he hunted and that this helped him to co-operate in slaughtering them. Some birds are depicted, and marine mammals are common in sites near the sea, but overall there is a focus on the most dangerous animals, which suggests a magical purpose to the drawings.

Later rock artists appeared to use their artform to express their wishes for human society, such as maintaining male dominance over women (Whitley, 1994). They also used sculpture for animal imagery, but the nomadic nature of the human population in the Palaeolithic period would have made this of limited value. The earliest known animal sculptures, a bird and a horse carved in ivory and found in Germany, suggest that such figurative art emerged about 30,000 years ago (Conard, 2003). Somewhat later (20–19,000 BC) is a small stone figure of a flying swan, probably an amulet. The reliance of the ancient nomadic people on animals is demonstrated by their use of an Animal Style of art, which employed animal images in weaponry, clothes, ornaments and jewellery (Carter, 1957). These images were not detailed but portrayed the most prominent features of the animals only. Use of the imagery is suspected to have been a means of protecting the people from evil, with the animals believed to have magical power (Mundkur, 1984).

Animals at this time were, therefore, more than just *things*, they were perceived to have spirits. The animal teleos, or individual identity, was held in high regard by the people that hunted them. At this time in our history, humans were therefore totally dependent on animals for their livelihood. Nowadays, most animals are partly dependent on people for their livelihood, and it behooves us to honour the opportunity that they gave our forebears to develop into the human society that dominates the world today.

Neolithic Period and Early Civilisations

As man started to develop closer associations with animals and to cultivate plants in the Neolithic period, there was more opportunity to construct artifacts to represent their relationship with animals. Many of the earliest sculptures, created 30–25,000 years ago, represented not animals but pregnant humans (Anon, 2007d), evidence of a desire for fertility that would have helped the population to replicate. As settled agriculture developed, the prospect of misuse of animal and plant resources became possible, and even likely. Many early

civilisations failed when their use of natural resources became unsustainable or climate change forced new directions in agricultural techniques. There is evidence of this in the livestock farming in the Middle East. There sheep and goats were first domesticated about 6–8,000 BC (Hatziminaoglou and Boyazoglu, 2004), in a region called the 'Fertile Crescent', but now that land is unable to support even enough animals to feed the local population. To fill this gap a buoyant trade in live sheep between Australia and the Middle East has been established. So now on the wharf in Western Australia you can often see large numbers of sheep waiting to travel by ship to the Middle East, leaving one fragile environment that could easily lose its ability to produce sheep in a sustainable way to another fragile environment, the Middle East, where the water available for agricultural production has reduced very significantly since prehistoric times (Araus et al., 1999). Other problems in the region which probably were associated with the collapse of agriculture in the region are salt accumulation from repeated irrigation of the land and forest destruction (Nissenbaum, 1994). History has shown us that truly sustainable agriculture is hard to achieve (Brown, 2007; Gintzburger et al., 2005), particularly in relation to water use, and one of the lessons from this period of early agricultural development is that we must ensure that animal production in fragile environments does not permanently damage the environment for future generations.

The Garden of Eden and its meaning to humanity The Garden of Eden is believed to have existed about 4,000 BC (Hill, 2000), 2–4,000 years after mankind first started to develop domestic sheep and goat breeds in the Fertile Crescent. It is tempting to think that it was man's changing relationship with nature, as a result of lessons learnt from over-exploitation of plant and animal resources, which was the reason for this story and similar ones in other religions. Carlson referred to the allegorical significance of this story when she wrote "today we use animals as symbols of a long-lost Eden, a connection to a religious 'wild'" (Carlson, 2002). Man's relationship with animals was changing from one in which he merely co-existed with animals, exploiting them where he could, to one in which he was responsible for managing them. He was developing the knowledge required to use the animals and plants judiciously, through agriculture. Although the Fertile Crescent was well supplied with all the necessities for domestic life and it was here that most of our current plant and animal species were domesticated (Diamond, 1997), the problems of drought, salinity and deforestation challenged farmers in the region in ways that are familiar to farmers pursuing agricultural sustainability today. The Fertile Crescent was a good testing ground for man's skills in sustainable agricultural management, and after several thousand years of developing systems of animal agriculture, this story warns us to respect the forces of nature.

In the allegorical story, man's relationship with nature was potentially the source of all wrong-doings, since his relationships with animals (the serpent) and plants (the apple) were fundamental to his knowledge of right and wrong. He learned directly from nature, in the form of the serpent, about right and wrong. He learnt that he was different from the rest of the animal kingdom

(because he was naked) and was initially ashamed of this fact and covered it up. He therefore shrank from his knowledge of good and evil, and not only did he cover his nakedness, he hid in the garden. The task required of him, to understand what is right and what is wrong and behave correctly according to this code, was initially too great. He was tasked (by god according to the story) with having dominion over the animals, managing them, making him distinctly different to all other animals. This is an enormous responsibility, and even if we don't believe that a god required us to take it on, it is clear that we have that responsibility now. Our impact on the plant and animal kingdoms' of the world is indisputable. Apart from all the animals that we manage directly, the farm, companion, research, sport, work and zoo animals, our impact on the natural environment is becoming increasingly evident. Sometimes we maintain or recreate ecosystems of a type we prefer and feel comfortable with. Or they may be from a particular period in history, as in the preservation of small farms and their integral connection to nature in British national parks. But our influence is far greater than that. We encroach on natural habitats to convert land to agricultural or housing use and we contaminate the atmosphere with gaseous pollutants, which eventually changes the environment worldwide. The influence of man on the atmosphere is not just greenhouse gases, heavy metals like lead have been emitted into the atmosphere and have been found in polar icecaps. Accepting that we have this influence on nature is a major responsibility, and one that, like Adam, we may find difficult to accept. As a society, we should respect those who take on that responsibility and manage animals well – farmers, staff in animal shelters, zoos, sanctuaries, animal laboratories etc.

We have learnt a lot about animal management since the Neolithic period, and important milestones, such as the simultaneous discovery of evolutionary principles by Darwin and Wallace 150 years ago, can now be viewed as increasing our knowledge to assist us to manage nature. The religiously inclined may believe that it was assisting God's purpose for man, rather than any challenge to his supremacy, which Darwin was so afraid of.

Early civilizations The development of early civilisations in the Middle East and Europe maintained a close contact with animals, firstly as objects to be hunted and secondly as gods, for example the cat in Egypt. However, they added new uses of animals, as livestock and pets, for guarding and as hunters. The ancient Mesopotamian civilisations were the first to develop urban societies, but the inhabitants still clearly relied much on animals. Art of this region has survived in the form of sculptures, ranging from the 26th C BC to the 6th C BC. Animals sculpted included bulls, sheep and horses. Sculpted dogs, believed to be for guarding purposes, have been found that are at least 15th C BC (Fitzwilliam Museum, Cambridge, UK). Assyrian cultures favoured depictions of bulls that had been stabbed, demonstrating a celebration of the animals' death that contrasts with many of the images of the prehistoric cave paintings. Later the Romans developed the practice of sacrificing bulls both before battle to cleanse the troops and prepare them for the task ahead and also after, to celebrate victory. Our best record of literature of attitudes to animals at this

time is the Old Testament, in which it is evident that animals played a major role in human society. However, they were beginning to become items of property, as evidenced by their use in sacrifice to appease gods. They were still revered, such as the Golden Calf that was carried with the Israelites in their travels in the Middle East.

Egyptian civilisations had many gods, most of whom had an animal form in at least some part of their body, and which was fundamental to the life of the everyday people. Many were half human, half animal – chimeras – which were common in other ancient cultures. Early Egyptian civilisations (about 7,000 BCE) commonly used animals in their artwork: baboons, perhaps as a fertility symbol, frogs, which symbolised the inundation of the Nile, and boars. The greatest evidence of animal symbolism comes from the late Egyptian to Roman period of 4,380 to 4,200 BCE, when animals were extensively depicted in their art. There were many representations of dogs, for hunting and guarding property, hippopotami, often shown being hunted, scorpions, which represented kings because they could both attack enemies and defend their territory, and cats, which were reared to be mummified at an early age. Some animals were believed to be representations of gods when they had died, and the coffins of mummified humans were adorned with much animal art, especially cattle, ibises and dogs.

The Etruscans of Italian Tuscany developed a vibrant agronomy, growing flax, grain and olives. There was less reliance on animal art because of this, but there were still the mythical centaurs, swans, lions, oxen and horses used to embellish everyday items, especially pots. The artifacts from this period in the Dachian civilisation of the nearby land that is now Romania also regularly depicted centaurs, chimeras and animals. As early as 7–11 C BC when the Etruscan civilisation started, there was less animal use because of the thriving plant-based agriculture had been developed in the near perfect climate. Later, it is interesting that few Italian saints are associated with animals, in comparison with for example, the Celtic saints (Preece and Fraser, 2000).

Greek and Roman civilisations The ancient civilisations of Greece had a close connection with animals. Their confident approach to depictions of animals in art in the Classical period reflects the self-assured nature that they displayed to their interaction with the natural world. Even the constellations of the sky were represented in animal forms. The Greeks greatly respected beauty, and like the Palaeolithic hunters, they depicted the large mammals in much of their art, particularly horses and bulls. The horse, from which they derived substantial benefit, was idealized in their art as a creature of great beauty. The art historian Kenneth Clark described their relationship with these animals that even now we consider beautiful:

> Primitive man's admiration for the beauty and strength of animals never died out, and in more evolved societies became the inspiration of great works of art. From about the year 1,500 BC sculptors have found in certain animals a grace, a delicate balance and a smooth relationship of the part to the whole which we have come to describe as beautiful. An undefinable word; but since it expresses the difference between our

> feelings when we look at a gazelle or a horse and those aroused by a crocodile or a wart-hog, it is worth preserving . . .as the description of a precious human experience. . ...The Greeks . . .had one superb vehicle for their sense of beauty, the horse. . . ..No wonder artists have been inspired by horses. The splendid curves of energy – the neck and the rump, united by the passive curve of the belly, and capable of infinite variation, from calm to furious strength – are without question the most satisfying piece of formal relationship in nature: so much so that good photographs of horses have the same effect on me as works of art (and of course a well-bred horse is to some extent the result of art) (Clark, 1977).

The extent to which the Greeks valued the beauty of horses is shown by their regular use of horse images on their coinage. The depiction of the horse in art not only emphasized their grace and fine lines, so expertly painted by artists such as George Stubbs, Leonardo da Vinci, Géricault and Degas, it also drew attention to their energy and at times ferocity.

The Middle Ages

The mediaeval period of the 5 – 14/15 C AD was characterised by much use of animal imagery, particularly on jewelry. Most of the people had close contact with animals, and in particular depended on them for food and tillage of their land. The pervasive nature of animal imagery at this time also extended to domestic artefacts, where even the jugs were often in the form of animals (aquamaniles).

It was during this period that the confidence of the European population was shaken by the ravages of plague and famine. The people turned to their God for help, hoping for appeasement through the construction of grandiose cathedrals, and the Christian church grew rapidly in power and influence. The respectful relationship of Europeans with animals was evident in the gargoyles that adorned the cathedrals.

Religion therefore played an important part in the lives of everyday people, and animal imagery was much used in ecclesiastical architecture and literature. In the absence of printing presses, monks were tasked with transcribing books, and they often illustrated the texts with depictions of animals in majestic or humorous scenes, adding interest and amusement. It was in this era that the signs of the zodiac were devised to provide shorthand to the months of the year.

The mediaeval period left a significant store of animal art in adorned books. The monks who created the animal art had better living standards than the majority of the population and they devoted themselves to two things, God and nature. The best example of their close relationship with nature is the Bestiary, a much used book with depictions of animals, mostly exotic or grotesque in nature, in symbolic pictorial stories. It was used during their long hours of prayer and reading. The stories drew theological or spiritual conclusions from observation of the natural world. The text derived from a 2nd C AD Christian book, Physiologus (meaning ‘naturalist’). The animals used to embellish the

manuscripts often came from the Roman and Greek literature of the early Christian church. Many were of North African origin. Their strange nature, with combinations of body parts from several species, also relates partly to the lack of direct experience of the animal on the part of the artist.

The classical attitudes to animals of the ancient civilisations clearly influenced the Middle Age animal art. For example, the respect shown for the horse in the Romano-Greek era, which verged on idolatry, was further developed in the Middle Ages by Europeans in the form of the unicorn. This was a mythical horned horse, which had probably been imagined by the explorers of the newly discovered African and Asian lands when they saw horses with riders brandishing spears or lances. Despite its large horn, a defensive weapon, it was portrayed as submissive in the presence of even the most vulnerable of humans, the young virgin, and was frequently depicted resting its head in the lap of a virgin. This may have symbolized the submission of the human male to the feminine nature of woman, but probably the true thoughts of the original unicorn artists will never be known. It later came to symbolize the risen Christ and thus the sacred character of the natural world. It was believed that a unicorn could purify water by dipping its horn into it, which symbolised Christ's purification of the world after the fall of mankind in the Garden of Eden. So prevalent was the image of the unicorn in mediaeval Europe, when later European explorers saw rhinoceroses in Africa, they mistook them for unicorns.

The monks' rudimentary knowledge of animal breeding, and the possibility to create different animal forms by cross-breeding, may also have driven them to depict fantastical animals. Some well-known northern European animals were drawn in forms that the artists must have known did not exist. The artists, who were mainly mediaeval monks, probably had a considerable interest in, and perhaps knowledge about the breeding of animals. In mediaeval times an extension of their knowledge of the inheritance of characteristics of farm animals to wild animals is a possible explanation for the fanciful animals that adorn the Bestiary. Several centuries later, another monk, the now celebrated Austrian, Gregor Mendel, discovered the mathematical principles of genetic inheritance through his careful studies with peas.

However, there is another reason for the mysticism, which may have prevailed in the early days of bestiary drawing. In the early Christian church these drawings were allegorical and there was a need for symbolism in the days of Christian persecution. It also represents the uncertainty that surrounded the church at the time, with a rejection of traditional paganism by many and a search for mystical and fantastical theories. Such new religious theories were explored through the depiction of animals in strange forms and situations, thereby demonstrating the closeness of the artists at least to the natural world. This symbolic use of animals was also evident about a millennium earlier in the biblical Old Testament book of Job, in which it was written 'Ask the beasts and they shall teach thee, and the fowls of the air, and they shall teach thee' (Job, Chapter 12, Vs 7).

Not all the mediaeval depictions of animals were of fantastical animals. The monks often drew pictures in their manuscripts of animals with which they interacted every day, such as fish or wild boar, sometimes to decorate an insertion of text, sometimes for no other apparent purpose than to provide a pleasing appearance to a page or to satisfy the artist's need to communicate his feelings for the natural world. These animal 'doodles' may mean little to us now, but it is symptomatic of the close communion with nature of the monks of the mediaeval period, that animals were commonly depicted in their texts. In some mediaeval texts and ecclesiastical frescoes, animals are put in humorous scenes, clearly for the amusement of the reader or viewer (Figure 2.1). Later, after the arrival of the printing press, such embellishment of the text with animals disappeared. It may have been unnecessarily cumbersome to set up on the printing presses, or it may be that writers did not wish to reveal such intimate aspects of their character for mass readership. Later, some bestiaries were defaced to remove the humourous images, such as the horned devils and people's bottoms in the Macclesfield Psalter of 1330, probably by those that equated laughter with evil in the Puritanical spirit that became popular through much of Europe in later years.

In addition to gargoyles and bestiaries, in England and other prosperous regions of Europe at the time, church effigies and brasses provide some material to enlighten us on attitudes to animals at the time. Memorials often included dogs lying at the feet of the deceased, but this was not because of their being required to accompany their owner to the next life, not to indicate the submissiveness of the dogs, nor even because of their emotional significance in the life of the owner, but rather because in colder regions of Europe at time, people slept with dogs at their feet for warmth and protection. The importance of some animals of the mediaeval period for the livelihood of the general populace is demonstrated by sheep depicted at the feet of wool producers (Fig. 2.2). However, lions were also commonly depicted in this position, illustrating the

Fig. 2.1 Execution of the cat by a procession of rats and mice. Detail from the Cathedral of Tarragona, Spain (Evans, 1896)

Fig. 2.2 Footrest from brass to unknown wool man, c. 1485, Northleach, Gloucestershire (http://www.mbs-brasses.co.uk/pic_lib/Picture_Library-Wool_and_Cloth_Trades.htm, accessed December, 2006)

reverence for this animal as a symbol of courage and strength, as in Richard the Lionheart. The lion has been the symbol of English kings since that time. In addition to the lion, many other animals had symbolic characteristics, as developed in heraldry. In Christianity, birds were the symbol of the risen Christ, and were also protectors against the plague. A mythical bird Charadrius could take any disease from humans. Doves came to represent the Holy Spirit, a symbolism that has been maintained to this day. Dragons represented the devil, and a red dragon symbolised the British people before the invasions by the Anglo-Saxons, which were represented by the white dragon. The red dragon is still used by the Welsh people as a symbol of their Celtic origins. Another fanciful animal, the basilisk, could kill by its smell, glance or hissing sound, and the manticore, with the face of a man, body of a lion and tail of a scorpion, had so seductive a voice of siren song that it could tempt Christians away from their life's journey in prayer and reflection.

The early Christian churches and manuscripts in England were therefore much adorned with animal art, mostly of the allegorical kind, some of which was copied from the Mediterranean animals, but some depicted northern European animals. In addition to that remaining today – the gargoyles, the illustrated texts with bestiaries etc. – the walls of the churches and cathedrals would have been painted with images that have long since been eroded away. The people of the Middle Ages, especially the monks, therefore had close contact with animals and they depicted them regularly in their art. The fact that they chose to illustrate books, adorn churches and probably their homes with them, suggests that they understood how the natural world functioned, and they believed that it had a moral perspective that humans needed to learn and understand.

Animals were also much used in sport. In one game, the village idiot was encouraged to bite off the head of a sparrow, which usually resisted fiercely. Many other barbaric rituals masqueraded as sports, such as cockfighting,

dogfighting and bearbaiting. Clearly animals were used both in the positive and negative aspects of mediaeval life.

The Renaissance

In contrast to the allegorical use of animals in the Middle Ages, the Renaissance movement, which originated in Italy in the late 14th C, was a worldly movement, enjoying life's pleasures and celebrating them in natural art. Renaissance art had less reliance on animals than previous cultures, but it was sometimes characterized by life-like depictions of animals in dramatic poses, displaying the ferocity that reminded people that nature could not be easily tamed. Animal art of the period was characterised by depictions of one of the most graceful animals ever painted: the horse, most notably by Leonardo da Vinci, who painted horses for almost his entire artistic career. He had a flair for, and interest in, depicting the anatomy of horses with great accuracy. The confidence with which he drew his horses, that may have surpassed even Stubbs in detail, was symptomatic of the enlightenment that pervaded this era. The contrast between the direct approach to animals and nature in Classical and Renaissance periods and the mythical approach of the northern Europeans in the Middle Ages may simply reflect the later development of civilization in northern, compared with southern Europe. It was not until the Victorian period that the northern Europeans came to portray dominance of humans over nature in art, but when they did it was with great romanticism, reflecting the confident mood of the people at this time of rapid progress.

The employment of any frivolity, such as the inclusion of animals to enrich religious texts, was greatly frowned upon in English texts of this period, and especially in the King James' version of the Book of Common Prayer, produced in 1603. Such heavyweight texts were needed to confirm the King's authority and to bring a sense of order at a time when England was troubled by civil war and there was general unease in the population. Despite the demise of the Stuart kings, the Book of Common Prayer continues to be used in some English churches until this day, reflecting the popularity of the ancient prose.

The first appearance of animal activism occurred at this time, encapsulated in a painting in the Hermitage museum of St Petersburg, *Portrait of a Hunter* by Paulus Potter (Fig. 2.3). In this picture hunting scenes in the peripheral paintings are juxtaposed with two main scenes that depict, first, a bear and two wolves hauling a hunter before a tribunal consisting of an elephant, a ram, a leopard, and a lion. A fox holds down the bill of indictment with his paw. The hunter's cringing dogs are dragged behind him, by a bear and a boar. The second scene shows the hunter being roasted on a spit by his former victims, while his dog auxiliaries are hoisted skyward on a rope. This reversal of roles was more famously portrayed in prose in George Orwell's Animal Farm, first

Fig. 2.3 Portrait of a hunter, Paulus Potter, Hermitage Museum, St Petersburg. c. 1650

published in 1945. Paulus Potter was a prolific painter of animals in the Golden Age of Dutch painting in the early 17th C. He wandered the countryside observing how animals behaved and was unusual because he was one of the first accomplished artists who made animals the focus of his paintings, rather than an accompaniment. His meadows were enlivened with frogs, lizards, poppies and butterflies, and he was more attuned to nature's moods and the timeless harmony of animal, landscape, and weather than any of his contemporaries, or perhaps predecessors. He died of tuberculosis at the tragically young age of 28.

In the 17th and 18th C, one of the most common depictions of animals was in family portraits, which usually had at least one dog in accompaniment. Edward Landseer, George Stubbs and others portrayed animals in bold, dramatic postures and settings, but under the control of humans, adding to the belief that animals were there to be managed. Frequently, characteristics of animals that people admired and desired were portrayed, such as the ferocity of the lions that Stubbs often depicted. Alternatively the animals were depicted dutifully mirroring the family head's gaze and expressions. Stubbs also painted cattle, such as the Lincolnshire Ox (Walker Art Gallery, National Museums, Liverpool, 1790), which was probably approximately 50% bigger than life size, by comparison to the human standing beside it. Other painters of agricultural animals also exaggerated body size, so that they appear to have impossibly small legs that could not support them.

Victorian Times

The historical art period that represents the strongest affinity with nature is probably the post-industrial revolution era in northern Europe. This may reflect nervousness towards industrialization, with its reliance on man's discoveries, perhaps also a reaction to the way in which modern societies had distanced themselves from nature in towns and cities, perhaps a concern about the pollution that began to pervade these areas or perhaps increased leisure time and money to enjoy the beauty of nature. Nowhere was this better represented than in the art of the day, in which the viewer was encouraged to see the countryside as innocent, beautiful, traditional and untainted with modern development, and generally a happy place to be in.

The European Pre-Raphaelite Brotherhood, founded in 1848, was at the forefront of the Victorian Romantic movement. A similar movement of romantic naturalism re-established nature as an acceptable subject of moral philosophy (Kalenda, 2005). In Victorian art, in contrast to the dull images of classical 19th C nudes, Constable's countryside scenes or even some of Stubbs' animals, the seven brethren of the Pre-Raphaelite movement depicted nature as romantic, with sensuous women and bucolic reposes of farm workers in natural settings. They used bright colours, with many shades of greens. Often there are small groups of animals in the fields, with bountiful supplies of fodder and shade from trees. They are depicted lying and resting, like those tending them; hence the life of the grazing animal appears idyllic, like that of their carers. This suggests that the artists believed that animals had to be happy for their carers to be happy. They could have depicted the animals hard at work grazing, while their carers rested. This contrasts with the paintings of Constable and his followers 50 years earlier, where rural scenes were less warming to the viewer, often with dark skies, distant animals grazing and the focus was on the harshness of rural life at the time. The Industrial Revolution had started and people were alerted to its potentially powerful effects by artists such as Turner, who did not espouse the classical style of the early 19th C, and painted neo-industrial scenes, such as the first steamships, with dramatic sunsets that are evocative of the dawn of industrialization. In contrast to this, fifty years after Constable and Turner, in the mid-late Victorian period, the Pre-Raphaelite brethren attempted to draw the city dwellers' attention to the beauty of the natural world that they had left behind.

The brethren began their work in Oxford, but continued in London, where the rapid growth of the Victorian city must have incited reminiscences of the pleasures that nature could bring. They promoted painting directly from nature (i.e. outdoors), being true to it, with a great attention to, and reverence for, the detail of nature, and they encouraged people to look at nature with pleasure and to appreciate wild places. Typical scenes included a few cattle or sheep, being tended by a small group of children or a family group, who were resting in the shade of a tree in a well-wooded valley. There was never a suggestion of failing crops, starving cattle or a poverty stricken rural population.

The reality of rural life was quite different from the pre-Raphaelite's romantic perceptions. By the 1870s England was in the grip of a severe agricultural depression, characterized by low wages, intense competition between farmers for markets in the face of cheap imported food, and rural depopulation fuelled by an increasingly mechanized agriculture. Still the landscape painters continued to depict idyllic rural scenes. This was the biggest period of rural change of the millennium, with the proportion of the population living in cities increasing from 20% in 1801 to 80% in 1911 in Britain. The expansion of Victorian cities was accompanied by the development of strict moral codes, necessary because of the poor working and living conditions. Fear of disease, poverty and a people's revolution similar to that in France added to the misery of city dwellers. At this time, the rural idyll depicted by such painters as the brethren's founders, Dante Rosetti and Benjamin Leader, attracted great attention in city exhibitions. The idea of family groups with their accompanying animals, which could easily gain a living from a countryside resplendent with abundant resources, must have given hope to many. The reality was that landowners operated strict control of their animal and plant resources, with gaming laws preventing families from supplementing their meager diet with even rabbits or pigeons, and some even preventing the collection of berries and nuts on their properties.

By contrast, the Australian paintings of the late 19th and early 20th C agricultural pioneers were typically more honest, showing large mobs of cattle in a wide open, but still beautiful landscape, traveling on a dusty road to slaughter. Meanwhile in Europe visiting the wild places became popular, which was facilitated by the growth of the railways in the mid to late 19th C. For example, the mountains and lakes of England and Wales became increasingly fashionable for tourists as the Industrial Revolution progressed (Trevelyan, 1949), suggesting that people working in stressful conditions needed contact with nature to recuperate. A typical picture of the day exists in the Bristol Art gallery and depicts the true story of a climber lost off Striding Edge on Helvellyn in the English Lake District, with the faithful dog found beside the body some months later. Fidelity, courage, strength, beauty were all favourite topics for Victorian artists painting animals.

Literature too embraced the benefits of a harmonious union between humans and animals. At the end of the Victorian era a major series of animal stories, the Jungle Books, were written by Rudyard Kipling, which used animals to portray moral stories to children. The canniness of the fox, the independence of the cat, and the sociability of the dog were all used to explain to children how they should behave. In these days, regular contact with animals was normal for most children, and the tradition of using animals to instruct children has continued to this day. However, it is debatable how long this will continue, because children will increasingly fail to recognise the animal characteristics that their forebears knew so well. There may be a stronger focus on animals known to city dwellers – domesticated pets and animals, such as foxes, that have adapted to city life.

Recent Times

In modern art, animals are less frequently depicted compared with most earlier art, showing that we have become more remote from contact with animals. Artists prefer to use manufactured items, especially those in every day use, and put them into unusual contexts to surprise the viewer. War scenes were commonly depicted in the first half of the 20th C, as artists wanted to depict the horrors that they perceived (for example Guernica by Picasso), in contrast to the patriotic and heroic messages of governments of the day. A rare but evocative first World War animal painting depicts a faithful dog, looking forlornly out of the window, with an obituary on the wall, and widow's knitting and reading book on the windowsill ('Will he come home', Bristol Art Gallery). Elsewhere few animals were depicted in art, which was preoccupied with war and the last vestiges of the Industrial Revolution. The motorcar had begun to have an impact on society, man could fly in machines and the Victorian fascination with the natural world must have appeared old-fashioned and irrelevant in the machine age.

In the mid to late 20th C, the public became captivated by the domestication processes that are at the centre of our relationship with nature. Genetic manipulation by humans had been a concern since Darwin's time, and the scientists had begun to consider the mechanisms of domestication. Jack London famously explored the relationship between wolf and dog in his influential books 'Call of the Wild' and 'White Fang', but was criticized for humanizing canines (London, 1939). In the 1960s, after the ravages of the wars of the first half of the century, there was a time of exploration of nature's beauty, perhaps as an antidote. The public were captivated by the work of Joy and George Adamson in Africa, in the books Born and Living Free and a film of the same name, in which they rescued orphaned lion cubs and cheetahs, hand raised them and reintroduced them to the wild. There was resurgence in art of the painting of animals in wild African settings, led by David Shepherd. People were for the first time beginning to question the ethics of rearing wild animals in captivity, and whether the domestication process changed animal form and function. Further afield the public became able to view the natural world from the comfort of their living room, through the endeavours of companies such as the British Broadcasting Corporation and their Bristol wildlife unit. Presenters such as David Attenborough, Johnny Morris and David Bellamy became household names and icons for their portrayal of the natural world in the media. Underwater, Jacques Cousteau began to reveal a world that people had only had very limited understanding and knowledge of before television. Children's television regularly used animal stories to reinforce the belief there is a hierarchy of care for animals, with mammals at the top and animals such as fish and invertebrates at the bottom (Paul, 1996). The use of farm animals in products such as meat and wool was rarely portrayed, thus avoiding the paradox of caring attitudes towards animals that are ultimately going to be killed for our benefit.

More recently, there has been a resurgence of interest in the beauty of animals and in their behaviour, which coincided with a growing realisation amongst scientists that the natural world was at risk from man's activities, and again a period of rapid urbanisation, as it had in Victorian times. The benefits of close communion with nature, for example taking 'green' exercise (walking or cycling in parks, conservation work etc) have now since been shown to be particularly beneficial for both self esteem and mental health (Pretty et al., 2007). Scientific studies have demonstrated that people living in buildings surrounded by green parks are less likely to suffer from stress, are less aggressive and more likely to engage in physical activities and have increased social cohesion (see Groenewegen et al., 2006). People increasingly understand that they need some close contact with nature and describe it as beautiful, soothing or edifying, not just green surroundings but also animals in natural surroundings. Despite this, where animals are used in art today, they are often included symbolically, or in an attempt to shock, a notion which pervades modern culture. Perhaps this is in response to a living style that is too protected, and as most people are free from involvement with wars, protected from the major infectious diseases, and enjoying unprecedented high standards of living, some have turned to nature to shock, terrify and amuse them. The depiction of animals in graphic or horrific images, or pickled as laboratory specimens, reminds the viewer that the natural world can still arouse our passions that have been dulled by the sterility of modern living. This was a technique used earlier by Stubbs, in his many paintings of lions attacking horses (an event he is believed to have witnessed), which had the power to alert our primitive instincts of fear and alarm. In the carefully constructed artificial world that many live in today, particularly those in cities, people appear to welcome this reminder, perhaps reflecting a primitive need for exposure to mock danger, so that we are prepared when real danger occurs.

More recently, in Australia at least there has been evidence of resurgence in interest in communion with nature through art, and renewed interest in the ancient aboriginal paintings of natural subjects is confirmation of this. The relationship which the traditional aboriginal peoples of Australia had, and to some extent still have, with nature has emerged to become respected by many in the western world. This recent reverence for that intimate relationship between man and animals was first evident when the cave paintings of horses, primitive cattle and others were discovered in the middle of the twentieth century in France. It may reflect nervousness that we are losing touch with nature, a concern that we are damaging the environment, beginning with issues such as the damaging effects of DDT, progressing to widespread habitat destruction and more recently pollution of the atmosphere with greenhouse gases. A return to nature is evident in today's Green movement, and the popularity of aboriginal art and its communion with nature is evidence of this movement.

Conclusions on Changes in Attitudes to Animals Over Time

It is often hard to discern the artist's message concerning animals, but it ranges from predominantly veneration in prehistoric times and early civilisations through to symbolism, which was particularly evident in the Middle Ages, respect and adoration, most famously in the Industrial Revolution era, and finally to attempts to shock and disturb, which has been used throughout history, but are probably the most common reason for including animals in modern art.

From the Palaeolithic period, when animals were the dominant subject in art, and in many cases the only subject, there has been a transition to animals becoming one of the less common subjects in the most fashionable art of today. This reflects the place of animals in society, from humans relying heavily on animals for their food supply to their having little or no physical need to have direct contact with animals. In between there were periods in early civilisations when most art had some connection with animals, but equally there were civilisations, both ancient and modern, whose art had little association with animals. Not all observers agree with this trend, Fraser (2005) believes that animals have received *increased* attention in literature, the visual arts and philosophy over time, at least since the beginning of the 18th C, and attributes this to increased scientific knowledge about animals and the transition from contact mainly with farm animals to contact mainly with companion animals. The best way to test the hypothesis is to visit national art galleries, which usually chart the development of the nation's art chronologically. For example, a visit to the national art museum in Bucharest, Romania, readily demonstrates that there was a transition from regular use of animals as centaurs, chimeras and agricultural animals in their early civilizations to much less frequent use by the second millennium AD. Indeed only a handful of the 1000 or so paintings from the 14th to 20th C on display include animals. Most of the bucolic images, that were almost as popular in this Latin country as they were for the Pre-Raphaelites, illustrate cropped fields and rustic buildings, with people enjoying the fresh air, good food and open space. The archetypal family portraits that were more common in northern Europe, with a father, typically standing and the tallest, a mother, often sitting, some children and one or two dogs are largely absent. A notable exception was a single painting of people and animals enjoying the forest, of which there is much in Romania, with the animals playing musical instruments, dancing etc, in a way that is reminiscent of the mediaeval bestiary of England, described earlier. Where animals are depicted in the countryside, and horses and cattle are included sometimes, they are not a central part of the picture, but are there to demonstrate their usefulness to agriculture. Animals of traction have pained expressions, in contrast to the humans, and other animals accompanying them. This simple examination of a country's national art treasures can therefore reveal the changes in attitude towards animals, at times showing close reliance on animals but also often demonstrating a utilitarian approach to animals. Nowadays the continued

popularity of household pets in these countries perhaps demonstrates their strong need for animal companionship.

The trend in British art over the last two hundred years to depict agricultural animals and their carers in harmony with nature is usually far from reality. The pressure on farmers to produce cheap food resulted in some unethical animal and plant management practices emerging that necessitated legislation to control the worst examples of animal cruelty, as well as requiring long working hours by the farmer and produced a feeling of isolation in many. The amalgamation of farms to make economically viable units has led to farmers being estranged through rural depopulation. The level of suicides amongst farmers is one of the highest of any profession. Technological developments have changed agriculture from an art to a science, leading Rollin (2006) to lament that *husbandry* is not taught in agricultural colleges any more, having been replaced by animal *science* courses. Nevertheless, the bucolic images continue, to tempt us into thinking that there is a better world away from the cities. The emerging focus on high quality food production both draws on our desire to support this rural idyll and may be instrumental in reversing some of the damage that has been done to rural life by commercial pressures.

Over time, the proportion of the population that has a close connection with animals has declined. In hunter-gather societies, most men would have had involvement with the hunt, and women and children would be involved in looking after companion animals and preparing food animals for eating. Nowadays in developed countries, only a small proportion of the population have a direct connection with animals through their work, perhaps no more than 10% in total. A large proportion of the population has companion animals, but this is voluntary. It conceivably represents an attempt to maintain a connection with the natural world, to bring it into our homes, where we can wonder at it in comfort and free from danger. There is increasing interest in keeping exotic, dangerous animals as pets, which demonstrates the sense of satisfaction that we have in mastering nature.

The Benefits of Naturalness

There has been a focus in art over the centuries to depict mainly the animals that are of benefit to us as beautiful, and these are animals that we empathise with most. Often in art, animals were depicted in a wild setting and both animals and nature were romanticized. This was particularly seen in animals that are beneficial to us. Rarely has the rat or the snake been depicted as a beautiful animal, on the contrary the snake is usually associated with the guile and cunning that was first displayed in the biblical Garden of Eden. The curving lines of the snake are more likely to evoke feelings of fear than beauty, despite the fact that they possess features that might be considered attractive in human empathy – curvaceous, slim and slow, gracious movement. Such features are admired in

other humans and some animals, such as horses, that are routinely depicted as beautiful in art. Fears of snakes and spiders are inherited characteristics (Kendler et al., 1993; Davey et al., 1993), demonstrating that our response to nature is not simplified to certain forms and features, but is complex and to some extent dependent on our genetic makeup.

Not only do the public view animals that are beneficial to themselves as more beautiful but also more sentient. In the ranking of sentience by university students described earlier (monkey > dog > newborn baby > fox > pig > chicken > rat > fish, Phillips and McCullough, 2005), the physiological validity of this ranking is dubious and there is no evidence that the dog is actually any more sentient than the rat. However, they were ranked at the opposite ends of the spectrum because the dog provides many benefits and the rat is generally viewed as a pest. Furthermore, these students believed that more sentient animals deserved better welfare, so perception of sentience may have a major influence on welfare standards. This shows the danger of relying on people's opinion to set welfare standards.

The feeling of beauty and wonder when we view the nature at its best is probably generated biologically in a similar way to the feeling of wonder when we see new technology that can help us in our daily lives, or the image of an attractive person. However, this perception of the sanctity of nature is something longer lasting, something that transcends the wonder of modern technology. Who has not stood in the nave of a big cathedral and wondered at the magnificence of the structure above? However, how more awesome is it to stand at the foot of great forest trees and wonder at nature's ability to create such an impressive structure. One of the characteristics that evokes that sense of wonder is probably the uniqueness of the feat, and this might lead us sometimes to be more inspired by man's 'cathedrals'. However, one can pass a beautiful natural scene every day and still feel respect for it and a calmness that is generated by the sight. The same cannot be said to be true for the sense of wonder on appreciating the possibilities offered for our lives by modern technology, whose attractiveness rarely survives the first few encounters. The delight of learning that a small machine like an Ipod, which you can keep in your pocket, can store all your favourite music is short-lived. No sooner has one wonder of modern technology delighted us than another captures our attention, as we search for that quick solution to correct the deficiencies in our lives.

There is likely to be adaptive benefit to such a sense of beauty, which is a feeling that has evolved to keep us knowledgeable about the natural world, developed after millions of years of dependence on nature. However, the same sense of wonder can be gained from watching the moon light up the waters of the sea, or the grandeur of a great mountain. Such attraction to scenes like these could have had positional benefit in the past, allowing man to accurately pinpoint his location in relation to his home territory. If this is true, we would expect such feelings to have developed in other animals.

Can we expect the same of animals – would they benefit from a close relationship with nature? Clearly they do not appear to use art to portray any positive feelings about nature, although sometimes their constructions, such as the nest of a bower bird, portray a sense of order and invoke a feeling of wonder that may incline us to believe that it is art. In contrast to this, the activities of the elephants that are persuaded to daub paint on canvases which are sold to tourists in Asia are not art, but merely the performance of a reward-driven behaviour. Even though they don't usually portray their feelings through the sort of art that we know and understand, we have reason to expect that animals derive similar benefit from a close connection to nature. As well as us, animals are likely to benefit from being able to identify the natural features of the environment and return to safe places at times of danger, find food sources more readily and obtain shelter when needed. If a latent need to be close to nature is present in humans *and* animals, it is likely that both derive mental satisfaction from a more natural environment – a need that may be partially satisfied if the enrichment in a cage is natural rather than artificial.

There have been a few experiments designed to test this hypothesis. One such was an attempt to discover whether rabbits, a natural grazing animal, prefer to eat grass or whether they would be satisfied with an artificial food mix that is commonly offered to caged rabbits (Leslie et al., 2004). The rabbits showed no clear preference for grass, although this could be explained because the mix could be eaten faster, and most prey animals like to consume their food as quickly as possible so that they can retreat to safety. Other students in my group were unable to demonstrate any benefit of, or serious interest in, natural enrichment (foliage and tree branches) for gliders (Greer, 2006) or the scents of favourite plants for squirrel monkeys (Carling, 2005) in a zoo environment. In another experiment, my research group did find that cattle function more efficiently (as in circumnavigating an obstacle faster) when their environment is bathed in green light, compared with red or blue light (Phillips and Lomas, 2001), suggesting that the light under trees might be more attractive. However, this could just be because this is in the middle of their visual spectrum, where acuity would be expected to be increased. This is a limited set of experiments, and there is much more to be done to test the hypothesis, but we can only conclude that so far there is very little evidence on whether animals benefit from being kept in a more natural environment.

If the hypothesis is supported, that animals do have a sense of beauty or respect for natural things, compared with man-made, then it may well be of benefit to the animals in zoos to provide tree branches for animals to climb, rather than alkathene pipes, or foliage to eat rather than pelleted food. Cages are often made to look natural for the benefit of the viewing public, who equate it with better welfare. This could be tested and adopted if found beneficial for animals in other intensive management situations – farmed and laboratory animals in particular. What features of the natural environment would be beneficial to add to the environment of animals housed in intensive environments? Should it be green, but this might not be appropriate

for a desert animal, and to what extent are these enrichment forms species specific? There are opportunities for research to determine the responses to natural or unnatural enrichment, but the difficulties centre on how to measure the responses. Some experts consider that it is not important that enrichment mimics the situation in the wild (naturalism), rather that the animal can perform similar tasks to those that it would perform in the wild (functionalism) (Swaisgood et al., 2003).

There are alternative hypotheses to the benefit of a sense of beauty that man has when he is in touch with nature. In the Christian religion, followers are encouraged to view nature as the work of God, for example in the Psalms, which encourage reverence for God and a belief in his powers in nature. Furthermore, if a god has instilled in man a sense of respect for nature, and in the Christian religion at least, has ordained man to manage and look after animals, then a sense of respect for nature, and a feeling of pleasure when we are in contact with it and it is correctly managed, would be a significant step towards achieving this goal. We may feel a sense of awe when we see a magnificent mountain, but when we see nature destroyed, such as when we come across animals killed on the road, or the mountain is transformed into piles of waste stones or slate by open-caste mining, we feel a sense of loss or shame. In the past many works of art were created by people supposedly inspired by their religion, but as Dawkins has argued, this is not necessarily evidence that a god exists, rather that the artists were following the dominant convictions of the time (Dawkins, 2006).

If our sense of wonder at nature was simply a feeling of nostalgia, a yearning to return to the times when man *was* in close contact with nature, it is unclear what benefit would derive from such a feeling. There can be no doubt that man's inventions, his construction of an artificial world around him, have benefited his survival. They have enabled him to colonise the planet in even the most hostile of regions, to live in relative comfort, with increased longevity and improved quality of life. And yet man still benefits mentally and to some extent physically from close contact with nature. The close and positive relationship with animals benefits people as much as it does the animals. The advantages of a close relationship between animals and their owners are emphasized in books on animal management, e.g. English et al. (1992), and they provide an altruistic reason for improving animal welfare, which is often referred to in prose, since people looking after animals well are themselves enriched by the experience. Conversely people that are cruel to animals are considered outcasts by society. For example, the poet William Blake emphasized the antisocial nature of ill-treatment of animals:

> He who shall hurt the little wren
> Shall never be beloved by men
> He who the Ox to wrath has movd
> Shall never be by Woman lov'd
> Blake, 1803

Having exhorted those who might be considering animal ill-treatment not to, Blake then encouraged people not to harm animals for fear of the wrath that might be upon them if they did:

Kill not the moth or butterfly
For the Last Judgement draweth nigh

Furthermore those who perpetrate cruelty to animals may not be at peace with themselves, let alone other men. Yet cruelty continues for several reasons. One is that it can become a form of redirected aggression. About one half of prisoners convicted of animal abuse are motivated by anger, the rest being motivated by the need for sex or to impress or imitate others (Hensley and Tallichet, 2005). When confronted with aggression from other humans, an individual may turn to animals, and particularly companion animals, to release their own aggressive impulses, because the chances of retaliation are less. A second reason is because animal managers are confronted with diverse ethical dilemmas, such as whether to place personal ethical standards, which require that he provides for his family, above the welfare of the animals in his charge. Similarly, provision of high standards of animal care may conflict with minimizing the environmental impact of a farm, an important consideration in relation to free range systems of production. A third reason is the desensitization of animal managers to the plight of animals in their charge. It seems likely that this is most common when animals are only in the care of the manager for a brief time (such as abattoir workers). Those with long term care responsibilities, such as companion animal or guide dog owners or managers of farm animals that are used to produce milk, are less likely to become desensitized to pain and cruelty.

Life in a Natural Setting

Some people might imagine that for animals in the wild there are stresses untold, which reduces their welfare compared with the husbanded animals. However, it is wrong to imagine that grazing impala on the plains of the Serengeti, with a crouched lion just a few metres away from them, suffer prolonged stress. They know their escape capabilities and can judge their flight distance very effectively. There is a similarly relationship between the wolves and caribou of the northern Canadian territories (Mowat, 1963), where wolves will periodically test the fitness of fawns and old does by making them run, since in these animals there is a greater proportion of injured, malformed or inferior animals. According to Mowat (1963), the caribou herd respond by sheltering these animals in the centre of their herds. The young wolf pups are taught to test weak animals in this way and ignore the majority of the herd, who are free to graze within a few metres of the wolves. Population density is mainly controlled by birth rate, which increases in times of plenty. In times of food shortage the biggest direct killer is not starvation but disease, with malnourished animals

quickly succumbing to rabies, distemper or mange. The major welfare influence has probably been from humans, even in this remote area, since wolves have been poisoned with strychnine because of their supposed remorseless killing of caribou.

Hence there is little evidence that animals in nature are constantly at risk of predation or that this causes prolonged stress, which would not in any case be adaptive for survival. The stress reaction evolved to cope with short term danger and the increased metabolic rate and other physiological adaptations caused by stress would not be adaptive in the long term. Being stressed is less efficient metabolically but it places the animal in a position of readiness to cope with danger. Darwin epitomized this view when he wrote 'We may console ourselves with the full belief, that the war of nature is not incessant, that no fear is felt, that death is generally prompt, and that the vigorous, the healthy, and the happy survive and multiply' (Darwin, 1859). His words suggest that he believed that it was maladaptive for animals to be constantly stressed by the presence of predators, and hence the flight or fight response is not usually continually activated.

Although they may not be stressed by the presence of predators, the optimisation of population size in relation to food resources means that wild animals are often less well nourished than their captive counterparts, which can reduce their welfare. Their typical longevity is usually less than their captive counterparts, perhaps only one half, with not only reduced plane of nutrition, but also limited possibilities for medication, in the event of sickness, and exposure to climatic extremes. However, some animals are particularly difficult to keep in captivity, such as elephants. Mean longevity of zoo elephants is only about 20 years, compared with 70 years in the wild (Wiese and Willis, 2004). Foot problems, caused by inadequate exercise, moist substrate on the floor, and exacerbated by obesity, together with circulatory disorders, account for the majority of premature deaths in zoos. In addition elephants will rarely breed in zoos (Clubb and Mason, 2003). Thus the achievement of potential lifespan in captivity depends on man's willingness to provide suitable living conditions.

Exposure to climatic extremes can cause major loss of life in both wildlife and free range livestock. The following passage by the wife of one of the pioneering Kenyan game wardens describes the devastating impact of drought on wildlife.

> the rains had been disappointing and insufficient to promote much regeneration of the shrubs favoured by rhino. Every bush was browsed almost to the ground, leaving only the hardwood. Lack of water elsewhere in the Park forced the elephant herds on to the river, and the vegetation suffered still further. Patrols brought in distressing reports of rhino dying daily. . .. . the plight of the rhino in the area was indeed pitiful and the reports had in no way been exaggerated. We saw several rhino, all pathetically weak and covered in black patches, and came upon one, which, unable to stand, was lying in the blazing sun and had only just enough strength to snort faintly and toss its head as we approached. We . . . tried to encourage it to eat, but it had lost the desire to live and died shortly afterwards. . ...Further along, we came across a baby rhino standing sadly beside its mother's carcass, nudging it at intervals and obviously puzzled at getting no response. The rangers quickly surrounded this little calf, who, although small and

> helpless, courageously refused to leave his mother's body and stood to face what he believed to be his enemies. The gallant behaviour of this baby rhino moved me to such an extent that I wished with all my heart that he might be spared and that we would be able to rear him. But another look at his wasted body, made me realise that there was little hope and this proved to be the case for, although we took him back to camp and did our best to save him, he died that night.
>
> On another occasion, we found a rhino lying on the banks of the river in the last stages of exhaustion, while a host of vultures were tearing the living flesh off its hind quarters. It was too feeble to keep them off and could only lie there and endure the torture in silence. A merciful bullet brought its suffering to end.
>
> Every day brought fresh examples of the appalling suffering which these unfortunate creatures were enduring. One particular incident which upset us greatly was the death of an old female rhino, who was well known to us for she possessed a pair of unusually long horns. She had been trying to reach some green leaves growing from a branch of a tree overhanging the river bank and had lost her footing and fallen into a pile of driftwood below. We found her fairly wedged between two logs with her head only a few feet from the edge of the river. It was obvious that she had been in this position from many hours, if not days, and it is not difficult to imagine the torment she had undergone dying an agonising death of thirst with cool water running by just out of reach. When we found her she was still alive and while. . .. the Rangers tried to free her with the help of an axe, I dipped my sweater into the river and squeezed the water though her parched lips. She gave a couple of weak gulps but again we were too late , and, with a heartrending sigh, she died a few minutes later. (Sheldrick, 1966).

In contrast to the suffering of wild animals under such conditions, farm animals are usually offered supplementary feed or moved to better conditions in such circumstances.. The delicate balance in the natural world is well understood by those managing game and national parks. Although they can do little to influence the forces of nature, or the balance of wildlife, they understand the importance of maintaining these reserves as a sanctuary for wildlife, when the forces of modern population pressure and the ensuing agricultural development bring even more hardship to wild animals attempting to gain succour from the land. This is how Sheldrick describes the objectives of one of the African game parks:

> the foundations of the Park have been laid with infinite care, patience and endurance, by a handful of dedicated men, not for material gain, but simply out of a deep rooted and sincere love of animals. It was as though the Creator, conscious of the threat to so many of his creatures in a fast changing world, called upon them to establish an island, where His animals can enjoy the freedom craved for so desperately by man himself, but often denied by him to his four-legged neighbours; a sanctuary where these have the right to live their lives in peace, and in doing so, can bring enjoyment to hundreds of people. . ... I have come to look upon them, not as four-legged machines put here for the benefit of mankind, but as creatures with as much right to enjoy the world God gave them as we have. (Sheldrick, 1966).

Although there are examples like the one above of occasional widespread slaughter and suffering of native animals, for the most part they are well fed and healthy. This can be illustrated by comparing the welfare of wild cats, which are native to most of the world, feral cats, which live in most peri-urban districts, and domesticated cats. The wild cats have evolved over millennia to their environment, and they are usually well fed. Evolving as an animal that thrives

particularly well in desert environment, they are well prepared for hot, dry conditions. Nearly all are free from diseases for the majority of their life, because of their large home range and low stocking density, which reduces the chance of high parasite populations to challenge the cats. The fluctuations in the numbers of their prey would be less than for feral cats, and natural selection would quickly remove any animals that became sick and vulnerable. The genetic variation is much greater than for feral and domestic cats, enabling an effective immune response to disease challenges in at least some animals (O'Brien et al., 2006). Wild cats are capable of being carriers of exotic diseases, such as the Feline Immunodeficiency Virus or feline homologue of the human HIV, without major suffering. Such diseases cause serious clinical symptoms in domestic cats (O'Brien et al., 2006). There is no clear evidence of greater susceptibility to disease of feral cats or domestic cats in shelters (Case et al., 2006).

As well as having limited genetic diversity to cope with disease, feral cats in peri-urban districts are subjected to a fluctuating food supply, often based around fast food outlets. They scavenge and may have to resort to consuming unnatural 'food' items, such as plastic bags. They are often in bad condition, emaciated and with skin disorders and parasites. The disease status can be influenced by the health status of the prey animals, particularly in areas where wild cats are not native. So, for example in New Zealand it has been found that 38% of feral cats are infected with the rabbit haemorrhagic disease virus (Henning et al., 2006). However, they have freedom to roam, which is often restricted in domesticated cats. The latter are fed a highly nutritious diet, but high nutrient intake coupled with inadequate opportunities to exercise may lead to health complications such as diabetes. Usually they have to change from being nocturnal to diurnal to match their owners (although they tend to revert back to nocturnality in old age). They are often kept permanently indoors, especially if the owners live in an apartment, as is increasingly popular. Although artificial breeding has produced domesticated cats that appear to have less need for access to outside areas than wild cats, they are not yet well adapted to the extremes of intensive human existence, in small apartments several floors from the ground. Their desire to perform natural behaviours is thwarted by their environment. Most people would agree that, of these three different types of cat, the welfare is best for the native animal.

Charles Darwin believed that nature prepares animals better for environmental challenges than artificial breeding: 'Man selects only for his own good, Nature only for that of the being which she tends' (Darwin, 1857). Thus, it is likely that valuable information can be attained from studying the wild relatives of domesticated animals, especially in relation to their behavioural needs. For example the Gaur cattle of Asia (*Bos gaurus gaurus*) could inform us about the behavioural needs of domestic cattle. Gaur cattle are one of the last remnants of wild cattle with a similar genotype to our modern domesticated cattle and despite the obvious merit in studying their behaviour, few attempts have been made to do so. The extent to which animals can perform natural behaviour

could be a better indicator of welfare than an anthropomorphic assessment of the conditions of the animals.

An example of the difficulties of an anthropomorphic assessment of welfare is the early weaning of dairy calves from their mother. Most people would believe that removing the offspring at one day of age would greatly reduced the welfare of both cow and calf, even if it does continue to be fed milk, although this time reconstituted from powdered sources. Research shows that stress levels experienced by the cow following separation do not support any contention of a major welfare impact (Hopster et al., 1995). However, it is necessary to consider what opportunities for close bonding between cow and calf have been forgone by the separation, emphasizing not the negative impact of the separation, but the absence of positive events.

Animals in the Wild, What Can They Tell Us About the Needs of Domestic Animals?

How important is the domestication process in determining an animal's behavioural needs? To answer that question, we must study the behaviour of domestic animals in wild and semi-extensive conditions and compare it to the behaviour of wild progenitors of domestic animals in the same environments. For example, there are opportunities to observe the behaviour of domestic cattle under natural conditions, such as at the Chillingham estate in northern England. Parkland cattle such as these were typically introduced to British stately homes to enhance the aesthetic qualities of the landscape in the 18th and 19th C, and have often been resident as a herd for several hundred years. A point of concern is that the opening of the estates to visitors in recent times has meant that the cattle can no longer be considered entirely free from human contact (Ritvo, 1992). One point of interest of such herds is their natural configuration of mixed sex groups. Unlike most domestic herds, where male and female cattle are segregated, these mixed sex groups typically adopt a matriarchal herd structure with groups of 10 to 20 animals being led by a dominant cow, and bulls that are evicted from the herd at puberty (Hall and Hall, 1988). This structure mirrors that of wild cattle herds, but is the behaviour of wild and domestic cattle similar? The behaviour of domestic cattle is well understood (Phillips, 2002), but opportunities to observe the behaviour of wild cattle have been rare.

I have been fortunate to study this in the central highlands of Malaysia, where there exists one of the last remaining groups of wild cattle that are close relatives of the domesticated *Bos taurus* and *Bos indicus* cattle used in farming systems today. Deep in the highland jungle, there are several hundred *Bos Gaurus* (Gaur) cattle, which have lived in this ancient habitat for many millennia. Most of Malaysia is covered with date palm or rubber plantation, but the Highland regions are difficult to cultivate and there are a remnants of rainforest

that preserve an important habitat for tropical fauna, including the Gaur cattle, or *seladang* in Malaysian (Solti et al., 2000). Cattle exist there in small groups of about half a dozen individuals, led by a dominant female with a dominant male close by, but outside the matriarchal group (Fig. 2.4). The only predator is the tiger, which will occasionally take small calves, but when there is the threat of attack the members of the herd will form a stockade facing outwards and the male will join the group as the primary defence unit. Bull threatening behaviour is similar to that seen in domesticated bulls: shaking of the head, pawing the ground, snorting and adopting a threatening 'intention to charge' posture. This demonstrates that the behaviour of wild cattle under threat of attack is similar to that of domestic cattle. In this and other behaviours, the differences between wild cattle behaviour and that of domestic cattle appear due mainly to the environments in which they are kept, and not their genetic constitution. There are differences in morphology between wild cattle and today's domestic cattle, with the former being deeper bodied, with pronounced strengthening of the anterior vertebrae to enhance the ability of bulls to clash heads and withstand the impact of charging. This deeper body structure causes the vocalisations to lower in pitch compared with domestic cattle. Apart from these differences in morphology, it is clearly possible to use observation of wild cattle behaviour as an indicator of the behavioural needs of domestic cattle.

To find out more about the behaviour of Gaur cattle, I trekked in the jungle with local rangers and camped at the logging stations, using a four-wheel-drive vehicle to scour the logging roads and those at the edge of the jungle near plantations, to try to find the tracks of the wild Gaur cattle. We found old cattle tracks, as well as tigers, wild boar, deer and tapir, but local villagers told us that the logging activities were disturbing the cattle too much and they had retreated to the higher lands. At the junction between the jungle and the oil palm plantation, where the cattle had previously been observed entering the plantation to forage at night, a double stranded high-voltage electric fence had been

Fig. 2.4 Family group of Bos gaurus cattle, Krau Wildlife Reserve, Malaysia

erected to keep both cattle and elephants from damaging the palm trees. Elephants are helpful to the Gaur cattle in clearing areas of the forest to allow shoots, grasses and other diverse young, nutritious vegetation to grow, but the size of this wildlife reserve was too small to sustain a large number of elephants.

We found recent cattle tracks at a salt lick, but even there the cattle were too elusive, being now very wary of human presence, because of the intrusion of loggers and local people. The local Orang Asli people were causing more disturbance in the forest now that they have motorbikes to go to the villages for the foodstuffs that they cannot get from the forest, such as sugar and rice. However, their natural coexistence with other forest life was evident, and they were still using blowpipes to secure monkeys for food, trapping birds by putting sticky substances on tree branches and collecting rattan, which they sell for furniture making. They had little to do with the cattle, and it was clear that these cattle were very shy of humans. We returned to the park headquarters, with no direct sightings, but evidence of cattle activity in the park. Fortunately, there was a captive Gaur cattle breeding programme at the park headquarters, with ten large paddocks of 1–2 hectares each, and three to five Gaur cattle in each. Some animals had been in this programme for as long as 25 years, demonstrating that in this case the lifespan of wild cattle was well in excess of that of domesticated cattle, which are usually only kept for four to five years if they are dairy cows and one to three years if they are being reared for beef. Observing wild cattle in these large paddocks was ideal as it resembled their natural forest habitat, but the animals were close enough for observation.

The cattle being primarily nocturnal, I visited the animals at all times of the day and night to obtain an accurate picture of their natural behaviour. By night they foraged continuously, taking mainly small twigs and leaves from tree material cut locally (the paddocks were not large enough to provide sufficient browse material for the cattle on a permanent basis). Their diet was markedly different from domesticated cattle, which are primarily offered pasture grass. It is still possible to see domestic cattle browsing the lower branches of orchards and trees in mixed tree/grass systems, demonstrating that grazing is not their only method of food procurement. The wild Gaur cattle only grazed if there was a shortage of tree fodder. The paddocks being relatively small meant that the grass was quite short, but of good nutritive value.

Another evident difference between the behaviour of wild and domestic cattle was the nocturnal habit of wild cattle, feeding by night and resting and ruminating during the day. This may have been a strategy that evolved to limit activity during the hot periods of the day in the tropical environment, but it may also limit the predation risk to young calves, since they can lie out of sight during the day. Cattle have large eyes with a reflective layer, tapetum, on the retina, which gives them good night vision (Lomas et al., 1998). Domestic cattle are also active at night, rarely sleeping, but their carers generally only see them during the day.

Heat stress resistance was enhanced in the Gaur cattle by the production of sebum, which reflects the heat, something which we no longer see in domestic

cattle in colder climates, which developed long coats in the domestication process in the northern latitudes. The sebum also deters flies from attacking the cattle's skin (Warnes, 1995). In hot climates, such as in Israel, cattle have reverted to a shiny, sleek coat which reflects the heat, compared with the long, hairy coats of cold climate cattle. The sebum production of the Gaur cattle was most evident in the mature animals, which are more susceptible to heat stress, and not in the calves. Suckling naturally lasted for nine months, compared to just a day or two in most dairy cows, after which the calves are offered powdered milk for just six weeks.

Reproductive behaviour in the Gaur cattle was limited to contact between the males and females during copulation, with little evidence of a prolonged courtship. Copulation started soon after the cow had given birth and usually led to a second pregnancy, which progressed whilst she suckled her first calf. There was no apparent seasonality in their reproduction, as expected in this equatorial latitude. By contrast, domestic cows often aggregate into sexually active groups during their oestrus and engage in homosexual courtship behaviour: mounting, sniffing and licking the anogenital region and rubbing their chins on each other's rumps. This is more pronounced in intensively-managed housed cows, rather than in cows outdoors, which suggests that it may be partly a response to the stress of the intensive environment, a phenomenon that we have observed in other mammals (Feige et al., 2007). It is also possible that humans selected for this behaviour during the domestication process, when bulls were probably shared between several families. A distinctive behaviour such as mounting would enable the cowmen to identify when their animals were ready to be served by the village bull.

The final difference that I observed between domestic and wild cattle was in their lying behaviour. When domestic cattle lie down, they usually tuck their head back towards their thorax, which may be to protect it from being trampling in a crowded environment (Phillips, 2002). The wild cattle always lay asleep with their head fully outstretched.

In all other respects, the behaviour of the wild cattle matched that of domestic cattle very closely. Tails swishing to remove flies, herding behaviour, cleaning the nostrils with the tongue and many other behaviours were all identical. These captive wild cattle adjusted to friendly human presence quite readily and would allow themselves to be touched, and stroked by people, and they recognised familiar individuals. Therefore, some behaviours have changed, because of the different circumstances of domestic cattle, but the innate motivations are mostly the same. It is most often the stressful conditions of the housed most after environment that requires cattle to change their behaviour. Their lying stalls, or cubicles, are often cramped and they can have difficulty changing position and standing up and lying down. In a cubicle house, they may be confronted by more dominant cows that can be aggressive, so subordinate cows stand half inside their lying stalls, to get some protection from other cows. Much more could be done to examine the behaviour of wild cattle to assist us in understanding the behaviour of domestic cattle, especially as the wild Gaur

cattle of the Malaysian highlands are threatened with extinction. There are also Gaur cattle in India, but they are mostly semi-domesticated.

Observing animals in the wild therefore reinforces concerns about housing them in small, confined spaces. Another animal that lives in the Malaysian jungle that has controversially been brought into confined spaces, this time for public viewing, is the Asian elephant. The circumstances of elephants in zoos present a number of welfare concerns, of which the lack of space and the absence of natural foraging behaviour are the most serious. These problems lead to low reproductive rates and the display of abnormal behaviours such as rocking and swaying (Wilson et al., 2004).

In relation to reproduction, studies of the elephants in North American and European zoos (where there are several hundred altogether and it is possible to evaluate their reproductive success) have shown that the reproductive rate will not sustain even the zoo population, let alone providing elephants to return to the wild (Clubb and Mason, 2003). One reason for the low reproductive rate is the small number of animals that exist in each zoo, which limits breeding opportunities, and another is likely to be the inadequate conditions in which they are often kept in comparison to their natural environment. The size and cost of maintaining an elephant in a zoo means that there are rarely more than two or three animals together. Introduction of new animals causes stress (Schmid et al., 2001). This contrasts with the situation in the wild, where the animals live in matriarchal groups of 10–30 animals, with several generations together and long-lasting social relationships (Schulte, 2000). In rangeland conditions some much larger herds of 50 to 100 animals form. Bulls are evicted from the matriarchal group at puberty and naturally live an isolated existence, although they sometimes roam the forest in a bachelor group of two or three animals.

In the wild, the distances covered by both the matriarchal group and the bulls are considerable. These animals, by virtue of their size and feeding habits, damage the trees in their habitat, and cannot afford to stay in one place too long. Home ranges vary from 10 to 800 km^2 (Dolmia et al., 2007; Shannon et al., 2006), but in zoos they are in enclosures typically of only a few hundred square metres, so that they can be readily seen by the public. Minimum recommended size requirements for enclosures, which are about 100–200 m^2 per elephant, relate more to what is possible than any considerations of the animal's behavioural needs.

It is difficult to recreate an elephant's environmental needs in a small zoo enclosure. Their natural environment is highly complex, and in the case of the Asian elephants, they may obtain food from almost all strata of the jungle: grasses and herbs from the floor, fruit, roots, leaves from bushes and shrubs, as well as small trees, some of which may be knocked over so that they can feed from the floor. Sometimes they will even stand on their hind legs to reach for tallest browse material. They spend about 16–17 hours per day looking for and eating food, whereas in zoos a nutrient rich diet is provided that they usually consume in about 10 hours (Clubb and Mason, 2003). As a result of their

environment being so restricted, they develop repeated, stereotyped behaviours: rocking or swaying repetitively, raising and lowering their legs or stimulating their mouths with their trunk, particularly before they are fed, handled or trained. These stereotyped behaviours have recently been linked to increased levels of the stress hormone cortisol and seem to function as a mechanism to cope with the stress of their environment (Wilson et al., 2004).

The training methods present another serious welfare issue, with the animals initially needing to be 'broken' by their keeper, so that they can be chained by the leg both during the night and when procedures are carried out on the elephants. The methods used in training include electric goads or long metal rods to control the animals' movement and isolation in between training sessions, so that the animal comes to value its moments of freedom and becomes responsive to the demands of the trainer. Close attachments can form, but the movement of elephants in captive breeding programmes makes these long-term attachments difficult. Regular movement of bull elephants around zoos for breeding purposes, although mimicking the roving behaviour of the bull in the wild, leads to serious welfare problems, because zoos will usually only provide small, restricted enclosures for the bulls to live in for the short time that they are required to serve the females. Not surprisingly, reproductive behaviour in such circumstances is very limited and there is a likelihood that zoos will now use artificial insemination to overcome this problem (Andrabi and Maxwell, 2007; Hermes et al., 2007). However, the bulls will still have to travel, because bulls' semen is not usually viable after freezing. The insemination procedure is much more difficult than domestic animals like cattle or sheep, and calf mortality is high. Hence breeding success rate, even with artificial insemination, has been disappointingly low.

In my visit to the central highlands of Malaysia, I was able to see first hand the problems facing the Asian elephant, such as enclosing the oil palm plantations with electric fences so that they cannot forage there at night, logging of at least the biggest trees in the forest and greater human activity. Our riverside camp was visited by a herd of elephants at 5 a.m., and I wondered then how long they would survive there with the extent of the logging and other human activities. Controlling the expansion of the human population in south-east Asia and the human activity in the forest, including logging, is the only way to ensure the survival of this species. Every child learns about elephants in story books and wants to see one, but confinement of these most intelligent and demanding of animals in small spaces in zoos is less desirable than in situ conservation, in particular addressing the problems in the South East Asian region. If in the face of continued human population and agricultural expansion in the region the in situ conservation ultimately proves impossible, then facilities with adequate conditions for elephant welfare should be provided in zoos and wildlife parks.

My next opportunity to compare wild animals' behaviour directly with those in captivity was again in Malaysia, this time in Sarawak on the island of Borneo. I visited the Bako National Park, where there are about 200 proboscis

monkeys – an endangered species only found on the island of Borneo. Named for their exceptionally long nose, especially in the male, these large ginger-coloured monkeys were of particular interest because much less is known about their behaviour than more common primate species. The best time to see them was at dawn, so I went to the mangrove trees that they often visited at about 6 am at the end of their daily migration from the hilly hinterland. At 7.10 am the first of the monkeys came crashing through the trees overhead. Clearly this daily migration to the beach could not be mimicked in captive proboscis monkeys. Later I observed another troupe more closely as it was settled eating near the beach. Dripping with exertion and tense with excitement, I was able to film these creatures for several minutes before they made their way back into the impenetrable jungle. I reflected on why these animals should inspire such a feeling of awe in the wild, when an encounter in the zoo would be only mildly stimulating. Was it respect, even jealousy, for the natural setting in which they were living, for the freedom that they exhibited, for their apparent love of life? Was it their rarity or their apparent control of their surroundings? Was it their unusual form, the vivid ginger-red colour of their coat? It mattered not, I came away enriched by the experience.

Later on this trip, I saw orangutans in captive and semi-wild conditions. Just outside the capital of Sarawak, Kuching, there is an orang-utan sanctuary called Semangok. Here orangutans that had been kept locally as pets were rescued and prepared for rehabilitation, by giving them restricted access to the jungle. They could return for food if they wished, but most chose to move away and colonise the surrounding areas. The offering of food provided a natural transition between captivity and the wild. The behaviour of the rehabilitated orangutans did not resemble the complexity of their wild relatives in respect of nest building, feeding and other complex behaviour patterns. Wild orangutans carefully bend branches to make their nest for the night, orang utans from captivity were comparatively naïve about nest building, frequently breaking branches and often having to reuse their nest because of the construction difficulties. Despite the fact that they would have been taught these behaviours as infants from their parents, the trauma that they experienced at the hands of their captors appeared to reduce their ability to perform complex behaviours. Animals that have been severely stressed can only make simple choices.

I was reminded of the stress imposed by captivity when we moved on to see the sanctuary at Matang (just inland from Semangok), which first receives the orangutans, performs any veterinary treatment and offers a home to those that are unsuitable for rehabilitation. Although relatively large and enriched compared with many European enclosures for orangutans, their enclosure obviously did not provide enough stimulation for these highly intelligent animals. The single orang-utan in one enclosure had only the visitors to amuse her, and it was clear that she wanted to make eye contact with each new arrival to the viewing platform. What differences could she recognise – gender, colour, clothing? Recognition of gender was very likely, as this one was reported to have

been violent to female visitors after she had had a baby, perhaps suspecting that they might challenge her for the baby. The contrast in behaviour from the orangutans that I had seen earlier was striking, here was an animal obviously bored and probably stressed. She vomited into a bottle and then drank the vomit, a common abnormal behaviour in captive great apes. She played with the many plastic bottles that the viewers had thrown into her enclosure, probably in an attempt to enrich her life.

Experiences such as this, seeing orang utans in wild and captive conditions, emphasize the difficulties in keeping cognitively advanced species in captivity. Often the space and enrichment requirements for adequate welfare are not compatible with allowing the viewing public an adequate experience of seeing the animals close up. These brief experiences of natural and captive behaviour of animals in the tropics served to reinforce my belief that much more has to be done to improve the life of captive animals. Not just in zoos and sanctuaries, the impact of captivity can be equally great on domestic animals. I once had to compare the behaviour of a herd of supposedly wild cattle at Chillingham in Northumberland with that of a 'tame' dairy herd for a documentary film. It transpired that the 'wild' Chillingham cattle were much safer to approach and appeared more contented than the 'tame' ones, probably because there were regular visitors to their park. The dairy herd's Friesian bull was particularly fierce, alone in a small pen, and was passed by many cows daily on their way to milking, which probably contributed to his dangerous demeanour. All animals, both wild and domesticated need the provision of a suitable environment, and learning about the behaviour of animals in a natural setting can prove invaluable in learning about their behavioural needs in captivity.

Chapter 3
Empathy Towards Animals

Moral behaviour – empathy, sympathy and feelings – empathy and domestication – gender issues – empathy and animal welfare – empathy and learning

Introduction

Moral behaviour involves actions to improve the welfare of others (Kurtines and Gewirtz, 1984). It is one of many values that motivate people (Schwartz, 2007) and contains elements of universalism (social justice, equality), benevolence, tradition, conformity and security. Other values directly promote self interest: power, achievement, hedonism, stimulation (leading an exciting and varied life), self-direction (ability to determine one's future). The balance between self interest and moral related behaviour is likely to determine an individual's propensity towards caring for others, including animals.

A perspective of our need to improve animal welfare can be gained by trying to understand how humans acquired the strong interspecies empathy that is at the centre of our concern for animals (Hoffman, 1987). Empathic theory originated with nineteenth century German aesthetes, who believed that humans can derive feelings from objects, particularly architectural or natural, for which they used the word *Einfühlung* or 'feeling into' (Wispe, 1987; Taylor, 1994). For example, considering the shape of columns in a Greek temple, short, fat columns would make them feel uncomfortable, as if they reflected their own feelings for people of that shape, whereas tall, slender columns of the same proportion as elegant humans would engender a comfortable feeling.

Although the term 'empathy' was first used by Titchener (1924) to mean 'humanising objects, . . . reading or feeling ourselves into them', its common use now relates more to 'an emotional response that stems from another's emotional state or condition and that is congruent with the other's emotional state or situation' (Eisenberg and Strayer, 1987) or 'the capacity to experience the feelings of another person or an animal, cognitively and emotionally' (O'Connell, 1995). Empathy assumes knowledge of the feelings of others and the ability to relate behaviour to feelings; it also involves the ability to attribute

C. Phillips, *The Welfare of Animals*, Animal Welfare 8,
DOI 10.1007/978-1-4020-9219-0_3, © Springer Science+Business Media B.V. 2009

mental states and perceive the feelings of others (Anon, 1987). I have already argued (Chapter 1) that we cannot literally experience the feelings of others, and that even imagining the feelings of animals will be immeasurably more difficult than humans. Thus empathy can only involve an assumed emotional state.

Empathy must be distinguished from sympathy, which is the heightened awareness of the suffering of another as something to be alleviated (Wispe, 1986). Sympathy involves an urge to take mitigating action, whereas empathy does not. Together empathy and sympathy are responsible for the caring attitude that we have for animals that we come into contact with. Their evolution could be due to utilitarian benefits to humans, but there are clear and frequent instances where caring for animals does not produce a net welfare advantage to the individuals involved. Self sacrifice for a drowning pet is one such example. The possibility of reciprocal altruism cannot be dismissed. Caring for pets is linked to caring for humans in some studies (see review by Paul, 2000) and may be considered a form of generalisation, but in one study the likelihood of owning a pet has been shown to be *inversely* related to the size of a woman's friend networks (Ory and Goldberg, 1984). Clearly generalisation does occur, as for instance in the generalisation of the empathy shown by young children towards their pets to siblings (Poresky, 1996), but it is not a universal phenomenon.

Empathy and Domestication

Caring for other species is not unique to humans, many animals in symbiotic or commensal relationships with other species have to protect their partners in the relationship (Wiese, 1996), and social species such as chimpanzees can show empathy across a wide range of circumstances (O'Connell, 1995). Plutchnik (1987) describes the survival value of empathy in animals as group behaviour, imitation and bonding, but he uses a broader definition of empathy ('the capacity for participating in, or a vicarious experiencing of another's feelings, volitions, or ideas and sometimes another's movements to the point of executing bodily movements resembling his'). In the narrower definition of empathy given earlier, these benefits of empathy have yet to be demonstrated in relation to human:animal interactions. Only bonding would seem to clearly offer survival benefit in the 'domestic alliance' that Coppinger and Smith (1983) propose is responsible for the evolution of human:animal symbiotic relationships. Initially, they argue, opportunistic plants which benefited from increased soil fertility colonised the regions around human settlements. Productive animals that required the nutrient-rich plants and could tolerate human presence became associated with the settlements, but animals and humans could only co-exist if the animals' behaviour, needs and disease status could be managed by humans. Farmsteads where the humans could recognise the animals' needs and respond more rapidly were more successful, and thus the ability to respond to animals' needs evolved.

It is easier to demonstrate interspecial empathy in humans than other primates (Chalmeau et al., 1997), and the development of empathy appears to lie on an evolutionary continuum (Brothers, 1990). There is circumstantial evidence that human sympathy towards animals may have evolved into a 'psychological need', which if thwarted could lead to dissatisfaction, stress and even violent and irrational behaviour (Groves, 1995). Human empathic feelings are not generalised to all species – they do not normally extend, for example, to potentially dangerous species, such as snakes or spiders. However, this is unlikely be true of professionals in the field, herpetologists and arachnologists, suggesting that there is substantial variation between individuals in the extent of their empathic feelings. The ability of humans to interact with and manage a large number of animal species for our own benefit (e.g. for food, protection and clothing) may indicate why we empathise with so many animal species. An ability to recognise, and ameliorate where possible, the suffering of animals in their charge would have benefited humans throughout the long history of dependency on animals, thereby giving reward to the evolution of empathy through reciprocal altruism (Leak and Christopher, 1982). For example, an ability to recognize and treat livestock diseases in the early domestication period would have enhanced the survival rate of both the animals and humans which depended on them. Evidence for the adaptive significance of empathy is chiefly that those animals that give us the most benefit evoke considerable empathy, particularly farm animals and companion animals (Serpell, 1986). However, animals such as primates that are phylogenetically close to us also evoke empathy, particularly if they are juveniles, suggesting that there is some generalisation of the human:offspring bond. Size of the animal also appears to be influential, with very large mammals such as whales evoking particularly high levels of empathy (Howard and Parsons, 2006). These stereotypes appear to be perpetuated in societial teaching, most recently through the medium of television (Paul, 1996).

Empathy in humans probably first appeared before domestication, since it is apparent in some other primates such as chimpanzees (O'Connell, 1995). A primitive form of empathy, termed an emotional contagion, has even been detected in mice (Miller, 2006). Miller found that the response of mice to painful stimuli was greater if they were with a familiar mouse that was also given the stimuli than if they were with an unfamiliar mouse given the same stimuli. The inference is that the mice were able to share the experiences of other mice and that they were more influenced by the experiences of familiar mice. Other research with rodents has identified that the amygdala in the brain is activated during the transfer of this information (Knapska et al., 2006).

It is often reported that empathy is an innate characteristic in humans (Stein, 1964; Kohut, 1977; Wispe, 1987), but in the certain knowledge that it can be influenced experientially, it is unclear whether nature or nurture is the greater influence. A well-studied instance of human:animal empathy relates to the evolution of dogs. Initially, commensal relationships between hunting men and dogs in the pursuit of their prey are likely to have promoted caring attitudes by humans towards their dogs. The affiliative behaviour that companion dogs

normally demonstrate towards their owners suggests that this attitude may well have been reciprocated. The process of domestication relies on the selection of behaviour patterns that are more prevalent in juveniles than adults – acceptance of novel situations and objects, receipt of food items from conspecifics, and incomplete behaviour patterns e.g. mock rather than injurious fighting, oestrous display in cattle (Woodgush, 1983). Hence, if the morphological characteristics of juveniles are related to their (juvenile) behaviour patterns (the neotenization hypothesis, Geist, 1971), the preservation of juvenile features by selective breeding of domesticated animals will have value in the maintenance of suitable behavioural patterns (Price, 1984). This is exemplified by the selection of two major types of working dogs used by livestock farmers – conducting and guarding dogs. The former are used to move sheep by guiding them as if they were stalking prey. The latter protect livestock by virtue of their size but do not stalk them. Both types of dog develop these behaviours instinctively, and Coppinger et al. (1987) suggests that the absence of predatory behaviour in the guarding dogs is evidence of selection for retarded motor pattern development (neoteny).

Gender Issues

The greater concern for animals by women than men in some societies (Herzog et al., 1991; Hills, 1995; Phillips and McCulloch, 2005; (Daly and Morton, 2006; Howard and Parsons, 2006) suggests that this trait may have been selected for post animal domestication, since in societies with domesticated animals women were usually involved with looking after animals in the farmstead and the men were responsible for other tasks such as hunting or fishing. Alternatively, the gender effect could be related to the greater responsibility that women have for the care of their young, and there is evidence that such interspecial generalisation does occur (Poresky, 1990). The greater intuitive care devoted by women to the young, which is logical since they have invested more than men in each individual offspring (Alcock, 1989), may cause them to seek to adopt the role of animal carers. Hence girls are more likely than boys to want to keep pets (Rost and Hartmann, 1994). Not only do women have a greater level of concern for animals, they also credit cats and dogs with a greater understanding of their owners and stronger feelings of love and compassion for them, compared with men (Vitulli, 2006). This suggests that women are able to enter into a deeper relationship with animals than men.

At the other end of the scale, animal phobias are more common in women than men (Fredrikson et al., 1996). They are at least partly genetically determined (Kendler et al., 1993; Davey et al., 1993), which provides indirect evidence that our attitudes to animals have a genetic component and, therefore, *ceteris paribus* an adaptive significance.

Nationality Issues

International comparisons suggest that it is in those areas where human populations traditionally depended most on animals for food that people show the greatest concern for animal welfare. There is in Europe at least and probably also in North America, an increase in concern for animals in more northerly latitudes, where humans relied more on animals for food (Curtis and Guither, 1983). Concern also tends to be greater in Europe than in Asia, but this could relate to the recent intensification of animal production in Europe (Phillips and McCulloch, 2005). This paradigm does not include recent migrations and changes in the geographical spread of animal husbandry. For example, the widespread use of the Americas for cattle raising does not necessarily equate with an increase in concern for animal welfare in these regions. However, the management of animals for meat production in this region is quite different to traditional methods of animal management for food production that have prevailed over the last 5,000 years or so. Contact with individuals is minimized and excessive attention to the welfare of individual animals would often be contrary to the efficient economic management of the farm unit. In addition, the relationship between the dependency on animals and concern for them does not easily extend to the animal keepers on modern farms, in fact in one study farmers, who spend more of their time with animals than the general public, demonstrated less empathy (Hills, 1995). This is possibly because they are subject to conflicts of interests, in which their livelihood and ability to care for other animals are reduced if they show too much empathy to particular animals in their care. Alternatively empathic feelings may become habituated over time in farmers, particularly as the supposed reward of reciprocity (Leak and Christopher, 1982) may be of little benefit to the farmer, or may not be evident in modern intensive farming situations. However, a recent study shows that many Australian livestock farmers believe that their sensitivity to animal welfare has increased, not decreased, over time (Phillips and Phillips, unpublished data). This may be because of increased responsibility in their position, a general time trend in attitudes to animal welfare, an increased realization of their own frailty over time or because of a reduced willingness to exploit animals to make a living as they age.

Empathy and Animal Welfare

The relation between human empathy to animals and their welfare is important in relation to its role in the development of sympathetic attitudes. We care most for animals that give, and more importantly gave, us the most benefit. For example, legal protection was introduced much earlier for animals such as horses, from which we derive benefit, than for vermin and other animals that may carry disease, with which we also have regular contact but few empathic

feelings. In 1641, the Massachusetts Bay Colony in the USA drafted one of the first laws which forbade cruelty to farm animals including horses (Stull, 1996). Our attitudes to animals therefore depend on their value to us, as evidenced by the anthropogenic decline in predatory and other dangerous animals in the wild, and the simultaneous proliferation of animals such as cattle that are suitable for food production (Coppinger and Smith, 1983; Rifkin, 1994). There is no lack of logic in our attitudes to different types of animals, since this approach represents the best human survival strategy. There has been a global pattern of animal differentiation, into those that are, and those that are not, useful to us, with survival of the latter jeopardised to expand the range of the former (Coppinger and Smith, 1983). However, with rapid change in global living conditions, climate and opportunities for the animal management, we must remember that we will in future benefit if we have preserved as much of the genetic diversity that we have inherited as possible. The pressure from human population expansion, climate change, resource exhaustion encourages a focus on systems of animal production that are of benefit to us now, with disregard for future opportunities.

Recently the ethical and environmental logic of our extensive use of traditionally beneficial animals has been questioned (e.g. Rifkin, 1994). The proliferation of beneficial animal species, however desirable in terms of providing food that is highly nutritious and therefore attractive, is not essential, since we now have the technology to produce enough food for the human population by agronomic means alone. The use of prime agricultural land for producing food from ruminants in particular may be less efficient than producing the equivalent amount of nutrients from crops, but the greater processing costs of crops compared with animal products is often not considered in this comparison (Blaxter, 1995). The environmental concerns focus on the facts that animals are often concentrated into small areas, making it difficult to dispose of their waste, that they utilise land in developing countries that has until recently been afforested and that they contribute to atmospheric pollution (Phillips and Sorensen, 1993; Phillips, 1994).

Empathy and Learning

Some aspects of empathy, such as imitative behaviour, are undoubtedly influenced by experience (Wilson, 1975), and some argue that parental and cultural influences i.e. learning, are primarily responsible for the observed differences in empathy to the various animal species, rather than genetic influences. There are three reasons why this is unlikely. First, other personality traits are known to be strongly influenced by genetic inheritance (e.g. Goldsmith, 1983; Carey and DiLalla, 1994), so it is to be expected by analogy that a trait with such obvious survival value as caring for animals would also have a genetic component. Second, empathy for animals is a trait observed at a very early age in children,

and this cannot be explained satisfactorily by such environmental influences as pet presence (Poresky and Hendrix, 1990). Third, within a population the strongest concern for the welfare of farm animals is to be seen in urban dwellers, which have little direct contact with farm animals and therefore less opportunity to learn about attitudes to them (Hills, 1995).

Further evidence for a relationship between the benefit derived from animals and the degree of empathy shown by humans is provided by a detailed examination of the different benefits. Benefits from animals are derived principally from the provision of food and other commodities, such as clothing materials, and this is mainly from farmed animals. Additional benefits are derived from symbiotic relationships, as in animals kept for companionship, draught and transport purposes. Finally some benefits are obtained from a semi-parasitic relationship between man and animals, such as when they are kept for sport. The greatest material benefit derives from the provision of food. Even though most people in industrialised countries are not in regular contact with animals farmed for food, the concern for their welfare, in particular pigs and poultry, is greater than for other anthropogenic risks to animal welfare, such as destroying natural habitats, hunting or the endangering of wild animals through the use of chemicals in agriculture (Fölsch, 1984). Hence we show the greatest concern for the animals from which we derive most benefit.

Conclusions on Empathy

Empathy is the ability to infer and experience what we understand to be the feelings of others, which is not unique to humans but is most evident in higher order animals. Evidence for an adaptive significance of animal empathy comes from the fact that we often focus our empathy on animals which give us benefit, either physical as in farm animals, or social as in companion animals. Such empathic reactions will benefit us through enhanced bonding and recognition of animal needs, as well as symbiotic activities such as hunting. Other influences on the level of empathy include phylogenetic similarity to humans and size of the target animal. The greater level of empathic emotions for animals in women than men suggests that there is a generalisation from empathic childcare emotions, which may have developed post domestication, when women looked after animals in the homestead. Several other lines of evidence support the view that empathic responses to animal emotions were influenced by the need to look after domesticated animals.

The evidence for empathy being an inherited trait in humans is strong, but definite proof is likely to remain elusive. If empathy evolved in response to the symbiotic relationship between humans and domesticated animals, we may conclude the following about the implications for our attitude towards the welfare of animals: we direct our attention most to those animals that are currently useful to us, but must also consider the relationship that we want to

have with animals in the future. It was proposed 50 years ago that empathy provides a reliable basis for consensus in moral judgement (Hume, 1957), but in view of the influences of experience on empathic values this would seem unwise. Some argue that we cannot logically take the view that all animals should equally be given the benefit of our care (Allott, 1991). Currently our concern to improve the welfare of animals is primarily directed at those animals that benefit us (Leak and Christopher, 1982), which has adaptive advantage for these species. As well as more tangible methods of improving welfare, this could take the form of educating children to enhance empathic attitudes (Hills, 1995) and instructing those using, or directly benefiting from animals on how they should be treated sympathetically (e.g. Wiebers et al., 1994). The evolution of animal empathy was probably also influenced by the need to manage animals successfully, which included understanding their feelings and taking appropriate action when necessary.

Chapter 4
Animal Welfare and Animal Rights

The evolution of moral standards – major influences on our attitudes to animals – animal welfare and animal rights – animal morality – cruelty towards animals

The Evolution of Standards Supporting Moral Behaviour Towards Animals

Northern European countries have been pre-eminent in establishing a legal framework for ethical standards in the latter part of the last millennium. This was in part because this region was a focus of industrial development at this time, together with the opportunities that the increased wealth generated. The towns and cities that had developed in the industrial nations were overcrowded, disease-ridden and with little space for penal settlements. In these urban centres, legislation had to be enacted to protect the underprivileged minorities, who were in danger of exploitation in these less moralistic societies than those in rural areas, which had evolved their own methods for maintaining moral standards. The call for an improvement in social standards in European countries was led by public demand, politicians, protestors and activists, who became aware that city dwellers needed protection through legislation in a way that village dwellers in the past did not. Closeknit village communities could protect the less privileged members of their society through mutual consent, admonition of miscreants by elders in the society and the threat of being ostracized from the society for misdemeanors.

Starting with the rights of the common over (Bill of Rights in 1789 in the USA and the abolition of slavery in the UK in 1833), there have been major initiatives to improve standards for children[1] (1889), women (1870–1920),[2]

[1] The Society for the Prevention of Cruelty to Children was founded in the UK in 1889

[2] Like animals, up until this time women were viewed largely as property. The 20th C attitudes towards women contrasts sharply with earlier attitudes, for example a 12th C BC Mesopotamian law determined that "when she deserves it, a man may pull out the hair of his wife, mutilate or twist her ears, with no liability attaching to him" (Starr, 1973)

C. Phillips, *The Welfare of Animals*, Animal Welfare 8,
DOI 10.1007/978-1-4020-9219-0_4, © Springer Science+Business Media B.V. 2009

ethnic minorities (1960s–1980s),[3] homosexuals (1960s–1990s)[4] and disabled people (1970s–2000s)[5]. Having championed the rights of disadvantaged people, society's attention increasingly focused on animals in the 20th C. Although the Society for the Protection of Cruelty to Animals was founded in the United Kingdom in 1824, major activities to advance the welfare of animals did not begin in earnest until the late 20th C, in approximately 1980. The 20th C focus of attention on animal welfare can be traced to 1965 when the Brambell Committee pronounced on farm animal welfare issues in the United Kingdom, but it took about a further 15 years before animal welfare became a major subject of concern in this country, and by the late 1980s there was an exponential increase in animal welfare research (see Fig. 8.1).

With all of these social movements, many relevant activities have occurred outside of these time periods, but the movements are periods when major advances were demanded and made, particularly in Western Society. This social development was unprecedented in world history, indeed in the urbanization of early civilizations laws were introduced that legitimized a much more hierarchical society than today, where the punishment for crimes depended on the status of the victims[6] (Starr, 1973). Typically there were four classes of human beings: the king, who was considered of divine origin, the upper classes, commoners and slaves. Like the slaves, women were considered to be property.

It was not just fortuitous that the modern era ushered in a period of major social development. The period of increasing prosperity since the mid 20th C has introduced opportunities for widespread availability of welfare support (universalism,[7] Schwartz, 2007) that would have been hitherto impossible. For example, if Russell and Burch had been born in the 19th instead of the 20th C, their attempts to reform laboratory animal welfare would have been futile, since the use of animals for laboratory research was in its infancy. The major social developments have been led by people who developed the right ideas at the right time. Even Darwin encapsulated the thoughts and ideas that were beginning to form in the minds of the British public at the time. He

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[3] The American Black Power movement began in the 1960s and progressed to black independent electoral activism during the 1970s. Countryman MJ (2006) "From protest to politics"—Community control and black independent politics in Philadelphia, 1965–1984. *Journal of Urban History* **32**, 813–861.

[4] Often considered to commence with the Stonewall Riots in the USA in 1969.

[5] The UN General Assembly adopted a Declaration of the Rights of Disabled Persons in 1975. Since that time there have been many major initiatives in different regions to advance the cause of disabled people.

[6] Punishments for violence were decreed by the King of Babylon in approximately the year 1800 BC as follows: "If a noble has broken another noble's bone, they shall break his bone. If he has destroyed the eye of a commoner, or has broken the bone of a commoner, he shall pay one mina of silver. If he has destroyed the eye of the noble's slave or broken the bone of a noble's slave, he shall pay one of less value." (Starr, 1973).

[7] Defined in social science as the motivation to promote the welfare of others, but taken here to mean the motivation to make welfare support available to all sectors of society

developed and led the reform of ideas on evolution, but there were other scientists proposing the same ideas at the same time.

In recent times the northern European nations have been the most influential reformers of societal standards. Even to this day, new standards in animal welfare devised in Europe are often extended to former Anglo-Saxon colonies, such as Australia, New Zealand, the United States and Canada several years later. The concerns are spreading worldwide, with societies to protect animal welfare becoming established or strengthened in most areas of the world.

Given that most social movements of the last two centuries have usually lasted between 25 and 50 years, we can expect that there will continue to be a major emphasis on animal rights and welfare improvement for several more decades, and probably it will last until standards have considerably improved. Given the contentious nature of our moral stance on animal welfare issues, it was perhaps inevitable that all animal rights activity would become synonymous with extremist views, in just the same way as those directly involved in the female emancipation movement were branded extremists. In reality, most members of the public acknowledge that animals should have some rights and recognize that this will lead to an improvement in welfare. However, they would not necessarily hold the extremist view that animals cannot be used by humans. A mutually symbiotic relationship between animals and man is, and will continue to be, accepted by most people, even after the 40–50 years or so of welfare reforms that can be anticipated. Such a relationship acknowledges that man dictates, and to some extent restricts, the basic freedoms of animals, but also assures a life that is reasonably well provided for, at least in terms of nutrition, safety and health care.

The animal rights advocacy framework has been not only growing but also becoming more sophisticated, and is part of the general evolution in social cause support groups. In the US these are doubling in size every twenty years, partly due to disillusion with political forces, and in particular the large size of the electoral unit. Communication with members is greatly facilitated by the internet (Lewis, 2005). The major activist organizations have membership lists of millions of supporters and very significant budgets. They employ many well-trained scientists to research campaigns, so that the organisation is well prepared when the campaign starts. Campaigns are focused on achievable targets, often involving groups in society that are susceptible to pressure. Typical weaknesses that can be exploited include the belief by young school children that animals used for fast food production are unhappy, the guilt of house spouses if they purchase fast food in preference to spending time preparing quality meals for their family, and the teenagers' fear that meat would make them smell unattractive or that milk would cause acne. Campaigns are often run in militaristic style, with victories heralded on the website. Bequests are still the major source of funding, but increasingly industry is targeted for support, and a seal of approval by the activist group may assist sales as well as helping advertising. By contrast the target animal industries have smaller budgets and employ fewer researchers to defend their practices.

In addition to the legitimate non-government organisations, there are also animal activist groups, that support illegal acts, although they usually require that these should not harm people or animals. These might include arson, harassment, vandalism, animal release and even bombing. Because the members of such societies engage in illegal activity, they do not have leaders but active spokespeople. Similarly, for legal protection they are not a club or an organization that people can join, but a concept that is realized only when an action takes place using the society's name. They aim to liberate animals from enclosed situations, such as laboratories, intensive meat animal farms, fur farms, etc, and place them in homes where they may live out their natural lives. They also seek to inflict economic damage on those who profit from using animals, and to make the public aware of the circumstances in which the animals are kept. The societies increasingly focus on electronic civil disobedience, such as frequent e-mails or telephone calls to those involved in the animal industries. They may identify a network of companies associated with a target organization, and try to persuade them to withdraw their support for the company. Whilst few people would condone the illegal nature of the activities of some members of these societies, it must be remembered that in the past activists of this nature have often illegally protested against activities that seemed acceptable at the time, but eventually come to be viewed as unacceptable to society at large.

Slow responses, bureaucracy and congestion in the legislative channels encourage members of the public to support groups engaged in direct action. Although the activities of some of the larger societies are across all the major animal use industries, the food sector is an increasingly popular target. This is partly because of our strong sense of empathy with farm animals that provide us with food and many other commodities (see Chapter 3), and partly because the food industry is now dominated by a small number of integrated, multinational companies (making them easy targets and creating the possibility of a domino effect within the industry).

The mode of action of the social activist groups is changing. Traditionally they simply lobbied parliament, which would then regulate industry. However, nowadays activist groups manufacture an issue (which is given a catchy slogan), create a public debate around the issue and make someone within the sector responsible. A viable alternative to the practice in question must be available and the transition must be achievable. The company is then forced to pursue this in order not to lose public support.

The most popular targets are practices that are unnatural, cruel, the result of human greed and displaying a lack of human care. These will attract far more concern than natural events that challenge the animals' welfare, such as drought. Consider the livestock export industry, sending about 6 million sheep from Australia to the Middle East and about one million cattle each year in large vessels. Such long distance transport is easy portray to the public as unnatural, as the animals are kept on large vessels for up to two weeks. Even before entering the ship, stock are transported to the port in vehicles, in which there may be bruising to the limbs, or animals may lie down and be unable to get

up (Jarvis et al., 1996). At the wharf, where loading is often in full view of the public, electronic goads may be used to handle the animals during loading, which stresses them (Warner et al., 2007). Once on board, the biggest problem for cattle leaving Australia in winter is that they still have their winter coat, which renders them more susceptible to heat stress when they enter the summer of the northern hemisphere. To counter this problem, the Australian government has stopped cattle being shipped from the southern ports of Australia in winter (Anon, 2006). The industry has also developed a computer model that estimates the impact of the type of cattle, their degree of acclimatization and the anticipated weather conditions during the voyage on heat stress risk, and adjusts the stocking density of cattle or sheep on the ship accordingly (Stacey, 2003). A high risk of heat stress results in stocking density being relaxed, allowing the animals to lose heat more easily. The most serious problem facing sheep on the ship is inappetence, with animals that are too fat being particularly prone to anorexia, in which apparently fit and healthy animals give up eating (Higgs et al., 1991). Fat animals are able to do without food for a few days more easily than thin ones, but then they permanently lose the desire to eat and may die as a result. Although the numbers of Australian sheep rejected are not known, in England over the last eight years approximately 0.02% or 2755 animals were rejected at the place of origin (out of total shipment of almost 200,000 sheep, 500 cattle and 150 pigs, traveling from England to the European continent in 50 shipments each year, DEFRA, 2006).

As I have argued elsewhere (Phillips, 2005b), it is possible to consider such long distance transport necessary because the livestock are reared in extensive rangeland conditions, far from the centres of human population. However, with such large numbers of animals and over the considerable period of time that they are transported, even on the best shipments there will be some mortalities *en route*. Defendants often point to the reduction in mortality in recent years (Norris and Gorman, 2007), now down to about 0.9% for sheep, but the animal welfare activists counter this by saying that 0.9% of 50,000 sheep is still an average of 450 deaths on each voyage. This argument appeals to the public perception that all animal's lives are to be respected and valued. The trade is also easily portrayed as a result of human greed, since the city-dwelling public is inclined to believe that livestock farmers are profiting excessively from the trade. Finally the lack of human care has been prominently exploited in the video footage of the handling of the animals in the recipient countries, some of which showed cattle having their leg tendons cut to stop them running away in an Egyptian abattoir (Animals Australia, 2008). The battle for the hearts and minds of the public continues.

Increasingly, the activist groups work through networks of supporters that are created on the internet. Direct assistance for lobbying is provided, which is a powerful influence on politicians in their decision making. Support for school activities is common, because this will influence opinion makers of the future. Information packs to assist teachers are made available, although in many countries industry has retaliated by attempting to reach into schools with counter views.

The high profile of the activists' campaigns ensures public support, which generates funds for the next campaign, and so on. In these campaigns, the focus is usually on a small part of the industry or one practice within it, such as the recent effective action against the mulesing[8] of sheep, rather than targeting the whole industry, even though many of the campaigners will be against the use of animals for food. The response of industry should be measured and considered, but it is often more of a knee-jerk reaction, in part because they see a dramatic shift in public support and are unsure what effect this will have on their business. They recognize that the financial impact of the adverse publicity is likely to exceed the direct losses caused by any change in practice. Often the media attention is very one-sided, and it is clear that the media have devised their story to appeal to public sentiment, without considering that industry may have a valid counter-story. The major risk if considered action is not taken is that management of the animal industries by referendum evolves, rather than by considered government.

Influences on Concern for Animal Welfare

To properly understand how the animal welfare movement is strengthening and expanding, it is necessary to consider the main influences, or drivers, for this movement. Concern for animal welfare is growing in most regions of the world, that much is evident from the attention paid to it by the media, the growing volume of scientific research in animal welfare (Fig. 8.1) and the increasing attention paid to animal welfare issues by governments around the world. It is important for the animal industries, and in particular the livestock industries, to be able to predict future changes in concern for animal welfare in order to manage the scale and direction of the industry, and most importantly, to provide the type of production system with which the public feel comfortable. Rapid changes may have detrimental effects on animal welfare, for example if live export of cattle from the northern parts of Australia were banned, they would be taken to southern states for sale and the lower price achieved would probably reduce the farmers' ability to feed their cattle adequately, at least in the short term. Different regions of the world will have their own unique consideration for animal welfare issues, and the many drivers of concern for these issues will have levels of importance that are peculiar to the region. Therefore, it is essential to understand not only how animal welfare concern is changing globally, but also the influences that are likely to be the most important in different regions.

One of the key influences is affluence, with people having more disposable income being more likely to purchase products from a high animal welfare system (Rahmann, 2000). Most regions of the world have experienced

[8] Surgical removal of loose skin from the hind quarters of sheep to prevent flies laying their eggs in the moist folds.

increasing affluence in the last 50 years – a result of economic growth and development and exploitation of many of the world's resources. The major exception to this is Africa, and in addition to this, there have been some serious but mostly temporary setbacks to economic growth in the former communist countries. As well as people having more money to spend on welfare-friendly products, countries that have experienced high economic growth have sought to increase the profitability of their animal industries by intensifying the production systems. Thus it may be difficult to discern whether the increased purchase of welfare-friendly animal products in the affluent countries derives from the increased concern about the animal production system or increased disposable income to spend on these products.

As well as there being increased disposable income, with the widespread adoption of capitalist financial policies, many countries have witnessed a greater divergence of income in their population. This is particularly relevant to animal welfare purchases if there is a threshold above which people start to spend more on welfare-friendly products, after they have satisfied their own material needs. There is no direct evidence of this to date, but if it is determined to be an economic phenomenon, we might expect some exponential growth in spending on welfare-friendly products as incomes increase, dependent on the difference in cost of welfare-friendly products relative to conventionally produced goods. This divergence in disposable income varies between regions. It has been most pronounced recently in the former communist countries, emerging from the conversion to capitalism, and least marked in countries with a high level of social responsibility, such as Australia, New Zealand and the Scandinavian countries.

As well as affluence, different regions of the world display varying levels of concern for animal welfare depending on their cultural heritage. As outlined previously, a preliminary survey has suggested that students from some Asian countries had less concern for animal welfare than those from Europe or America, but they all had similar levels of concern for animal rights (Phillips and McCulloch, 2005). This is likely to be due to their different cultural heritage and the levels of education of people within these countries. Levels of concern for animal welfare issues tend to increase with the level of education (Poss and Bader, 2007). The increase in educational standards in South and East Asia, following on from a period of significant economic growth, may be one reason for the growth in animal welfare interests in this area. The growth in awareness of animal welfare issues was originally a phenomenon largely confined to the Anglo-Saxon regions of the world, northern Europe, the northern sector of North America, and to a lesser extent, Australia and New Zealand. However, the movement appears to be spreading, partly driven by new national and international standards from the European Union.

Some cultural traditions towards animals derive from religious teachings, others from the different practices in relation to animal management that have evolved over the last few centuries. There is much debate about the influence of religion on concerns surrounding animal welfare (Lindeman and Vaananen,

2000), but the low number of adherents to religious creeds and practices in much of the Anglo-Saxon world suggests that religion is not a direct major driver of concern, rather an indirect driver through former influences on culture and beliefs (Li, 2000). An absence of direct influence of religion is suggested by reduced levels of concern for animal welfare in Asian people compared with northern Europeans (Phillips and McCulloch, 2005), even though the Buddhist and Moslem religions, which predominate in Asia, contain more teaching and instruction on the good management of animals than the teachings of Christ, which are officially followed in northern Europe (see Chapter 6). Furthermore, the small proportion of the population that is confirmed adherents to religious faith of their country in northern European countries may have increased the need for the development of codes of practice and legislation in these countries.

Coupled with increasing affluence in nearly all first world countries, there has been an increasing trend towards urbanization in all regions of the world. For many in developed regions of the world this brings greater affluence, and so the two influences on animal welfare are intertwined. But urbanization also brings removal from day-to-day contact with farming practices, and this loss of regular contact with the farming industry results in people becoming more sensitive to farm animal cruelty. Standards for keeping animals may be derived more from their companion animals, than food animals. Probably regular exposure to food animals in the rural population brings about a desire to support the rural industries and community, even if people are not directly involved in farming.

Urbanisation brings opportunities of choice for consumers of animal products. City dwellers use their affluence to eat out more in restaurants and fast food outlets, and this brings the opportunity to purchase high quality meals from welfare-friendly items without requiring more time and knowledge on the part of the consumer in the preparation process. Hence expenditure on food is increasing, and because food consumption is a major source of pleasure, we may expect the provision of welfare-friendly products through commercial outlets to increase substantially in future years (Denton et al., 1999).

Gender is also a major influence on animal welfare concerns. Females have greater levels of concern for animal welfare issues than males (Phillips and McCullough, 2005), although this may not extend to food purchasing habits (Lindeman and Vaananen, 2000). This greater concern of women may derive from the close relationship between the women and animals at the homestead during human evolution (see Chapter 3). There may also be some generalisation, from the more caring attitude that women have towards children than men, as a result of their greater investment in the reproductive process. Up until recently, women have always been the major food purchasers in shops and markets, however, with female emancipation having been a major force in the last century, and many women leaving the home to work, we should not assume that the majority of purchases of food items will be by women in the future. Animal welfare concern is very much related to gender. The personality traits usually associated with masculinity (adventure-seeking, aggression and

dominance) are in contradiction to the caring, compassionate nature of the human feminine nature that is often associated with concern for animal welfare. The association between femininity and animal welfare attitude is explored by Laurie Carlson in her book *Cattle – an Informal Social History,* in which she contrasts the femininity of cow keeping with the masculinity of men hunting wild animals in prehistory (Carlson, 2002). The link between animal welfare and gender was also advocated by Mahatma Gandhi, who indirectly corrected the masculine human personality characteristics to a lack of care for animals, which he considered to be an indicator of moral backwardness[9](Gandhi, 1927).

Animal Welfare vs Animal Rights

There is a fundamental distinction between animal welfare – the quality and quantity of an animal's experiences – and animal rights – man's duty to exercise morally correct behaviour in relation to animals. An animal's welfare is a scientific absolute, evaluated on a continuous scale from low to high. By contrast, animals' rights are determined by beliefs and their existence is even denied by many individuals, religious groups and most legislation, for which animals are just property. Extreme advocates of animal rights usually believe that the life and integrity of individuals is of paramount importance and cannot be sacrificed for the benefit of humans or other animals. However, some have argued more generally that 'rights' are unsuitable to be the building blocks of society, because they are firstly illogical in some instances (why do wild animals have fewer rights than farm animals, for example?) and they are secondly, focused on ourselves and those injustices that are uncomfortable for us to live with (Bagaric, 2006). Bargaric argues that focusing on the consequences of our actions would be more logical. However, public sentiment is usually supportive of increasing both the standards of animal welfare and the level of rights afforded to animals, although they are not always willing to pay the extra cost. Prescribing rights creates a sphere where we can live comfortably without being confronted by hardship and cruelty. However, with increased communication around the globe, we must remember that images and actions from places other than our immediate neighbourhood may intrude on our daily lives.

In some cases, the entitlement to life proposed by many animal rightists may conflict with the animal welfare advocates, who frequently espouse a utilitarian view. For example, animal welfare advocates may believe that animals may legitimately be sacrificed in experimentation to find a technique for improving animal health, if it improves the welfare of other animals sufficiently, whereas animal rightists would oppose such sacrifice. Mahatma Gandhi was one of

[9] 'The greatness of a nation and its moral progress can be judged by the way its animals are treated' M. Gandhi.

many animal rights advocates who did not believe in utilitarianism.[10] Animal rights do not have to be extreme, they could simply relate to a right not to be maltreated to a certain degree, rather than a right to a life or the maintenance of integrity. This is enshrined in much new legislation concerning people's duty of care to animals. In this less extreme rights philosophy, the type of beneficiary may determine the level of an animal's rights. If the perceived beneficiary of, for example, animal experimentation is a member of the family of the aggrieved animal, its right to avoidance of the experimentation would in most people's view be less than if it was merely conducted to be a benefit for another animal species. Many people still take an anthropocentric view and consider that a benefit to humans is the most worthy and justifiable reason for animal experimentation. Preservation of similar genetics is the primary force at work and is likely to be more engrained in our attitudes for the purposes of adaptive evolution. Some even argue that this attitude prevails within our own species: countries where the inhabitants are ethnically pure, such as in Scandinavia, are more likely to have an extensive human welfare support systems (Ragin, 1994; Rojas, 1999; Kildal and Kuhnle, 2002; Bay et al., 2007). People in the Scandinavian countries have the highest expectations for the welfare of their animals of any in Europe, and they also recognize that provision for welfare is at a high level in their country (Eurobarometer, 2007), suggesting that high expectations can produce improved welfare outcome.

The animal rights movement is likely to grow in rapidly developing countries such as Australia, due to increased urbanization and the increasing spread of American ideologies, of which animal rights philosophy is one. The modern animal welfare movement originated in Europe, and hence the two most influential regions of the world on Australian ideology, the USA and Europe, both have strong considerations for animals, although from different perspectives. These influences are likely to continue and even strengthen due to the dominance of the USA and Europe in world affairs.

Western Attitudes Towards Animal Welfare

Australia is a high income, urbanised society, and both the affluence and the degree of urbanisation tend to increase the strength of concern for animal welfare and rights. The recent history of colonising land that is marginal and climatically challenged has led to speculation that the competition created between livestock and native fauna in such environments is too great, and that these areas should be left for native fauna (Higgins et al., 2002). This movement has been growing in parallel with the animal welfare movement, and both movements are increasing as people have more money to spend on

[10] 'I do not believe in the doctrine of the greatest good of the greatest number. The only real, dignified, human doctrine is the greatest good of all' (Gandhi, undated).

food that is produced to high standards of welfare, as well as safety and environmental sustainability. Increasingly, there will be less acceptance of farming practices that do not conform to the high ideals of a largely urbanised society.

The emergence of animal rights considerations has been a gradual development over the last 150 years, beginning with the Darwinian acceptance that there are no fundamental biological differences between animals and man, and that man evolved from animal progenitors. In fact, this fundamental challenge to anthropocentrism was much more revolutionary than the gradual acceptance that animals have rights, which is emerging today. Extreme animal rights advocates today form a body of highly dedicated and determined individuals, who are resolute in their pursuance of rights for animals and who usually occupy a more radical position in their beliefs about animal rights than the general public. History suggests that these people will be seen in the future as the social reformers of their day, in the same way that female emancipators and slave trade campaigners are now viewed as a necessary part of the social evolution of our democracies. As they represent an extreme sector of the population's views on animals' rights, we do not have to expect that all of their beliefs will become incorporated as a societal norm, for instance opposing the killing of animals for meat. Although they often support the most extreme positions, e.g. veganism, they usually expect to persuade government and individuals to support some of their more moderate demands, for instance the banning of cages or stalls for sows to be held in during pregnancy. Their message is appealing to the media, containing the classically attractive elements of first, cruelty or at least antisocial behaviour towards a defenceless being; second, domesticated animals; and third, social reform: an attack on the landowners, who are perceived to be rich. There is also the possibility of redistribution of their wealth to the land poor members of the public, if the landowners can be persuaded or forced to adopt more costly, welfare-friendly practices at no extra charge to the consumer. Over the last 50 years, industrialisation of animal agriculture has dramatically reduced the price of animal products, but sometimes at the expense of the quality of life of the animals. However, with man's inherent love of aesthetics and the natural world, we readily empathise with animals that are kept in unsuitable facilities, and act to eliminate unacceptable practices.

Addressing the Animal Rights Issues

In the long term, the best way to address the issues posed by animal rights extremists is through scientific investigation to find suitable alternatives to the systems that are the subject of the criticism. In addition, knowing how the public perceive animal practices and educating farmers about how new practices can improve animal welfare is essential. Most farmers would be very happy

to use more or better resources than they currently do to improve the welfare of their animals, however, their system of production has to be economic. The welfare state of farm animals is therefore at least partly the product of consumer buying habits. Developing accurate information for consumers on welfare status is essential.

Anticipating the activists' next focus of attention will enable an effective public education response to be mounted at the right time, but in reality research should be in place and information programmes available for all the major animal practices that are suspected of presenting a challenge to animal welfare. Australia has some different welfare issues to Europe, such as poor feed availability for rangeland stock, which is generally not so much of a problem in Europe. This relates to the more marginal land that is used for livestock rearing in Australia, compared with Europe. The extensive nature of Australian livestock farming brings threats of food shortages, but also opportunities to inform the public that these practices are conducive to fulfilling the animal's natural requirements for space and a natural social order, in comparison with European production systems that more commonly include intensive animal housing, which is often crowded and does not respect the mother-offspring relationship. Such advantages are actively promoted by New Zealand, but Australia has to first address the worldwide view that its livestock farming is inherently cruel because of the invasive practices that it employs. The unacceptability of invasive practices to animal rights activists is founded in their belief in maintaining the integrity of the animal. Therefore practices such as dehorning, tail docking, branding and mulesing are all seen as undesirable, even if the consequences of not doing the practice brings greater harm, or a risk of greater harm. Some would even take this view if not doing the practice produces a negative welfare situation overall, such as when a sheep is struck by flies because it has not had the folds of skin removed from the hind quarters in the mulesing operation. There is an urgent need for critical evaluation of the impact of invasive practices on whole-of-life welfare, including disease evaluation that incorporates assessment of the duration of the disease and the severity.

Free choice of the animal to select the optimum environment and diet are also perceived by many as desirable, since *our* ability to exercise free choice is one of our most valued resources. There is currently little evidence that animals do or do not value this free choice. Research on diet selection by sheep suggests that they make limited use of pre-consumption information that might direct choices, rather regular information processing during feeding informs choices directly (Illius et al., 1992). Furthermore, when eating an ideal diet, they will regularly return to sample an inadequate diet. This could be because they want to confirm that the diet is inadequate, but it could also be to maintain a microflora in the gut that is capable of digesting both an ideal and inadequate diet, in case they only have access to the latter in future. Thus it is beneficial for animals to experience good and bad circumstances, particularly as they develop, so that they can learn to cope with the bad circumstances.

Morality Towards Animals

Although most people agree that conditions and facilities for animals are improving, although perhaps not as rapidly as for their human counterparts (see Chapter 1), largely as a result of technological advances, there is limited evidence of improvements in our moral attitudes to standards for animal welfare. An animal's welfare is a function of both the level of welfare that we are able to afford and the level that we aspire to provide for them. The higher the aspirations, the more we are likely to sacrifice luxury goods for our own welfare, to make provision for the welfare of animals in our care. The improvements that we see in animal welfare in recent decades appear to derive largely from improved wealth and opportunity to provide better conditions for animals. Thus we are more able to keep them closer to the standard which we would aspire to, as a result of technological advances and increased affluence.

Some evidence that we may be aspiring to better welfare standards for animals comes from increased activity by nongovernmental organizations, increased concern by the public, in the media and more legislation and codes However, we also see increased activity in many other areas of social awareness and this may merely be a reflection of more responsive governments that listen to such pressure. Contrary evidence, that moral attitudes towards animals are not improving, derives largely from the reports of animal abuse and the minor offences against animals that we all witness in our everyday life. Whilst there has not been any formal documentation of the frequency of such abuses, it is likely that in the past they occurred regularly but were not reported or of interest. In Australia at least, most abuse (80%) does not involve deliberate cruelty on the part of the perpetrator but is the result of ignorance, poverty or adherence to tradition (Green and Gullone, 2005). Deliberate animal abuse may be as low as 0.6 % of cases seen by veterinarians (Sharpe and Wittum, 1999) and may be motivated by aggression, or an outlet for sex or attention seeking[11] (Munro and Thrusfield, 2001b). Only about half of one sample of small animal veterinarians have had to deal with abuse, mostly in dogs (Munro and Thrusfield, 2001a), yet they are ill-prepared by their training (Landau, 1999). Of increasing concern is the fact that abuse of animals links directly to abusive attitudes and bullying of children and women, but veterinarians rarely address this associated human abuse (Henry and Sanders, 2007). We shall return to animal abuse when considering cruelty.

Looking at societal changes generally, it might be suspected that the pressures of modern living would cause some people to vent their frustrations on animals. Man's humanity to his fellow man appears at first sight to have

[11] A Munchausen syndrome by proxy syndrome has been observed in about 2% of animal abuse cases, involving attention-seeking behaviour by the owner, apparently fictitious clinical signs and injury (Munro and Thrusfield, 2001b)

deteriorated considerably in the first half of the 20th century. Although accurate statistics are difficult to find, historians are agreed that there was a considerable escalation in the proportion of the world population killed in wars in the 20th C (about 5%), indeed there has been a progressive increase since the advent of modern warfare in the 16th C (Roland, 2007). Undoubtedly much of the increase was due to the increased effectiveness of weapons and the conflict between global empires rather than individual countries, rather than a decline in moral standards. Another reason for the increase in 20th C lies in the emergence of eugenics movement, which was at least partly responsible for the most expensive war yet, the Second World War, claiming over 50 million lives (White, 2005). This movement can be traced to America's attempt to suppress the coloured people at the turn of the century (Black, 2003), and before this to the views of Sir Francis Galton, who took the works of his cousin, Darwin, one stage further to advocate selective breeding of humans for the purposes of genetic improvement (Allen, 2002).

Fortunately, although the eugenics movement continues in a variety of forms, the rate of death from war declined substantially in the second half of the century, which some attribute to the development of nuclear weapons and the reluctance to use them because of the scale of the consequences[12] (Roland, 2007). More likely it was due to a growing responsibility for, and ability to control, world events. In addition, following the atrocities committed by totalitarian governments with misguided objectives, there was a marked change in the latter part of the 20th century towards more democratic government. This has brought the opportunity for more social responsibility in governments and also for the people to demonstrate their concern for the less fortunate members of society, including the animals in our care. As a result of these democratic changes, we now see active animal welfare organisations around the globe, enabling people to express their intentions to treat animals better.

Thus it has taken time for man to start to develop a responsible attitude to managing change after he realised that he could control and manipulate his own destiny, not just his own genetic destiny and that of the animals within his care, but it is increasingly realised that management of the global environment is man's responsibility too. There will be further brutal acts by dictators and probably more genocide, but the seed has been sown for major and prolonged social improvements that will enable us to care better for the animals within our charge. We must never forget that, as Lord Acton said 'power tends to corrupt, and absolute power corrupts absolutely'. However, the worldwide move towards representative government which emerged in the late 20th century, and most notably in the former communist countries, must give us optimism that multicultural societies will thrive and flourish in the future, embracing a multitude of attitudes towards animals.

[12] The same argument was made for dynamite when it was invented (Roland, 2007)

Cruelty to Animals

Cruelty to an animal usually has the elements of an intentional act towards an animal, or willful neglect, that causes unnecessary suffering, in that it affects their life, health or comfort (American Humane, 2003; LLL, 2008). It can include mental harm and reasonable apprehension or fear of physical or mental harm. It does not include acts which merely offend or can be assumed to hurt the feelings or brief displays of passion.

Widespread and regrettably sometimes glamorized cruelty to animals has been a scar on man's attempts to create civilized societies for several thousand years. However, when considering primeval man's hunting practices, it may be difficult at first sight to differentiate cruelty from natural predator behaviour. In prehistoric times, men engaged regularly in hunting forays, where an animal would be injured or killed by a range of projectiles, or it could be surrounded and driven into a pit, and then gradually beaten or speared to death, perhaps with a degree of torture, in the same way that many predators will play with their prey before the kill. Is this any different to the slaughter of large animals by the ancient Romans, surrounded by an audience of appreciative citizens? The major difference is the necessity of the act, which affects the motivation. This fundamentally alters the acceptability of the practices, since the Roman games were a spectacle designed to appeal to the crowd's sense of satisfaction in animal suffering, in much the same way that an animal sacrificed in the bullring delights the audience nowadays. The motivation for primeval man was survival, for which he had to procure food. The feelings of satisfaction in suffering have no place in modern society, and many great civilizations have thrived in the past without such activity. Hence the British government recently made the traditional practice of hunting foxes with dogs illegal (Hunting Act, 2004), because the event is a spectacle for the enjoyment of both those engaged in the sport and other viewers.

Early hunting activities did not always celebrate the animal suffering in the way that the Roman games did. The ancient Egyptians rarely depicted hunting scenes in their art, and did not engage in the mass slaughter of animals for pleasure. When hunting scenes were painted, in the earliest Egyptian cliff engravings of the 8th millenium BC, they conveyed more of a feeling of grace rather than ferocity (Andrews, 2005). The Assyrian kings were keen on hunting lions (British Museum, 2007) in a ritualized chase, with caged lions released so that the king and his followers could shoot at them with arrows. This has the element of intention that is necessary in cruelty and also some of the danger associated with the Spanish bullfight. Early reliefs show lions being driven towards the king's men in chariots, sometimes attacking the chariots (Anon, 2008b). Victorian pictures of hunting, where the squire (who often commissioned the painting) sits aloft an elegant horse surrounded by well-groomed and obedient dogs, convey an appearance of grace and elegance in the same way as the Egyptian engravings. The emphasis is on mastery of nature, rather than the

suffering involved in animal sacrifice. Similarly the ancient Greeks did not glorify the torture and slaughter of animals in the way the Romans did, although they did sacrifice animals to appease the gods, in particular bulls (Thomas, 2003). Earlier civilizations had glorified hunting, which in essence was not dissimilar from bull-fighting.

Animal sacrifice, the ritual killing of an animal as part of a religion, was a unique form of cruelty which featured strongly in many early civilizations. The ritual element lent acceptability to a cruel practice. It is inconceivable to imagine that such ceremonial sacrifice of animals would be tolerated by modern society, yet it is perpetuated in pagan ceremonies in many countries, where chickens or other farm animals are regularly slaughtered. The Romans sacrificed vast numbers of animals to appease the gods, even accepting that there may be some inaccuracies in the historical records. Animals' heads were first sprinkled with bread and wine and then disemboweled for inspection of the quality of their internal organs, before having their throats cut (Anon, 2008a). Any imperfections led to other animals being used. Bulls were particularly favoured, which probably stems from their being an object of reverence both for their ferocious nature and displays of sexual activity. The scale of their sacrifice may be a reflection of the Romans' strong belief in the need for the support of the gods. Bullfighting in the Iberian peninsular, France and South America persists, but perhaps surprisingly it did not evolve from the Greek and Roman bull sacrifice, but was introduced more recently into Spain by the Moors, who established bull-fights in the ancient Roman amphitheatres of Andalusia. The bull-fight, unlike the ritualized pagan slaughter of animals, cock-fighting or fox hunting, assumes some of its appeal because of the danger that men face when fighting the animals. This supplication to the hot-blooded nature of the Latin temperament has ensured its recent survival in the face of mounting criticism from animal welfare supporters. However, despite the claims of bull-fighting supporters, the practice has not continued for centuries but in many cases achieved a resurgence in popularity in the 1970s and 80s (FAACE, 2001).

As the bull was revered in both the ancient Egyptian and Roman civilizations, so too were other animals revered by ancient people: lions by the Assyrians, and more recently bears by the Siberian Samoyede nomads. The Samoyede peoples of Siberia were one of the last hunter-gatherer societies to survive and illustrate the close relationship between hunters and their animals. They relied on hunting deer, wolves, bears and squirrels for meat and hides and led a largely nomadic existence as recently as the Middle Ages, living in the tundra region where no agriculture was possible (Newell, undated). They kept domesticated reindeer, some of whom they venerated as gods, and these were decorated and given special treatment. Eating the flesh of the reindeer was rare, and forbidden in the case of the sacred animals, but the does were used as decoys to lure wild stags to be killed for meat and hides. Even more recently than this, a similar close and respectful relationship between men and cattle was found in the Nuer tribesmen of the

Southern Sudan by a famous anthropologist working in the middle of the last century (Evans-Pritchard, 1940).

Thus the traditional relationship between primitive man and animals was one of respect and veneration on the part of man, with some animals benefiting from the care that humans gave to them in a symbiotic relationship that came to represent the domestic contract. This contract, which primitive people employed for keeping animals when they started domesticating them about 12 C ago, provided for a good standard of nutrition, health and safety for the animals, but also dictated their longevity, their relationship with their offspring and other animals that they kept and the utilization of products from the animals, such as milk. As humans have developed, in terms of the conditions under which they live, it is to be expected that they should seek to keep their animals in better conditions. Because of this, cruelty to animals is increasingly recognised as unacceptable by most members of society. Yet as society becomes more sophisticated and complex, attempts to impose new standards of morality towards animals are often ignored and flagrantly flouted by a minority of individuals.

Animal welfare activists may have a different perspective on animal cruelty to those directly involved in the animal industries, in that they focus on invasive procedures, such as mulesing in sheep or dehorning or castration in cattle, rather than longer term problems of poor stockmanship, long distance transport, inadequate food supplies or lack of shelter. This may be due to a lack of knowledge, as in the public, who may change their views on a practice when they have more knowledge. For example, with limited knowledge the public generally disapprove of mechanical harvesting of poultry, but when informed about the welfare impact in comparison with harvesting by people, they frequently change their mind (Delezie et al., 2006). The least informed are young female, urban members of society, who also display the greatest concern about animal welfare issues (Delezie et al., 2007).

Those more directly involved in farming recognize that invasive practices prevent some far more damaging welfare problems, such as mulesing sheep to prevent them from being attacked by flies, or dehorning cattle to prevent them from injuring each other. There is little evidence that farmers become immune to the short-term pain that animals suffer during and after these operations, because of their regular exposure to them. However, although such people are usually doing their best for the animals, with societal standards for animal welfare increasing at a relatively rapid rate, some systems of production may be accepted by the producers but unacceptable to the public, and even to the consumers of the products. Hence it may be necessary for systems to change, which requires producers to be flexible. The long time that it takes to learn how to manage an animal production system mitigates against sudden change, but it is the mark of an advanced, responsible society that it helps producers to make the necessary changes if they are drastic. Financial incentives (golden handshakes) for those leaving the industry and support for those adopting new, more

suitable methods of production are two methods of facilitating the adoption of systems of production that are in accord with public demand.

Action on animal cruelty depends on being able to measure the risk of it happening. Theoretically the risk to welfare of cruelty events can be evaluated mathematically by determining two factors – the severity of the event and the likelihood of it happening. Systems of risk management that employ Hazard Analysis and Critical Control Point are now being advocated to deal with animal welfare issues (Hegelund and Sorensen, 2007). There is often some understanding of the severity of different events, but little understanding of the risk factors for the occurrence. One such risk factor is abuse to humans, since criminals that have committed such offences often admit to having abused animals as well (Arluke et al., 1999). It is not clear whether this is a causal relationship, but the fact that the two co-exist should encourage protection societies for humans and animals to collaborate in identification of offenders.

Whilst we have no direct evidence that the levels of cruelty inflicted on animals are actually increasing, we might anticipate that the changing demographics in modern society are likely to have an impact. The majority of the perpetrators of cruelty are male (Herzog, 2007) and likely to be without employment or a good education. Both young boys, eager to demonstrate their bravado to their peers by abusing animals, especially cats, and teenage or adult males, who may find cruelty to animals, especially dogs, to be an easy form of release for their pent-up aggression, are commonly involved (Arluke and Luke, 1997). Cruelty may offer a form of amusement, when there is little else to occupy them. The pressures of modern society, and the increased number of people living alone without the stability of the traditional family unit, are likely to increase the number of people wishing to harm animals. Although this cannot be condoned, understanding the aggressive impulses of the young male, and how best to disburse these through peaceful means, would help to deal with the problem of cruelty to animals.

Incidences of extreme cruelty are entering the media headlines with increasing regularity, demonstrating that the phenomenon creates a sense of outrage in the law-abiding members of society. The type of human abuse with which animal abuse is often linked is usually wife battering or child beating (Ascione et al., 2007). Although this is increasingly speculated upon, the evidence supporting a causal link is still equivocal. About 25% of aggressive criminals, when questioned in prisons, self report that they have performed violent acts to five or more animals previously. Non-aggressive criminals self-report that about 5% of them conducted violence to animals, and this compares with an incidence in the general population approaching 0% (Frank Ascione, personal communication). One of the most brutal killers in recent times, Saddam Hussein, was also reputed to have been an animal abuser as a teenager. According to his Press Secretary, "he used to put an iron bar on the fire and make it red hot, and when he saw an animal passing he would run out and stab it in the stomach" (Simpson, 2004). He had had a turbulent childhood, and showed a penchant for violence throughout his life. These reports give some support for the

contention that childhood violence towards animals will eventually lead, at least in a proportion of the perpetrators, to violence towards fellow human beings. However, care in interpretation is warranted because aggressive criminals may be likely to inflate their reputation for aggression by claiming to have abused animals in the past, since it can be done with much less risk than claiming aggression towards humans. Alternatively aggressive criminals may even under report, due to the stigma attached to being a violent criminal in prison. The determination of any link between animal and human violence is therefore difficult, because only a very minute proportion of the population are ever convicted of either offence. As only about one quarter of aggressive criminals report having abused animals, it seems likely that animal abuse does not lead to human abuse in many cases. However, it should be treated, not just for the offence against animals that it represents, but more generally, as evidence of psychological disturbance in the mind of the perpetrator. The involvement of social care workers should be sought as soon as a case is recognised.

The role of the veterinarians in reporting animal cruelty is crucial. As only about one half of veterinarians will have to deal with animal abuse cases, they have little opportunity to develop the correct responses. Most likely, the first response will be to counsel the client, and then the dilemma will emerge as to whether to preserve client confidentiality and perhaps maintain harmony in a household if the veterinarian was called in by someone other than the animal abuser, or whether to report the incident to the police or the animal cruelty inspectorate. Ethicists usually come down on the side of the animal (Rollin, 2006). In the United Kingdom, newly qualified veterinarians, on entry to their controlling body or college at the end of their study swear an oath[13] that requires them to put the welfare of animals in their charge as the first priority for the duration of their career.

In other countries, veterinarians may be legally required to report animal cruelty to the police. This dilemma will face an average veterinarian only rarely, but their decision will be very important for the welfare of animals that come into contact with the potential animal abuser. Inevitably, there is much abuse that is unreported, and even within a family situation, aggression towards a pet may be seen as a more acceptable form of aggression than between two people. For the veterinarian, the issue is a classical dilemma, since they have responsibilities to their clients, to their profession, to animals, to society and to themselves, which can easily present conflicts of interest, particularly between clients and animals.

The most commonly abused animals are cats and dogs, which is no doubt in part due to the fact that they are the most common family pets. We may speculate that cats in particular often appear quite fearless in their approach to other animals and humans, an attribute which has probably been selected for

[13] "I promise, above all, that I will pursue the work of my profession with uprightness of conduct and that my constant endeavour will be to ensure the welfare of animals committed to my care."

over the course of their evolution as a solitary hunter. This may bring them into conflict with the dominant member of a household, who may feel that his position at the head of a household is threatened. Tensions in the modern household today are more likely to arise from the pressures of both parents having to work longer hours than previously. The sorts of injuries sustained by both cats and dogs include burns, lacerations, gunshot wounds, poisoning, injury to genitalia, bruising and fractures (McGuinness et al., 2005). In Australia there is believed to have been a recent increase in antipathy towards cats as an introduced species (PIAS, undated). Cats readily become feral and threaten native fauna, in particular birds and small mammals. Such concerns may appear to legitimise the disposal and sometimes brutal killing of members of the introduced species. A similar stigmatisation has condemned many cane toads in Australia, with some environmental agencies actively encouraging people to put these animals to death (Beatty, undated). The impact of such apparently benevolent action by members of the public on population dynamics is negligible. In this, as in other areas, animal welfare may be in direct conflict with environmentalism. During wet weather, when the toads emerge onto the roads, many car drivers will attempt to drive over them, which in their minds is legitimized because of the environmental cause.

Another form of animal abuse that appears to be increasing is that of bestiality. As modern society becomes more complex and pressured and we put up social barriers to protect our integrity, more people live alone rather than in the traditional family. There appears to have been an increase in the tendency for people to seek sexual gratification from animals rather than fellow human beings, perhaps due to the aforementioned social changes, perhaps due to the availability of images on the internet (Mehta, 2001). At least there is greater awareness of this problem, and of concern is the possible link to violence towards people (Hensley et al., 2006). In an age when the barriers towards sexual activities of homosexuals, transsexuals and transvestites are being broken down in the name of freedom of expression, the stigma attached to bestiality is inevitably being challenged (Landry, 2001). However, although the debate will continue about whether the moral depravity involved in sexual acts with animals will facilitate the perpetrator engaging in similar acts with humans, perhaps even infants, the adverse effects on animal welfare are obvious, particularly if the animal is small and helpless.

There is an urgent need for more research to investigate deliberate animal cruelty, because of the outrage caused in the general public when serious incidences arise, and because the small proportion of cases that come to the notice of the general public are undoubtedly an indication that there is a much greater problem of deliberate cruelty towards animals that needs addressing. Increased vigilance on the part of veterinarians, animal cruelty inspectors, the police and the general public will assist in the raising of levels of awareness in the general public, which is likely to further increase the stigma attached to animal cruelty so that people are aware of its social unacceptability.

Cruelty Legislation

Traditional animal welfare legislation relies on preventing cruelty to animals, which as well as the definition in scientific terms (see introduction to Cruelty, above) has a specific legal context. Definitions of cruelty have evolved over the last two centuries, being originally taken to mean 'the unnecessary abuse of any animal'. In the early twentieth century, cruelty legislation was defined in the United Kingdom largely for the purposes of preventing horses being mistreated in London, and therefore contained a catalogue of potential abuses of such animals (a person being guilty of 'cruelty' if they [cruelly] beat, kick, ill-treat, override, over-drive, overload, torture, unfuriate, or terrify any animal). The most important offence under which most people are prosecuted in the United Kingdom today is when they 'wantonly or unreasonably do or omit any act causing unnecessary suffering to any animal'. Two key elements are the necessity of intentionality, which was not present in the first definition, and the possibility that unnecessary suffering can be caused by either commission *or* omission. Other pioneering twentieth century British legislation relates to specific acts of suffering that may not necessarily require commission: enabling fighting between animals, administering injurious drugs, operating without due care and humanity, and tethering horses (Radford, 2001). It should be noted that cruelty generally refers just to the negative treatment of animals, whereas 'animal welfare' also has positive elements within it (Radford, 2001). This deficiency is increasingly being taken into account in new welfare legislation, which identifies that people in charge of an animal have a duty of care towards it (e.g. Queensland Animal Care and Protection Act, 2001).

The legislative difficulties that animal welfare science can address are principally in the determination of when unnecessary suffering has been inflicted. Assuming that the suffering is both unnecessary and inflicted voluntarily, the difficulty often confronting the courts is whether significant pain[14] and distress[15] has been caused. The Queensland Animal Care and Protection Act defines cruelty both by the causation of unjustifiable, unnecessary and unreasonable pain, and by specific instances of cruelty that include beating an animal to cause pain, abusing, terrifying, tormenting or overworking it. Cruelty during transport, killing and the inflicting of injury are qualified by the Act, by being required to be inappropriate or unreasonable.

The number of cruelty complaints to the RSPCA, Australia, is approximately 45000/year, which results in about 330 prosecutions and 200 convictions annually (RSPCA, 2002a). Most complaints are received for dogs (15,000), livestock (7,000) and cats (5500). Wildlife and horses each receive about 3,100

[14] Defined as an aversive sensory experience caused by actual or potential injury that elicits protective motor and vegetative reactions, results in learned avoidance, and may modify species specific behaviour, including social behaviour (Broom, 1992)

[15] Defined as a severe stress response accompanied by behavioural signs suggesting that the animal finds it unpleasant (Ewbank, 1992)

complaints and 1,800 for birds. The different reporting systems and data collection methods in the different Australian States and Territories make comparison over time difficult.

Both physiological, disease and behavioural evidence can be used to determine that pain and distress has been inflicted. The courts tend to rely more on physical evidence (disease) where deliberate cruelty is inflicted by commission. However, there are many cases of omission which inflict cruelty, for example about 300 prosecutions for abandonment are brought each year by the RSPCA in the United Kingdom. In such cases physiological evidence is preferred to behavioural, despite the fact that behavioural responses are more directly involved in the definitions of pain and distress. The reasons for this are (1) samples for chemical analysis of physiological parameters are relatively easily taken, and (2) normal (reference) ranges for physiological parameters are well known and are generally within a narrow range. Animal behaviour is considerably more variable than physiology, because homeostasis confines the optimum function of the body's metabolites to a narrow range for its own protection. Physiological parameters that indicate abnormal function are difficult to identify, in part because behavioural modification protects the animal's physiology. For example, animals that are deficient in a particular nutrient will often develop an appetite for abnormal food items that will satisfy their need, as in bone chewing in phosphorus-deficient cattle. Demonstrating that animals are severely undernourished is difficult because the physiological indicators that are utilized in starvation cases mainly refer to short-term undernutrition (Table 4.1). The reference range of these indicators is easy to establish, but when my research team investigated the values obtained for two herds of cattle suffering from prolonged undernutrition, none of them were consistently outside the reference range, despite the fact that several of the animals had died (Agenäs et al., 2006).

In such instances, behavioural changes, such as the development of a depraved appetite and lethargy are more likely to be of value in indicating pain and distress, but they are difficult to monitor and present to a court of law. In other cases the incidence of abnormal behaviour can be taken to indicate the existence of pain and distress. Stereotyped behaviour that serves no obvious

Table 4.1 Reference ranges for serum nutrition status indicators in adequately-nourished beef cattle and values for two undernourished herds (Agenäs et al. 2006)

Indicator	Reference range	Undernourished herds	
		1	2
Albumin, g/l	25.0–44.4	36.1	27.1
β-hydroxybutyrate, mmol/l	0.12–0.61	0.31	0.29
Creatinine, μmol/l	110–225	157	81
Fructosamine, μmol/l	183–365	248	367
Globulin, g/l	27.2–49.2	36.6	34.9
NEFA, μmol/l	176–1317	467	343
Urea, mmol/l	1.88–7.00	4.3	6.5

purpose other than to provide a distraction for the animal concerned is one possible indicator of mental suffering. Broom and Johnson (1993) suggest that stereotypies performed for 40% of the time indicate very poor welfare, those performed for just 5% of the time indicating some adverse effects on welfare. However, the incidence of stereotypy performance varies significantly between animal species and between individuals within a species, with most people acknowledging that the animal probably derives some psychological benefit from performing the stereotypy. Furthermore, it is not clear whether the absence of stereotypy performance in species such as cattle demonstrates a greater ability to cope with a difficult environment. Ruminant animals in particular show few oral stereotypies, even when placed in severely confined conditions that would elicit prolonged stereotypy performance in pigs, for example. This may be because they already spend more than one half of their day in chewing activity, either when consuming food or ruminating. Does this legitimize such conditions for ruminant animals? Using abnormal behaviour as indicators of pain and distress may therefore be feasible for 'extrovert' species such as pigs and chickens that readily perform such behaviours, but of less value for 'introvert' species, such as ruminants. In stressful situations it is not adaptive for wild cattle or sheep to draw attention to themselves, as the best defence for a vulnerable animal from attack by predators is hiding. Wild boar, however, scatter to their den in times of danger and jungle fowl fly into the trees, so warning others would be of adaptive advantage. Hence abnormal behaviour, including vocalization, is a common part of the adaptation of some, but not all animals to stress and danger.

An alternative way in which animal welfare science reduces cruelty is through improved codes of practice, assurance schemes and directly into commercial practice. Industry funds a significant amount of animal welfare science, but is most likely to adopt changes to normal practice when there is little adverse commercial impact or there is a positive benefit.

Concluding Remarks

Animal welfare and animal rights movements are distinct, but linked in many people's minds. The growing public concern for these issues will pose a significant financial threat to the animal industries unless consumers can be persuaded to pay for animal output produced to a higher standard of welfare than at present. The cost of welfare improvements can eventually be passed on to the consumer, but in the short term intense worldwide competition keeps the price low and discourages some farmers from adopting novel, welfare-friendly practices. Greater understanding of how to measure welfare and develop improved systems is essential before audit systems for animal welfare can be effectively used in industry. A failure to improve welfare in this way and preserve animal rights will lead to a greater demand for legislation, which will confine the industry to prescribed legitimate practices.

Chapter 5
Welfare Assessment

Welfare perception – positive and negative welfare components – developing useful measures – legislation and audits

Introduction

The welfare of an animal, or a group of animals, is a complex concept and therefore assessment is not simple, and there are no perfect, instantaneous measures. Expert opinion may be all that is available, with little or no scientific evaluation, but even though experts may agree, their assessment can be wrong or exaggerated. To take an example, how do we assess whether it is wrong for cows to be kept in dirty conditions, and in extreme cases this might be buildings where so much faeces and urine have collected on the floor that their walking becomes difficult (see Phillips and Morris, 2000, for evidence of this)? First, the effects on the animal's welfare have to be assessed, but by whom and over what period of time? We can measure the choices that cows make when offered the opportunity to be in clean or dirty conditions, but this will not necessarily tell us *how much* they prefer the clean conditions, if they do. We can make cows work to obtain the preferred environment, for example by having to walk further to get to it. We can ask people their perception of the situation, and if they understand it in reasonable detail they may automatically assume that it is damaging to a cow's welfare to be kept in dirty conditions, as it is likely to soil her coat and makes the floor slippery to walk on. This may be unnecessarily anthropomorphic, as we ourselves would not like to live under such conditions and we would be particularly concerned about the spread of diseases. However, the limited amount of research with dairy cows kept under these conditions suggests that they quickly learn to tolerate the presence of faeces in the passageways of their buildings and when given a choice of clean or dirty passageways, they will not actively avoid them after just a short period of exposure (Phillips and Morris, 2000; Phillips et al., 2000). When given the opportunity, cattle *will* avoid faecal deposits (Whistance et al., 2007), but there is only limited evidence so far that their welfare is adversely affected by being in dirty passageways.

C. Phillips, *The Welfare of Animals*, Animal Welfare 8,
DOI 10.1007/978-1-4020-9219-0_5, © Springer Science+Business Media B.V. 2009

An opinion based solely on the available scientific evidence might therefore conclude that such conditions do not adversely affect the cows' welfare. However, cattle may not be able to foresee the long-term consequences of their choices, and the avoidance of faeces will help to protect animals from acquiring parasites, in particular stomach worms, and potentially dangerous bacteria, such *Escherichia coli*, and those causing tuberculosis and paratuberculosis. Such diseases are rare, but this scenario emphasises that there may be risks that the cow cannot foresee, which her genetically-controlled behaviour does not recognise or respond to. The cow will only learn to associate the presence of faeces with consequentially poor welfare if the two are closely related in time, and there may need to be repeated events for the relationship to be learnt.

Therefore, there are some benefits to expert assessment, which may make it more useful than direct choices posed to the animal. However, the extent to which assessment should depend on perceived values or observed behaviour is partly dependent on whether the expert opinion recognises real dangers to the animal. Expert opinion may be essentially folk knowledge, which may be based in reality, but could also be based on hearsay or speculation. People are particularly concerned about issues that would bother them, rather than the animal, and they may exaggerate the perceived welfare impact, so in the case of animals living in or near their own faeces it may pose only a remote risk of contamination if they are given the recommended anti-parasite medication. People are most concerned if the animals themselves have no control over their environment, for example in hot conditions cattle may choose to shelter under a tree if they have the choice. In requiring animals to have some freedom of choice, people acknowledge that animals often know better than humans what is good for them. People are even more concerned if others that they don't know and trust have control over their animals, for example, when animals are sent overseas for slaughter. These are some of the public's simple rules for assessing animal welfare: trust the animals' ability to choose their best environment and trust people that are looking after them to do the same if, and only if, they are people like themselves.

We often rely on politicians to implement our concerns about animal welfare, but in wishing to please their electorate they are likely to have divided loyalties. Relatively large numbers of the general public make some form of direct representation about animal welfare issues to politicians, compared to other social issues, so they feel obliged to act.[1] However, too great a level of government control over animal welfare in the primary industries, especially in countries in which these are economically important, will reduce their profitability and potentially cause problems of rural

[1] Quote from Euro-MP Neil Parish 'Animal welfare is the issue raised most frequently in my mailbag'. "MP to support animals". South-West Farmer, Thursday, February 1, 2007. http://www.southwestfarmer.co.uk/mostpopular.var.1163285.mostviewed.mp_to_support_animals.php

depopulation, as well as impacting on the general economy of the country. Countries with high welfare standards will always be under threat of importation of animal products from countries with lower standards, unless there is restriction of trade on the grounds of differing animal welfare standards. Similarly, although too great a level of control over pet owners will not affect national prosperity, it may alienate some members of this sector of the population.

The public are particularly suspicious about the extent to which farmers and laboratory scientists provide adequate care for their animals because of their vested financial interest, especially following the recent intensification of the animal industries (see Chapter 9). The lack of contact with individual animals and the pressures on managers to produce financial returns to their investors may have led some to become desensitised to animal suffering. In the case of farmers an additional constraint is the severe economic competition which has prevailed in times of food surpluses. This may encourage some to place personal ethical responsibilities to their family above their professional responsibilities to animals. Farmers are often not collectively organized to obtain an adequate return from the retailers of their products, some of which may take advantage of this, so that they can reduce prices to the public and improve the competitiveness of their products.

The general public appears to be increasingly less well informed about the management of animals in rural districts, as fewer people live and work there than previously and there is limited information provided to consumers on production methods (Duffy et al., 2005). For example, in Australia, 92% of people live in cities (compared with 50% worldwide) (Newman, 2006). Whereas only a few decades ago most Australians had a strong connection with activities in the countryside through their parents or grandparents, this is increasingly no longer the case, and people rely more on the media for information. 'Abuse of animals' stories are popular with the public and appeal to their concern for animals.

Another concern relating to assessment of welfare by the public is that their views differ depending on their culture, country of origin etc. In the multinational survey of students of many different nationalities previously referred to (Phillips and McCulloch, 2005), in which students from Asian countries appeared to have less concern for suffering of animals during life than reverence for the life of animals, whereas those from European countries generally had more concern for suffering during life, this may be because welfare provision is worse in European than Asian countries. In addition across the nations, women have a more caring attitude towards animals than men, and hence are more often employed as animal carers (see Chapter 3). In the former Communist states of Eastern Europe, where division of labour on the large collective and state farms was at a more advanced level than in the West, women would usually be given the tasks relating to animal caring, and men were primarily involved in mechanical aspects of the farm's work, driving tractors, working as engineers etc.

Welfare Perception

Welfare perception by humans is therefore influenced by many factors, including cultural traditions, gender, intelligence level, probably human genetics and possibly age. There may be a distinct difference between the perceived and actual animal welfare. Both will be relevant for welfare assessment, but the former will be most useful to understand the public position on welfare requirements and the latter for objective improvement. As society progresses, the perception of the desirable animal welfare state will change, and it is likely that there will be greater emphasis on equity in provision for animal welfare. Currently very different standards are aimed for, depending on the type of animal. Greater equity would be a mark of a more caring society, representing societal progress, whereas focusing on traditional attitudes to animals that derive from the benefits that they produce ignores the responsibility that we have to manage all animals. For example, rats used to be a major cause of disease, infesting crops and offering no benefit to human society. They were universally reviled and where possible exterminated. Now that their antihuman activities have, in most developed societies at least, been controlled, their benefits to society as companions or laboratory animals are beginning to be recognized.

Positive and Negative Welfare Components

Animal welfare can be measured in terms of good and bad experiences, as outlined in Chapter 1. In terms of good experiences, happiness is a major goal for all living beings, as numerous spiritual leaders over the centuries have taught, perhaps most notably the current Dallai Llama (Mehrotra, 2005). Human and animal happiness are both dependent on the balance between perceived negative and positive experiences, but for humans with their complex cognitive abilities there is the opportunity to alter the perception of any event from negative to positive just by training the mind. It is likely that the opportunity for animals to train themselves, or be trained, to increase their level of happiness by freeing their mind from worry, hatred or other negative emotions is more limited than for humans. Nevertheless, companion animals will often be comforted by their owners, providing reassurance that they should not be frightened, for example in a thunder storm. The benefits of complementary therapy for animals, including relaxation techniques, such as through touch, are evident for humans and may also be applicable to animals but are rarely explored scientifically. Cats and dogs are often patted and stroked to enhance the bond with humans and calm them, and sometimes cattle stockmen will also use contact positively in this way. Animal physiotherapy is now adopting a more universal application, rather than just for veterinary medicine. Animals

that suffer from anxiety, such as dogs separated from their owners, probably would benefit just as much as us from relaxation therapy.

The impacts of diet on animal welfare are also starting to be explored. A high protein diet, long recognised to stimulate boxers to be more aggressive, has some of the same mood enhancing effects in the common dairy cow (Phillips and Kitwood, 2003). Conversely diets that are deficient in essential nutrients may stimulate animals to fight over food, or develop exploratory feeding habits in an attempt to rectify the deficiency. Odours may influence the mood of animals, as it does in humans, and beneficial effects of lavender straw have been observed in reducing travel sickness in pigs (Bradshaw et al., 1998). Some odours, such as citronella oil, are noxious to animals and are now used to control barking behaviour in dogs, with a collar emitting a short burst of the oil every time a dog barks (Steiss et al., 2007).

Some scientists are beginning to question whether there should be more emphasis on the creation of positive welfare states, instead of focusing on avoiding negative welfare. For example, Yeates and Main (2008) recently suggested that more attempts should be made to extend welfare assessment to indicators of positive affect, or emotion, recognising that they largely concentrate on negative emotion at present. The reason that they concentrate on the negative elements may be partly because the public are better able to empathise with animal's negative experiences. Many would agree that we owe animals a life with avoidance of the most serious negative emotions, but that there is less moral imperative to encourage us to create experiences likely to result in positive emotions. However, a major common theme underpinning most religions, and hence moral imperatives, in the world today is the golden rule which says that we should treat others in a way that we would like them to treat us. This does not distinguish between positive and negative consequences of our actions. It does not suggest that treating others badly is any more important than not treating them well.

Nevertheless, most research has been conducted on negative aspects of welfare and the several different methods of measuring welfare allows us to be confident that some practices do indeed cause negative emotion. So animals are likely to respond to a practice which induces negative emotions with negative behaviour responses (such as abnormal behaviours, stereotypies and avoidance behaviour), increased disease incidence, reduced production and reproductive rate, reduced longevity and adverse effects on physiology. For example, a lame dairy cow will have behavioural indicators that she is experiencing negative emotions – she will limp, in order to withhold pressure on her diseased claw and will lie down for a long time (O'Callaghan et al., 2003). She also will eat less and produce less milk (Bach et al., 2007), have a reduced life expectancy and is less likely to become pregnant (Bicalho et al., 2007; Melendez et al., 2003). Her nutrient status, as evidenced by her body condition, is likely to be low (Garbarino et al., 2004), and physiological measures could detect the metabolic consequences of the lameness (high cortisol concentrations, adverse effects on reproductive and nutritional hormones, for example) (El-Ghoul and Hofmann,

2002). The tools for welfare assessment all suggest that the cow is being negatively affected by the lameness. More specifically it is now possible to distinguish which forms of negative emotion are associated with specific behavioural, physiological and immunological changes. In cats, stimulating different areas of the hypothalamus can induce different forms of negative emotion, which appear to represent restlessness, defensive attack, retreat and biting attack (Mori et al., 2001). The first three all have similar behavioural components, but at different levels, and are associated with elevated cortisol, but they are different from biting attacks, which have different behavioural components and during which cortisol is not elevated. Defensive attack and restlessness are associated with increased immunocompetence, but not the other negative traits. It is this sort of information that is needed to assess the welfare impact of negative emotions, and it may ultimately make the assessment of welfare from experiences that are classified as good or bad, or positive and negative, appear too simplistic.

We can have less confidence that supposedly positive emotions are beneficial for the animal, rather than just neutral. For example, animal play is often used to infer positive affect, yet it is now believed that social play can switch rapidly from positive to negative affect even within a bout (Burgdorf et al., 2006). It is difficult to ascribe a common purpose to play, with often disparate characteristics and different affective properties. For some aspects of welfare, there is an obvious continuum, such as in nutrition, which includes both positive and negative emotions. We feel good when we eat to satiate hunger, which is related to the stress responses abating, and we feel bad when we need to eat, mainly because of physiologically-induced stress associated with this state (Adam and Epel, 2007). However, for other welfare measures, such as the thermal environment, it is not necessarily the case that increasing provision of the resource will increase the positive emotion resulting from it. Moving from low temperatures to a satisfactory temperature improves welfare, but increasing temperature still further will return welfare to a low level. There is good reason for addressing positive and negative affect separately – they are not just the opposite ends of a cognitive continuum, even though negative welfare is often inversely correlated with positive welfare measures. Further evidence that positive and negative affect are not diametrically opposed comes from depressed humans, who respond physiologically in a different way to normal humans on presentation of pictures suggesting negative emotion, but both groups respond similarly to pictures suggesting neutral or positive emotion (Abler et al., 2007). Physiologically the negative emotion is clearly dominated by amygdala activity, whereas the brain centres responsible for most positive affects have yet to be identified (Garolera et al., 2007).

Until we understand positive emotions better, we remain compelled to focus on welfare indicators that suggest negative emotions, because there is general agreement that these impact on welfare. However, because of the inverse correlation between many negative emotions and the productivity of animal units, systems of animal management have been developed that largely prevent

animals experiencing major negative emotions. Controlled environments, used especially for pig and poultry production and laboratory animals, attempt to prevent extremes of temperature, to control infectious diseases and avoid major social challenges. While effectively minimising negative emotions, they do little to foster positive emotions, and if the trend towards welfare improvement continues it will be increasingly important that we include positive emotions in welfare assessment schemes, examining the opportunities for play, environmental exploration, satiation following eating, free choice etc.

One positive emotion, happiness, has been quite extensively studied in humans because of its obvious relevance to life satisfaction. It has been scientifically researched by Richard Layard of London University (Layard, 2005), and his findings potentially have some important implications for animal welfare assessment. Layard provides evidence for two compelling arguments:

1: Most people in developed countries of the world have not experienced an increase in happiness over the last the 40 years, despite increased personal wealth
2: At any one point in time, rich people are happier than very poor people

These can only be reconciled by accepting that above a certain base income level, which Layard estimates is probably about US $20 k, people only strive to gain more resources in order to elevate their status. [2] However, it is impossible for everyone to gain increased status, so if becoming happier is our goal we would be better off changing our lifestyle to adopt other established techniques of achieving this – altruistic deeds, religious pursuits, calming exercises that reduce negative emotions etc. By doing this everyone could be happier, not just the privileged few of high status.

It is likely that the same principles apply in animal societies that humans manage, in which a higher status does not necessarily confer successful reproduction. Like humans, it is likely that above a certain level of resources, animals only compete to elevate themselves in the dominance hierarchy and increase their chance of their genes surviving through increased reproduction. Therefore, above a minimum level of resources, being dominant through having access to more resources is more important to animals than the resources themselves.

In an attempt to measure human happiness, quality of life surveys have broadened the types of resources that are normally included in any measures of welfare. A popular Quality of Life measurement index is one developed by Mercer Human Resource Consulting (MHRC, 2007), which takes into account the following key indicators in determining the best place for humans to live in:

[2] They are probably genetically programmed to do this, since it would have had adaptive advantage in the processes of evolutionary selection, with higher status people successfully rearing more offspring. Nowadays it no longer has adaptive benefit – wealthier people do not necessarily rear more offspring successfully, and in modern society benefits to that society are no longer gained by proliferating one's genes to the greatest extent. So fecundity is greatest in poor countries today (Aarssen, 2005).

- Political and social environment (political stability, crime, law enforcement, etc)
- Economic environment (currency exchange regulations, banking services, etc)
- Socio-cultural environment (censorship, limitations on personal freedom, etc)
- Medical and health considerations (medical supplies and services, infectious diseases, sewage, waste disposal, air pollution, etc)
- Schools and education (standard and availability of schools, etc)
- Public services and transportation (electricity, water, public transport, traffic congestion, etc)
- Recreation (restaurants, theatres, cinemas, sports and leisure, etc)
- Consumer goods (availability of food/daily consumption items, cars, etc)
- Housing (housing, household appliances, furniture, maintenance services, etc)
- Natural environment (climate, record of natural disasters)

This assessment focuses on the quality of the resources offered to individuals in different locations. Quality of life surveys can also focus on the individual's ability to utilize such resources, which can then be used to prioritise health care provision by public services. The Mercer scale can be adapted to provide a scale to determine an animal's quality of life, which would be wider ranging than conventional animal welfare assessments.

- Political environment – consistency and quality of management, availability of personal choice
- Economic environment – economic provision for animal care, including provision for emergencies
- Socio-cultural environment – companionship with suitable conspecifics, or failing that similar species
- Medical and health considerations – veterinary care
- Education – provisions for training and development, availability of parental care
- Transportation – transport facilities and availability of personnel to maintain facilities
- Recreation – environmental enrichment
- Consumer goods – availability of food, water etc
- Housing – quality of accommodation offered to animals
- Natural environment – climate, natural disaster frequency

Welfare Assessment

Welfare assessment can be based on scientific research, public opinion or the opinion of experts. Scientific research is slow to provide the answers to welfare questions, usually taking several decades, whereas public opinion can change quite quickly, often in response to media releases, but also in the long-term in response to changing societal standards. However, scientific research is invaluable in setting standards because it is objective and untainted by

anthropomorphic attitudes. Often science is needed to provide the welfare assessment, but it is vital to understand public opinion as well because this will dictate the level of provision for the animal to an acceptable standard. Hence we might use science to evaluate an animal's responses to a particular practice, say vehicular transport, but then we need public opinion to say what is acceptable once we know how the animals respond. Public opinion is not usually particularly valuable for detailed welfare assessment, because the public do not have sufficient knowledge to make such an assessment, and they are open to persuasion by welfare activist groups. Nevertheless, scientists must recognise that it is usually public pressure that most often brings about changes in animal management systems and that their role is a supportive one, not a decision-making one.

The opinion of experts can be rapidly gathered; it represents an informed opinion and is often based on scientific principles (see examples of indices devised from expert opinion by Whay et al., 2003; Rousing et al., 2007). However, it may be biased if it comes from those integrally involved in industry or from academics dependent on industry funding or goodwill for their work. Most codes of practice for welfare assessment are based primarily on expert opinion, and that is why they are not usually enshrined in law, because scientific evidence is not available to provide definitive proof of welfare status. Over time, more codes of practice will become based on scientific evidence and more will then be able to be legally enforced.

The Centre for Animal Welfare and Ethics at the University of Queensland has initiated a series of welfare assessments based on expert opinion, as a first stage to developing robust standards. These all assume that different aspects of welfare provision are at least partly exchangeable. So if food availability was sub-standard in a particular animal keeping practice, this can be at least partially compensated by improving another attribute, such as space availability. The currency adopted for exchange of welfare attributes is the Importance attached to each, as determined by the experts. Indices of performance that can be used to compare the welfare level of different animal systems are being produced. These are being constructed for the welfare of farm livestock on ships, great apes, especially orang utans, chimpanzees and gorillas, and for elephants in captivity. The first step for the researcher constructing an index is to identify who the experts are. This might include veterinarians, keepers of the animals, managers of the animal facility, scientists studying the species, knowledgeable animal welfare organisation representatives, those who transport the animals, and any other stakeholders or interest groups with a detailed knowledge of managing the species. Secondly a small group is interviewed, that is usually one to two individuals nominated by relevant societies representing an interest group. The aim in this part of the process is to identify the principle welfare resources that the species needs. If these were set by the researcher, the questionnaire to finally determine the importance of each resource would be biased by their choice and description of resources. The output is a list of the key welfare components that can be elaborated upon in the questionnaire to the

different interest groups. Often these are based loosely around the Five Freedoms, that are now commonly used as a basis for welfare assessment (Webster et al., 2004):

- Freedom from hunger and thirst
- Freedom from discomfort
- Freedom from pain, injury and disease
- Freedom to express most normal behaviour
- Freedom from fear and distress

Having derived this framework, a group of about 10–20 welfare indicators are chosen on the basis of their being most popular with the stakeholder representatives, their practicality to be measured and their perceived relationship to animal welfare. They usually include resources like space availability, dietary adequacy, frequency of feeding etc. Care has to be taken that welfare impact is not counted twice, with four of the freedoms primarily indicating feelings and one (freedom to express most normal behaviour) indicating an expression of the feelings externally. Suitable levels are chosen, usually two to four per welfare indicator, in conjunction with those directly involved in managing animals in the systems that are the focus of the study. So, for space availability for chimpanzees, the levels could be providing enough space for individuals to escape from dominant animals all of the time, most of the time, or not at all. Another welfare component could be access to an outdoor enclosure, with the levels being all of the time, some of the time or never. For stocking density of animals in transport, we could choose enough space for the animal to perform most normal behaviours, enough to turn around and enough to stand up and lie down. This approach recognises the difficulties in putting figures to many components because of differences in size and breed of the animals and quality of space. These are then entered into a questionnaire, which is available on the worldwide web, as this potentially allows large numbers of experts to contribute to the construction of the welfare index. Typically this will be several hundred and could run into thousands, but responses can be weighted according to an individual's level of experience. Running the questionnaire on a computer allows questions to be tailored to a respondent's interests, producing an adaptive questionnaire, so if two components are rated similarly and of high importance, the computer will cease asking about components that it already has been told were rated unimportant by the respondent and begin trying to differentiate between the two similar components. The respondent is asked questions in the following form: if all else was equal, which of the following two welfare components is more important, or which of the following scenarios is more acceptable from a welfare perspective: component x at level 1 or component y at level 2? Respondents are also asked which is the preferable of two scenarios, each with the same two components but at different levels, such as scenario 1 with animals having enough space to avoid dominant animals most of the time but no access to an outdoor enclosure, compared with scenario 2,

where animals have insufficient space to avoid dominant animals but do have complete access to an outdoor enclosure. The questions are manufactured by the computer to focus on welfare components that the respondent is rating of similar value. Conjoint questions of this nature, whilst appearing difficult to answer and sometimes rather contrived, are a powerful tool to elicit detailed information on the respondent's preferences. Armed with ratings for the perceived importance of the different levels of each welfare resource and the perceived relative importance of the different resources, these can be simply compiled into a mathematical index for use in the field.

After it is formulated, it is important to test the accuracy of the welfare index. So for an index for zoos, for example, each enclosure can be rated for the different welfare indicators, either by a visiting assessor or in a questionnaire sent to the zoo director, and the total added to provide an overall score for the zoo for the particular animal species. Comparing different zoos' performance will allow assessors to determine which welfare indicators are presenting the most difficulty in achieving a reasonable score. It is important to modify the index if it is considered that there is scientific evidence that refutes the experts' opinions. If there was no clear consensus on whether a particular component is important or not, or which level is best for the animals, it might be dropped until clear evidence becomes available. Finally, surveys of consumers can be used to determine how much people would pay for the animals to be provided with higher welfare. For example, how much would people pay to enter a zoo where animals are being kept at a higher point on the welfare index? How much more would people pay for meat products from animals kept at a higher welfare? Such information could be compared to the cost of providing the extra facilities, or even to determine the most cost effective way to improve the welfare of the animals. In this way, zoo directors, farm managers and even animal transporters can objectively determine the best way to improve the welfare of animals in their custody. It may then be possible to make an economic argument for the improvement of animal welfare, if the public survey indicates that people would prefer to pay more to access the product (zoo visit/foodstuff etc) if animal welfare is at a higher level.

These indices can be used in practice to assess either individual animal welfare, or more normally, the welfare of a group of animals, for example in a farm or a zoo. League tables will encourage competition to improve welfare standards, just as tables for individual farm productivity used to be constructed to encourage high production in dairy cow herds.

Legislation and Audits

Despite the goodwill of many animal managers towards the animals in their care, the conflicting ethical responsibilities that they are faced with often means that legislation and audits are needed to achieve minimum standards required

by the public. Given the strength of public opinion today, we may expect that the animal welfare and rights movements will not diminish until there is a fundamental change in provision for improved conditions for animals, which may take several decades of legislation. Slavery did not disappear entirely following the 19th C campaigns, but the proportion of the world population that were slaves diminished due to new legislation, leaving the only remaining incidences of slavery as covert operations, and this state remains today (Walvin, 2007). The same is likely to happen in the animal welfare movement, new legislation will substantially improve the welfare of animals, but some problems will continue, particularly in fields that are unsuitable for legislation. Animal welfare legislation can be based on expert or public opinion, but it is likely to be more credible and long-lasting if it is based on scientific data. This can be provided by physiological or behavioural information collected from animals, and also the preferences of animals that are given choices. The preferences that they display will indicate the extent of their feelings about a particular resource, particularly if the strength of their preferences is measured by requiring them to work to gain access to the resource. When setting standards, legislators prefer to use evidence of physiological impact on an animal, rather than preferences, which may indicate a difference in mentality rather than health.

An alternative, which is likely to be preferable to legislation for industry, is the development of a system of industry-led audits or accreditation/certification programmes. This has had some success in Europe, for example of Swedish pig producers (Bruckmeier and Prutzer, 2007), with legislation being reserved for the most severe welfare problems. Given the strength of feeling by the general public, accreditation schemes that simply provide a rubber stamp for the status quo in the industry will be only temporarily credible. Thus audits must be sufficiently robust to ensure that standards are improved, preferably to levels acceptable to the public, although the possibility remains to convince them that other scientific alternatives are more desirable. This may mean pressure on some farmers to leave the industry, allowing the best farmers to remain. With a better understanding of animal welfare, it should be possible to devise audits that allow a variety of routes to a common endpoint – a healthy, happy animal. This requires knowledge of the relative merits and demerits of specific practices – for example, how do hot and cold branding affect welfare, and how severe is the problem, in the animal's perception, compared with tail docking? Until we know the answers to questions such as these, based on scientific data, we can do no more than rely on experts' opinion.

The best audits will allow farmers to trade welfare impacts, allowing a long journey to slaughter, for example, to occur only if the animal has been reared in benign, free range conditions with adequate food and social resources. Such exchange is only possible if a fully numerical audit is devised. So it is not only necessary to know that transport is to a high standard, but to allocate numerical values to each component of the practice. These may be based on scores by auditors or direct measurements. Often the measures chosen will not be ideal in terms of relation to end products. For example, the potential for cattle on ships

to develop heat stress is known to be high when they are in hot ambient temperatures. The most appropriate biological measure is probably a panting score, which relates directly to the animal's apparent suffering due to heat stress (Mader and Davis, 2002). However, assessment is subjective, and repeatability both within and between individuals is likely to be low. Using it to assess welfare would present problems of both measurement and interpretation. A more precise animal measurement, which does not relate so directly to the animal's suffering, is respiratory rate, but this suffers from the problem that it does not relate linearly to ambient temperature (Brown-Brandl et al., 2006). Even this would be difficult to apply on ships, because it is unclear who could measure it and on which animals. An audit would typically in this situation fall back on wet bulb temperature measurements, which are repeatable, fast and cannot be manipulated. These do not relate so well to animal discomfort, because wind speed cannot be taken into consideration easily, but they would still allow standards to be improved so that severe heat stress events are prevented. The greatest risks are when the ship docks in port, as the ventilating effect of open sea breezes is lost. Minimising the time in port will reduce the likelihood that heat stress could occur. This illustrates the difficulties in deciding which measures to include in audits or welfare assessment schemes. Under conditions where animals can be more easily monitored, such as laying hens, the strong and well understood relationship between animal measures and their welfare suggests that these can be used more frequently (Mollenhorst et al., 2005).

Chapter 6
Managing Animal Welfare and Rights

Religious and historical perspectives – recent developments of attitudes – modern management of animal welfare – animal's right to life and welfare – animal sacrifice – animal slaughter – pain – improving animal welfare in developed and developing countries – treatment of animals by indigenous people

Introduction

Animal welfare and rights advocacy are two of the most pervasive influences of our time, but they are viewed as a threat by many in the animal industries because the changes sought by proponents of this movement are likely to reduce the profitability of animal enterprises. Effective animal business management, including the welfare of the animals, requires an understanding of, and ability to predict the standards expected by advocates, consumers and the public. In many cases these standards are derived from religious and historical perspectives. In this chapter welfare and rights management is considered from a variety of different perspectives, including that of the general public, those involved in teaching animal managers, and traditional societies.

Religious and Historical Perspectives

Of the four major religions in the world, Christianity, Mohamedanism, Hinduism and Buddhism, all have different perspectives on the management of animals. In terms of the number of adherents to the major faiths, one could add Chinese Traditional or Folk Religion as a fifth major religion, and because of its historical significance Judaism warrants inclusion as a sixth.

Christianity

The dominant Christian view of the management of animals is that God ordained that man should have dominion over, or rule them. At the start of

C. Phillips, *The Welfare of Animals*, Animal Welfare 8,
DOI 10.1007/978-1-4020-9219-0_6, © Springer Science+Business Media B.V. 2009

the Bible, we are told that "God said, 'Let us make humankind in our own image ... and let them have dominion over the fish of the sea, the birds of the air, and over the cattle, and over all the wild animals of the earth, and over every creeping thing that creeps upon the earth." (Genesis Chapter 1, verse 26). Although there may be some doubt about the extent to which the Hebrew word for 'dominion', rādâ, means either lordship/mastery or careful husbandry, the intention of the unknown author of Genesis is clear (Preece and Fraser, 2000). Humans are believed to be made in god's image and have the responsibility to manage all living things. Nevertheless, some critics of Christian attitudes to animals, including celebrated ethicists such as Peter Singer (2005), have used this text to suggest that the dominant Christian approach to animals is one of enforced servitude. However, clarification of the Christian ideology is presented later in the Old Testament of the Bible, particularly in relation to the treatment of livestock, which as Preece and Fraser (2000) describe, reads in part like a husbandry manual for livestock. This was because it was particularly relevant to the pastoral society for which it was written. This is just one instance of how the messages of the ancient scriptures, in this case the bible, should be considered in the context in which they were written, and to gain a correct understanding of attitudes of the time it is often necessary to consider texts from several books, which may in the first instance appear conflicting (Regan, 1990; Preece and Fraser, 2000). The writer of the Genesis account, which was probably written in approximately 1,400 BC, obviously had no knowledge of the scientific principles of human evolution, and the text usefully exhorts us to consider our responsibility to look after animals, a responsibility that when fulfilled brings a sense of satisfaction that the long-term health of the animal kingdom is assured.

Given that humans have, according to the bible, been empowered to manage the animal kingdom, probably the most contentious message of the bible is that there is a hierarchy in the animal kingdom, described by a Psalmist's supplication to god as follows:

> 'You made us a little lower than yourself, and you have crowned us with glory and honour. You let us rule everything your hands have made. And you put all of it under our power – the sheep and the cattle, and every wild animal, the birds in the sky, the fish in the sea, and all ocean creatures' (Psalm 8, verses 7–9).

This approach is supported by many in the Western world, and even Tom Regan, the animal rights advocate and staunch opponent of speciesism, believes that god has given man the authority to manage animals (Regan, 1990). Proof of our responsibility will never be found, and indeed in Aristotle's view should not be necessary for educated people (Regan, 1990).

Regardless of whether the power is divinely given or not, and there is remarkably little evidence on which to base any decision, it has become abundantly clear in recent times that we *are* responsible for virtually all the animals on earth. Our activities touch the lives of almost every animal on land and in the sea. Whereas in the past, we might have thought that our impact on some

ecosystems, in particular the marine ones, was limited, it has recently become clear that we have had an even greater impact than on many terrestrial ecosystems. Clearly for some animals our influence is remote, and not a direct action, occurring only through our influence on the ecosystem in which they live. This could be through the harvesting of some animals or plants or the pollution of the environment. As well as the influence of harvesting of wild animals, it is now evident we are now having a serious impact on the global atmospheric environment through our use of fossil fuels in particular, which may be faster than the ability of wild animals to adapt to the changing conditions, with some species facing extinction as a result. In relation to environmental pollution, human influences continue to be discovered that were hitherto unexpected. Deer grazing on lichen and natural grasses in the Austrian Alps have been found to have a high prevalence of cadmium toxicity in their kidneys, because this element can travel from the industrial areas of central Europe to the alpine grazing pastures (Beiglbock et al., 2002). Similar instances of nephropathology have now been discovered in a number of European birds and mammals (see review by Phillips and Prankel, 2008).

The concept of human differentiation from animals is further developed in the story of the Garden of Eden, which suggests that humans are different from animals because they have a knowledge of good and evil,[1] or right or wrong. This knowledge was imparted by god, the story tells us, since man was made in god's image. In the story, man's role of managing nature is a highly demanding one, and for this reason knowledge of right and wrong is essential. People need to regularly consider these responsibilities and discuss together how best to foster good animal welfare. Prayer is one method advanced by the Christian church to provide guidance and may be useful for people with responsibility for managing animals, especially any sick animals within their charge. In a survey of American owners of cats and dogs diagnosed with cancer, prayer was used by almost one half of those surveyed, mainly in an attempt to improve their animal's welfare (Lana et al., 2006). After supplements, it was the second most commonly used form of 'alternative or complementary treatment'. There is little evidence of its efficacy in animals, but there have been several meta-analyses[2] of reports of the effects of intercessory prayer for the health of the human subjects (who do not know that they are being prayed for)

[1] Many people reject the concept of good and evil because of the way in which the message was used to guide behaviour in the past. The threat of going to hell because of wrongdoing was used to frighten people into correct or right behaviour. The concept of the devil, as the antidote to god, was used by many, including religious leaders, to externalise wrongdoing, as a means of putting the blame onto some other being, so that we do not become weighed down with the consequences of our actions. However, rejecting this concept fails to acknowledge that religions are useful in offering opportunities to learn from one's mistakes, receiving forgiveness following acknowledgement and confession of wrongdoing, and encouragement to improve on subsequent occasions.

[2] A review, usually with statistical analysis, of all the published or available literature on a topic

(Abbot, 2000; Astin et al., 2000; Hodge, 2007; Masters and Spielmans, 2007). One (Masters and Spielmans, 2007) suggests that there is no benefit to the subjects, and the rest suggest small benefits or they are inconclusive (Abbot, 2000; Astin et al., 2000; Hodge, 2007). In the only study of the effects of intercessory prayer on the healing of animals, in this case self-inflicted wounds following excessive self-grooming in primates, the group of primates that were prayed for healed much more quickly than the control without prayers (Lesniak, 2006). The biological mechanism was explored and the primates that were prayed for had increased red blood cell, haemaglobin and haematocrit concentrations and they groomed themselves less. While it is not good science to compare the results of meta-analyses of several tens of trials involving many humans, with a preliminary study involving just 22 primates, it should be noted that in all of the meta-analyses some of the included studies generated significant benefits of prayer to humans. The difficulties of setting up double-blind trials of this nature may explain some of the ambiguity in results and also explains why praying for animals was the subject of the one study cited. One meta-analysis generating inconclusive results of the effects of prayer on human healing noted that the best designed studies yielded positive results (Abbot, 2000; Hodge, 2007).

Although the direct effects of prayer are unclear, increased hope and decreased anxiety are two main ways in which prayer could benefit those with close bonds to their animals. However, these effects have not yet been demonstrated in people's attitudes towards animals, even though there is evidence that prayer can reduce generally reduce anxiety (Arias et al., 2006; Coruh et al., 2005), especially if the prayer involves actively seeking god's assistance (Harris et al., 2005). Conversely, concentration on an animal's health problem can exacerbate anxiety (Hill and Pargament, 2003).

Although the Old Testament initially emphasizes the responsibility of humans to have dominion over animals, later we see a different view of man's relationship with animals emerging. This is evident after the fall of Adam and Eve from their special relationship with god, and states that man should have a covenant with animals, created by god. In the biblical book of Hosea, written as if god was instructing the people, it is said that '(I) will make for you a covenant . . . . . with the wild animals, the birds of the air, and the creeping things of the ground, and I will abolish . . . war from the land, and you shall lie down in safety' (Hosea, Chapter 2, Verse 18). The emphasis was on creating harmony with nature and the environment, with man's safety secured. This covenant could have been to protect humans from wild animals, but the fact that birds were included, which were not a threat to man, suggests that the covenant was more universal, with humans entering into an agreement with animals that was ordained by god. This book of the Bible was written about 700 BC, and demonstrates the gradual transition towards stewardship in the Christian faith.

Although people were exhorted to enter into this agreement in Old Testament times, still later in the Bible, in the New Testament, we get renewed confirmation of the Christian belief in man's superiority to animals. For

example, the Gospel writer Matthew wrote that if a man could rescue a sheep from a pit, how much better it would be to rescue a man from a pit (Matthew Chapter 12, verses 11–12). Elsewhere in the New Testament there are few references to the way in which we should manage animals, indeed Jesus had remarkably little to say on the matter. He did contentiously cast out demons from a wild man, presumably a mentally disturbed man, and apparently sent them into a herd of about 2000 pigs, which then killed themselves by rushing down a steep hill into the sea (Matthew Chapter 8, verses 30–32, Mark Chapter 5, verses 11–13 and Luke Chapter 8, verses 32–33). Whilst we can perhaps explain the pigs' behaviour as being prompted by their fear of the 'wild man', which may have caused a stampede down the hill, there is no doubt that the gospel writers thought this an acceptable way to treat a madman – to pass on his problems to 'lesser' beings.

Although there was much teaching on the management of animals in the Old Testament, there is very little in the New Testament. In the latter, Jesus sometimes referred to animals in his parables, particularly sheep, as well as occasional references to wild birds, poultry and goats (Matthews, 1937). The different emphasis in the two Testaments is probably because in Old Testament times there was a need for instruction about animal management in a predominantly pastoral society (Preece and Fraser, 2000), but in New Testament times there was a major need for instruction about man's relationship to his fellow man. The Romans had occupied Israel and brought with them challenging and aggressive attitudes towards people of other nations in the occupied territories. Jesus' principle message was one of non-violence and love to all people, similar to Gandhi's message during the British occupation of India. Both men gave their life to their cause and subsequently became revered, but it is symptomatic of the fundamental differences between the Hindu and Christian faiths that Gandhi's teaching included a message of respect for animals, but Jesus' did not. Indeed Jesus is reputed to have said "Look at the birds in the sky; . . . . . Are not you more important than they?" (Matthew Chapter 6 vs 26). The Christian faith has therefore consistently emphasized man's superiority to animals, but also the responsibility to manage them well.

Furthermore, Christianity tolerates meat eating in a way which most of the Eastern religions do not. However, there are prophecies in the Bible that indicate that ultimately it is expected that the consumption of meat will cease, even in predatory animals. 'The wolf and the lamb will graze together, and the lion will eat straw like the ox; and dust will be the serpent's food. They will do no evil or harm in all My holy mountain' (Isaiah, Chapter 65, vs 25), and 'Wolves will live with lambs. Leopards will lie down with goats. Calves, young lions, and year-old lambs will be together, and little children will lead them' (Isaiah, Chapter 11 vs 6). In this last prophecy the responsibility of humankind, even young children, for the animals of the world is recognized. Although biologically implausible, these prophecies represent the Christian objective that ultimately there will be complete harmony between living creatures, even between predator and prey. Prophecies of harmony in the world are not confined to

religious texts but are common in the writings and sayings of society's cultural icons. For example, in the most popular song of recent times, Imagine, John Lennon wrote: 'You may say I'm a dreamer, but I'm not the only one. I hope some day you will join us, when the world will be as one'.

The Islamic Faith

The religious texts of the Islamic faith contained many references to good management of animals, in particular cattle, but it is assumed, as in the Old Testament writings, that animals were made available for human use and benefit. For example, it is written in the Qur'an, that Allah says "And cattle He has created for you. From them you drive wont and numerous benefits and of their meat, you eat" (16: 5–8). Like Jesus, Mohammed ate meat and when one of his companions wanted to give up meat, he was told that this was wrong. Ritual slaughter of livestock was normal on several feast occasions in the year, in particular the feast of Eid-ul-Adha, which still entails dividing the carcase of a sheep or cattle into one third portions to be distributed to the poor, neighbours and the members of the household managing the slaughter, in memory of Abraham's generous offer of his son when God asked for a sacrifice. Nowadays although the principle of dividing the animal is preserved, the slaughter process is often delegated to abattoir workers.

It is often assumed that Muslims have little concern for animals because they do not usually allow animals to be stunned before slaughter and because there are many widely cited examples of animal cruelty in Muslim countries, such as the recent publicity given to the cutting of the tendons of cattle in Egyptian abattoirs to immobolise them before slaughter (Sidhom, 2003). However, it must be remembered that many Christian countries engaged in similar abuses of animals when they were at the same stage of development as many of the Muslim countries are today, so it is not necessarily the religion that affects animal welfare, but the stage of economic development.

One of the least troublesome examples of animal slaughter that I have witnessed was by the Bedouin Muslims deep in the Negev Desert in Israel. Accompanied by an Israeli colleague from Beersheva University on the edge of the desert, I visited Bedouin encampments and settlements to see how they kept their animals, mainly sheep, goats, horses and camels, which are all well adapted to cope with the hot, dry conditions of the region. Camels and horses roamed close to the tents, while their owners went about their daily business, such as working on Israel's intensive fruit farms. We were often welcomed into the Bedouin's tents and invited to drink tea and eat the unleavened bread and meats that they cooked over an open fire at the front of the tent. On one occasion we arrived at a small village on the edge of the desert just as the preparations were being made for a feast. A key part of this was the killing of a sheep to feed one of the extended families. We were invited to watch the head

of the household preparing to slaughter the sheep. Knives were sharpened, a clean area prepared and the man then calmly entered the flock, that was kept in a modest shelter adjacent to his house. These animals were used to the presence of people and did not associate human presence with anything painful or distressing. Children played in the streets by the animals and helped to look after them. They were taught to respect the animals and not to taunt or abuse them, a central tenet of the teaching of the Qur'an. The animals for their part learnt that humans were in control, and that to resist would lead to punishment, but that humans provided them with food, water and protection.

The head of the household entered the pen and extracted a large sheep, which offered little or no resistance as it was led outside. Then at the corner of the shelter, facing Mecca and holding the sheep on the ground by one horn, with the other hand he reached for the knife and then drew it quickly across the animal's neck. Any attempt by the animal to struggle was stifled by a second man kneeling gently on the animal's back. As the slaughterer slit the sheep's throat, he said the usual prayer to God, "Bismillah Allahu akbar" (in the name of God, God is great), and then both men held the animal until it had expired. In the event, the animal did not offer any perceptible struggle, or any noise, and in less than a minute it was respectfully transferred from the land of the living to that of the dead. It lay on the floor in a pool of blood. Almost immediately, it was hung from the eaves of the shelter and stripped of its skin and internal organs by the slaughterer putting his foot in the space between the skin and the carcase and gradually easing the two apart by pushing downwards with his foot. Three small boys watched the spectacle with interest before returning to their play. Gradually the slaughterer dissected the muscles from the carcase and put them into a large pan of boiling water, where the women were busy adding vegetables, herbs and spices. There was no shame in the process; I was invited to photograph the entire procedure and even to partake in the feast, which unfortunately we did not have time for. Nigel Brown, the British vet in the Middle East who was employed by the Australian meat and livestock corporation to assist in promoting good welfare for the Australian livestock that are shipped to that region, tells of similar experiences. He testifies that he has seen some of the best and worst examples of animal welfare in the Middle East.

Good animal slaughter practice is one of the central beliefs of Muslims in relation to the management of their their animals, and it is therefore ironic that Westerners often single out the failure of Muslims to stun animals before slaughter as evidence that their treatment of animals is inhumane. Muslims believe that animals must die in the quickest and most painless way possible, using methods prescribed in the Qur'an and Hadith (the sayings of the prophet Mohammed). Contrasting the welfare implications of the death of a sheep that I had just witnessed being slaughtered in the Muslim way with the lengthy gathering of livestock from the field, waiting to be transported, often without food or water, and then lingering in abattoir lairage before finally being killed for sheep in Western countries, it seemed evident that Muslim slaughter can be just as humane as that in Christian countries.

When visiting Muslim countries, it is easy to see examples of poor animal welfare (as it is in Western countries). Cattle in the Nile delta confined to walking all day in a small circle around a shadoof, blindfolded so that they do not get distracted, clearly indicates poor welfare. Such practices have remained unchanged for centuries, and the Western industrial revolution of the last two hundred years has yet to have a major impact on livestock management practices. It is not unusual to come across a few buffalo housed in the basement of a house in the middle of Cairo being kept for milk production. These are likely to be permanently tethered in a hot, windowless clay building, fed on a small amount of rice straw and cottonseed waste, leading to an apparently poor welfare status. But can we be sure that these buffalos' welfare is worse than intensively farmed dairy cows? They are fed regularly and they are likely to have a close relationship with their keeper. Unlike the dairy cows, they don't have to fight for their daily ration, they are not struggling to stand upright on a slippery floor, their manager probably talks nicely to them when they come to milk them, in contrast to the dairy manager, who ushers them into a courtyard with an electrified fence that moves gradually forward behind them, forcing them into the milking parlour. The Egyptian system has evolved over centuries, with the manager dominant to his cows, but respecting them. The intensive dairy farm is a recent invention, devised to minimise labour use, but also meaning that each animal has a respectful, but probably also necessarily fearful relationship with its manager to enable him to control large numbers of animals.

Perhaps the worst examples of poor welfare is where developing countries are persuaded, often by aid agencies, that intensive animal production is the solution to the country's burgeoning hunger for meat and milk products. A typical example was witnessed in Malaysia, when I saw their attempt to build a Western-style milking parlour, but because of space constraints the entry and exit ramps were so steep that many animals slipped on them. When I visited, a cow was giving birth on a concrete pad, watched by all the other cows. The calves were taken to narrow pens for rearing, in which they could neither turn around nor reach down to groom themselves. Sustainability and good welfare are just as necessary in developing country animal production as they are in the industrialised countries.

Judaism

Judaism has similar origins to Christianity and the Muslim faith, all three originating with Abraham, of Old Testament fame. Jewish principles are enshrined in Talmudic literature and include 'tsa'ar ba'alei chayim' or the mandate to avoid causing unnecessary harm to animals. Traditionally, Judaism has several rituals requiring animal slaughter, such as the Feast of the Passover. Hence meat consumption is accepted by most adherents of the faith, although some argue that it was appropriate at the time of the Old Testament teachings, but is not necessary today.

Hinduism

India has followers of several related faiths; Hindus, Hare Krishna, Jains and Sikhs, all with variations on common central beliefs. The Hindu religion has the most followers and has numerous gods, many of which are animals or animal-related. Followers are encouraged to have reverence for the animal gods, and this translates to care for the animals themselves. There are gods for rats, tigers and almost all common Indian animals, and the divinity is closely allied with the natural world. Encouraging good treatment of animals by their association with gods has benefited animal welfare, and in recent years has aided the conservation of endangered animals, such as elephants.Because animal welfare attitudes in India have a firm basis in their religious teaching, the animal welfare laws are well established, however, implementation cannot always be assured.

The elephant god is one of the most popular, and for this reason many elephants are paraded in religious festivals. Elephants for this purpose are kept in sanctuaries, which are supported and visited by the public. Elephants may be donated or loaned to the sanctuaries, which then hire the animals out for the many festivals taking place in Spring time. They are not usually slaughtered and when they die naturally they are buried.

Cattle are also sacred and their five major products – milk, curd, butter, urine and faeces – are believed to have cleansing properties. They are still allowed to roam the streets in much of northern India, scavenging for any biodegradable material. Unfortunately this often leads to plastic consumption and a pot-bellied, gaunt appearance. In some of the more affluent parts of India, cattle have been largely removed from the streets and refuse collection instigated. Severe fines are levied on motorists that hit cattle on the streets, and most cattle are allowed to live out their natural life. Sometimes members of other faiths, especially Muslims, are employed to slaughter cattle, thereby at least partially externalizing the ethical impact of meat consumption for Hindus.

Hinduism encourages vegetarianism but does not insist on it. Indeed meat consumption in the Indian subcontinent is increasing in line with the growing affluence. The Indian sacred book, *The Laws of Manu V, 45–52* states that 'Meat cannot be obtained without injury to animals, and the slaughter of animals obstructs the way to Heaven; let him therefore shun the use of meat.' Hindus also believe that what they eat has a strong bearing on their well-being.

The Vedic texts are the set of instructions on which the religion was founded over 3000 years ago. Although these espouse the vegetarian concept as desirable, they also acknowledge that animal sacrifice has a role in producing meat for consumption. It was long after the Vedic texts and the development of Hinduism that vegetarianism became common. Ahimsa, or non-violence, is a guiding principle afforded to humans and animals alike.

Hindus believe both in hierarchies of humans in society, the caste system, and that humans are superior to animals. They believe that their spirit came

from a series of migrations from animal to animal, finally ending up in humans, which have the ability to use their reason to attain the Ultimate Truth. Thus it is possible to end the cycle of rebirth and attain the Kingdom of God. However, those less fortunate or badly behaved are punished by being reborn as animals.

Buddhism

Like Hinduism, Buddhism evolved in India, but its followers separated because they were unhappy with the caste system. Thus, although Buddhism shares many beliefs with Hinduism, it differs in that it openly espouses equality of humans and animals. The Tibetan Buddhist spiritual teacher, the Dalai Llama, advocates that all sentient beings should be considered equal, the inference being that they should be treated equally (Mehrotra, 2005). Accordingly, affording such equal treatment to humans and animals is necessitated by the interdependence of the human and animal worlds, and the Dalai Llama counsels that 'the interests and well-being of human beings is dependent upon the well-being of animals living on the same planet' (Mehrotra, 2005).

In the Buddhist faith, all animals and humans alike have the potential to become Buddhas, or enlightened beings. Buddhists pursue ahimsa, or an absence of harm or death to any other being, and an absence of suffering, even to the smallest of animals. Like Hindus, Buddhists believe that they are reborn as either other humans or as animals, and hence all animals and humans are interrelated. As in Hinduism, it is recognized that animals suffer at the hands of humans, so it is considered a penalty for leading a bad life to be reborn as an animal. Humans are therefore exhorted to be kind to animals because of the possibility that they might be reborn as one. Reincarnation as an animal is undesirable, or in the words of the Dalai Llama, 'is extremely miserable' (Mehrota, 2005). This belief evolved when many animals managed by man did indeed have a worse existence than their masters. Both were struggling to survive and humans were able to take advantage of their position of control by exploiting them. Even though many of the worst instances of animal exploitation have been brought under control, the threat of rebirth as an animal is still used to exhort Buddhists today to abstain from specified non-virtuous actions. These are taking life, taking what is not given (to them), abusive sexual behaviour, lying, slander, harsh words, idle gossip, covetousness, malice and wrong views. In Buddhism, humans may even be reborn as many small animals at one time, hence even small insects are to be respected. For this reason, and because life is to be revered, killing another animal is a major sin. This contrasts with the Christian belief of original sin and the belief that all beings are sinful, unless redeemed by god. Even unborn foetuses are the subject of Buddhist compassion, and Buddhists must prevent others from killing animals, thereby liberating them. Buddhists also have a strong recognition of the sanctity of nature, and many Buddhist temples in east Asia exploit this belief by selling animals, mainly

small birds, to people to be released from captivity into the wild. In one survey, about 30% of the population of Taiwan purchased animals for release into the wild (Severinghaus and Chi, 1999).

Religious Unification on Attitudes Towards Animals

As the world becomes increasingly united through common media, travel and trade, there is a need to develop a common philosophy in relation to the welfare of animals. Globalisation trends will increasingly bring people of different cultural and religious backgrounds into contact, and this will lead to conflict unless an agreed common approach is developed. Although the positions of the different world religions on the treatment of animals may at first sight seem to be diametrically opposed, they are not necessarily mutually exclusive, provided that the scriptures are viewed as instructional and allegorical, not literally the word of god that must be obeyed at all times. Religions have to be allowed to develop and adapt to changing circumstances.

The position of the Abrahamic faiths, Christianity, the Islamic faith and Judaism, that humans are given the responsibility to manage animals, through their dominion over animals, is not necessarily incompatible with the position of the Eastern religions that animals and humans are equal. An analogous situation is the treatment of children by adults. The responsibility of adults to manage children does not confer superiority, which has increasingly come to be recognised in the new social ethic that has evolved in the last century, with legal protection of children and affirmation of their rights. The biblical position that man was superior to animals should be seen as outdated and a new social ethic established that if man is to gain benefit from animals he must engage in a mutually-beneficial contract where animals are not penalised. Such unwritten contracts are not unique in human society; many professions have similar constraints on a person's living and the employee often has no more opportunity to relinquish the 'contract' than animals have.

No-one can deny that we do have the ability to manage animals, since our actions affect nearly all animals, wild or domesticated. Whether that ability is given by an all-powerful being, or god, or whether we assumed the right by virtue of our greater intellect and managerial ability, is controversial. Statistically, we appear to be outliers in the animal kingdom. Our use of tools and ability to harness technology, our cognitive power, the complexity of social relationships and our language ability are all considerably in excess of those of even the most closely related primates, so that for a long time it was even disputed whether these skills were possessed by any other animals. We also have a unique ability to represent things and events pictorially (Valladas et al., 1992), and our advanced capacity to place events in a contextual timeframe may be the key to our high level of consciousness (Humphrey, 2006).

This cognitive divide between ourselves and other animals is often attributed to brain size, rather than any unique abilities of the human brain (Kirkcaldie and Kitchener, 2007). Even the size of the human neocortex fits into a comparative (exponential) relationship between species evolution and brain size (Kirkcaldie and Kitchener, 2007). Our brain is about 3 times bigger in relation to our size than other primates, which in turn are about twice as big as other mammals (Schoenemann, 2006).

There are two pieces of evidence that suggest that our animal management skills were acquired by natural selection, rather than by divine intervention, which could still be part of intelligent design. First, as previously mentioned, the human brain, although unique in its cognitive ability, appears to be the pinnacle of cognitive evolution. As you progress through the phylogenetic tree, from vertebrates to mammals to primates to man, the brain becomes increasingly large in relation to body size. Second, there is fossil evidence that the human brain increased in size, if not gradually, in a punctuated manner, with no evidence of a single, large increase (Schoenemann, 2006). Although the emergence of a dominant, intelligent animal is without precedent in prehistory on this planet, it seems likely that the social skills that we have evolved to exist as a complex society also benefit us by enabling us to manage animals. Thus, although the debate on whether our peculiar faculties derive from a god or evolution has continued for over 125 years with no clear winner (Bleckmann, 2006), the scientific evidence favours the evolutionary perspective. However, Intelligent Design supporters argue that humans possess souls created in the image and likeness of god, giving them a unique sense of self-awareness (Moreland, 2001). On this science must remain agnostic at present, although future neuropsychological research may eventually enlighten us.

The position of the Eastern religions on reincarnation of humans as animals at first sight appears directly opposed to the Christian position. However, we now know that higher mammals share most of their DNA, and whereas the literal interpretation of the scriptures implies that individuals will be reborn as specific animals, a common position would be that our DNA is shared with other animals, as we are all inter-related. When we die, our DNA is perpetuated most directly in our children, but because much of it is shared with other animals, the evolution of animal life on our planet involves a constant selection of animals with the most suitable DNA for the occupied niche. Seeing ourselves as part of that common evolution of genetic material allows us to believe in our continued contribution to life on earth. We saw earlier how attitudes towards animal management in the Christian religion have evolved over time, and a common approach to reincarnation may involve this more liberal interpretation. In other respects the scriptures, most of which are derived from the teachings of inspired prophets several thousand years ago, contain many messages that are equally relevant today as when they were written.

Recent Development of Attitudes to Animals

As the human race has advanced, there has been an increasing trend to view animals as part of man's custodianship of the earth and less to view them as needing to be suppressed or in a combative role. This may be in part because we are gaining greater controlling ability in relation to our management of animals. The suppression began to end in Victorian times, when there was a focus was on understanding animals, by recording and classifying them in great scientific detail – the first stages in management of animals and nature. Expeditions to explore the world's fauna were funded by geographical societies, such as Darwin's famous voyage to South America on the Beagle. Sometimes this new-found scientific purpose was used as a front for colonising expeditions, which sought to seize territory. Sometimes it even hampered the expeditions, as was the case with Scott's bid to be the first to the South Pole in 1910. On this occasion, the time devoted to scientific discovery and experimentation was at least partly responsible for Amundsen claiming the prize. The acquisition of knowledge of the natural world was well established in British explorations, mainly to satisfy an ever curious and knowledge-hungry British public. The British government had supported expeditions of discovery for over 300 years and now, following the Industrial Revolution, the British public was eager for links to the natural world. The prospect of 'better' worlds, with exotic fauna and flora, were appealing to a population seeing their country being buried in smoke, pollution and hardship. Advances in news reporting meant that the British explorations in foreign lands were rapidly conveyed back to a public eager for news of the great adventures.

The emphasis on gaining control of new conquests in the Victorian era by establishing an ordered system of mapping and recording was applied just as avidly to the natural world as it was to their territorial conquests. A systematic method for the classification of animals and plants had been first proposed in the mid 18th C by Carl Linnaeus, and by the late 19th C approximately 1,000 new species were being described by British explorers and scientists every year (Ritvo, 2001). The mapping of animal species in Victorian times was comparable to the mapping of the animal genomes that is currently underway, marking the establishment of a knowledge base before major advances in plant and animal management and manipulation could be made. We can look forward to major advances in animal management over the next century as a result of our recently enhanced understanding of genetic effects on animal form and function.

The rudiments of breeding management for improved cattle and sheep genotypes had been established as early as the late 18th C, but in Victorian times the same techniques were applied to the increasingly popular companion animals, especially dogs. Before the Victorian era contact with nature was confined to situations in which man could be expected to benefit financially. A geographical text from the early 19th C describes how nature was necessarily

'subservient to the distribution and industry of mankind' (Pinkerton, 1807). In the late 20th and early 21st C, the ability to genetically manipulate animals led to an accelerated potential to develop new genotypes, which was utilised most in medical research, primarily with rodents, but is just now beginning to have a major impact on farm and companion animals. In future the emphasis will be on developing animals that fit better into their environment, thereby avoiding some of the damage done by, for example, developing dogs with extreme features, such as short noses, leading to respiratory problems, overlong backs, unnaturally short legs etc.

Pet ownership thrived in the 19th and 20th C, although signs of decline in the cat population were beginning to be seen in Australia in the late 20th C (Baldock et al., 2001), as a result of lifestyle changes and concern for native fauna. Standards for pedigree companion animal breeds were established in the same way as they had been for livestock. The Kennel Club of England was established in 1873, and was followed by the National Cat Club in 1874. Champion dogs of highly desired breeds, such as St Bernards, were worth considerable sums, often in excess of 1,000 pounds, equivalent to many tens of thousands of pounds nowadays. The welfare of companion animals became an issue at the same time as rising ownership. In 1868 Queen Victoria exhorted her subjects to be more concerned for animal welfare, complaining that 'the English are inclined to be more cruel to animals than some other civilised nations are' (Hibbert, 1984). It is not clear what her evidence was.

The Victorian era also saw the widespread establishment of menageries in Europe to allow the public to view exotic animals. In London, Regent's Park Zoo was established in 1828, amidst fear that England was falling 'behind' other European countries in exhibiting animals to the public. Some menagarists indulged the public blood lust by offering live prey. Concern about this practice was expressed by the newly established Royal Society for the Protection of Animals (founded in 1824), as much for the moral wellbeing of spectators as for the welfare of the animals. Contact with animals by viewers was encouraged, with viewers taking umbrellas and sticks into the zoo to provoke the animals through the bars of the cages. This accentuated the belief that the animals were aggressive, and that the viewer could share a similar, if less extreme, experience to the explorers that collected the animals. Food was often provided for the visitors to offer to the animals. However, attitudes began to change, and the historian Harriet Ritvo, described the position thus 'Gradually administrators began to understand wild fauna as a valuable resource in need of husbanding, rather than a source of diversion (and sometimes a nuisance) whose disappearance was an inevitable by-product of the progress of civilisation. . . . . The perceived balance between humans and the natural world had definitely shifted. The role of the people was now to protect.' (Ritvo, 2001). However, Anglocentism was embraced by colonisers in many parts of the world, and the introduction of British fauna, such as rabbits and foxes, is rued to this day in colonies such as Australia.

Modern Management of Animal Welfare

Following the Victorian era of discovery, and the tumultuous war years of the first half of the 20th C, which heralded an era of peace and development, there has been a quest to improve the welfare of animals in at least the developed regions of the world. Affluent societies worldwide are requiring better conditions for managed animals, and most have introduced codes of welfare for the major animal species, supported by appropriate legislation (Fraser, 2006). The codes attempt to protect animals from suffering and cruelty, and often extend to a duty of care that animal owners have towards their charges. They are more effective than extensive legislation, which can only protect against the worst instances of cruelty. Many animal industries are characterized by their diversity and in modern Western societies the marketplace usually requires products from animals kept under a variety of different welfare standards. A minority of people will choose to purchase products from animals kept at a very high level of welfare, most people will purchase products from animals kept under normal conditions, and it is conceivable that only a few people would, if they were allowed, purchase products from animals kept under very poor welfare, assuming that there is a direct relationship between welfare level and cost of production (Fig. 6.1). The shape of this curve will differ between animal products and populations. If the majority of the population are of the opinion that animals should not be kept in systems where the welfare is very poor, then this practice is usually prohibited by law (Fig. 6.2). People in developed countries are increasingly demanding that food items that they export and import are produced to at least the same standards as foods that are produced and consumed in their home country. Hence the welfare of livestock exported from Australia to developing countries is scrutinized closely by the welfare lobby group and must be to a very high standard.

Welfare decisions may be based on individual experiences or on the sum of experiences. In the former case, individual events may be deemed to be too severe, particularly if they offend the majority of the population. The degree of

Fig. 6.1 Hypothetical changes in volume of sales of animal products with welfare level in a market economy

Fig. 6.2 Hypothetical changes in volume of sales of animal products with welfare level, in a market economy with a restriction on sales of animal products with low animal welfare

offence caused will depend on the essentiality of the experience to the quality of life of the animal, for example experiences such as the dehorning of cattle, which are largely for the animal's benefit because it prevents injury during fighting, may cause less offence than procedures which are arguably less severe, such as transport or hormone treatment, but are solely for the benefit of consumers. 'Welfare' experiences are traded by humans all the time in their own lives, and therefore it is logical to allow the same for animals. A typical human scenario might be 'I am buying a meal for dinner that I know is unhealthy, but it tastes good, and I need to improve my wellbeing after a bad morning'. The implication is that the person wishes to forego resources (long term health status, capital) in the short-term to achieve a rapid resumption of their welfare state.

Welfare can be measured from events as they happen or the resultant outcome on the animal, such as the final body weight or condition score of cattle after a period in a feedlot. Outcome-based measures could potentially provide a flexibility of approaches, which would be useful for on-farm assessments, and they are more likely to be directly related to welfare, compared to resource-based measures (Botreau et al., 2007; Edwards, 2007). However, it is hard to identify suitable indicators for welfare, especially if access to the animals can only be gained some time after the experiences have occurred. For example, the welfare of sheep transported by ship can be prescribed in the form of direct influences of resources provided for the animals during the journey (e.g. stocking density, temperature, humidity, noise levels), or the state of the animals at the end of the journey (e.g. live weight, coat soiling, behaviour, skin elasticity – a measure of dehydration status). We already know the relationship between most of these key resource indicators and possible animal measures, for example between temperature and the risk of heat stress (Marai et al., 2007). Not all animals will respond in the same way, depending on their physiology, morphology and previous experiences, and this is a disadvantage of using resource-based measures, but employing resource-based measures is often the only possibility on the basis of cost, reliability, repeatability and acceptability. Metabolic 'markers' of welfare state have proved equally elusive, as attempts to identify metabolic indicators of undernutrition have shown, because

the animal's homeostasis maintains most metabolites at 'normal' levels (Agenäs et al, 2006). A combination of measures is likely to be needed in most circumstances, and it is likely that a prescriptive resource-based set of measures will be used in most instances for the forseeable future.

The minimum level of care afforded to animals managed by humans could be that which they would get in the wild, assuming that there is a niche for them to occupy. There may be wild relatives of our domesticated animals, whose welfare we can assess in pristine habitats to provide benchmarks for their domesticated relatives. In this way our contract with animals would have at least a neutral and preferably positive effect on the animals. Alternatively, for animals that are managed and used (including consumed) in their country of origin, the level could be as close as possible to that afforded to the minimum level that humans in that environment experience. However, this suggests that most humans will be better cared for than animals, alluding to human supremacy, and would invoke a charge of speciesism, that is so fiercely opposed by philosophers such as Tom Regan (1990).

An alternative approach is to use the democratic processes in a country to determine minimum welfare standards. Armed with useful measures of animal welfare, minimum standards for animal managers could be established in a democratic society according to the majority view. Some practices will be deemed by a majority to be unacceptable, for example the deliberate mutilation of animals for pleasure, as in bullfighting. Others might be seen as acceptable if the purpose is to secure animal welfare in the future. For example, removal of horns in young calves with the application of anaesthetic should involve little pain (Sylvester et al., 2004), and will prevent injury later during fighting. Other operations are more contentious: the mulesing operation in sheep (removal of flaps of skin in the region of the vulva of sheep) is conducted in order to protect the animal from blowfly infestation (James, 2006). From a utilitarian approach there are major welfare benefits for the few animals that have avoided a blowfly infestation by having the operation, whilst for the majority of animals the impact is negative, since only a small proportion would suffer a blow fly infestation. For some animals the impact would be profoundly negative, since there are risks associated with the operation, in particular a mulesing-induced flystrike. Perhaps the public would decide that if most animals had no benefit, the operation is too painful to allow, and that if the risks of flystrike are very high on some farms then sheep should not be kept there.

In the long term, human society will not be at peace with itself until sentient animals, wherever possible, are offered as good conditions for their welfare as humans. In support of this, the previous social movements have strived for nothing less than to improve the opportunities of less fortunate members of society, including children, women, disabled people, ethnic minorities etc. so that they equal that of the most privileged, in particular the healthy adult males. As with less fortunate members of society, conditions for animals do not need to be the same or even similar, but appropriate. The facilities provided to all sentient species, including humans, therefore need to be tailored to their needs

(Bartussek, 1999). Suitable rather than equivalent levels of care should be the aim, and consideration needs to be given to other ethical issues than welfare which are involved in our management of animals: genetic modification, premature slaughter, speciesism, altering the animal's integrity, reproductive manipulation, habitat destruction etc.

Many animals are treated worse than humans, and this is tolerated if not approved by society. As evidence of this, comparison with animal conditions is used as a means to express o concern for human standards, saying that they are no better than those offered to animals. 'Brutal' treatment, the 'cattle class' in aeroplanes, living rooms being a 'pig sty' all demonstrate that we recognise that animals are treated worse than humans. Whilst conditions are still improving to an acceptable level for many humans it is inevitable that animals will be less well provided for. The greater the human deprivation, the more likely it is that conditions for animals will be poor. However, as conditions for humans rise above the threshold for happiness that Layard (2005) enumerated, animals will be increasingly better cared for. There are even instances of animals being offered better conditions than humans, some cats and dogs for example, whose owners afford them all the luxuries that many humans aspire to. Other highly valued animals, such as those with rare genetics that are used for breeding animals for sale, may be kept in superior conditions to many humans, who are not only constrained by the captivity of their immediate environment, they also have to spend up to 50% of their time (or perhaps 80% of their time awake) working to be able to support themselves and dependent offspring. Elephants kept in Indian sanctuaries for religious purposes are usually given plenty of food, companionship, space, good veterinary care, and there are several mahouts to look after each one. They have to parade in festivals for several months and then have at least six months without work.

The public concern about animals kept in small enclosures with limited stimulation is not always extended to humans that have to endure similar conditions, but the impact of living in small confined conditions is little understood in either. Familiarity with the environment is of obvious survival value and therefore can be comforting, and living in one small room enables the occupier to come to know their surroundings in intricate detail. However, humans have considerable cognitive ability, the suppression of which could lead to boredom. This is also recognised in many animals that are kept in solitary conditions, especially those in zoos and non-domesticated animals. At the opposite end of the spectrum, are animals that find their environment too difficult to cope with, leading to anxiety, which may be associated with self-directed behaviour, sometimes harmful. Other symptoms known in humans are rapid switching between tasks, tachycardia, tightness of the chest because of shallow, rapid breathing, over-oxygenation of the blood, leading sometimes to dizziness and panic attacks. Many animals also suffer from social anxiety, but particularly the gregarious ones. Sheep, for example will demonstrate a severe stress response when they are isolated (Degabriele and Fell, 2001), and dogs

with a strong bond to their owners suffer anxiety when separated from them (Houpt et al., 2007).

Despite these problems, there can be little doubt that conditions for animals have improved in many situations in recent years. For example, livestock mortality in the late 18th C shipments from the Cape, Calcutta or the west coast of America to Australia averaged about 50% (Peel, 1986), whereas today for the shipments from Australia to the Middle East it is just 1% for sheep (Higgs et al., 1999) and 0.1% for cattle. Carlson has provided graphic descriptions of the cruelty inflicted on cattle shipped to England only just over one hundred years ago, demonstrating how transport conditions have improved over the course of the last century (Carlson, 2002). The cattle were given scant food and water and were continually prodded and made to move to keep them alive. On arrival, since only live cattle were paid for, hot paraffin was sometimes poured into their ear canal, which was stuffed with hay and then set alight in order to incite the near-dead animals to move. In this case, standards for animals have undoubtedly improved, but the trade is still regarded as cruel by many (RSPCA, 2006). This demonstrates the rapid improvement in welfare standards expected by the general public.

Animal feeding too has seen many improvements in recent years. In the early 20th C, the ability of farmers to keep their cattle alive over winter in cold climates such as in northern Britain was often limited by their stocks of conserved fodder, in particular hay, and most animals would lose weight. Some would even die in a hard winter. In milder climates standing fodder or foggage could be used, and it still is in many countries, but in Britain snow cover limited this option. Nowadays, with fodder production vastly improved due to mechanisation of the process and fertilization of the soil, such malnutrition is rare (Phillips, 2001). Even in Australian drought conditions the ability of farmers to keep their animals alive by either bringing conserved feed onto the farm or sending cattle away to areas where feed is available is much improved over the last 50 years. Farmers' ability to manage their feedstocks has improved, with consequential benefits to animal welfare (Hogan, 1996). In other animal industries, nutrition has improved in parallel with improvements in human nutrition. Diets are available for companion animals that will not only optimise their growth, they can correct for diseases and enhance the animal's welfare (Diez and Istasse, 1995).

The driver for improvements in living conditions around the globe is partly the new social ethic, described in Chapter 4, but it is also new technology, which has been developing at an ever increasing pace. Having been at the mercy of nature for so many millennia, we are at last learning how to manage the planet and its animals and plants. The nirvana, the attainment of good living standards for all sentient animals and people alike, will take many hundreds of years to reach. Current improvements in animal welfare should not lead to complacency, but neither is it correct to say that deteriorating animal welfare standards through intensification are the main driver for increasing animal welfare concern, as proposed by Rollin (2006). In many fields of society, post war

generations have been both spectacularly ambitious and achieving, and in animal welfare there have been many improvements, and we can still anticipate future benefits to animals, particularly as we develop better tools to manage their genetics.

Animal's Right to Life and Welfare

The animal rights philosopher Tom Regan (1983) believes that some animals are sufficiently similar to us, in that they show evidence of sentience, that they should be afforded special status, termed by Regan the 'subject-of-a-life'. This makes them eligible for certain rights, such as life, freedom from hunger, fear etc and other important aspects of welfare provision. In support of this concept, the great apes have been the subject of an attempt by a group of philosophers to afford them the legal status of humans, principally because of their rational thought powers (Singer and Cavalieri, 1993). This has been partially achieved in Spain, although it seems likely that they will still legally be kept in captivity (GAP, 2008). Other animals who do not demonstrate sentience are ineligible for such considerations (Regan, 1983). The division between sentient and non-sentient animals is frequently used in setting standards for animal management (e.g. Australian Code of Practice for the Care and Use of Animals for Scientific Purposes, 2004), but it is difficult to imagine how a distinct division between those with and without this capacity can be scientifically justified. A graded scale of sentience is more defendable. Others argue that animals can only have these rights if they claim and accept the rights and the responsibilities that accompany them, and because the animals are in most cases managed by man they cannot demonstrate the free will necessary to assume responsibilities (Seamer, 1998).

The validity of using sentience as a criterion for assigning welfare benefits depends on how animal welfare is defined. If it is defined as the animal's feelings then it must be essential for an animal to have the power of sentience in order to have the opportunity to have good feelings rather than bad. However, another key criterion for attributing our welfare concern is the animals' role in their ecosystem. Some are essential members and hold a key role in the ecosystems managed by humans. Others are not, and as stated previously, the right to life is not absolute. All animals are interdependent in the living ecosystem, and they are not all equal. For example, it must be considered whether an animal is native to the habitat or introduced, and if the latter how long ago was it introduced? Maintaining a high proportion of native species preserves stability and diversity and helps to limit the rate of change in ecosystems. However, it is not just the status of the animal itself but the interdependencies with other animals that are important. Large predators have been largely eliminated from the Australian landscape, so the Australian dingo appears to have a role to play despite its relatively recent introduction about 6000 years ago (Savolainen et al., 2004).

The available habitat and the species' impact on ecosystems have also to be considered, with African elephants being controlled even though they are native because of their destructive effects on local fauna. Finally the use of the species for human purposes must be considered.

Animals' relationship to humans and the human ethical responsibility to end animal suffering must also be taken into account (Albright, 2002). The annual Japanese whale cull of 860 animals evokes much greater public outrage than for the annual Australian kangaroo cull of 3 million animals (RSPCA, 2002b). All animals have their part to play in the ecosystem, but for some species that part will include preparing the way for others. That is the nature of evolution. Who determines whether an animal species has a major part to play, whether its welfare should be preserved at the expense of others? Generally human society takes this responsibility, but society's attitudes are changing to become more inclusive, with more concern for the animals that have previously attracted little attention. Society will sometimes get it wrong, but we must accept that all animal life is part of a dynamic ecosystem and not a mass of individual entities. Humans have been called upon in the past to sacrifice their life, or part of it, for the benefit of others, most notably in conflicts. Sometimes this is in error, but humans learn from the error of past mistakes, that is part of our contribution. Evidence for the integrated nature of human society is to be found in the many examples where humans willingly sacrifice themselves for the benefit of others. Animals do exactly the same, most famously the lemmings of Scandinavia, who sacrifice themselves approximately every four years for the benefit of the next generation, thereby depriving the animals that prey on them, snowy owls, long-tailed skuas, arctic foxes and stoats, of their sustenance and limiting their population for the future benefit of the species (Wang and Kuang, 2007). Altruism is not unique to humans, nor does it have to be reciprocated to be of genetic benefit.

A key moral issue is whether the rights or welfare of individual animals can be sacrificed for the benefit of other conspecifics or even humans. Tom Regan's philosophy places an emphasis on the rights of individuals, which cannot be forfeited for the benefit of others (Regan, 1983). The opposing (utilitarian) view is that the rights of an individual can be sacrificed if it brings overall benefit (or increased happiness) to the population. Although the latter is a form of trade off that happens all the time in human society, there has been a movement in the last century to diminish the responsibility of individuals to society. The sacrifice of millions of young men in the First World War for the benefit of civilized European society went almost unquestioned at the time, but it is doubtful whether it would be morally acceptable nowadays. Society's boundaries are expanding with globalization, and with this the traditional allegiance of the individual to their country is diminishing. However, with this changing perception of human responsibilities has come the recognition that an individual animal's rights are also important. The question of degree is important, and few would argue that a mild injustice to an individual should not be tolerated if it brings considerable benefit to many others. Such is the essence

of altruism, which may actually benefit the individual, since he or she will gains a sense of satisfaction in helping the community and rewards if such assistance is reciprocated. This good feeling probably evolved in communities that benefit from individuals acting for the common good. However, even those that espouse a utilitarian approach to animal rights, such as Peter Singer, do not accept that a major loss of rights, such as the right to life in farm or laboratory animals, is acceptable for the benefit of others (Singer, 1975). Singer also argues that the use of farm or laboratory animals brings about a major cost to the animals, but the benefit to humans is only minor. A key moral issue is therefore how much should individuals be prepared to sacrifice for the benefit of others? Is it just sufficient for them to gain benefit of belonging to a close community, or should it be sufficient for others to gain benefit at their expense?

The right to life is one of the most fundamental rights, yet it is dependent on the use of animals, for example being controlled by humans for many farm and laboratory animals. Farm animals kept for the production of meat usually lose their right to life after they have reached about half of their mature size. Dairy cows kept for milk live as long as they are economically producing milk, which is usually until they reach the age of about five, considerably less than their potential longevity, which is about 25 years. In southern Mediterranean countries there is a tradition of killing food animals at a very young age, when their muscles are tender. Many animals, such as lambs, calves and piglets are killed when they are still consuming milk, directly from the mother in the case of lambs and piglets. In northern Europe farm animals are slaughtered at an older age, because they then have more fat in their bodies, and there was traditionally a need for the inhabitants of these colder climes to consume meat with a higher fat content in the past.

Laboratory animals rarely reach senescence, indeed they are hardly ever used for more than one experiment. Furthermore, the repetition of experimental procedures on an animal is not advised by some authorities due to the potential cumulative effects of the experiments on the animal's welfare (Australian Code of Practice for the Care and Use of Animals for Scientific Purposes, 2004).

Companion animals will often live to senescence, and indeed because of the strong bond established with the owner, the life of pets is often maintained even if the quality of life is severely reduced. However, this desire sometimes contrasts with that of the attendant veterinarians, who will often counsel that it is kinder to destroy an animal whose quality of life is reduced than keep it alive. Perhaps because of their unwillingness to allow animals to suffer, euthanasia is advocated, although we do not fully understand the animal's ability to preserve its mental wellbeing in the face of physical disabilities. The advantage to an individual's genes of preserving life, even in the face of severe physical problems is considerable, as long as it could potentially breed. Hence it is likely that animals share the human desire for longevity.

Nevertheless, there is a distinctly different attitude to the right to life in humans and animals. Some humans would accept voluntary euthanasia as octogenarians but as teenagers it would be considered wrong by nearly

everyone, with a severe stigma attached. A long lifespan in humans is heralded with a sense of achievement in obituaries. In animals the attitude to preservation of life depends on species, situation and the owner or manager's cultural background and religious beliefs (Phillips and McCulloch, 2005).

Animal Sacrifice

Although the deliberate taking of life before natural senescence occurs may seem by some an infringement of an animal's rights, it is deeply embedded in human society. Indeed in the ancient biblical period before Moses' time the taking of an animals' life was believed to be necessary to maintain a good relationship with god. The scriptures do not state whether this was believed at the time to be fundamental to our primeval nature or ordained by god. The latter belief prevailed in some scholars as recently as the late Victorian period (Smith, 1880). Sacrifice by the Israelites was probably originally borrowed from neighbouring countries, especially Egypt, where it was part of their religious practices. However, the biblical explanation of sacrifice by the Israelites as a ritual practice to cement the covenant between god and humans differs from the beliefs of neighbouring peoples, who viewed their gods as being angry and jealous, requiring sacrifice to appease them.

In the biblical writings after the time of Moses, the story gradually unfolds that sacrifice, especially of animals, was for the atonement of the sins of humans, and it is clear in the New Testament that this was its principle purpose. Biblical texts also speak of the sacrifice of praise, thanksgiving, charity and devotion, which were offered to god and 'with which he is well pleased' (Hebrews Chapter 13, vs 15–16). There is considerably less emphasis on religious sacrifice of animals in the New than the Old Testament, because in the former it is proposed that Jesus Christ became the 'sacrificial lamb' in a single act of atonement for man's sins through his death. Nevertheless, the idea prevailed that humans were sinful and that the sins could be offloaded onto sacrificial animals or other humans, rendering the people pure and holy. Such ideas persisted into the Middle Ages, when animals were killed to atone for particular crimes. The practice of sacrifice at religious festivals still persists in the Middle East (Alboga, 2003), but there is less emphasis on appeasement of god. Even in Western society the consumption of lamb remains traditional at Easter, when Christians remember that Jesus became the sacrificial lamb. Also in the Christian religion the idea developed that believers could atone for their sins by confessing them to god and their priest and repenting for them. Now that animal welfare has become a major societal concern, this is a more acceptable way of dealing with immoral behaviour and the priest replaces the sacrificial 'scapegoat'.

In Old Testament times sacrifice was both public and private. Public sacrifice might involve, for example, the slaughter of two goats for the

people and one bullock for the priest on a day of atonement (Leviticus Chapter 16). This would encourage the people to be reverent to both god and the priests. Although it was considered to be essentially a peace offering in the Old Testament era after Moses, it was also used in supplication for benefits, such as clement weather. Private sacrifice was also accepted by the law, which guided and limited the practice. Hence, in ancient Judaea, although sacrifice of lambs aged about one year was common, no lamb under eight days of age was allowed to be killed (Leviticus, Ch 23, 27), (Smith, 1880). Prevalent as it was in many ancient religions, it is likely that requiring humans through private sacrifice to be willing to forsake the things that were most precious to them, i.e. their animals and in Abraham's case even his own child, enabled the priests to maintain a degree of control over the people. In the case of animals, the priests' power was only over the life and death of the animal, not its use for human consumption. Controlling the latter would have severely constrained the food supply for any society, so it is entirely logical that animal sacrifice became associated with religious festivals.

In the Muslim religion, animals are sacrificed at festival times to share between relatives, neighbouring families and the poor (Alboga, 2003). This is a logical development because it would bond people together, preserve the population and also because there is too much in one animal for one family. The Koran advocates such sharing of larger animals:

> 'We have made the camels a part of God's rites. They are of much use to you. Pronounce over them the name of God as you draw them up in a line and slaughter them; and when they have fallen to the ground eat of their flesh and feed the uncomplaining beggar and the demanding suppliant. Thus have We subjected them to your service, so that you may give thanks.
>
> The Koran, Pilgrimage, 22, 35–37 (1990)

Cattle were commonly used for sacrifice in Muslim society, and the Koran requires that the name of God should be invoked whenever cattle are offered for sacrifice. This should be done by priests only after the cattle have been used by humans for other useful purposes, such as producing fuel in the form of dung and working to till the fields. The scriptures remind the people that the cattle are a gift from God (Koran, Pilgrimage, 22, 32–35).

> 'In the cattle, you have but an example of Our power. You eat their flesh, and gain other benefits from them besides. By them, as the ships that sail the sea, you are carried.'
>
> Koran, The Believers, 23, 21–23

Like Muslims, Hindus still regularly practise animal sacrifice in India, although those in Western countries have difficulty in obtaining permission (Smith, 2000). In India chiefly goats and chickens are sacrificed, and the practice is often managed by the temples. In Buddhist cultures it is much rarer, but still exists in the form of externalizing punishment for people's crimes in Sri Lanka (Feddema, 1995).

Animal Slaughter

Animals are killed mainly for meat production, other 'products' such as wool, dung for fuel, companionship and sport being derived from live animals. The choice of animals for meat production is principally driven by the ease and safety of keeping them. Animals that are polygynous, precocious and prolific are favoured. Herbivores are both less likely to transmit zoonotic diseases than carnivores and more efficient users of land, and hence cattle, sheep, deer and other herbivores are popular. Omnivores, such as pigs and chickens are also popular food animals but are fed mainly on plant rather than animal products, especially after the emergence of zoonotic BSE in cattle after they were fed animal products.

Animals used for meat production mostly possess high levels of sentience and there is therefore considerable public concern to make the killing process as quick and painless as possible. People demonstrate considerable empathy in their high level of interest in this process. Preventing awareness of their fate is a major concern, but there is only limited evidence of awareness of the death process in animals, even 'higher' animals such as elephants (Bradshaw, 2004), dogs and primates. Indeed fear of death is almost certainly greater in humans than in animals because of a greater ability to anticipate and imagine the event, and the concern for an afterlife. Animals do not apparently plan for the future to the same extent as humans and therefore probably do not demonstrate a long-term fear of death (Hui et al., 2006).

Awareness of death encourages the development of religious beliefs, which are obviously most evident so far in man. The anxiety created by the desire to maximize productive life, may be controlled by a belief in another life, be it the immortal soul residing in heaven in the Christian religion or the rebirth in the form of other animals or humans in the eastern religions. Whilst it could be argued that the major cognitive powers of man have allowed for considerable inventiveness in religious beliefs, there are some who argue that the rudiments of religious belief exist in higher animals, in that they perform some moral behaviours, by avoiding incest for example (Broom, 2003).

Methods used for animal slaughter range from the purely physical, such as when piglets are killed by swinging them hard against a wall or the floor, to the chemical, such as when animals are injected with a lethal dose of sedative or deprived of oxygen. The need for rapid slaughter of large numbers of animals in a painless manner has led to the search for chemical methods that can be applied to a roomful of animals, without the need to treat each animal separately. Increasing the carbon dioxide concentration is one method favoured by some for the slaughter of laboratory and farm animals, even though animals will suffer pain for about 10 seconds before becoming unconscious if they are rapidly exposed to high concentrations (Hawkins et al., 2006). A gradual fill may reduce the pain sensation but increase breathlessness. Humans, who metabolise carbon dioxide in just the same way as farm animals, have reported

severe respiratory trauma when accidentally exposed to the gas (Hawkins et al., 2006). Considerable concern rightly exists amongst laboratory and farm animal scientists that this constitutes unnecessary suffering but other methods, such as lethal injection are time consuming and not practical for rapid euthanasia of large numbers of animals.

The death process, even if relatively quick, commands more attention than long-term suffering. The few seconds before death, when the pain is probably severe and exacerbated by anxiety, represent perhaps 0.003% if the animal's life, yet they receive more attention than the keeping of laboratory animals in enclosures that prevent them performing natural behaviour throughout their short lives. By focusing concern on the animals' death, people may be displaying remorse for the killing of these animals.

There are other anomalies in animal death that appear speciesist. Little is known about the duration and extent of suffering in wild animals, for example the kangaroos and camels that are slaughtered in Australia to manage their population (Ford, 1986), or seals that are slaughtered for their pelts (Ambrose, 1992). By contrast, even though the suffering of farm and laboratory animals during death appears shorter and less severe, it is much researched and also closely monitored for quality control.

Expectations for the normal longevity of an animal will depend on the environment in which it is kept, its genotype and management. Longevity in sexually reproducing animals is determined principally by the need to exchange genes on a regular basis, in order to accommodate both environmental change and the dynamic population of other species that compete with them. In asexually-reproducing animals reproduction provides the opportunity to rapidly increase the population, with large numbers of offspring produced to potentially colonise new habitats or confirm occupancy of existing ones. Across species, natural longevity tends to be greater for larger animals, because of the more protracted investment in growth of the animal.

Sexual reproduction therefore evolved because the ability to change conferred advantage in a competitive world. The environment constantly changes and it is advantageous for animals to be able to adapt to meet those changes. A fundamental central question is why the world needs to change. If a supreme being established the physical laws and designed a world which humans evolved to manage, with increasing effectiveness, why did the being not design a perfect world in the first place, with the physical and biological systems in harmony. The answer may lie in our construct of good and evil (see above, Religious and Historical Perspectives in this chapter), which we have developed to allow us to manage biological systems. Pain and cruelty are only associated with evil because they have been useful constructs in the past to steer people towards sustainable management systems. We may already exist in a perfect management system and have all the tools for sustainable management of our animals and plants. Our biological systems and the evolutionary principles that allow them to adapt to novel circumstances are designed to optimize sustainable use of the planetary resources. Many philosophers, including Goethe, Liebniz and

Spinoza, have argued that each animal species is in itself an instance of perfected design, even if others have erroneously argued that perfection increases as we move up the species hierarchy (Preece and Fraser, 2000). Any pain or suffering that we experience, or which animals experience, appears wrong to us because of our desire for self-preservation, whereas we should see ourselves as just part of the much larger spectrum of life on the planet, interconnected and interdependent (Dawkins, 2006). Therefore we should not *expect* to live for any particular period of time, nor could any animal within our charge, but we should maximise the contribution of each individual to the spectrum of life, in order to sustain life most effectively. This may mean not slaughtering animals for food at a very early age, not sacrificing animals or humans unnecessarily – in other words behaving altruistically.

Pain

Pain has been described as "an aversive sensory experience caused by actual or potential injury that elicits protective motor and vegetative reactions, results in learned avoidance, and may modify species specific behaviour, including social behaviour" (Zimmerman, 1986). It therefore fulfills a vital function of alerting an animal to potential or actual injury, so that they can take evasive action. Without the feeling of pain animals would die at an early age. If we acknowledge the welfare of an animal to be a function of its experiences, positive and negative, then pain obviously has a direct input into welfare, because it exists both during and after a negative experience. However, it may help to avert further negative experiences through the animal's evasive action, which will have a positive impact on lifetime welfare. The exhibition of pain, therefore, is not necessarily indicative of an overall negative impact on welfare.

Pain is one of a suite of primary negative affects,[3] all of which are probably common to higher animals and humans. They include fear, terror, hatred, distress, dissmell,[4] anguish and disgust (Tomkins, 1963; 1991). Secondary negative emotions include shame and guilt, which in the view of humans at least may be more common in humans than other animals.[5] These affects often co-exist and one may predispose to another, so in the case of pain, the additional negative affects are most commonly fear and distress.

The pain response to physical injury is not a 'straight through' biological mechanism, where the affective response is directly proportional to the tissue damage, but it is influenced by the subject's level of attention, anxiety, suggestion and prior experience (Melzack, 1987). Up until the 1950s it was believed that pain responses were only a function of the somatic neuronal pathways,

[3] A brief biological, innate, instinctive response to a stimulus

[4] The negative affect of experiencing noxious odours

[5] Legally animals cannot experience guilt since they are recognized only as property in most parts of the world

which could be best controlled by neurosurgery, at least experimentally (Melzack, 1993). After this date, psychological influences, such as those referred to above, that had previously been dismissed as *reactions* to pain began to be recognized as pain modulators, and it became clear that a 'top-down' approach was necessary in examining pain responses. Furthermore, Melzack and Wall (1965) suggested that the transmission of nerve impulses from afferent fibres to spinal cord transmission cells is modulated by a spinal gating mechanism in the dorsal horn, which can be influenced by signals from the brain. They proposed that if the number of nerve impulses is more than a critical value, pain is experienced. They found that rubbing the affected area closed the gate, whereas pinching opened it. This began two decades of research to elucidate the mechanisms involved in brain regulation of pain responses.

Surveys of Attitudes to Pain as a Component of Animal Welfare

We have little direct evidence of the importance of pain in animal welfare, other than the extent of scientific research, compared to other areas of welfare, and attitudes of stakeholders in the animal industries. By the year 2005, the number of scientific journal articles that had been published on pain and animal welfare (4793) was considerably greater than those on the other Freedoms commonly recognized as the major components of welfare (normal behaviour, 2,599; fear/stress 1,286; hunger and thirst 1,247 and discomfort 486) (Phillips, 2005a).

Most surveys of attitudes to pain have investigated it in relation to animal welfare. Several surveys have investigated attitudes in American university staff and students concerned with animals in veterinary or animal science programs, who will be, or are leaders in the field of animal management and health treatment. When animal science faculty members in a variety of American universities were surveyed on their attitudes towards animal welfare, nearly all (97%) believed that animals should have freedom from unnecessary pain (Heleski et al., 2004). They also believed that animals should be free from other negative affect, such as thirst, hunger, fear or distress. However, when asked about specific practices that are commonly used in the animal production industries and are known to cause pain, such as castration without anaesthetic use (Taylor and Weary, 2000) or beak trimming in poultry, approximately 70% of the staff believed that these practices did not warrant concern. This agreed with the majority view that current farm practices did not require any change, or that changes should be minor. Later, in a direct comparison of veterinary and animal science staff, Heleski et al. (2006) concluded that the former had greater levels of concern for farm animal welfare, especially for meat birds, beef and sheep. Both groups of staff strongly believed that farm animals should be free from pain and discomfort, with no difference between disciplines.

Amongst tertiary level students of veterinary medicine and other disciplines, there is a belief that some domesticated species are more capable of experiencing

emotions than others (Levine et al., 2005; Phillips and McCulloch, 2005). Specifically, students of veterinary medicine in an American college believed that dogs and cats were more capable in this respect than farm animals, with a particularly low rating for poultry (Levine et al., 2005). In contrast to the animal science faculty members, most of the students considered normal practices with farm animals that are known to cause pain, such as branding with a hot iron, castration by banding or at a very young age and surgical procedures, to be inhumane. Amongst students of all disciplines and of a mix of nationalities, there was a belief that species have differing ability to experience sentience, and the dog receives a particularly high rating, despite an absence of anatomical or physiological evidence to support this belief (sentience ratings: monkey > dog > newborn baby > fox > pig > chicken > rat > fish, Phillips and McCulloch, 2005). In a further American survey, animal science students also believed that there are species differences in the capacity to feel pain, with chickens apparently having less capacity than other farm animal species (Heleski and Zanella, 2006). Approximately 50% of students believed that farm animals experienced pain in a similar way to humans. What is most concerning is that these differences in attributed sentience levels influence the students' attitudes to practices that cause pain or cruelty, with a more tolerant attitude if the animals were believed to be less sentient (Phillips and McCulloch, 2005). Some differences between students of different nationalities towards sentience were also detected, for example pigs and poultry were attributed high levels of sentience by students from southeast Asia, and Chinese students attributed particularly high levels of sentience to rats and fish. In an international comparison of 15 different nations (Pifer et al., 1994), members of the public were asked to agree or disagree with the statement *'Scientists should be allowed to do research that causes pain and injury to animals like dogs and chimpanzees if it produces new information about human health problems*.' The intensity of opposition ranged from low levels in Japan (42%) and the USA (42%) to high levels in France (68%) and West Germany (60%), with Great Britain, Italy and Spain being intermediate.

In Pifer et al.'s study, gender also affected the attitude to animal research, with women being more opposed than men in all 15 nations. Gender also influences attitudes to practices that affect animal welfare, with women having greater concern than men (Pifer et al., 1994; Heleski et al., 2005; Phillips and McCulloch, 2005), but men and women have similar attitudes to the sentience capabilities of different species (Phillips and McCulloch, 2005).

Evaluating Pain Responses as a Component of Animal Welfare

The science of determining that an animal is in pain has been successfully developed through the self-administration of analgesics (e.g. Sneddon et al., 2003). Self-selection of analgesics by chickens has demonstrated that

lame birds are experiencing pain (Danbury et al., 2000). More detailed quantification of pain is needed, in order to compare welfare impact of different husbandry procedures. It is possible to determine the severity of short-term pain responses from the levels of stress invoked and the longevity of the response, and by multiplying these two an estimate of welfare impact is possible (as has been proposed by Broom, 1999, for pest animals). Hence, responses to mastitis could theoretically be evaluated by measuring the duration and the degree of pyrexia. However, mean disease durations and the stress responses over the time have received little attention, so caution is required in any interpretation of such models. There are exceptions, for example the mean duration of lameness in dairy cows is approximately three months (Phillips, 1990). Evaluating the welfare implications of pain responses in this way does not take into account the long term increase in avoidance of humans and possible anxiety/fear that may develop in the animals concerned.

Pain also has the potential to cause anxiety and fear in humans, and pain therapy aims to dissociate pain from such conditioning factors (Pruimboom and van Dam, 2006). Asmundson and Hadjistavropoulos (2007) have demonstrated physiologically, by looking at the time taken to react to words, that human patients with high fear of pain also have a generalized anxiety towards their health and even non-threatening issues. However, Wilson et al. (2007) have suggested that individual differences in baseline anxiety levels do not modulate pain responses in rodents, and it is therefore unclear whether animals respond cognitively to pain in the same way as humans.

Conclusions on Pain

Pain is perceived as one of the most important topics in animal welfare, both in terms of the research focus and effect on animal welfare. There is major concern amongst stakeholders in the farming industries that it should be controlled when invasive practices are performed (Cross et al., 2008a, b). However, those closely associated with the animal industries may become habituated to the pain that animals experience when they are treated and accept it as a normal part of the system. Scientific methods of demonstrating pain in animals have improved considerably, but quantifying pain is difficult, especially given the paucity of information on responses in animals. Significant pain is likely to induce secondary negative affects, such as fear and anxiety, but this has rarely been investigated in animals.

We need to understand both people's opinions on the importance of pain as a welfare issue and the extent to which animals can experience pain better. Whilst we can theoretically compare different experiences in terms of the pain produced, it will be much harder to compare the importance of different negative emotions for animal welfare.

Improving Animal Welfare in Developed and Developing Countries

There have been some substantial lapses in standards along the general path of improvement of animal welfare in recent times. The emergence of intensive 'factory' farming practices in industrialized countries in the 1960s to increase food production, after the shortages of the 1940s and 1950s, represented an unacceptable shift to prioritising human welfare at the expense of animals in many people's view. This was mainly a reaction to the threat of starvation and food shortages endured during and after the Second World War, particularly in the United Kingdom, but it was also a continuation of the process of intensification begun in the mid 18th C. At that time British breeders began to develop specialised livestock for different purposes, meat and wool production in particular, because of the need to intensify production for an expanding population. The population expansion at the start of the Industrial Revolution heralded an increase in demand for animal products. The intensification of livestock production in Britain in the mid-late 20th C met with fierce opposition at times (e.g. Harrison, 1964), but because of the economic consequences its reversal has been slow and somewhat limited. The widespread adoption of intensive production in the developed and now increasingly in the developing world had been assured by the greater efficiency of labour use and often superior profits that it generated, compared to traditional techniques. The argument has been commonly made that animal welfare in intensive production systems is good because the animals are growing, lactating or reproducing effectively, without considering the impact on the animals themselves. Even before the major era of intensification, a prominent agricultural lecturer reported that 'cattle are equally well suited to the extensive ranching methods of the remote and indifferent grazing regions, where the animals fend for themselves, and the intensive methods of densely populated countries, where they seldom, and sometimes never, leave the stall' (Shanahan, 1925). It is true that they can be kept in either situation, but their greater suitability for extensive grazing systems than indoor management is apparent from the health and behaviour consequences of the latter (Phillips, 2001, 2002; Phillips and Sorensen, 1993). It is increasingly accepted that some forms of farming allow for economic production but do not adequately provide for animal welfare (Appleby et al., 2003).

Animal production has not always been intensifying and we have a tendency to regard traditional systems as extensive and modern ones as intensive. This is not always the case. Sheep farming is nowadays generally regarded as one of the most extensive forms of animal farming, but accounts from biblical times show that the production systems employed then were labour intensive, with each animal being known by name and led out to pasture each day by a shepherd calling them individually (Smith, 1880).

The response of the public to intensive animal production has been varied. In the United States, intensification was rapid in the pig and poultry industries,

with multi-tier buildings and many of the tasks automated, from egg collection to 'spent hen' harvesting in the poultry industry. Only recently has there been opposition from the American public to unacceptable animal management practices. Such opposition is only just beginning to emerge in developing countries, and many do not have the democratic procedures to allow the people's wishes to be considered. The last century was dominated by a greater struggle than ever before to achieve democracy, the struggle against totalitarianism being one of the most protracted and difficult. In the words of Margaret Thatcher, 'Civilization has its ebbs and flows, but if we look at the history of the last five hundred years, whether in the field of art, science, technology, religious tolerance or in the practice of politics, the conscious inspiration of it all has been the belief and practice of freedom under law; freedom disciplined by morality, under the law perceived to be just' (Thatcher, 1986). This moral freedom is now being exercised in many developed countries, and includes improvements in animal welfare.

Improvement of animal welfare on farms has required the industrialized farm model that evolved in post-war Europe to be challenged and amended to take into account the people's demand that animals be treated with respect and greater concern for their welfare. The intensive route to food production has significant risks: antibiotics will often be routinely administered because the high stocking density of the animals means that they have to be protected artificially from infectious diseases (Ravindran et al., 2006); food supplies may be exhausted if insufficient reserves are held; selection for rapid growth and high milk production can increase susceptibility to disease and reductions in genetic diversity through intensive breeding practices may limit future production capacity. The recent trend to use animal feed for biofuel production is likely to have a more significant and rapid impact on intensive animal production than animal welfare concerns. In the medium term future, the keeping of farm animals is likely to be relegated in future to marginal land, instead of using prime land that might be needed for fuel (biodiesel or ethanol) or human food production, and animal food products will be used more as a luxury food item by some people, rather than the main item of most meals for most people. Much of this will be necessitated by the need to use very large areas of land to produce human food or fuel, extracted from potatoes, sugar cane and other suitable crops, in order to reduce reliance on fossil fuels, particularly those from the Middle East (Mattison and Norris, 2007). Relegated to marginal land, animal products will be more likely to come from cattle or sheep than pigs or poultry. Producing in a less intensive way involves the farmer in less risk and is more sustainable (Phillips and Sorensen, 1993). At present farmers in many countries, including Australia, England and other highly developed nations, receive government aid if there are adverse climatic or other unforeseen events, in order to preserve food production capacity. In future additional government assistance is likely to be offered for the establishment of sustainable farming systems, incorporating agroforestry, recycling of resources and integrated systems mixing crops and animal farming.

It is evident that the majority of the population in Europe wants improvements in animal welfare (Eurobarometer, 2007), and the activities of the non-government organisations (NGOs) against the corporate animal industries has been increasingly intense. Recently, the growth of these NGOs, as a result of public donations, and the support of many prominent people in the media, as well as some industry, has resulted in significant changes in industrial practices. A recent example is the outlawing of the mulesing operation in Australian sheep. This operation to remove loose skin on the hindquarters of sheep in order to prevent flies laying their eggs there has been necessitated by the breeding of wool sheep with folds of skin in this region of their body, to increase wool yield. The outlawing of the operation was achieved by public pressure, channelled through one of the NGOs (Flugge, 2004). Such a freedom for NGOs to pressurize industry would not be possible under a totalitarian regime, and our hope for the future of relationships between animals and man should surely be encouraged by the democratic government systems that were established in much of the world in the last century (UNESCO, 2001). Using these effectively requires those in the NGO to have a good understanding of the major welfare issues on farms (Cross et al., 2008a, b) and it may initially bring conflict with industry. However, in the long term after product prices have stabilized to take into account increased costs of production, farmers will be more satisfied from keeping animals that are in a high state of welfare. Demonstrating that animal welfare is at a high level is also good for public moral and the country's international image.

In developing countries, although the livestock industries are often integral to the nation's wellbeing, with animals produced largely for local consumption, it is not fair to the human inhabitants to require that the animals receive the same level of welfare as those in developed countries. Therefore while a marked difference exists in human living standards between world regions, truly international animal welfare standards that are equivalent in different countries and anything more than very basic minimum standards are not possible or just whilst there are major inequities between the living standards for humans. The subjection of animals to inadequate standards is still morally wrong, but a wrong from which the perpetrators can be excused (Regan, 1990). If, however, animals are exported from a developing country to a developed country, public sentiment in the latter may require that living standards for the animals in the developing country are increased to that of the animals in the developed country, the cost of which has to be met by the consumer. Therefore, if the animals are destined for export to another country, the level of welfare afforded to them should be at least that in their country of destination. Consumers in developed countries can then be assured that their animal products are from systems with similar welfare standards, regardless of place of origin. In the case of developed countries exporting animal products to developing countries, it will be necessary to take into account the standards demanded by the population in the developed country, and they may not wish animals to be exported to countries where they are not managed well and where the journey is long and arduous.

A high level of animal welfare can lead to improved people-animal and people-people relationships and better social cohesion. Improved people-animal relationships are evident at farm level, since stockpeople will work better if they have the resources at their disposal to feed and care for the animals in their charge to a high standard (Hemsworth and Coleman, 1998). They are likely to spend more time visiting the stock out of normal working hours to make sure that the animals are well cared for, to take a more active interest and pride in their job and to spend time updating themselves on the latest techniques of animal keeping, from which the animals may benefit.

To improve animal welfare standards, better documentation will be required, preferably in the form of a Welfare Record for all animals. This could include a health record, psychosocial record, information on the animal's response to humans/handling and any experimental procedures that have been conducted. Much of this information is already collected, but there is a need to standardise across species and management systems, to ensure a more equitable treatment of all animals in different management systems. In France for example, farmers are required to keep a register of veterinary treatment, which will provide information on the health of animals on the farm, but also enable potentially hazardous or misused drugs, such as antibiotics, to be known for each animal. The register contains information which includes a farm description, a livestock fact sheet, a record of all animal movements on and off the farm, a comprehensive health record and a record of all veterinary visits. Such a register should remain the responsibility of the animal's owner throughout its life and must accompany any animal if it is moved from the farm.

The Treatment of Animals by Indigenous People

When considering animal welfare and rights, it is important to reflect on the traditional relationship between indigenous people and their animals. Although many have emphasized the closeness of this relationship (e.g. Serpell, 1986), nowadays poorly developed indigenous communities are often chided for their ill-treatment of animals. In part this is because of the Western concept of animal welfare is different to their own and in part it may be because they do not use Western methods to manage health and reproduction in their animals. For example, dogs and cats may be communally owned and be evident in the streets, rather than having an individual owner who locks the animal in his house or garden when he goes to work each day. Modern-day indigenous societies are sometimes characterised by a breakdown of the traditional tribal management system, which uses Elders in the form of a local council presiding over the village people. Sometimes the poor living conditions for the people and lack of opportunities for work means that companion animals are badly cared for. In the past it was probably worse in many primitive societies. In the middle of the last century the American writer Joseph Furnas described how Polynesian and

Melanesian people treated their animals when he visited them: 'Hawaiians .... when collecting dogs for a feast, ...let them lie moaning for days with muzzles tied up and legs broken and tied over their backs .....Hawaiian women flocked to see cattle slaughtered as a good show. Melanesia was no better. The Trobrianders singed hogs alive as lingeringly as possible in order to enjoy their screams. South Sea missionaries have accomplished little, and I can find no indication that they have tried hard to encourage humanity towards animals among their converts.' (Furnas, 1948). It is ironic that the terms humanity and humane treatment are often used to describe gentle treatment, when in reality it is only the human population that perpetuate and derive pleasure from torture of animals in this way. Many predators will play with their prey before killing it, thus affording practice in chasing and managing the prey, but no such benefit appears to derive from deliberate cruelty to animals by humans, other than as an outlet for stress.

A recent case of recurring animal ill-treatment in Australia was that of horses on Palm Island, just off the coast of Queensland. There are about 200 horses on the island that were originally brought there to help work the cattle. The island is inhabited by about 1600 indigenous people that were deported there almost 100 years ago, because of the problems that they posed to the society that the new settlers were trying to create. Cattle and pig farms were established on the island to give them work, but fell into disrepair and were discontinued as the locals became increasingly reliant on social support in the second part of the 20th century. Nowadays, the island population is about 70% unemployed and although subject to state legislation, the main governance is by a local council of Elders, which struggles to maintain law and order in the poor socioeconomic conditions on the island. Although many westerners would consider life on a tropical island in northern Queensland to be idyllic, there is actually little to occupy the villagers, who are hampered by their remoteness from the mainland. There are strong tribal factions, as originally about 40 clans contributed to the island population. A large part of the island was cleared for cattle grazing, and after they were removed the pasture was available for the horse population. As the youths of the island have little to occupy them and no possibilities of a career or societal structure to give moral guidance, horses are a major recreational facility for 8-14 year old boys and girls. Lacking the funds for saddles or horse tackle, they ride bareback, and improvise for the bridle and bit, using wire or rope, which cuts into the horses' mouths, and can lead to paralysis of the lower lip. Excessive bareback riding causes saddle sores and of the 200 horses, only a proportion will allow themselves to be ridden, perhaps 30 or 40, and most of these have saddle sores. The sores may be initiated by the horses biting each other, particularly stallions, since there is no reproductive control or gelding of the stallions, and they comprise about 40% of the island's horse population. There are also reports of cruelty to the horses, such as using barbed wire to inflict injuries on the horses (Wilson, 2003).

The youths muster the horses in an attempt to ride them, and many horses seek refuge on the high ground. Some seek refuge in the sea but their movement

is restricted, and the youths can readily jump on their backs. Their sandy, nylon shorts provide an abrasive surface to create the saddle sores, like sandpaper. Once the riders are on the horses, they may ride them to exhaustion, over a whole day or more. A proportion of the horses become lame, which makes them even easier to mount.

The major lesson is that welfare is often reduced through ignorance and neglect, and is related to human social problems. Children need to be taught how to treat animals, they need to be gainfully occupied during free time. They need structure in their society to know where their position and their goals lie. They need training and instruction, in this case in horse management, but also in all aspects of life, and often the level of education is pitifully inadequate. In Australia horses have held a valued place in aboriginal society, so, for example. there has for a long time been a taboo against eating them. Many aboriginal workers are highly valued for both their horsemanship skills and their skill in managing cattle. This respect for the animals needs to be conveyed to the young members of society in a structured teaching programme. In this instance a serious animal welfare issue is interwoven into societal problems, with racial issues, democracy and governance being at the heart of the problem. Attempts to solve the problem have resulted in horses being removed, impounded when their saddle sores become too bad, which usually means that the youths work even harder to gain new recruits from the horse population, so an even greater number of animals suffer. These problems have to be addressed from all angles, by social workers, educators and animal welfare staff, but with the active involvement of the tribal Elders.

Chapter 7
Teaching Animal Welfare

Animal welfare knowledge – veterinary training in animal welfare – animal ethical considerations in veterinary medicine – decision making for the treatment of animals by veterinarians

Animal welfare knowledge, correctly disseminated to those directly managing animals, can often achieve improvements in animal welfare much faster in the short term than research. This knowledge is potentially disseminated in schools, universities and in adult education. At present the emphasis is on university education, with animal welfare being taught in veterinary, animal science and agriculture courses. Agricultural colleges often run animal care and stockmanship courses, which aim to improve animal management, even though they often don't specifically consider animal welfare. Much of the responsibility for animal welfare lies directly with animal carers. The declining attractiveness in many countries of agricultural animal management jobs is a serious cause for concern in relation to animal welfare improvement, and is partly due to the greater attractiveness of jobs in cities. In addition to this concern, the increased size of industrialised livestock farms means that the contact between stockperson and animal is limited. No longer can the conscience of the stockperson be relied upon to prevent the ill-treatment of animals. This is causing a greater reliance on regulatory control, but because of the diverse nature of farming enterprises, it is difficult to apply. The cost is ultimately borne by the consumer in many cases, and the industry progression to industrialised systems should be considered in the light of the cost of regulating them from a welfare and environmental perspective. The decline in attractiveness of farm stockperson positions and farm veterinary practices in many parts of the world is a source for concern, which needs to be considered in the light of the cost of regulating standards, as well as the reduced attractiveness to stockpeople and vets of working in industrialized systems of animal production.

Veterinarians are often at the vanguard of animal welfare concerns, and they are held in high regard by members of society (Seabrook and Wilkinson, 2000). They have a particular role by virtue of their clinical skills, but their diagnosis and treatment of diseases and correct use of prophylaxis are all key elements

C. Phillips, *The Welfare of Animals*, Animal Welfare 8,
DOI 10.1007/978-1-4020-9219-0_7, © Springer Science+Business Media B.V. 2009

of their profession. The role of veterinarians is being strengthened by new legislation and the codes, particularly concerning the duty of care, as opposed to cruelty being the main basis for prosecutions. In teaching, as well, there's also a key role for veterinarians, with about 5% of graduates entering this profession. Some will be involved in teaching other veterinarians, and veterinary nursing students, but many will be involved in agriculture or animal science programmes. Veterinary graduates also enter research programmes, but because of the long training that they have already undergone, regrettably few enter doctoral research training. Veterinary graduates play a key role in government, and animal welfare issues may be included in statutory work, such as amending, redefining and administering legislation and codes of practice. In the recently emerging activities of the World Animal Health Organisation in establishing global animal welfare standards, veterinarians have played a prominent role in guiding and governing welfare practices.

Veterinarians will be also involved in more minor roles – the ethical approval of research, for example. Australian Animal Ethics Committees all have to have a (Category A) veterinary member. Many veterinarians become involved in legal cases, providing expert witness and opinion.

The activities of veterinarians are not solely defined by the universities that provide their training, because the practice of veterinarians is in many countries governed by legislation through Act of Parliament. Thus a statutory body exists in most countries – in Australia, the Veterinary Surgeons Board. In the United Kingdom, students are admitted to the Royal College of Veterinary Surgeons (RCVS) at or soon after graduation, in a ceremony that recognises that welfare is of paramount importance in their qualification. Graduating students swear an oath, which acknowledges the prime importance of their welfare responsibilities:

> "I promise, above all, that I will pursue the work of my profession with uprightness of conduct and that my constant endeavour will be to ensure the welfare of animals committed to my care."

The United Kingdom's Royal College of Veterinary Surgeons has also defined essential competencies, including the recognition of clinical signs of specified diseases and effective treatment. Several essential competencies relate directly to welfare and ethics (Table 7.1). Students, on graduating, have to be aware of their ethical responsibilities and the emotional climate in which they function, which will govern the treatment that they give. They have to be aware of the ethical codes, of their own personal limitations, and must seek treatment from elsewhere if they feel that they can't conduct the necessary surgery. They have to be aware of legislation relating to welfare and should promote welfare. They should euthanase with sensitivity to the feelings of the owner of the animal, address and implement welfare records and advise on accepted welfare standards.

Table 7.1 Core competencies established by the Royal College of Veterinary Surgeons (RCVS) that relate to animal welfare and ethics

• Being aware of ethical responsibilities
• Awareness of 'emotional climate'
• Ethical codes
• Personal limitations re treatments
• Legislation relating to welfare
• Promotion of welfare
• Euthanasing animals with sensitivity to feelings of owner
• Assessing and implementing welfare records
• Advising on accepted welfare standards

There are many skills required of veterinarians and welfare concern is central to their profession. The key skills are disease detection and reporting, including surgical treatment, drug therapy, epidemiology, population medicine and preventive medicine. In addition, they must understand animal behaviour, nutrition and reproduction sufficiently well to be able to advise how to prevent or cure disease. They have to make treatment decisions in accord with ethical norms, and they have to know and apply relevant animal law and codes of practice. They should handle their patient and the owner with care and diplomacy, particularly in relation to small animal practice, and must often manage their own business.

Veterinarians often have to give guidance on ethical issues, and in doing so they must balance the requirements and demands of a number of different interest groups. They have responsibilities to their clients, to their patients, to the public, in managing the welfare of animals in the community, and to other veterinarians, in terms of maintaining professional standards and upholding the reputation of the profession.

Teaching Veterinarians About Animal Welfare

Almost the entire veterinary course could be said to be aimed at improving animal welfare, and preserving welfare should be a central tenet in all the core courses in veterinary training (anatomy, physiology, biochemistry, pharmacology, pathology, biology of diseases, epidemiology, oncology, reproduction, animal husbandry, animal behaviour, nutrition, species medicine and clinical practice). The only parts of the course that are not directly concerned with aspects of welfare are some zoonotic diseases, with the aim being to uphold human, rather than animal health, and some toxic substances such as cadmium, which rarely presents problems to domestic animals but can present problems for the terminal consumer, humans, who are therefore subject to the greatest problems of accumulation.

In addition to the core courses, veterinarians may study professional practice, which is usually focused on client and business management communication, skills, etc. This may include aspects of animal welfare management. Other optional subjects include wildlife and exotic animal medicine, poultry medicine and advanced nutrition[1]. Animal welfare is taught as a separate subject in many veterinary colleges, and this is likely to cover some of the theoretical background – ethical approaches to managing animals, which will influence animal welfare concerns, the means of measuring animal welfare, contrasting physiological and behavioural methods, and relations between the major animal diseases and welfare. It is useful, but less essential to highlight the major animal welfare issues in each animal management system. Much of this can be taught in other subjects, parasitology for example, but it is helpful also to have a broad-ranging perspective which combines the considerations of animal welfare, economics and environmental sustainability for each system. Animal handling and transport can also be included. The objective should be to enhance the students' welfare knowledge so that their clinical and paraclinical skills can be used to best effect.

The veterinarian qualifies with clinical, para-clinical and associated clinical skills. Many, but not all of the clinical skills are unique to veterinarians, and they are derived from a sound medical knowledge. As in human medicine, the amount of knowledge is increasing very rapidly, and the increased expectations of owners, particularly of companion animals, encourages the introduction of advanced medical science into the program. Para-clinical skills, such as in animal behaviour, epidemiology, production medicine, nutrition are also growing in importance. Associated skills include health and welfare management, economics, animal ethics, role of animals in society, client management, etc. In this field, the level of skills will probably depend on the level of interest of the student and the particular interests of the university faculty.

There is a transition from farm to small animal practice and usually between two thirds and three quarters of graduates will small animal practice. The remainder mostly enter large animal practice. Small animal practitioners have particular need of para-clinical and associated skills, especially animal behaviour, nutrition of small animals and client management skills, because the problems that they have to deal with may relate to the client's management of the animals.

The recent 'gender switch' in veterinary education is likely to have an impact on welfare management. The majority of all veterinarians practising in developed countries will soon be female. At the beginning of the 1980s, there were approximately 92% male and 8% female students on veterinary courses, and now it's almost reversed, approximately 20%–30% male and 70%–80% female, in most of the developed world. The reasons are numerous, including

[1] RCVS specifies that their veterinarians do not have to be advanced nutritionists, in particular in relation to dairy cow nutrition, since there are others who will take this role.

females performing better academically in late teens, an across-discipline tendency for more females to enter university, the job characteristics of low salary and long hours being more likely to be accepted by women, the transition from farm to small animal work and females being often more patient with animals than males. Women are keener to work with small animals, especially if this includes regular working hours, and they particularly value good workplace relationships. There is little truth to the traditional image of women struggling to cope with an extended calving, and with their smaller hands than men, they may be better at maneuvering calves and lambs in a malpresentation than men. Women tend to be more concerned about animal welfare than men, in a survey of attitudes of international male and female students towards welfare issues, females rated the issues on average 4.0 out of 7 and males only 3.6, with 1 representing little concern and 7 a major concern (Phillips and McCulloch, 2005). The increasing science content of veterinary medicine courses may be more attractive to males. Subjects such as oncology were barely considered 20 years ago, whereas today it is an important part of small animal medicine.

Teaching correct attitudes to animals is a vital part of veterinary education. A sound understanding of animal ethics is particularly needed to ensure that the most appropriate decisions are taken in treating animals (Rollin, 2006). Terminal surgery practicals are considered by many to be essential, because they expose students to surgical practices which would be difficult to achieve using alternative teaching methods. Some universities utilise dogs from local pounds that would otherwise be euthanized, but students may have concerns about dogs being used for their benefit in this way, or about becoming desensitised to unnecessary death. There is a risk of stress and trauma to some of the students, particularly if they start with an apparently healthy dog, which is then surgically operated upon and euthanased by the students. The advantages and disadvantages of this particular use of dogs should be assessed by animal ethics committees that are usually responsible for approving the practicals. If students are suffering stress and trauma, veterinary faculties should be offering counselling facilities before, during and after a particular practice. Because of these controversies, many universities use pigs and sheep for this purpose, which could be considered speciesist, or arrange for cadavers to be donated from local veterinary practices or pounds. Guided teaching of veterinarians in commercial practices, shelters or pounds already occurs, but could be used to a greater extent. Learning on surplus animals or animals in developing countries presents another alternative. Other alternatives to using live animals for teaching, such as videos, models and computer simulations are being developed, and the American Veterinary Medical Association (AVMA) and the RCVS have already accredited some veterinary schools with 'no harm or kill' policies.

Another ethical issue relating to veterinary practice is that some students, particularly those from non-Christian countries, may have concerns about studying and treating food production animals. Muslims and Hindus are likely to have concerns about pig and beef cattle medicine, respectively. Students

should have the opportunity to have their ethical objections considered and the different persuasions of students acknowledged, as they are sincerely held and it takes courage for students to stand up against a majority view. There may be concerns amongst some students about visiting abattoirs, a topic which has been increasing in importance in the veterinary curriculum. There are many different ways in which students can be taught about the public health implications of veterinary medicine. Vegetarian students of veterinary medicine have to learn to trim chickens beaks, castrate lambs and calves and conduct other practices that allow the animals to be kept in intensive management systems. Veterinary students have a range of ethical persuasions, from those that are unwilling to treat farm animals, but accept the value of animals as companions for example, to those that treat animals as commodities and are focused mainly on developing a good clinical skills base. Although an industry body ensuring sound practice and learning is a major advantage for any profession with such responsibilities, the imposition of a compulsory framework of learning, which includes practices that some of the veterinary students do not agree with, is a major disadvantage of accreditation. Some of the more contentious practices should be optional and universities should be encouraged to offer the students choice and accredit them only in practices that they wish to study. They could then be licensed to practice only in areas that they are accredited in, and this accreditation could be acquired during their training degree, or indeed afterwards in dedicated courses. Such diversification would lead to more dedicated and skilled veterinarians, which would be a benefit for animal welfare. Specialisation is already possible through advanced courses, such as in exotic animal disease (EAD) recognition, in which case it is acknowledged that only veterinarians with the relevant postgraduate training should be involved in EAD diagnosis (Kerwick et al., 2008). The veterinary accreditation bodies should give careful consideration to allowing students to specialise in areas of animal medicine that are most appropriate to them, rather than requiring them to be able and by inference, willing, to treat all types of animals.

The veterinary profession is therefore changing rapidly. There are many more women, which may be beneficial because they tend to be more caring to animals than men, and there is a greater focus on companion animals. And the long-term trend is for an increasing demand for science in the course, in response to public demand. Today's students are likely to be concerned about the ethics of animal use.

Decision Making for the Treatment of Animals by Veterinarians

After graduation veterinary students will be faced with many ethical dilemmas, not least the decision of whether to treat an animal or not. This is likely to be made on many grounds, including the probability of the treatment being effective, the expected lifespan of the animal, the cost of treatment, the

value of the animal, the ability of the client to pay, and other risks, such as environmental or human health that are involved in the treatment. The major rule in decision making is to maximise utility. Sometimes the decision may be too hard, and the client may choose to avoid treatment in order to minimise their regret if things go wrong. If an animal is afflicted with a serious ailment, it is usually not seen as the owner's fault. However, if the owner opts to allow the animal to undergo major surgery, for example, then there would substantial and sometimes unbearable regret at having committed the animal to the surgery if it results in a worse welfare than if no treatment had been made. The risk of this may be particularly unbearable if the net result of surgery may shorten the animal's life if it goes wrong. The owner 'plays safe' by allowing the animal to live out its natural life, that way he or she absolves himself or herself of guilt, even if the outcome for the animal is likely to be worse than if some treatment is attempted. The owner may also feel that the decision is too big to make, and may need professional guidance, in part to absolve himself or herself of guilt if it goes wrong. Such circumstances may result in irrational decisions being taken by owners if no guidance is given, and it is necessary to consider whether the owner is the best person to make the judgement. In the same way that parents may make irrational judgements over whether their children should be medically treated, owners may need to be counselled by the veterinarian over whether their pets should be treated.

Some owners, particularly of companion animals, may go to the other extreme and feel that their animal's illness is their fault, and then they will go to any lengths to have the animal treated in the hope that a cure will be found. They cannot bring themselves to face the demise of the animal and again irrational decisions can be made, that veterinarians should counsel against. If there is little hope of drugs producing a cure in a specific case, there may still be a case for veterinarians advising treatment on the grounds that the experience gained may assist in future when animals are afflicted with the same disease.

Owners may feel that giving their animals at least a chance of continued life is a risk worth taking, and this makes them feel better. In this circumstance they must balance the risk of the utility to the animal with the utility of the risk that they might acquire through this course of action. In all events the veterinarians should counsel their client to choose in the best interests of the patient.

Chapter 8
Animal Welfare Science

Historical development – growth in animal welfare science – impact of animal welfare science on animal welfare – independence of research effort – industry funding of animal welfare research – Relationships between farm profitability and animal welfare: the lessons for animal welfare research

Historical Development

Compared with most other scientific disciplines, animal welfare is a relatively new science. Whilst philosophers and ethicists have debated the way in which animals should be treated for thousands of years, it is only in the last thirty years that a scientific approach has become properly established. There had been limited research in animal welfare over the course of the 20th C in particular humane killing methods, experimental techniques, pain control, treatment and prevention of painful diseases, and the University Federation for Animal Welfare had, amongst others, promoted a scientific approach to animal welfare since the 1920s (UFAW, undated). However, in the late 20th C the establishment of animal welfare positions in universities, journals focusing on animal welfare and courses teaching animal welfare as a science gave credibility to the contention that animal welfare could be considered a science. Furthermore, although agricultural research had attempted to improve conditions for farm animals for over one hundred years, the objective was to increase profit from animals, rather than improving their welfare *per se*.

Many of the principles for animal welfare reform were set in the mid 1960s, with the publication of Ruth Harrison's Animal Machines in 1965, and the Brambell report, which established the Five Freedom's in the same year (Brambell, 1965). However, it was not until the early 1980s that animal welfare science really began in earnest, fostered by a small group of British scientists, the foremost of which were David Woodgush, Donald Broom and Marian Dawkins. The forum for such scientists to meet and discuss their new interest was the Society for Veterinary Ethology,[1] which had been started by the Edinburgh veterinarians Andrew Fraser,

[1] The science of animal behaviour

C. Phillips, *The Welfare of Animals*, Animal Welfare 8,
DOI 10.1007/978-1-4020-9219-0_8, © Springer Science+Business Media B.V. 2009

Alex Brownlea and Bill Jackson in the late 1960s. Although originally confined to veterinarians, the SVE was soon opened up to other interested scientists in the early 1970s, principally David Woodgush and later, Donald Broom and Ian Duncan. An early task was to convince people that animal welfare was a legitimate scientific discipline, particularly in some of the prestigious British universities where many of the key scientists held academic positions. Pain, anger and other terms that might imply emotion were rarely used at this stage (Broom, personal communication). Later the SVE became the International Society for Applied Ethology, the major international society dedicated to animal welfare issues, despite its obvious focus on animal behaviour.

The foundation of animal welfare science in ethology has had a profound impact on the way in which the science has developed. Although many would see components of veterinary medicine, animal physiology and animal psychology as being of at least equal importance, the fact that animal welfare science began with a strong connection to ethology has unfortunately sometimes distanced it from other relevant disciplines, in particular veterinary medicine. Ownership of the new discipline should not be claimed by any branch of science, and the dedication of the early founders of this should be respected for the breadth of scientific disciplines which they encouraged, not just their former interests. Thus, Donald Broom embraced agricultural science, animal physiology, philosophy and veterinary medicine in his research, Marian Dawkins has vigorously pursued animal psychology and cognition, and undoubtedly David Woodgush would have done the same, were it not for his early death. Since the pioneers developed and formulated the new discipline, the science has grown with the support of governments in 2005, non-government organizations and philanthropists. However, the number of scientists worldwide teaching and carrying out research in animal welfare on a permanent or semi-permanent basis was still less than one hundred in 2005, comprising 19 professors of animal welfare, mostly in veterinary schools, 12 other professors who mainly work in animal welfare and 45 other active scientists (Broom, 2005). There are also philosophers teaching ethics of animal use and veterinarians and animal scientists teaching animal care/husbandry. Most of these 76 scientists working directly in animal welfare were appointed after 1995, and the majority of the appointments, for example 13 out of the 19 professors of animal welfare, are in the English-speaking countries: the United Kingdom, Canada, the United States of America, New Zealand and Australia. The concentration of animal welfare professors in veterinary schools results from a desire by many, including politicians, to closely connect animal welfare science to animal health. However, although most research by veterinary faculty members is aimed at diseases that adversely affect animal welfare, there is a separate, more holistic focus for animal welfare research in the 21st C, which embraces sociology (understanding attitudes to animal welfare), philosophy (examining the moral basis for welfare provision), nutrition and reproduction (as major animal needs), fundamental biology (for strategic advances) and psychology (for the mental state of animals). Veterinary schools are traditionally narrowly focused on clinical

disorders and pathology, especially infectious diseases, which is understandable because even this is a large remit given the number of species covered. Ultimately animal welfare study will probably stand alone as a university faculty, and attempts to centralize research in one or two locations in each country are a step in this direction.

Growth in Animal Welfare Science

As public concern for the welfare of animals has grown, there has been an increase in attention given to the science, which is seen by many as the best solution to the increasingly entrenched positions occupied by the animal rights lobby and those who make their living from animal management. Care must be taken that the animal industries do not hide behind the need for scientific evidence before making changes, because this takes many years to gather, and in the absence of robust science, there still may be a justification for change on the basis of public opinion, or the opinion of those knowledgeable of the industry.

The scale of the recent increase in science is evident from the increase in the number of publications on animal welfare or wellbeing in scientific journals, reviewed for the RSPCA in 2005 (Phillips, 2005a) (Fig. 8.1). Of course, there have been many articles written that are of relevance to animal welfare, but

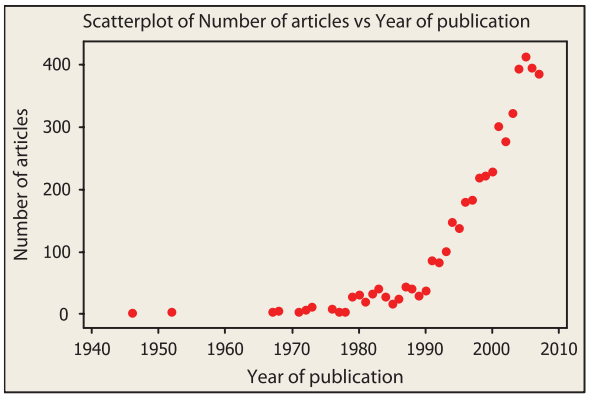

Fig. 8.1 Number of animal welfare articles[2] in the electronic database of scientific journal articles, Web of Science, 1946–2005

[2] All articles containing 'animal welfare' in the abstract or key words in the electronic database of publications in scientific journals, Web of Science. Note that in America the term 'well-being' is sometimes used in preference to 'welfare', but in this search only nine articles contained 'animal wellbeing' and not 'animal welfare'. In addition some articles address animal welfare without specifically mentioning the term, but this survey demonstrates the increase in popularity in animal welfare science as an entity.

which do not explicitly mention the term 'animal welfare' or 'animal wellbeing', but there is still an underlying trend of increasing popularity of the discipline, and the graph shows an exponential increase starting about 1987. The reasons for the increase in public concern for animal welfare are much debated (e.g. by Rollin, 2003), and these have been considered in chapter 6.

The different research disciplines represented by articles on animal welfare, as classified by the Web of Science, are listed in Table 8.1. Despite the origin of the animal welfare science being in animal ethology, veterinary sciences are responsible for over half of the publications, with zoology and domestic animal science (including ethology) accounting for most of the rest. A small minority are devoted to ethical and economic issues.

The number of publications in the areas defined by the Five Freedoms, that are commonly used to describe animal welfare needs, is presented in Table 8.2. Since veterinary sciences are well represented in animal welfare publications, it is not surprising that the majority of publications are devoted to *health aspects*, and to a lesser extent *behaviour*. Investigations of *fear* and *discomfort* are few, perhaps because they are less easily identified as serious welfare problems in animals, compared to disease and behaviour. *Nutrition* is also not well researched in relation to animal welfare, despite the long standing record of farm animal nutritional investigation in the countries leading animal welfare research. This may be partly because its impact on animal welfare is less obvious than disease, but also because farm animals are generally well fed or they would be unproductive, albeit often with foods that differ markedly from those that they evolved to consume. The other major animal 'need' is reproduction, although it is partially covered under 'normal behaviour'. The number of articles containing the terms 'animal welfare' and 'reproduction, breeding or prolificacy' was only 188 over this time period, demonstrating that the area receives little attention.

Table 8.1 Number and proportion of animal welfare scientific papers in different disciplines, as determined from the Web of Science electronic database of scientific journal articles from 1945–2005

Field	No.	%
Veterinary sciences	1110	55.5
Zoology	481	24.1
Agriculture	473	23.7
Toxicology and medicine	80	4.0
Environment	79	3.9
Food science and technology	69	3.5
Behavioural sciences	57	2.9
Ethics	52	2.6
History and philosophy of science	45	2.2
Psychology, biology	33	1.7
Ecology	26	1.3
Other	157	7.8

Table 8.2 Number and proportion of animal welfare scientific papers in the Five Freedoms (and respective key words), as determined from the Web of Science electronic database of scientific journal articles from 1945–2005

Freedom from pain/injury (pain, injury, disease, health)	4793
Freedom to perform normal behaviour (behaviour, behavior)	2599
Freedom from fear and distress (fear, distress, stress)	1286[3]
Freedom from hunger and thirst (nutrition, nutrient, food, eat, hunger, thirst, drink)	1247
Freedom from discomfort (discomfort, comfort, space)	486[4]

The language of most (85%) articles on 'animal welfare' was, as expected, English, however, the significant proportion of articles in German (12%) is worthy of note, given that the proportion of articles in other disciplines that are in German is less: nutrition (4.6%), animal reproduction (2.5%), toxicology (2.0%). This shows a focus of attention to animal welfare in the German-speaking countries.

There are many journals in which animal welfare articles were published (Table 8.3), with the majority being in two journals specializing in animal welfare and ethology: Animal Welfare and Applied Animal Behaviour Science. Veterinary journals published a significant number of animal welfare articles, but the number in traditional animal science journals (Journal of Animal

Table 8.3 Number and proportion of animal welfare scientific papers in different journals, as determined from the Web of Science electronic database of scientific journal articles from 1945–2005

Journal	No. papers	%
Animal Welfare	354	17.7
Applied Animal Behaviour Science	120	6.0
Veterinary Record	91	4.5
Deutsche Tierarztliche Wochenschrift	84	4.2
Alternatives to Laboratory Animals	82	4.1
Journal of the American Veterinary Medical Association	42	2.1
Acta Agriculturae Scandinavica	41	2.1
Australian Veterinary Journal	40	2.0
Journal of Agricultural and Environmental Ethics	39	1.9
Alternativen zu Tierexperimenten	36	1.8
Laboratory Animals	35	1.8
Journal of Animal Science	34	1.7
Zuchtungskunde	29	1.5
Animal Science	27	1.4
Livestock Production Science	27	1.4
Other	170	7.7

[3] Only 424 if stress omitted
[4] Only 114 if space omitted

Science, Animal Science, Livestock Production Science etc.) was small. This may reflect a reluctance of some editors in these traditionally production-orientated journals to accept scientific papers on the new science of animal welfare or a reluctance of authors to relate their work to animal welfare in the titles or abstracts of the article.

Many organizations were responsible for conducting the research in animal welfare (Table 8.4). The preponderance of British and other northern European institutions is evident, as well as the lead taken by universities in this field, as compared with research institutions. The only major institution in the southern hemisphere publishing in this field was the University of Massey in New Zealand, although this has now been joined by a substantial commitment to animal welfare research in Australia. There has therefore been a more progressive attitude to animal welfare science in northern Europe than elsewhere (Broom, 1992). Conditions, attitudes and types of production systems are very different in the two hemispheres, and this will determine the optimum welfare status for the animals.

The types of animals that were the subject of the animal welfare research are listed in Table 8.5. The major focus was on farm animals, with cattle, pigs and poultry featuring most strongly. The quantity of research on cattle and sheep is surprisingly large, given that most public concern is focused on the pig and poultry industries because of the intensive housing systems and because of their size compared with, for example, the cattle and sheep industries (see Chapter 8). The focus on farm animals, compared to other types of animals, may reflect the fact that research facilities and personnel were already established for the purposed of increasing productivity in Northern European countries, particularly after the Second World War when these countries had been subjected to food shortages. The changed directive of many of these research units is away from research focused on increasing farm productivity towards sustainable

Table 8.4 Number and proportion of animal welfare scientific papers from different organisations, as determined from the Web of Science electronic database of scientific journal articles from 1945–2005

Organisation	No. papers	%
Univ. Bristol	68	3.4
Univ. Edinburgh	49	2.5
Univ. Utrecht	47	2.4
Royal Vet & Agr Univ.	42	2.1
Univ. Oxford	38	1.9
Swedish Univ. Agr. Sci.	34	1.7
Univ. Cambridge	33	1.7
Danish Inst. Agr. Sci.	30	1.5
Scottish Agr. Coll.	29	1.5
INRA, France	25	1.2
Massey Univ.	24	1.2
Other	222	10.3

Table 8.5 Number and proportion of animal welfare scientific papers using the different animal types,[5] as determined from the Web of Science electronic database of scientific journal articles from 1945–2005

Animal type	Number of articles
Food animals	
Cattle	557
Pigs	506
Poultry	413
Sheep	270
Goats	21
Total	1767
Entertainment animals	
Racing	457
Zoo	78
Circus	8
Rodeo	1
Total	542
Experimental animals	
Mouse	114
Rat	27
Total	442
Companion animals	
Horse	109
Dog	78
Rabbit	45
Cat	39
Hamster/gerbil/guinea pig	27
Total	298
Fibre animals	
Fur	69
Mink	61
Wool	16
Total	137
Wild animals	116

[5] Words used to define animal types, in conjunction with the generic term
Cattle: calf, steer, bull, cow
Pig: piglet, swine, sow, boar
Sheep: lamb, ewe, ram, wether
Poultry: chicken, hen, cockerel, chick
Goat: kid, nanny, billy, caprine
Cat: kitten
Dog: puppy, hound
Horse: equine, stallion, mare, colt (not racing/race)
Rabbit: doe, buck, bunny
Hamster, gerbil, guinea pig
Mouse: mice, murine

farming systems that do not damage the environment and take account of consumer demands for improved welfare of the animals. Such established research capabilities have not been available for other types of animal use, such as zoo or companion animals, even though the public have considerable concerns about the welfare of these animals. The research capability in farm animals has matched the concerns by industry that consumers may be influenced in their buying habits by welfare issues, and therefore more research funding is provided by farming than other animal industries. Hence the attention paid to farm animals by the scientific research community is greater than that paid to entertainment, experimental, companion, fibre and wild animals together (Table 8.5). Of the other areas, only racing animals commanded significant attention, which was predominantly research on horses.

Identifying the most important animal welfare problems that industries have, does not necessarily indicate where changes should be made, since the most serious problems may have greatest commercial impact. For example, the perceived biggest improvement in the welfare of cattle might be reducing the duration of transport, but this would render production in remote areas difficult, therefore more achievable goals, such as improving nutrition, might be more appropriate targets. The research sponsored by the farming industry is therefore largely directed at making the greatest improvement in welfare with minimal impact on production efficiency. Some topics that deserve research attention because of their significance to welfare may be avoided because of the potential impact on production efficiency. However, if the public find a particular practice offensive, for example mulesing of sheep in Australia, there may be sudden changes demanded following campaigns by the animal activist groups. Industry must be proactive in researching alternatives to any practice that is likely to have a major impact on welfare, as well as being aware of public concerns and how they change over time. Regrettably, only a small minority of scientists are proactive in animal welfare research, attempting to work on areas that *they* believe could bring dividends, because they are reliant on research funding from industry. This reflects the change in Western universities from curiosity-led research to that driven by ambitious goals for the scientists, in terms of research grant income, and full cost recovery by the university. This progress will not necessarily lead to the most rapid improvement of animal welfare, because strategic research is likely to be scarce, with short term welfare problems dominating the research conducted. Research on some issues may be so far from identifying a solution that industry is unwilling to commit funding. Such is likely to be the case in the under-researched Freedoms identified in Table 8.2 or species identified in Table 8.5.

Animal welfare research has the potential to generate further concerns by the public, if evaluation of welfare issues demonstrates greater impact on welfare than hitherto believed. Therefore industries may avoid important areas because any changes recommended following such research could reduce the profitability of the animal enterprise. Unscrupulous industries may even attempt to use research to justify existing practices. An element of animal welfare research,

at least, should be under the control of bodies other than those industries that are directly involved, for example, government, the universities and animal welfare organizations. Governments should be aware of significant welfare problems that industries avoid because of their commercial significance or the considerable funds required to provide solutions. They should maintain an overview and some control over funds provided for animal welfare scientists from the industrial sectors, particularly if they are matching the industry funding with public money.

Impact of Animal Welfare Science on Animal Welfare

Despite this significant and continued increase in scientific activity in the field of animal welfare, it would be rash to assume that this is having a major impact on animal welfare. Our attitude towards animal welfare is as much governed by our gender, culture and education as it is by the science that has been conducted to evaluate and improve standards of animal care (Thompson et al., 2007). In the short term, giving advice to those looking after animals is likely to bring about the greatest improvement (Anderson, 2007), however, in the long term a systematic and prolonged research effort will produce significant dividends (Blokhuis et al., 2000). The areas in which research is most likely to have a significant impact are amending or redefining legislation, improving the codes of practice or assurance schemes, and improving management practices involved in the husbanding of animals. It will also sometimes have an indirect impact by informing the public and research funders of latest developments in issues, which may then translate into additional funds or concern expressed by the public.

Independence of Research Effort

The animal industries are constantly being challenged by welfare activists. However, although their concern is well meant, they have different views on what constitutes the most serious welfare issues, focusing on invasive practices, compared to those directly involved in the industry, who focus on longer term issues (Wojciechowska et al., 2006; Cross et al., 2008a, b). It is likely that stakeholders in the industry are better informed on the most pertinent issues to challenge animals within their care, although it is possible that some of them become inured to the pain and stress involved in the most invasive procedures over time. The ultimate test of whether practices are harmful to animals must be by well-planned, co-ordinated research, and in many countries welfare research in specific industry sectors is now managed by a research and development corporation funded by industry, often by levies raised from industry members. These research and development corporations may receive at least matched

funding from government as part of the effort to develop a state-of-the-art industry. However, many welfare activists' perceived improved welfare systems for animal management would be expensive both to effect the change and to maintain the system into the future, and so the animal industries have a vested interest in procuring research that demonstrates that their practices do not actually cause damage or harm to the animals. Researchers may be under pressure from their university or institute to generate research income from external sources and should have strict ethical standards to preserve their integrity as animal welfare scientists. The following principles are a minimum set of ethical guidelines for animal welfare scientific research work:

- The principle research activities should have animal welfare and/or ethics as the primary focus
- The results of research should be in the public domain, particularly if supported by public money, and if necessary after a time for industry to prepare for any necessary changes
- Research should not be conducted if it causes animals to suffer unnecessarily
- An independent, evidence-based approach to welfare issues is essential
- Publicity for the research should be approved by the scientific leader, and if necessary by the sponsor of the research

Industry Funding of Animal Welfare Research

There is concern nowadays that industry is corrupting university research, which may be relevant to animal welfare considerations:

> We must ensure that some areas of science remain free of commercialization. It must not be a requirement that all research 'pays'. The independence of science has values that are measurable in ways that are not financial. Scientists themselves have to speak out when commerce corrodes disinterest. Then we can renew the presumption that scientists are honest, disinterested and incorruptible.
>
> Kennedy et al. (2007).

Scientists used to be highly respected for their integrity. In the days of Victorian scientific endeavour, the financial rewards to scientists were small. Most had other means of support, and it was considered an honourable pursuit for clergymen or explorers. Darwin waited until the last possible moment to publish his most famous treatise on evolution (Darwin, 1857), knowing that he was not alone in his discovery. The delay was due to his sense of responsibility to the population of the United Kingdom. With admirable foresight, he knew that his results had profound implications for religious believers and possibly beyond, and he wanted to delay the onset of the attention that he knew would detract from his work. His motivation was clearly to advance science, not his own scientific standing. However, nowadays the system of rewarding scientists only if they produce major publications has fostered some unethical practices, such as repeat publishing of the same results.

In many developed countries, industry funds a significant proportion of animal welfare research. Some of this may be to increase profits, for example by control of diseases or an economically viable increase in productivity due to alleviation of stress. However, welfare research could also decrease profitability of farming units, for example a discovery that farm animals need more space, even though they do not produce more product, would potentially improve welfare and decrease profits if implemented. Industry is most likely to fund research in which both animal welfare and industry profitability are likely to be increased. They are less likely to fund work in which profit is reduced if welfare is increased, for example research on stocking density of animals during transport. This will be increasingly unlikely to occur as scientists develop all the methods of improving welfare that do not involve reductions in profit. Of course even if profit is reduced in the short term, in the long term a better market may be accessible if welfare is improved, such as to consumers paying more to purchase products from animals kept in high welfare systems.

Second, industry may fund research because changes to the production systems are being demanded by animal welfare activists, arguing that such changes cannot be made without scientific evaluations of welfare impacts. A major research programme can take ten years to complete, but is necessary to provide information for an informed decision. Thus in some countries, particularly those in which the industries have major economic significance, governments and industry may be reluctant to use expert opinion to establish standards, when no scientific information is available. European research on animal welfare is the most comprehensive, but is often seen as irrelevant outside of this region, because it was not conducted in the climate/situation of the country in question.

Relationships Between Farm Profitability and Animal Welfare: the Lessons for Animal Welfare Research

The level of animal welfare on production units is significantly affected by the quality of animal management, which also will have an important influence on the profitability of the unit. The most important animal management influences on welfare are the quality of stockpersonship, the infrastructure for animal keeping (buildings, handling facilities etc.), and the resources available for providing for the daily requirements of the animals, in particular food, water and veterinary attention. The industrialisation of animal food production industries over the last 50 years has made it imperative that there is a legislative framework for the maintenance of adequate animal welfare, as well as regular inspection of animal units, but this is a last resort, to deal with extreme cases of animal mismanagement. Regulatory control is particularly difficult because of the diverse nature of the systems used to produce animals, and hence the various interest groups are partly dependent on animal welfare being improved by good

husbandry and the improved profitability that will normally ensue. On a broad scale, husbandry extremes do lead to direct welfare correlates, for example a diseased animal will be less profitable than a healthy one, taking into account loss of productivity and treatment costs. However, there are numerous examples of systems or components of systems that are both unsupportive of good welfare and yet return good profits to the producer. Battery cages for chickens and veal calf production are two of the best known examples, but there are also systems that regularly experience breakdowns in animal welfare when adequate resources and environmental conditions are not provided for the animals, such as barn and free range systems of egg production or feedlots for beef cattle. These still may be profitable systems at all other times. Furthermore, there are numerous practices that are the most economic option, but they do not necessarily lead to good welfare, such as early weaning of pigs and calves. Finally there are many practices that lead to a temporary reduction in welfare but in the long term will increase welfare as well as preserving the economic output of the system, such as some invasive procedures and preventative medicine, which entails catching and treating the animal, with all the associated stress. This emphasizes the need to research welfare measures over a long duration, and preferably the life time of the animal. The adverse effects of long-term stress on immunocompetence, particularly leucocytes, can clearly be demonstrated (Lin et al., 2003; Stoyanchev et al., 2007; Tuchscherer and Manteuffel, 2000). However, although they could adversely affect animal health, the hygienic conditions operated in many forms of intensive animal production, with limited exposure to external pathogens, mean that often animal health is not be affected.

The relationship between management practices and welfare is therefore not simple, but it is the belief of many that substantial improvements in animal welfare could be obtained on most animal farms by better research directed at management. Attention to detail, good observational skills, a thorough knowledge of animal keeping technologies and a dedication to the job are all essential attributes of good stockpeople that will improve conditions for animals in farms (Hemsworth and Coleman, 1998).

Chapter 9
The Scale and Intensity of the World's Animal Industries

Intensity of animal industries and corporate interests – Differences between intensive and extensive animal industries – Scale of the animal industries – Intensification of animal production for food – Changes in companion animal management

Intensity of Animal Industries and Corporate Interests

As a result of industrialization of agriculture following the Second World War, the profitability of farming animals for food was generally greater in the second half of the 20th C than the first (Clements, 2006). Although profit per farm increased over this period, it has been argued that decreased profit per animal may have resulted in reduced animal welfare (Fraser, 2005). Fraser argues that pressure from retailers reduces the product price, which reduces profit per animal and forces the farmer to reduce inputs. He cites two examples of welfare apparently being worse in low input outdoor pig production systems than intensive indoor production: first, a survey that found more lameness and shorter longevity of outdoor sows in Croatia, compared with indoor sows (Cox and Bilkei, 2004), and second, the trend towards higher levels of neonatal mortality in oudoor piglets, compared with those reared indoors (Kerr et al., 1988), which was also observed in Cox and Bilkei's survey. However, these are only components of the system and if, as well as sow lameness and piglet mortality, freedom of movement, freedom from pain and injury and opportunities for social interaction were considered, it is likely that the outdoor system would be judged to lead to better welfare. In addition there is probably considerable variation between farms in their welfare provision, particularly in outdoor systems with variable environmental conditions and a need for advanced management skills.

The increasing net worth of farms since the Second World War offers farmers the opportunity to invest to improve welfare. This is unlikely to involve reversion to traditional systems, which were usually based on low levels of mechanical input. Technical advances have enabled animal management to be automated and labour input to be reduced.

C. Phillips, *The Welfare of Animals*, Animal Welfare 8,
DOI 10.1007/978-1-4020-9219-0_9, © Springer Science+Business Media B.V. 2009

Intensification has been most actively embraced by corporate enterprise, which for example used their corporate investment potential to adopt intensive housing effectively in the latter part of the last century. This led to increased profitability and the emergence of a new industrial farming sector, based on corporate enterprise. This sector is now expanding rapidly, at the expense of family businesses, and it brings a new economic imperative to the animal industries. Even if automation can effectively improve animal management, the profit-driven enterprises can pose a challenge to animal welfare in the size of the operations, the potential lack of close contact between stockperson and animals, and the reliance on housing systems with relatively little space for its occupants. There is no universal truism that intensive systems are associated with low welfare and extensive systems with high, but if these challenges are not addressed an intensive system will inevitably lead to poor welfare. However, there are also occasions when large-scale corporate-owned livestock farms can utilize capital resources to sustain an enterprise when confronted with difficulties, such as drought, disease challenges etc, in a way that smaller family owned units could not. Multiple sites in a corporate beef enterprise, for example, facilitates the movement of cattle from one site to another when drought persists, when such a move from a privately-owned property would be more difficult, requiring negotiations to arrange agistment for the stock and the capital for the move.

Differences Between Intensive and Extensive Animal Industries

The principal differences between extensive and intensive animal industries are difficult to define. The most significant is that capital utilization is greater in the intensive system. The need for large amounts of capital to be injected into intensive systems tends to concentrate them into the hands of industry, which often has other assets and available finance. Small family operations, which were traditionally the normal systems of animal management in most countries, are increasingly rare. Occasionally this trend has been temporarily reversed, such as when the collective and state farms of the former communist countries of Eastern Europe and Asia were dismantled in the 1990s, and the land returned to the multiple previous owners (Rizov, 2003) However, following the rapid political change in these regions, small farms have exchanged hands regularly to make larger, more viable units. Extensive livestock production, in particular sheep, was a common path chosen by families with limited capital to start farming, but the low returns have resulted in farms rapidly being sold and combined into larger units.

Intensive units are more likely to be at the forefront of technology and engage in entrepreneurial activity in order to maximize profit, but they are also more likely to be indebted than small-holder farms. The latter are characterized by the multiple functions livestock serve, the integrated nature of

livestock activities, the multiple objectives of the producers, as well as poor infrastructure, markets, and access to information at the community level (McDermott et al., 1999). The reduced reliance on labour inputs and increased mechanization in intensive units could be viewed as more efficient, but has the disadvantage of a reduced ability to employ people in sometimes deprived rural districts or forcing them to look for non-farm income to alleviate poverty (McDermott et al., 1999). The increased labour efficiency is likely to result in weaker bonds between the animals and the stockmen, although it is sometimes argued that employing labour-saving technology, for example automatic milking for dairy cows, allows labour to be more effectively used in assessing the stock and detecting problems earlier.

Intensive units aim to maximize animal output per unit of food, and often offer highly processed energy and protein rich food to achieve this, which does not support normal feeding behaviour. The concentrated energy and protein feeds could alternatively be used for human consumption, whereas in extensive livestock units the feed is more likely to be pasture based and produced in areas that could not grow arable crops needed for human consumption. Intensive units often use animals that have been bred for high productivity, which further necessitates them being fed an energy and protein rich diet.

Scale of the Animal Industries

If intensification is reducing the welfare of animals, compared with the improved extensive systems that are available nowadays, attention for welfare reform should be focused on the large scale intensive industries, as well as those increasing in scale and those increasing in intensity. Although the global position is not always well understood, Table 9.1 represents an attempt to quantify the scale of different animal enterprises where there is a direct impact on animals.[1] On a global scale, the most numerous land-based animal industry is animals used for farming, with many more pigs and poultry than cattle and sheep, and the number of pig and poultry units expanding in response to the demand for more meat in developing countries (Table 9.2). Pigs and poultry are more easily kept in intensive units and they utilize high energy and protein feeds more efficiently than the ruminants like cattle and sheep, which are better suited to utilizing rough grazing pastures.

Ruth Harrison, in her influential book *Animal Machines* (Harrison, 1964), as well as drawing attention to the industrialization of poultry farms, also commented that farm animals were much more numerous than companion or laboratory animals and therefore deserved more attention (Broom, 2005). As

[1] There are indirect impacts, such as disease introduction or environmental change, which are almost impossible to quantify. Those presented are impacts that are the direct and immediate result of human activities.

Table 9.1 Estimated world population of animals in the major sectors, whose welfare is directly and immediately impacted upon by humans (see text for sources)

Animal group	Estimated population
Farm animals	
Ruminants	3 billion
Pigs/poultry	17 billion
Companion animals[2]	1–2 billion
Laboratory animals	50–70 million
Zoo animals[3]	1 million
Work/entertainment animals	100 million
Wild animals (annual mortality)	
Wild caught fish	70 billion
Bycatch	10 billion
Cat kills	12 billion
Road kills	1 billion
Death by habitat loss	Unknown
Total	Approximately 120 billion

well as numbers of animals involved, it is important to consider the extent of human involvement. For those whose focus is animal rights, interest will be focused on animals that are managed by humans, such as farm animals, and less on wild-caught animals, such as fish, that are affected by humans only

Table 9.2 World livestock populations in 1992 and 2001. From CAB International (2002)

	Population 1992	Population 2001	Percentage change
Donkey	43.7×10^6	42.0×10^6	– 2.29
Water buffalo	153.1×10^6	167.6×10^6	+ 9.50
Cattle	1302.8×10^6	1360.1×10^6	+ 4.41
Goat	597.6×10^6	693.5×10^6	+ 16.0
Horse	60.3×10^6	58.3×10^6	– 3.40
Pig	869.6×10^6	927.7×10^6	+ 6.68
Sheep	1161.3×10^6	1059.1×10^6	– 9.80
Camels	18.2×10^6	19.1×10^6	+ 5.17
Other camelids	5.41×10^6	6.20×10^6	+ 14.5
Mules	15.1×10^6	13.5×10^6	– 10.4
Rabbits	519.7×10^6	481.6×10^6	– 7.33
Rodents	22.9 x 10^6	14.9×10^6	– 34.9
Chickens	11500×10^6	14700×10^6	+ 27.3
Ducks	652.1×10^6	915.4×10^6	+ 40.4
Turkeys	223.4×10^6	241.4×10^6	+ 8.04
Geese	163.5×10^6	240.6×10^6	+ 47.2
Beehives	57.9×10^6	58.9×10^6	+ 1.68

[2] A restricted definition of companion is used here, including animals that provide friendship, but excluding those, such as ornamental fish, that are kept primarily for display purposes.
[3] The number of wild animals in 'rescue and rehabilitation' centres probably greatly exceeds the numbers in zoos, but would be difficult to quantify.

transiently at the end of their life. However, the impact of humans is not always negative; some animals are well cared for and derive much benefit from this symbiotic relationship.

Agricultural Animals

Cattle and sheep farms are usually less intensively managed than pig and poultry farms, with the latter usually housed in controlled environments. However, there has been a trend towards intensification of cattle production through the expansion of feedlot finishing in many of the major producing countries, with only a temporary retardation as a result of increased cost of high energy foods, because of their potential for biofuel production. Poultry units intensified in the latter part of the 20th C in response to demand for cheap meat and eggs and appear to have reached a point where further intensification, especially genetic increases in growth rate, will reduce the welfare of the bird, for example by increasing skeletal disorders (Tatara, 2006). The number of birds kept worldwide has expanded and also the size of individual farms. Some farms now house more than four million hens, and the majority of poultry production is in the hands of a small number of companies in countries such as the US, which have intensified the most. Here just 60 companies own nearly 80% of the country's birds, and many of these have fully integrated production systems, controlling the process from production of the food, growing the bird to slaughter, processing and marketing of the finished product. Increasingly, these companies operate internationally, taking advantage of reduced labour costs abroad to outsource some of their activities (USDA, undated). The intensification is driven by economies of scale that allow both greater mechanization and reduced purchase costs, of for example feed supplies, due the high volume being supplied. Modern egg processing machines can handle over a hundred thousand eggs per hour, which can only be provided by a large layer flock. To justify expenditure on such automation, US companies therefore have to manage several million birds (United Egg, 2007).

Some developing countries are only now establishing intensive farm animal production systems, which are replacing extensive, small-scale production in villages, even though they are not necessarily more biologically efficient or sustainable (Verhulst, 1993). However, in response to animal welfare concerns in developed countries, and strong economic competition between new entrants to the industry, extensification of individual farms, particularly in less profitable upland livestock farms seems likely (Matthews et al., 2006). There is much criticism of intensive animal food production industries, and a general belief that we should return to more extensive systems. This would probably benefit animal welfare in many cases, but we should not imagine that the extensive systems of producing food today are the same as the extensive systems used in the past. Indeed it is probably wrong to say that the movement from extensive

to intensive management in the latter half of the 20th C necessarily caused a reduction in animal welfare, a theory advanced by Rollin (2006). In the past, animal farming was often devastated by problems such as high mortality (as a result of failure to control virulent diseases, like rinderpest and tuberculosis in cattle), chronic undernutrition during winter or drought (because foods could not be adequately stored), and cramped housing conditions, that caused the rapid spread of infectious disease, such as tuberculosis. So, for example, the mortality of the livestock on the First Fleet sent from England to Australia at the end of the 18th C was about 50% (see page 111). This may be an extreme example, but in most other areas of production agriculture the major welfare indicators have improved. Hence the new extensive systems, that for example meet the demands of the public for more space for their animals, should only be introduced if welfare is improved. In some circumstances, such as the transition from a battery cage system for laying hens to a free range system in a harsh climate, the welfare of some birds may actually be reduced by extensification Feather pecking and even cannabilism are common in free range systems involving up to 18% of birds in some genotypes (Kjaer and Sorensen, 2002; Sedlackova et al., 2004), and the birds may make little use of the outside area if it is too hot or cold or there is insufficient cover (Dawkins et al., 2003).

Intensification of agricultural production brings many threats, not just to animal welfare, due to the concentration of wastes onto small sites, which has led to the bizarre spectacle of manure being transported from northern Holland, where pig farms are sited so that they can benefit from cheap grain near the ports, to southern Holland, where the soil can tolerate the manure without toxic substances, such as copper, accumulating to dangerous levels (Westhoek et al., 2004). Another threat from intensive production is the reduction in biodiversity, as companies use only animals with genetics suitable for the economic climate of today. Short-term profit is maintained but the gene pool is reduced and changes in the future, for example a demand for a return to more extensive production, would leave the industry woefully lacking in suitable animals from which to choose. A most extreme example of this is poultry production, where fewer than two dozen companies worldwide control the production of the breeding (grandparent) stock (Hoffmann, 2005). These birds are developed for high egg production or muscle growth from energy-rich, cereal-based diets. If the cereals were required exclusively for human consumption, these birds would be unsuitable for less concentrated diets.

Most people do not support intensive production, for example a survey of Australians living in Canberra that showed that nearly three quarters of the public would support banning cages for poultry (Greens, 2007), but this often does not translate into purchasing preferences, when it comes to choosing from a variety of products (Heleski et al., 2006). There are several possible reasons. First the public do not yet understand that banning cages will inevitably increase cost. Second, the food purchasers in the family are prepared to sacrifice

the moral standards provided for the birds for the financial benefit of their family. In the early days of intensification, the public could be excused for not knowing how chickens were kept in the new 'battery' farms. Nowadays, with greater publicity, particularly by high profile personalities, more use of video technology and major campaigns by the activist groups, few can be unaware that intensive production is believed by at least activists to be damaging the animals' welfare. A third possibility that food purchasing habits do not always agree with people's sentiment about production systems is that many people's food consumption habits tend to be conservative, emulating their parents' diet (Montonen et al., 2005). Changes in dietary preferences take time to evolve, but the recent increase in sales of food from animals with improved welfare standards is evidence that purchasing habits may indeed be changing (Hoogland et al., 2005).

Companion Animals

It is difficult to define the exact group of animals commonly referred to as companion animals. In essence the term refers to animals with which something is shared. This could just be time, in which case non-domesticated animals such as birds and fish would be included (CAWC, 2003). However, if companion animals are providing friendship they would include mainly domesticated animals, especially cats, dogs and horses, although there undoubtedly many individual examples of captive wild animals providing friendship in special circumstances. For the most part, fish, reptiles and possibly birds are kept for other reasons, the beauty and extraordinary nature of their bodies and songs, their behaviour and in the case of some birds, their ability to mimic humans. Determining populations of non-domesticated companion animals is difficult and has necessitated that a restricted estimate of numbers, assuming that the global dog and cat populations to each be approximately 40%, with 20% other animals, principally horses. Others estimate the proportions as 36% dogs, 32% cats and 32% other for the US (AVMA, undated; Belotto and Silva, 2006). About 80% of the cats and dogs worldwide are strays (Butcher, 2006; Davies, 2006).

Total worldwide companion animal populations are much less than for farm animals, estimated to be 150 million in the United States, 500 million in Europe and 100 million in the China (WSPA, undated, data from 2002, the European Union, 2005, and Li, 2004, respectively). In China, the population of companion animals is predicted to expand rapidly because of strict control of the number of human offspring in families and the people's growing wealth. The official press agency of the government predicted a five-fold increase between 2004 and 2009 (Li, 2004). In many countries there is a change in the management of companion animals, which resembles the intensification of the farm animal production. It takes the form of less contact with the owners and less space for living, and arises because first, within a family it is more likely that

both parents will be working than in the past, and second, people are moving into high density housing with no garden or land for the animals to use, which means that they are often confined indoors all day by themselves. In addition there is increasingly less opportunity to exercise dogs off leash, with small areas being devoted to such activity in the major towns and cities and restrictions being placed on use of open land and beaches.

The large numbers of animals euthanased in shelters each year continues to be a major cause for concern. Estimates in the United States vary from 3–4 million (HSUS, 2005) to 10 million (AH, 1997) cats and dogs euthanased annually.

Laboratory Animals

The number of laboratory animals worldwide is hard to estimate because countries record the different species used in different ways and some record none at all. A few record all animals used. Clearly the total number used annually is much less than the number of companion or farm animals. Recent estimates suggest that Australia,[4] UK, Canada and Italy respectively use annually approximately 5.8, 2.6, 1.7 and 0.9 million vertebrate animals annually for research, with a total for 15 European Union member states of 11.6 million animals in 1996 (Bayvel, 2004; Gauthier, 2004; Passantino et al., 2004; Anon, 1996). In Japan the data collected from universities, institutes and laboratory testing companies suggested that just over 10 million animals were used in 1995, but the number recorded had supposedly dropped to 5.6 million by 1998, mainly because concerns about adverse publicity caused many institutes involved in vaccine development to withhold information on the numbers of animals that they were using. In addition the Japanese government prevented stray dogs and cats in pounds from being used in research. In the USA only the number of non-human primates, cats, dogs, rabbits, hamsters and guinea-pigs used for research is recorded, which is perhaps only 4% of the total, that must include many mice and rats. Thus the total use of these six species in the USA, currently about 0.8 million per year, suggests a total vertebrate use of approximately 20 million per year.

Developing countries, particularly in south-east Asia, are increasing their animal research, partly because they are becoming more involved in medical research and partly because some scientists are moving there because stringent regulations are making it difficult to work freely and rapidly in developed countries where the public are more vocal about the animals' welfare. In some countries, such as the United Kingdom, governments are attempting to limit numbers to assuage public concerns, and there are reports of declining numbers of animals being used for research being since the 1980s in the UK, since about 1985 in the US and since the early 1990s in Canada (Gauthier, 2004). One

[4] In Australia the definition of animals used is likely to be more broad ranging than other countries, with a greater chance of double counting of animals by different institutions.

analyst believes that animal use for experimentation increased exponentially between 1910 until 1970 due to the development of biomedical disciplines, then declined due to greater public awareness, increased legislation and better quality of animals used in laboratories until the mid 1990s (Baumans, 2004). After this time, he believes that it has increased due to the increased use of large numbers of animals for genetic modification experiments. Although his sources of information are not clear, his total use of animals for research, at 75–100 million per year is similar, but slightly higher, to the estimate presented above. The United Kingdom publishes annual statistics on animal use, and these have recently shown small (1–2%) increases annually (Hudson, 2007). This is believed to be due to large-scale genetic experiments.

The most common laboratory animal is still the mouse, accounting for about two thirds of all procedures (Hudson, 2007). The number used increased in the 1980s due to their extensive use in molecular biology experiments, then in the 1990s decreased as in vitro models became more popular. More recently, in many institutions the use of mice for the production of transgenic mutants has been expanding due to technical developments (Gauthier, 2004). In this research thousands of animals are used in individual experiments in the hope that a few valuable mutants will result from genetic modifications. Previously only a few tens or hundreds of animals would be used for a single experiment.

Zoo Animals

Zoo animals are less numerous than most other forms of animal use, there being 1200 core zoos worldwide, with an estimated 1 million captive animals in total, and about 3000 vertebrate species exhibited in total (IUDZG/CBSG, 1993). Many of these contribute to the International Species Information System (ISIS), which involves 613 institutions from 70 countries on six continents. Members keep and share standardized information on more than 1.8 million zoological specimens of 10,000 taxa, but this includes invertebrates (World Association of Zoos and Aquariums, 2005). The number of animals worldwide may be increasing as zoos attempt to keep self-sustainable numbers for captive breeding and release programmes. However, there is also public pressure on zoos to treat animals well, which may result in some zoos keeping fewer species with additional space and enrichment for each. There are also many animals in sanctuaries and shelters, apart from companion animals, which it would be difficult to quantify because most are small and unregulated.

Utility Animals

Utility animals, for work or entertainment, number about 100 million, which are mainly horses used for agricultural work. The mechanization of the

agricultural industries in recent years is reducing the number of animals used for work, principally horses, but also some donkeys and cattle (Table 9.2). There are smaller numbers of animals used for entertainment, but the welfare and ethical impact can be extreme, for example the approximately 10,000 bulls that are slaughtered annually in bull fights worldwide (Catan, 2007). In addition to the obvious cruelty of the fight itself, the animals are selected at an early age by challenging them to determine their levels of aggression. They are kept on extensive pasturelands, so that they have little contact with humans, and their reaction to the matedor in the fight is then all the more valiant if they have not been subjugated by humans before. In some countries, such as Portugal and France, the bulls are fought but not killed in the ring, although they are slaughtered immediately afterwards. Extending the period of severe pain and cruel treatment in this way probably has an overall negative effect on the animal's welfare.

Wild Animals

Wild animals obviously number many billions, but only a proportion has their welfare impacted by man. This includes animals killed or maimed by vehicles, hunted animals, wild caught fish and those whose habitat has been affected or even destroyed by man.

Road kills are mainly mammals and birds, many of which are killed while feeding off other kills. Reptiles and amphibians are underrepresented. In Britain alone, an estimated 50,000 badgers, 100,000 foxes and 10 million birds are killed or maimed on the roads each year (Born Free Foundation, 2007). There are also many cats and dogs maimed or killed in road traffic accidents. In one Australian survey kangaroos were killed at a rate of 0.03 deaths/km/day on a major road, attracted to it by the proliferation of food supply on the verges of the road (Klocker et al., 2006). Most of these are killed at night, because the kangaroos freeze when spotlighted by a car's headlights.

To get a global figure for road kills, it is possible to relate the numbers killed in Britain to the distance vehicles travel on the roads. The car population in Britain is approximately 33 million, and vehicles travel about 500 billion km annually (Optimum Population Trust, 2007). Scaling this up worldwide, the number of vehicles is between 600 (Anon, 2007b) and 750 billion (Optimum Population Trust, 2007), and they are driven about 6500 billion kilometers annually. By this crude method of estimating the worldwide number killed or maimed on roads annually, it is probably about 130 million birds and 2 million mammals. However, in the US alone it has been estimated that about 365 million vertebrates are run over each year (Anon, 2007a), suggesting that the British figures are an underestimate. Also, with population growth and the number of cars increasing at about 2% annually, it is predicted that the number of car kilometers traveled annually worldwide could reach 70,000 billion by

2050, which would increase annual road kills/maims to at least 1.4 billion birds and 22 million mammals. In the face of this uncertainty on road kill statistics, it would seem likely that at least 1 billion vertebrates are currently killed annually on roads. In addition to the animal welfare issues that surround every road accident to an animal, the trauma and financial consequences to owners when domestic animals are killed or maimed on the roads is very significant. Animals that survive become nervous and frightened of cars; their owners let them outside less; most owners consider the emotional consequences to be severe, in comparison with the less serious financial consequences (Rochlitz, 2004).

Many countries sanction widespread slaughter of feral animals, in the belief that it helps to control the population. They may be slaughtered by shooting, hunting, mustering or the administration of poisons. Although statistics are hard to obtain, it is likely that several million rabbits, at least a million pigs, and smaller numbers of goats, horses, buffalo, donkeys, camels, foxes and wild cats are killed annually in Australia. The systematic killing of wild animals for food is perhaps most advanced in the case of kangaroo culling in Australia. Approximately 3 million are harvested annually, from a quota of almost 6 million (1.5% of the population)(RSPCA, 2002b). Commercial shooters are licensed and in some states the kangaroos must be shot in the head if they are to be sold commercially. The greatest concern is for the welfare of the young at foot and pouch young that will die when their mother is shot. Nevertheless, this probably represents a less significant impact on welfare than kangaroos that are maimed by vehicles which do not stop (RSPCA, 2002b).

Although these numbers of animals may seem considerable, they are small compared with the numbers of wild fish caught for human consumption. The commercial fishing quota is declining, but is still very substantial. United Kingdom commercial fishermen alone caught over one million tonnes of sea fish in 1997 (Parnell et al., 2000). Worldwide the total tonnage of wild caught fish, including shell fish, in 2001 was 92 million tonnes, five times greater than in 1950 (Vannuccini, 2003). At an average weight of 1.3 kg each (Karpov and Albin, 1995), there are approximately 70 billion fish caught annually. Most of these die by asphyxiation on the deck of the ship. The most numerous species are anchovy, pollock and mackerel. This does not include the bycatch, fish that are too small or of the wrong species for consumption, which may be discarded, made into fish paste or fishmeal for animal food. The weight of fish and other animals returned as bycatch is about 8% of the fish actually harvested, i.e. about 8 million tones globally each year (Kellcher, 2005), but they are smaller than the main catch, so the number of animals affected is greater. Bycatch species that are returned to the sea have a high mortality rate, as much as 50% for some species. Some progress in reducing the bycatch was made when driftnets were banned internationally in 1992. The impact of the bycatch on the ecology of the area and the biology of the species concerned is considerable (Dayton et al., 1996). Some countries are beginning to implement sustainable fishing policies that include a guiding principle that there will be no discards. It is not just the land animals affected by habitat destruction, but trawler fishing

has enabled considerable numbers of fish to be harvested and has been very damaging to the marine environment, especially where the nets are dragged along the bottom of the ocean. In addition, the welfare impact of commercial fishing is not just to the fish, since porpoises and other mammals are caught in the nets. Sea birds, especially diving birds, are killed by gill nets, and trawling along the bottom of the oceans has produced widespread destruction that must be affecting the entire ecosystem. Other human activities impact on the welfare of marine life. The underwater noise generated by shipping, and in particular the naval forces, is suspected of interfering with the navigation and communication systems of the higher mammals, such as whales and dolphins.

Although commercial fishing is declining, recreational fishing and fish farming are increasing. Recreational fishing has been increasing as people in developed countries have more leisure time, and in developed countries such as Australia and Canada it is estimated that approximately 17–25% of the population participate in this sport (Hardy-Smith, P. personal communication; Anon, 2008c). In Florida alone, the number of angling trips has increased from 2 to 5 million per annum over the last 20 years (Florida Fish and Wildlife Conservation Commission, 2007). The major welfare impacts are the pain induced by the hook and the pain endured between capture and death. The latter depends on species, with eels for example it is particularly slow. As well as utilization of fish for food and recreation, there are fish used for ornamental purposes and fish held in aquaria in restaurants before being killed and served fresh to the customers, a growing trend in many regions of the world.

In addition to animals that are deliberately killed by man, there is secondary killing by animals owned and managed by humans. The world domestic cat population, at approximately 0.5 billion, is responsible for the killing of several billion wild animals, mainly birds, rodents and amphibians each year. In the United States, it is estimated that there are approximately 90 million domestic cats and a similar number of feral ones. These together kill hundreds of millions of birds, and more than a billion small mammals, such as rabbits, squirrels, and chipmunks, each year (ABC, 2007). The killing of wildlife by cats has received much adverse publicity in Australia, particularly because they kill some endangered native animals such as tree frogs. It is estimated that the average Australian household cat kills 25 creatures a year; a total of 100 million creatures every year in the entire country (WIRES, 2007). Feral cats eat the equivalent of 7 bush rats each week, over 400 million creatures a year. The adverse publicity given to hunting by cats in Australia is believed to be partly responsible for the declining cat population. In Australia there are approximately 3 million pet cats and 12 million feral cats, giving an annual total slaughter of perhaps 0.4 billion native animals (Queensland Parks and Wildlife Services, personal communication). Scaling this slaughter up to worldwide populations, there could be about 12 billion vertebrates killed each year by cats. Roughly 60% to 70% of the wildlife that cats kill is small mammals; 20% to 30% are birds; and up to 10% are amphibians, reptiles, and insects (ABC, 2007).

The number of wild animals whose welfare is affected by humans or their companions is very considerable and probably much greater than that of the next largest sector, the farm animals.

The Human Footprint on the 'Silent Majority' of Animals

The annual population of sentient animals whose welfare is directly affected by man, at about 120 billion, is clearly a majority compared with the global human population of c. 6.8 billion. Each person on the planet potentially affects the welfare of about 18 animals each year. Given the significant overall impact of our actions on animal welfare, it is not surprising that animal welfare activists worldwide are increasingly concerned about this 'silent majority' of animals whose welfare needs better protection. We have the potential, the knowledge and the resources to manage animals in a better way, and the constant plea from the activists is that our 'footprint' on the animal kingdom is considerable and we need to make sure that it is a more positive one. In terms of the subject of attention, the focus on farm animals is logical if both the number of animals affected and the considerable welfare impact of many husbandry practices are taken into consideration. However, more attention should probably be given to wild animals, particularly in the marine environment, even though the welfare impact is not yet well understood.

Intensification of Animal Production for Food

In order to focus on the most important issues in animal welfare, it is important to consider not just of the size of the animal sectors and the welfare impact of human management practices, but also how the different groups are changing over time.

Agriculture has undergone the most rapid period of intensification of any of the animal industries, because of the opportunities provided by mechanization and the economic benefit to consumers of increased efficiency. This has been a progressive change since the start of settled agriculture, but it accelerated in the latter half of the 20th C to match the escalating growth in population and personal wealth, which created a strong demand for high quality food products from animals. England was one of the first countries to intensify its agriculture and it is worthwhile considering the pressures that prompted this small country to seek to change its systems of production in response to public pressure for cheap meat and milk.

The industrial revolution, which started in the 18th C, was a major stimulus to the early mechanization of agriculture, which in turn became the key to increased output (Crafts, 1985). One of the precursors to this in England was a shortage of land. The British government passed several Enclosure Acts in the

late 18th and early 19th C, which restricted the rights of the people to graze their livestock on common land. Enclosing this land enabled it to be used to grow more cereals to feed the expanding population. At the same time, land use was intensified through mechanization, and Britain became a major exporter of agricultural machinery in Victorian times. The recipient countries were mainly countries that were in the process of colonial development, such as India, which were encouraged to pay by supplying food back to the home country. Even this did not keep pace with increasing demand in Britain. By the start of the Second World War, Britain was only about 40% self sufficient for food production, with a population approximately half that of today. British agriculture was in a moribund state, with a shortage of labour after the losses of manpower in the First World Way, derelict land and a market undermined by cheap imports from overseas. The Depression of the late 1920s did not have an impact on agriculture until later, and grain prices were at their lowest level in 1934. During the Second World War, the poor state of British agriculture was recognized by the Germans as the Achilles heel of the island people. Indeed, the German U-boats nearly succeeded in starving Britain into submission by preventing shipments of food from crossing the Atlantic. Food imports from overseas, that had hitherto been taken for granted, dried up because of the blockade. The shortage of food supplies led to rations on staple foods being imposed in 1940, initially just bacon, butter and sugar, but then all meat and flour.

The farmers of the day rose to the challenge, with assistance from the 'Land Girls' and prisoners in the later years of the war, and the mentality of intensifying food production started to be instilled into the island race. The principle strategy for increasing food production involved ploughing up grazing lands for the production of cereal crops, thereby utilizing fertility that had accumulated in the pre-war years, when much land was fallow or underutilized. Farmers were given quotas of crops to grow, including such staple foods as potatoes, but also cereals that were grown for livestock to increase their milk or meat output. The nature of British farming was changing rapidly. In the pre-war years, cows were usually kept at pasture during winter. Hence farms had to be kept in permanent pasture to withstand the pressure of the cows' hooves during the wet months of winter. More productive temporary leys were badly damaged during wet weather. With increased land required for crop production, farmers began to keep their cows inside during winter and feed them hay and cereals. The cows were tethered throughout this period, even though the restriction on movement could make them lame.

After the war, the shortage of food persisted for several years in Britain, and food rations were not lifted until 1953–4. Trading industrial goods for food from the colonies was rare in post-war austerity. At the final lifting of meat rations in 1954, prices escalated because of limited supply. Most of the prisoners of war and land girls had left the land, and many of the demobbed men from the armed forces went to farm, because of the shortage of other jobs. These men were not trained in agriculture and were often reluctant to accept advice from labourers. In times of such rapid change new farming methods often evolve.

Intensification continued through the 1960s, with the introduction of group housing for pigs and cages for laying hens. In the late 1970s, government moved to ensure that Britain would never again be vulnerable to food shortages by investing heavily in agricultural research and encouraging farmers, through grants, to increase the intensity of their production systems. A comprehensive agricultural development and advisory service was established, which had evolved from the War Agricultural Committee that controlled production during the war years and immediately afterwards. Agricultural education thrived. Government grants were made available to improve farms, for example by removing hedges between fields, providing housing for animals and access roads for hill stock. The emphasis was on increasing production with little consideration for either the environmental or animal welfare consequences of farming methods.

In the 1960s intensive housing units were first developed so that animals could be more productive, but it was not until the 1970s and 80s that most farms began to adopt them. This included cages arranged in 'batteries' or rows of similar units for laying hens, in which the hens were grouped 5–6 in each cage, with the eggs rolling out of the cage for easier collection, and the faeces falling through the wire floor. Intensive breeding and fattening units were constructed for pigs, with farrowing crates to restrain the sows, creep feeding for the piglets and verandah units (with indoor and outdoor accommodation) to fatten them into porkers or baconers. More sheep and cattle were kept indoors during the winter, which gave better control of the feeding and management, but also gave rise to lameness and behaviour problems because of lack of space. Male cattle that had previously been raised in the fields, after castration to control their aggression, began to be kept indoors without being castrated. This increased their growth rate, even though it meant that potentially aggressive and dangerous animals were being raised in small, confined spaces. They were prone to riding one another and developed other sexual behaviour abnormalities, but there was not sufficient interest in animal welfare issues at the time for any control to be considered.

In addition to intensive housing, high energy and protein feeds were manufactured from cereals and other quality feed sources for feeding to the farm animals, which responded by growing faster, producing more milk and laying more eggs. Piglets were weaned from their mother after just three weeks, so that more than two litters could be obtained from each sow every year. Cows were fed concentrated energy and protein supplements that could bypass their rumen and increase production still further. For winter feeding hay came to be replaced by grass conserved by a natural process of acidification – silage – which had higher feeding value because it could be cut at a young and green and transported directly into storage systems. Previously hay had had to be cut at a mature stage and then dried in the field to ensure that it would not go mouldy when formed into stacks. Ensiling grass and other crops was made possible by mechanized harvesting, necessary to transport the wet grass, storage in pits and towers and distribution by machine to the animals.

Dairy cows were an exception to the intenstification drive, as they were not as intensively managed in the post war period as some had been in early Victorian times. Before railways were developed to transport the milk to cities from rural areas, there were cow keepers in the all the major centres of population. These usually had 8–10 cows each, housed in cellars, tied day and night and fed hay and concentrates (Lea, 2005). They were often the older cows whose milk was no longer good for cheese production. They were not mated, so after about a year their lactation had declined to an uneconomic level and they were walked out of the cellar, for the first time for a year, to be slaughtered. Such city production continues in some developing countries today.

During the industrial revolution, as well as milk produced in the cities, cheese production was developed in the western parts of Britain, where the grass grew well and the product could be stored before being taken to the cities for sale. Stocking rates at pasture in the mid 19th C were typically about 2–3 acres per cow, each animal producing approximately 250 lbs of cheese per year. By contrast in the 1980s, with inexpensive fertilizer to increase grass growth and supplementary feeding of concentrates, cows were stocked at about one per acre and each animal was expected to produce over 1000 lbs of cheese per year, a tenfold increase in output per acre compared with 130 years ago. Multinational fertilizer companies were producing large quantities of artificial nitrogen fertilizer to allow farmers to sustain the high stocking rates, and farmers were being encouraged to spread up to 3–400 kg of nitrogen on each hectare of land. However, the high stocking density caused damage to the land in winter, particularly in wet conditions, and winter housing became preferred for high productivity. Intensive stocking in summer resulted in significant health problems from parasites on the pasture, which could be easily transmitted from one animal to another. The winter housing also produced many health problems: lameness from standing on concrete all day, mastitis from lying in bedding contaminated with faeces and swollen joints from lying in uncomfortable stalls, as well preventing the normal foraging behaviour of the cows. Hence this tenfold increase in productivity per acre in little over 100 years was achieved at the expense of the welfare of the cows, but it was a profitable system of production, as long as nitrogen fertilizer was cheaply available, and it reduced the milk price to the consumer and increased profit for farmers. Government advisers were actively involved in the intensification of British dairy farms, attempting to assist farmers to get the most from their land, whilst ignoring the cost to the cows.

The development of milking parlours in the mid 20th C allowed cows to be free in their shed during winter, instead of being tied in individual stalls. Dairy cows that had been milked in their stalls came to be milked in these parlours, usually twice a day, but sometimes three times if milk prices were good. Milking machines of the sort that are used in parlours were first developed at the start of the 20th C, but the economic climate was not right for their widespread adoption until the 1960s. Before this the farmer had had to take the milking unit from one cow to the next in a byre, or mobile milking station, which could be

transported to the field where the cows were grazing. The development of parlours – static milking stations to which cows were taken – probably represented a welfare benefit of mechanization for housed cows, since it enabled the cows to have more freedom of movement to display natural behaviour. More machinery was needed in the parlour than in a portable unit, but these became increasingly sophisticated until about 100 cows could be milked per hour, thus reducing the labour requirement for this task.

In early 20th C Britain, the government controlled the markets for most of the major animal products, for example the Milk Marketing Board, which was established in 1933 and offered a guaranteed price for all the milk that farmers could produce. This incentive for expansion of output continued until Britain became self-sufficient for milk (with an agreed importation of New Zealand dairy products included) in the 1980s. At this time, dairy cows were often fed so much cereal-derived concentrate, in an attempt to maximize milk production, that they developed digestive upsets and the so-called 'production diseases' of acetonaemia, fatty liver syndrome and low milk fat syndrome. Such was the drive to increase milk yield per cow that the Milk Marketing Board produced league tables of farms in each region that produced the most milk. Some control of digestive upsets was achieved by feeding the cereals in small amounts regularly over the day, by mixing it into a complete diet with forages, or by rationing cows by providing them with an electronic key to control their access to the feeder. If the cereals were over-processed or were fed in large amounts at milking, cows got acidosis – acidic conditions in their rumen – which badly affected the micro-organisms in their digestive system and could result in the cow's death. The new feeding methods for high milk yields were pioneered by Professor Boutflour at the Royal Agricultural College in the late 1940s, but did not come to be in widespread use for dairy cows until the early 1980s. The intensification of the production of beef cattle came earlier, driven by inexpensive availability of calves and cereals and growing demand for beef in the early 1970s. Some farmers began to fatten cattle intensively indoors on a diet of just cereals, despite the metabolic disturbances and ill-health that often caused welfare problems (Preston and Willis, 1974). The calves grew very fast, and were allowed to eat as much concentrated food as they wanted, so that by nine months of age they were ready for slaughter, instead of the usual 18–24 months if they were fed a grass-based diet.

The driving forces behind the intensification of animal production in the late 20th C were clearly not aimed at improving animal welfare. Most of the impact of the intensification had adverse effects on welfare, since animals were pushed to their limits metabolically. Furthermore, ill health and boredom often resulted when the animals were kept in systems that only aimed to maximize the rate of output of animal product, be it muscle growth, milk or egg yield or reproduction. The biological system was often stretched to the limit by focusing on one aspect of production, in just the same way that an athlete pushes elements of his or her body. Dairy cows developed massive udders, which could only last a few years before the suspensor ligaments gave

way and the cows had to be slaughtered (Brade, 2005). The bodies of beef cattle (Freudenberg et al., 2007), pigs (Barnett et al., 2001) and poultry (Oviedo-Rondon et al., 2006) grew so fast that their legs could not support them, and developed joint problems. Sheep were developed that could produce so many lambs that the mothers could not adequately rear them (Davis et al., 1993). Farming came to be managed more by big businesses, often with integrated chains that controlled all aspects from the growing of the animal food, to the slaughter in the abattoir, and the family farms began to decline.

The reason that these changes were not stopped was principally because animal welfare was, and to some extent still is, just a small part of the economic and ethical package in which farmers function. At the time of the recent major intensification of the British animal production industries, there were more pressing issues to deal with, national food security and human welfare in particular, so that animal welfare was barely a consideration when the movement was in full force. Later, when the threat to national food security had abated and human welfare was not at risk, animal welfare became a key consideration and developed into the focus of attention that it now holds.

Farming Skills

Farming is a diverse operation, taking into account the varied conditions, climatic, topographical and economic, of each unit. Families have benefited in the past from handing down local knowledge about farming practices from one generation to the next. Good stockpersonship is recognized as one of the most important influences on animal welfare. Any period of rapid change, such as the entry into farming of the demobbed soldiers after the Second World War or the intensification of the late 20th C, is likely to lead to some people managing animals badly, until the necessary skills have been learnt. For many centuries it was expected that the sons of farmers would take over the family farm when the father became too old to do the job, or they would take over a similar farm in the locality. In rangelands animals usually stayed on the farm when ownership was transferred from one farmer to the next, to maintain continuity and because the animals were adapted to the territory. The same was essentially true of the farming families. The opportunities for children with a farming background to enter other types of work were limited, and the standard of husbandry was maintained at a high level by the accumulated knowledge. Such knowledge is important for the management of the stock. It can be learned, but farmers' offspring learn most of what they need to know about managing the animals at home before they even leave conventional school.

In former times, the importance of this knowledge was recognized in leasing agreements for farms. In mid Victorian England, during the (first) agricultural revolution, a typical mixed farm would be about 50 acres, with approximately six cows, six steers, a few calves, four horses, three pigs, eight sheep, hens, ducks

and geese and a total net value of just a few hundred pounds. Most farms were tenanted, a legacy of the feudal system that had predominated in mediaeval times, and three people could be named in the lease, usually a farmer and two of his sons, ensuring that farms could be transferred to the next generation easily. At this time, an initial entry charge of £ 110 was payable by the first tenant, which was the equivalent of about 50 cows, and then a small rent of about £ 8–10 per year had to be paid. To transfer the tenancy to the second person cost the family only their single, best beast, or increasingly as the century progressed a small monetary sum was required, about £ 3–5. Thus the system ensured that farms and the knowledge that had accrued were maintained between the generations. The landlord had much greater control over his tenants than today: a set number of days had to be worked free of charge for the landlord or a fine was levied, and in times of war every tenant had to provide a man and/or a horse, depending on the size of the tenancy. The stock that the tenant kept and the crops that he grew were dictated by the landlord and sometimes a proportion of the products had to be surrendered annually.

Life was hard for the 18th C farmer and most of his possessions, such as furniture and linen, were handmade on the farm using locally grown materials. His life was integrally connected with his animals; recreation included cock fighting, hare coursing etc, which today are considered cruel, but his interest in these pursuits reflected the constant struggle with nature that characterized his life and that of his family. At the same time, the bond between stockperson and the animals in his care was strong and engendered the empathetic attitudes to the stock that are often absent in large, intensive units today. This was vividly illustrated in Thomas Hardy's celebrated novel 'Far from the Madding Crowd', when the shepherd, Oak, saw all his sheep lying dead at the foot of a cliff after being chased by dogs: "Oak was an intensely humane man. . .A shadow in his life had always been that his sheep ended up as mutton – that a day came and found every shepherd an arrant traitor to his defenceless sheep. His first feeling now was one of pity for the untimely fate of these gentle ewes and their unborn lambs." (Hardy, 1902). Such views typify the strong bond between stock and stockman that developed when they spend long hours with their animals.

In the last quarter of the 20th C, the traditional system of farms passing between the generations and being managed by the whole family was breaking down. There was an increased standard of education amongst farmers, providing increased job flexibility. Families became smaller and there were fewer people on the farm to take care of the animals. On dairy farms, looking after the calves, or on sheep farms, the orphan lambs, had often been assigned to the farmer's wife or children. Then economic pressures for cheap food led to the farmer's wife often working away from the farm, and even the farmer having to take part-time work.

Whereas previously it was expected that a farming family would endure for several generations, by the late 20th C it had become common for farms to change hands several times within a generation. People now enter and leave jobs

frequently, and since fewer people are needed in agricultural work and the cities offer the prospect of higher incomes and more leisure opportunities, rural depopulation has been a major problem worldwide (Westhoek et al., 2006). Agricultural training programmes have suffered from a lack of interested students (Pongratz and Schmitt, 1990), and more people are entering the industry in later years as part of a lifestyle change after working in cities. Such 'hobby farmers' are often lacking in knowledge about animal husbandry, but they usually have money to spend on the farm, including maintaining the health of their animals in conjunction with veterinarians, and their ethical standards may be higher than those of young, ambitious farmers who might be prepare to sacrifice animal welfare to build up the economic viability of their farm (Holloway, 2001).

The period of rapid agricultural intensification in Britain after the Second World Way was already coming to an end by the mid 1980s because the country was becoming self sufficient for most commodities. As a member of the European Community since 1972, Britain under the Thatcher government of the 1980s took the stance that agricultural subsidies, which continental European countries benefited from much more than Britain, must be reduced if the Community was to grow economically. Mrs Thatcher also fought hard to control the agricultural surpluses that were being produced as a result of the subsidies – which in her words demonstrated 'the Mad Hatter economics of the Common Agricultural Policy' (Thatcher, 1995). Subsidies were strongly favoured by the French and the Germans because of their large rural population that benefited from them.

For a period, the investment in intensive animal production units that had occurred during the 1970s and 80s continued to pay economic dividends, but as animal houses wore out and public demand for less intensively produced animal products increased, there was a gradual trend to replace these units with less intensive ones. So from the early 1990s until today, there has been a gradual movement towards less extensive animal production. This is not a reversal to production as it was in the 1930s, because the buoyant economy in Britain has created a population that is prepared and able to pay for high quality food. Governmental support is increasingly directed towards environmental management, rather than food production. Previously support for farmers depended on their stock numbers, so they were encouraged to overstock their farms, which then might not be able to produce enough food for all the animals.

Locally-produced food is now favored, and local marketing and farmers' markets, where the food is sold direct to the public, have gained in popularity. Although originally a small niche market, the local production of food to high environmental and animal welfare standards has only become possible after the liberation of the market place from centralized control, achieved by the Thatcher government of the 1980s. In less than 50 years, British agriculture had been transformed from almost total state control, with enforced cultivation of land, the grading of farms by the War Agricultural Committee according to production potential and centralized machinery stores operated by the

Committee, to a free market system that allowed farmers to produce according to the demands of the population. Such changes were not confined to the heavily industrialized countries. Similar changes in agricultural policy occurred in New Zealand in the 1980s, which although initially causing hardship for farmers, eventually produced an agriculture that was able to respond to market demand, including the demand for high welfare products. New Zealand dairy products are now marketed abroad as coming from grazing cows that are kept in a high state of welfare, which are recognized as a marketing asset.

As some cultures move rapidly towards high animal welfare provision, others struggle to evolve from their ancient past. Pressures on cultures to develop must be considered in the light of other changes taking place, principally pressure from a population that is three times larger than when our grandparents were born, and pressure to preserve and improve the environment. Aboriginal cultures still exist in Australia that survive mainly on 'bush tucker', comprising the numerous fruits and nuts of the forest, but also wallaby, goanna, and other small mammals that can be easily harvested. These communities mainly exist on the islands off northern Australia, and the harder they are to reach, the slower the adoption of western culture. Traditional animal management practices are under threat, such as the harvesting of sea turtles. Australian law requires that such animals should be stunned before slaughter, whereas the Aboriginal method of killing is wringing the neck or smashing the head with a rock. Exceptions to the laws are made for Aboriginal communities, but there is considerable pressure for common standards for all Australians. The apparent neglect of cats, dogs and horses in Aboriginal communities attracts the accusatorial eye of westerners, but derives mainly from a lack of ownership of the animals by individuals, in favour of communal ownership, and a reluctance to use modern veterinary medicine to treat skin diseases and other non-lethal ailments. Aboriginals reliant on bush foods have less footprint on animal welfare. The average Western person eats over two tons of fat, nearly two tons of protein and eight tons of cholesterol in his lifetime. Bush animals do not have their welfare interfered with by man, only the time of death. The impact of the Aborigine is much less, but the balance of nature is fragile – commercialization of such bush tucker harvesting practices would potentially destroy their symbiotic relationship with animals.

Industrial Impacts on Animal Health and Welfare

There are many short-term activities on farms that challenge animal welfare, and these often receive the most attention from animal welfare activists, transport of animals for example. These events are finite, but what is often not realized is that the industrial revolution has left a legacy of polluted land that will have an impact on animal health and welfare for centuries and which is very difficult to redress. Some of the issues have been recognized and addressed, for

example the influence of PCBs in the environment on the viability of birds' eggs (Fernie et al., 2000), but many are only just becoming evident. The accumulation of heavy metals on pasture land has been a recent cause for concern (Wilkinson et al., 2003), with much criticism of the former Communist countries of Eastern Europe for heavy emissions. Cadmium accumulation from smelter emissions and phosphate fertilizers has recently become a cause for concern, and the longevity of both cadmium and lead in the soil is considerable, particularly lead which will not be leached for hundreds of years. Both of these metals have potentially serious adverse effects on grazing animals. Rumen fermentation of pasture grass is disrupted, kidney function is likely to be impaired in animals surviving to maturity (such as horses), because of the long half life of the metals in the body (30 years for cadmium). Many domestic grazing animals do not live long enough for their health to be affected, but wild animals such as deer are increasingly found to have kidney function damaged by cadmium (see review by Phillips and Prankel, 2008).

Changes in Companion Animal Management

Because of the strong emotional bond with companion animals, people often display more concern for their welfare than farm, laboratory, wild or other animals. Indeed demands for increased welfare standards for farm animals may be influenced by the members of the public's increasing concern for the welfare of companion animals. Although such generalization of attention to companion animals to concern for farm animals may be true in many cases, there are noted exceptions. Ernest Hemingway's affection for cats was well known, but he delighted in the spectacle of the bull fight and his favourite pursuits were big game hunting and deep sea fishing.

The keeping of companion animals has been subject to different patterns of change in the various parts of the world, which means that there is no overall pattern of increasing intensity as there is with farm animals in most parts of the world. However, there is one almost universal truism, that the trend towards high density living is forcing dog and cat owners to leave their animals indoors for longer, and in some cases permanently. In heavily industrialized or regulated countries such as Japan and Australia, there are limited off-leash areas to allow the dog to run free.

Dog keeping has become specialized as the industry has grown over time. It is now recognized that there are many different reasons that people keep dogs and these need to be taken into account by matching the dog's characteristics to the owner's needs when shelters rehome dogs or puppies are purchased. These include companionship alternatives, in particular child, partner or friend substitute; exercise for the owner; protection of the owner's property, or their person (people also may own dogs to help them avoid contact with other

people); breeding, either to sell puppies or to hire out a stud dog; showing, to be good examples of a breed, to bring monetary reward or recognition to the owner; an outlet for nurturance instincts (humans, especially females, are believed to have an innate need to nurture others); sport/recreation (dog sports are becoming more popular and include agility and obedience trials, lure coursing, endurance competitions, fly ball and scavenger hunts); utility (dogs often assist their owners, such as guide dogs for the blind, deaf or disabled, herding of farm animals, or act as security guards, and the keen olfactory sense of dogs is used in immigration controls); social connectivity facilitators (some people like to keep a dog to help them to integrate into society, they may facilitate conversation when walking) and finally animals may be kept as a status symbol (some persons seek to enhance their reputation through animal ownership, perhaps because of its beauty, value, danger or ferocity).

As society becomes more complex and people adapt to high density living, there is a need for everyone to conform to a sustainable, recognised method of keeping companion animals. Hence individuals should not be allowed to keep large numbers of pets, treat them badly or ignore their needs. A uniform set of standards has rarely been available, let alone enforced in the past, but nowadays it is more likely that the behaviour of an individual dog or cat will impact on people around them. Regulatory control of the number of pets is now common in Australia, but the specified constraints, for example animal numbers per household, will depend on the locality. In Brisbane the maximum number of cats or dogs allowed is three per household (BCC, 2003), on the Gold Coast of Australia the number varies with the size of the property, if 600 m^2 or less only one dog is allowed, otherwise two, and only two cats are allowed on each property (GCCC, 2007). Birds are similarly regulated, a property of less than 300 m^2 can only accommodate four small birds, e.g. budgerigars. A larger property may be used to keep twenty small birds and four big birds, such as Galahs, whereas only one is allowed on properties of up to 4000 m^2. Thus there are increasingly common regulations on companion animal ownership that prevent them from being kept in very intensive conditions.

Conclusions

Intensification has affected both the farm and companion animal industries, but intensification of interaction with wild animals, although not considered here also has had a major impact on welfare. The number of animals whose welfare is affected by humans is much greater than the number of people on the planet, with each person potentially directly impacting on the welfare of about 20 animals each year of their life, emphasizing the considerable responsibility that we all hold for management of animals on the planet.

Intensification has had negative effects on many aspects of animal welfare, even though it is not the only reason that people are increasingly concerned

about welfare issues. Animal welfare concern is greatest and advances are most easily made when the economic conditions are favourable and the technical knowledge is available. The potential to improve animal welfare in intensive units exists, but to date the main focus in intensive units has been to increase productivity of farm animals.

Chapter 10
Animals in Research

Historical background – ethical assessment of animal use in research – ethical dilemmas – genetic modification of organisms – xenotransplantation

Historical Background

Concern for the use of animals in research has been evident since they first began to be used for this purpose in modern Europe, beginning in the late 17th C (Pocard, 1999). An emerging view of some philosophers, most notably Descartes, was that animals were just machines. This was not a common belief, but was used by a minority of scientists to justify their use of animals for research (Preece and Fraser, 2000). Many scientists at this time, including Isaac Newton and Robert Boyle, opposed the treatment of animals for such research, as did many philosophers and writers. The concern was strongest in the United Kingdom, where the experimentation was most advanced and the populace had a burgeoning concern for animal welfare. It was here that the first legislation in the world to protect animals in research was enacted in 1876, which was utilized through most of the 20th C (Pocard, 1999).

Ethical Assessment of Animal Use in Research

As a result of expansion of medical science, animals are now used extensively for research on a world-wide basis. The welfare standards and ethical issues surrounding the use of these animals are a focus of attention for activist groups, particularly where the use of the animals is for research that is not directly aimed at improving the health of humans or animals, such as the testing of cosmetics. The response of most governments in developed countries, and an increasing number in developing countries, is to have the animal experimentation monitored by either government agencies or institutional bodies or a combination of the two. This formal ethical assessment of the use of animals for research is a response to the concern and has evolved in parallel with

C. Phillips, *The Welfare of Animals*, Animal Welfare 8,
DOI 10.1007/978-1-4020-9219-0_10, © Springer Science+Business Media B.V. 2009

assessment of the use of humans for medical research. Regulation of animal use in research is generally more advanced than that for humans in research, probably because of the activities of animal advocates against animal experimentation (Schuppli and Mcdonald, 2005). In the United Kingdom and Germany there has been a major reliance on government monitoring, through the Home Office in Britain, which is now augmented by institutional bodies which provide a preliminary assessment of the ethical viability of the research (the Ethical Review Process) (Bradshaw, 2002). The Ethical Review Panels of institutions must include a named veterinarian and representatives from the Animal Care and Welfare Officers. By contrast, in Australia, Canada and the US there has been primary reliance on institutional monitoring, although in Australia this is now augmented by government auditing at a State level (Schuppli and Fraser, 2007). Many developing countries are now establishing institutional monitoring of this type. Systems of institutional monitoring, which can include members of the public, and is accompanied by government auditing of the process in some instances, has emerged as the most popular system, probably because the major cost and responsibility is then passed back to the organization conducting the research. Comparing the United Kingdom and Australia, the systems of assessment were until recently quite different, with the UK relying almost totally on government inspection and Australia relying on institutional monitoring (Bradshaw, 2002). Both have broadened the scope of the monitoring and now use institutional and government bodies for approval. In developing countries, animal research standards are usually voluntary and individual institutions may introduce their own standards, administered by an ethics committee, for example in some South Korean universities. Some countries, such as Singapore and Iran, are consulting the Australian Code of Practice for the Care and Use of Animals for Scientific Purposes (2004) and adopting the institution-led model for ethical assessment. The development of adequate assessment methods is particularly important in developing countries, as increasingly more research is conducted there to benefit from the low costs of labour and laboratories, as well as there being fewer, if any, legal restrictions. In the past, developing countries have trained many of their best scientists in the Western countries, some of whom are now continuing their work at home. Unless these countries adopt similar requirements for research work, so that it lies within acceptable ethical standards, there will be an added attraction to working in developing countries, of reduced regulatory control. However, it is necessary to understand the cultural differences in attitudes to the use of animals in research in these countries, as the concerns of the European public may not be shared in Asia, for example (for evidence of this, see Phillips and McCulloch, 2005).

Although government monitoring is cumbersome, time-consuming and expensive, it should guarantee high standards of assessment that are repeatable. Government inspectors are trained in the administration of government regulations and therefore can be held accountable for the quality of the work that they do in monitoring projects. They understand the ethical principles upon

which decisions are made. A key principle is that there should be substantial gain to either animals or humans if any animals are to suffer as a result of the experimentation: a utilitarian perspective. Research aimed at cosmetic or frivolous changes in animals is unlikely to be allowed, for, example breeding animals to have extraordinary features purely for the amusement of the public. The inspectors also recognize that sometimes the impact on the animals will be too severe, regardless of the benefits to humans or animals: an animal rights perspective.

In contrast to regulation by government bodies, institutional monitoring depends largely on untrained individuals, whose beliefs are likely to be governed by their upbringing and cultural identities. A study of the views of animal ethics committee members in Canada has revealed significant differences in attitudes and approaches of individual members (Schuppli and Fraser, 2005), for example on whether it is the role of committee members to address reduction in the number of animals requested to be used in experiments. Some members felt that it was not their role, that numbers were irrelevant providing that the optimum procedures were conducted. Some members believed that they had insufficient expertise to suggest changes in numbers; others believed that scientific review by grant-awarding bodies adequately fulfilled the process, and others believed that the cost of using animals in experiments would naturally keep numbers to a minimum. Few believed that it was should ever be necessary to recommend increased as well as decreased numbers to avoid animal wastage, which is the reality of inadequate experimental design. Refinement of techniques, one of the three R's,[1] was very poorly understood, with a variety of views as to what it meant. Some members employed a scale of sentience in their own minds, which for example made it preferable to use a hamster than a rabbit, which in turn was preferable to using a cat for research. Such review practices are evidence of a lack of understanding of the complexities of ethical review by the panel, and in this case directly contradict biological evidence, for example that a cat is no more sentient than a rabbit. Avoidance of pain is clearly not uniformly addressed, or even advocated. Environmental enrichment is not supported by many scientists, because of the effects on experimental results (Hubrecht, 2000), even though there is considerable evidence that abnormal results will result from situations where animals lack a suitable environment (Poole, 1997).

Such discrepancies between members are understandable, since they come to the committees with varied backgrounds, but it is apparent that members may have widespread misconceptions which can only be addressed by a rigorous training. Regrettably, the review by Schuppli and Fraser (2005) does not engender confidence in the process. Different outcomes may emerge from different committees and there is currently little attempt to harmonise the

[1] Replacement, Reduction and Refinement, advocated as a framework for the improvement of laboratory animal research and hence of central importance to the ethical review process (Russell and Burch, 1959)

processes or results. This could be done by training or standardisation of recruitment procedures for committee members, and also by a reviewing body. The lack of training of committee members is evident; some institutions provide training to new researchers, but this is often superficial and covers only the basics of ethical practice in animal research. A few institutions sponsor committee members to attend relevant conferences, but in Schuppli and Fraser's study, a lack of familiarity with guidelines on research ethics was particularly evident, with some committees sanctioning LD 50 tests,[2] for example, in contradiction to international guidelines.

The method of recruitment is crucial to ensuring that committee members represent the public's point of view (Schuppli and Fraser, 2007). However, all too often it is hard to find volunteers for these positions, and people with extreme views and vested interests may find their way onto the committees. Payment may bring people to the committees for the wrong reasons. Volunteers can be chosen as representatives of the major stakeholders in the process: animal laboratory staff, animal scientists, veterinarians and animal welfare organizations, but these may not reflect the public viewpoint. They may be inherently more caring, having been attracted to work with animals, but they may also have become inured to some of the more invasive practices. Members of the general public may also serve on institutional committees, and are likely to have a wide variety of opinions, depending on their upbringing and circumstances. Adding one or two members of the public to the committee may make the decision-making process more difficult. They will probably have more disparate views than the scientists or veterinarians on the committee, who have all been through similar training programmes (Schuppli and Fraser, 2007). Most committees place considerable importance on the views of those supposed to represent informed public members when it comes to ethical decisions. However, if discussion focuses on the scientific conduct of the experiment, as often it does in institutional committees, the lay members can feel ostracized because of their lack of experience in experimentation (Schuppli and Fraser, 2007).

Australian animal ethics committees contain one representative from each of the following groups – animal scientists, veterinarians, animal welfare organizations and the public. The administering body for the committees, the National Health and Medical Research Council, stipulates that members of the last two categories should not be numerically outnumbered by the animal scientists and veterinarians. There is no official representation from animal laboratory staff, although these are often co-opted as non-voting members or in attendance. Because of the lay membership on the committees, applications by scientists to conduct work must be written in plain English. Inevitably, much of the discussion in these committees focuses on the science to be undertaken,

[2] An index of toxicity (*lethal dose 50%*), the amount of the substance that kills 50% of the test population of experimental animals when administered as a single dose

for example the impact of specific procedures on the welfare of the animals. The chairman is often also an institutional animal scientist, although it is generally advocated that they should ideally be from another discipline (Australian Code of Practice for the Care and Use of Animals for Scientific Purposes, 2004; Schuppli and Fraser, 2007). The scientific discussion helps to refine the experimental protocol, so that the work is scientifically sound and imposes the minimum welfare cost to the animals. However, there is much less, if any consideration of whether the benefit of conducting the work, to humans, animals or theoretical knowledge, is justifiable on ethical grounds, i.e. the benefit outweighs the cost to the animals.

Some guidance is given in the Australian Code of Practice for the Care and Use of Animals for Scientific Purposes (2004) on making decisions on the ethical acceptability of research work, suggesting that the benefits to humans or animals must outweigh the cost to the animals involved in the experimentation. This therefore advocates that the decision should be made on utilitarian grounds, i.e. favouring the outcome which produces the greatest good for the greatest number of individuals. However, there are concerns that utilitarianism may support some unnatural decisions, that members of the public would not make, especially major impacts on the welfare of individuals for a relatively minor benefit for a large number of animals. Most people would prefer to preserve the welfare of the experimental animals, even if it meant that an opportunity to improve welfare of a large number of animals had to be foregone. Many people with no vested interest in the process would take the view that all sentient animals are the subject of a valuable life, and that welfare cannot be compromised significantly for the benefit of other animals or humans. The contrast between this view and the views of some scientists, who might wish to make sure that the path to experimentation is easy, could prevent non-scientists from expressing their views openly. Alternatively assessors who are scientists may be influenced by professional competitiveness, which is targeted at specific individuals, or alternatively could be keen to defend the rights of scientists and animal experimentation. Some veterinarians, because of their training, are less likely to acknowledge mental than physical suffering in experimental animals (physical symptoms of disease tend to be considered more important than the mental aspects of animal suffering in veterinary courses, Rollin, 2006).

Volunteer assessors from outside the institution, who represent animal welfare organisations or the general public, may be concerned if the institution profits from the work undertaken, and this may influence their judgement on applications. Sometimes, institutions take on the role of assessing applications from other nearby small companies or research establishments. These companies may have only a profit motive, unlike academic establishments which usually have a learning objective. Some assessors within the university system may dislike research which is conducted purely for profit and be less likely to approve it. Institutional rivalries may surface as well. If a university is assessing applications for other organisations, it is essential to ensure that the latter are

inspected regularly by the university's or government authorities and that they are subjected to the same rigorous process as those within the university, especially if the university benefits financially for providing ethical approval for the animal research. The training of research personnel in small establishments may be more difficult to achieve than in a large university. If a company is profiting significantly from the research, institutional members may feel that the process is a misuse of the panel's time, which is supposed to be supporting the university. Scientist members may consider that the company is providing competition to their own research, or those of colleagues within the university. From the company's point of view, especially if they are entrepreneurial companies set up with venture capital, they may be using more novel technology, which they believe the universities are not adequately able to assess, xenotransplantation for example. A different attitude towards scientific research often pervades the two types of establishment. In some countries, institutions are establishing their own committees, and representation must be fair and open to scrutiny, as well as the activities of the committee.

Ethical Dilemmas

Some ethical concerns on the use of animals for research have their parallel in the ethics of experimentation involving humans. Increasingly, human medical research is being taken to developing countries, where patients will be willing to take unproven medication if there is a chance that they will be cured (Abbas, 2007; Kemp, 1996). By conventional ethical standards, the researchers should offer the control patients the best possible treatment that has been medically proven. However, this adds considerably to the cost and researchers accept that they may improve the lives of future users of the drug if they identify a useful treatment, even if the control patients have no benefit. The moral dilemma is whether an ethical panel assessing the morality of such experimentation should support the rights of the patients to receive best treatment or the rights of a future population to effective medicine? If they insist that the control treatment should be best available practice, the work may never be done, because it is too expensive. Similarly control animals in case:control studies should theoretically be given best practice treatment, as long as it is based on scientific evidence. This becomes an issue when panels have to assess applications in which the objective is to improve the conditions of animals housed in less than optimum conditions, such as some zoo animals, animals in live export etc. Although we may know little about the actual husbandry standards offered to such animals, requests to learn about the conditions and seek to improve them may not be favourably judged by those that are fundamentally opposed to such practices.

In this era of globalisation, there is a likelihood that the more contentious and risk-taking animal research will migrate from developed countries, with their increasingly stringent standards, to developing countries. The best

solution to this dilemma is extensive collaboration between developing and developed countries in producing and administering the standards for animal research. Those few people championing the pursuance of ethical standards for animals in research in developing countries should be given every support possible from the developed countries, because they are at the vanguard of animal protection, whereas in developed countries animal advocates already receive considerable public and other support.

A suitable compromise might accept that utilitarian values are useful to judge most applications (Schuppli et al., 2004; Schuppli and Fraser, 2005), so that allocating some animals to be transported in a ship would be acceptable even if no improvement in their conditions was being tested, as long as animals would benefit in the future from the knowledge gained. However, there are extremes examples of offences to animals which cannot be allowed under any circumstances, whatever the benefit to humans or animals (Schuppli et al., 2004). Little is known about precisely which these offences are, but they probably include severe mutilation and other affronts to an animal's integrity, vivisection, trials that result in the painful death of animals and trials that involve the creation of extreme anxiety or fear in animals.

Much of the laboratory animal research is far from public view, unlike the rearing of farm animals or the management of companion animals, which is exposed to many. The public rely on the appraisal systems for the maintenance of their ethical standards. Without adequate and regular appraisal of experimentation by trained government assessors, there is a possibility that some institutional appraisal will be superficial and without the knowledge of trained officials. People on institutional assessment panels usually act voluntarily, and many are dedicated in their service to the committee. However, the system will only work if the institutions support the appraisal panels, with training, secretariat etc, so that each application can be rigorously and promptly considered.

Another ethical dilemma is whether the committees should be primarily dealing improving the design and analysis of experiments, assuming that their objectives are ethically valid. Usually it is rare for members of the panel to have received training in ethical decision making in relation to animal experimentation, but they will be faced with ethical dilemmas, such as applications using modern genetic technologies with large numbers of animals, only a small minority of which will produce successful mutants. Such research is justifiable from an economic and scientific perspective, because the mutants produced may be extremely valuable for medicine, but with the loss rate being much greater than in traditional experiments, the ethical validity of the work should be carefully considered. Once an ethical case has been accepted, there should be careful scrutinisation of the number of animals actually used and destroyed after the experiment, but unfortunately statistical justification is often rare or vague (Schuppli and Fraser, 2005). The increased use of animals for genetic modification, largely rodents, demonstrates a reversal of the trend towards reduced numbers of animals used for laboratory research at the beginning of the 21st C (Schuppli et al., 2004).

Many experiments do not use the correct number of animals to test their hypotheses (McCance, 1995). Two thirds of articles published in the Australian Veterinary Journal, for example, show statistical flaws, and nearly 10% used too few animals to prove or disprove their hypothesis (McCance, 1995). The work may still be useful to be published if repeated experiments can be linked through a statistical combination of several experiments, or meta-analysis (Phillips, 2005b). However, inadequate attention to statistical design leads to wasteful use of the animals in research.

The process of ethical approval by institutional panels is time-consuming and sometimes underfunded, relying largely on volunteer labour and a skeleton staff for administrative and clerical matters. However, it has the advantage over governmental processes in that some recognition is given to the views of the public and those members of activist organizations concerned about the welfare of research animals. The failure of some institutional ethical review processes to include members of the public or activist groups, such as the new ethical review system started in Iran (S. Aldavood, personal communication), will need to be addressed if it is to be credible internationally.

The processes can be accelerated by using documented standard procedures, which can be referred to in applications. In theory, this should give more time for discussion of the ethical merits of the work, but in practice it is likely that this will still be assumed to be acceptable. There's also a risk that the assessors will be desensitised to the procedures by seeing them referred to just as a code or reference number, and they may not adequately consider the relevance of the procedures to the specific experiments being evaluated. If they are used, these documented procedures must be regularly reviewed, so that when an improved technique becomes available its use is rapidly made known.

After these general considerations concerning the welfare of laboratory animals, it is pertinent to consider two contentious and relatively new areas of research that are likely to have a major impact on animal welfare.

Genetic Modification of Organisms

Genetic modification of animals has been pursued by man ever since they were first domesticated (Uzogara, 2000). Initially, the objective was to select animals that were best suited to the environment. In the last 50 years, however, with the industrialization of livestock production, the objective has moved rapidly towards economic goals, with the focus on increased productivity. Although genetic modification is not new, the speed with which changes can be introduced has been accelerating and the knowledge base has increased. Animal modifications are now conducted with some understanding of the changes at gene level, whereas in the past selection was based on phenotype alone. As the genetic constitution was unknown, progress was slow, but the phenotype could be expected to lie somewhere between the most extreme expression of the selected

trait and the normal phenotype of the population. The traits selected for were usually multilocus and therefore extreme results were rare. However, now that the genes themselves are deliberately targeted, and the expression is often improperly understood, extreme results are more common (Sillence, 2004). Hence the research can be conducted with a danger of producing phenotypes that could potentially release unwanted genes into the environment. As the precise functioning of the genes is often uncertain, and the modifications are targeted at an array of possible genes, the animals produced could be at risk of congenital welfare problems. Some will have high morbidity, and be susceptible to a variety of physiological complications. In addition, the very low success rate of many genetic modification programs, for mice at least, gives cause for concern about the ethics of the procedure. Sometimes, in large experiments with several hundreds of mice, the offspring will all be euthanased or they may not reach maturity, because of malfunctions and morphological complications, or because they failed to produce any suitable modification and are redundant for the experimental purposes. The standard production of GM mice in the laboratory therefore poses a major ethical dilemma as to whether large numbers of animals should be used in a production process with high mortality rates.

If the production of GM animals for laboratory research is contentious, so too is their utilisation in agriculture. Genetic modification of crops that are produced to be resistance to specific diseases or to be able to withstand pesticides and herbicides, to avoid the crop being contaminated with pests and weeds, respectively, is less morally questionable (Knight, 2007). An ability to tolerate pesticides and herbicides may actually reduce the volume of these chemicals required (Uzogara, 2000). These objectives may be laudable, but the long-term impact on the native flora and fauna is unclear. The impact in particular, on soil micro-organisms, which are at the start of the food chain, has received inadequate attention (Toro et al., 1998). Although most investigations have found little evidence of danger to humans, animals or micro-organisms of the production of genetically-modified crops (Toro et al., 1998), experimentation at Cornell University with the ecologically-valuable Monarch butterflies demonstrated the potential for their larvae to be killed by genetically-modified corn (Dively et al., 2004).

Genetical modification of sentient animals is more contentious, and early experimentation demonstrated the potential for welfare problems, because of the uncertainty of the phenotype. Some animals were genetically modified for increased growth and had problems with their leg joints, because farm animals have already been selected for rapid growth and other productive traits. Selection for cattle with a double muscling gene, which has a high prevalence in the Belgian Blue breed, directs growth preferentially to muscle and away from fat deposition and basic organs (Clinquart et al., 1998). The size of these animals and their high level of muscularity make them difficult to join with conventional cattle breeds without producing large foetuses, which require parturition by Caesarean section (Webster, 2002). Nevertheless, the search for genes connected with increased growth and production has accelerated in the last

30 years. The resulting animals are showing susceptibility to welfare problems: broiler chickens have high levels of congenital leg disorders (Bessei, 2006), many pigs are lame (Barnett et al., 2001) and the reproductive rate in extreme dairy type cows has declined (Roman et al., 1999; Shook, 2006).

There is now an increasing emphasis amongst farmers to breed for better disease resistance in their livestock, for example to enable cows to produce 10,000 litres per year or more without succumbing to lameness (Distl, 1999). Despite considerable improvements in treatment (Bolgov et al., 2002), the prevalence of mastitis is at the same level as 50 years ago. This is because many dairy cows are kept in intensive housing systems, where they come into contact with their excreta, that harbours the bacteria causing some of the most serious types of mastitis. In addition, walking on concrete all day can lead to damage to the laminar structure of the hooves, making walking painful (da Silva et al., 2004). The potential exists to genetically improve the hoof laminar structure in cows or to change the management system, but concrete is the normal material for floors because of its durability and ready availability.

There are therefore many ethical issues associated with genetical modification of animals: the welfare of all the laboratory animals used to develop them; the impact on humans or farm, companion or wild animals of consuming food from genetically modified animals, including the potential transmission of bacterial resistance to the animals themselves or their gut microflora, and finally the risk to the welfare of farm animals when using genetic modification to enhance production. However, there are potential welfare benefits from judicious use of this technology, by breeding animals that are more resistant to disease for example, or breeding animals better able to cope with heat, nutritional or other stresses.

Xenotransplantation

One of the new potential uses of laboratory animals, which illustrates the emerging ethical dilemmas now facing researchers, governments and the public, is xenotransplantation, the transplantation of animal tissues, cells or organs to humans. At a time when there is major shortage of organs for transplantation, it offers a hope of meeting the human demand, as well as potentially contributing to cell therapy, for example in renal dialysis. However, as well as presenting serious ethical issues, the transplantation procedures are technically difficult, mainly because of the rejection of the transplanted tissue or cells by the recipient (Yang and Sykes, 2007). This rejection is often very rapid, causing a hyperacute immune response, and in the case of major organ transplantation it is usual for the recipient to survive only a few days. Some improvements in controlling the immune response are emerging, particularly eliminating rejection by genetic modification of the source animals (Groth, 2007). However, the technique also poses dangers in relation to the emergence of new diseases and transmission of

existing diseases between species. This risk to the animal and human environment is heightened by the fact that the immune system of the recipient is heavily suppressed in an attempt to control the rejection problems.

Many western governments have prohibited animal to human transplantation, at least until the science is better understood. This is because, although most patients in need of a transplant would accept one from an animal, they are unlikely to understand the risks associated with this action (Ellison, 2006). Public opinion is less supportive (Deschamps et al., 2000). Most countries, including Australia, allow animal to animal transplantation, so that scientists can explore the techniques before they are used on humans. Animal to human cadaver transplantation is another possible method of improving the technique (Siepe et al., 2007). There is a common concern for both animal welfare and the environment as a result of the potential emergence of novel pathogens in this process. The most common source animal is the pig. The pig is omnivorous, like humans, and many of its organs are of approximately the same size as those of humans, although the heart poses some challenges because of the quadrupedal gait of pigs (Siepe et al., 2007). It is routinely kept for food production, and so may be seen as more ethically acceptable than animals that have to be captured from the wild before surrendering their organs, or animals, such as the dog, from which we derive emotional comfort. The pig as a domesticated animal has become partly adapted to intensive management systems and a considerable amount of research has been conducted on the improvement of the welfare of pigs in intensive management systems. Methodology has been prepared to assess porcine welfare accurately (e.g. API, 2004). However, when they are kept as source animals, pigs need to be confined in very clean, bioexclusion environments to control most pathogens (Tucker et al., 2002). No access to soil for rooting and nesting behaviour is possible, unless it is sterilised, and supplying toys to enrich their environment also has to be strictly controlled. The need to keep their environment scrupulously clean means that the housing systems are sterile, featureless enclosures, which leads to welfare problems such as fighting and tail biting. Even with all these precautions, pigs routinely carry some microorganisms that could be conveyed to humans during transplantation. The porcine endogenous retrovirus (PERV) is carried by most pigs, and at least theoretically has the potential to infect humans (Boneva and Folks, 2004). Recipients that become infected with PERV could develop novel diseases, particularly because the organism is changing from one species to another, and these may be capable of causing a worldwide epidemic. Thus recipients of transplants from pigs would have to agree to regular monitoring of their health status and this could lead to potential complications if they disappear or emigrate. They could not themselves donate their own organs for fear of transmission of any novel diseases. The risk has not yet been fully evaluated and appears considerable, although in animal-to-animal transplants the recipients can be closely monitored and contact with other animals limited. Such control would be very difficult or impossible to achieve with human recipients.

Some people find that xenotransplantation is contrary to the values that require the maintenance of the integrity of the animals (Thompson, 1997). There may be ethical problems for the human recipients relating to their religious beliefs (Hagelin et al., 2001), since Muslims are not allowed to eat the flesh of the pig and using their tissue could be equally abhorrent. There could also be a psychological stigma surrounding the human identity of recipients, who are essentially hybrid animals or chimeras (Modell, 2007). These were commonly depicted in the art and prose of many cultures, occasionally as graceful animals, such as the centaur, but usually as demonic animals or those meant to amuse, particularly in mediaeval manuscripts (Powell, 2004). Such chimeras are now beginning to be possible with genetic engineering and are raising people's concerns about the resulting 'animals'. However, the use of animal tissues in human medicine has been tolerated for many years without complaint, and it is likely that some of the fears surrounding the ethics of chimeras are unjustified.

Whilst there is no doubting that it is very tragic to see thousands of people dying whilst waiting for organ transplants, xenotransplantation is unlikely to offer an easy solution. The alternatives of artificial organs, stem cell transplants or medical campaigns to prove improve awareness of health issues probably offer more cost-effective and immediate control measures and a greater likelihood of success. The challenge of transplanting organs to humans will probably attract scientists to pursue this endeavour for years to come, but whether it should be a major recipient of government funds is highly debatable because of the ethical and welfare concerns. Possibilities remain that animal cells may be useful for transfusion procedures in renal or hepatic dialysis in the case of kidney or liver failure, respectively. But even in this situation animal cells are likely to be recognised as foreign material by the recipient and an immune reaction initiated. Attempts to encapsulate the source cells in an inert material have not been very successful. Another problem concerning rejection relates to the alpha galactose molecules on the surface of most mammalian cells, which cause immune rejection in the initial stages (Kiessling, 2002). It may be possible to genetically modify pigs to remove these molecules but the impacts on other aspects of porcine physiology are unknown.

The widespread use of pigs as source animals for transplanting organs would undoubtedly cause problems to many in the world's population that avoid pig meat and other products for religious reasons, in particular, the Muslim and Jewish people. Buddhists and Hindus would probably avoid this technology, in all probability, because of their belief that animal should not be used for human benefit, so the technology seems mainly targeted at the world's Christian population (Hagelin et al., 2001). The Buddhist belief in the transmutation of humans into animals between one life and the next might make the practice more acceptable for some. However, many people within Christian societies have developed serious concerns for the welfare of pigs. This together with concern for the potential threat to the environment of novel pathogens and suspicion with modern scientific developments suggests that there may be

limited acceptance of the techniques (Glass et al., 2005). Many argue that if there is a substantial need for organ transplants (and of this there is no doubt), then this would be more ethically met from the human rather than animal population. The limited number of organs available from humans is largely because people have to opt into schemes for organ donation. Some progressive countries such as Belgium have adopted a policy that assumes people will allow use of their organs after their death, unless they opt out (Roels, 1999). Thus people have to positively state that they will not donate their organs, and availability has dramatically increased.

Chapter 11
Future Developments in Animal Welfare

Regulatory control – farm animals – companion animals – wild animals – the scope of animal welfare concerns

Having considered the development of animal welfare in the past and the present, it is pertinent to reflect on how it is going to develop in the future. The significant changes in attitudes to animals in recent centuries suggest that over the course of the current century, attitudes will continue to change, probably stimulating an accelerated improvement in animal welfare. There will be many technical developments that facilitate improvements in animal welfare, some of which are generic to all animals. For example, there is likely to be more use of systems of electronic surveillance of animals, coupled with automatic provision of resources in response to demand or need.

Over the course of the century, it is probable that regulatory control of animal welfare will increase. Codes of practice will become more prescriptive, specifying facilities required for animals in detail. There will be increased emphasis on the establishment and maintenance of global standards for animal welfare. These are starting to be formulated by consensus between co-operating countries, such as in the European Union. However there will be a major role for international organizations with responsibility for animal welfare, in particular the World Organisation for Animal Health (OIE). This organization started in 1924 and now has representation from 172 countries. It adopted animal welfare as part of its portfolio in 2001. It has a particular focus on harmonizing animal welfare standards internationally, whilst recognizing cultural differences in attitudes to animals. International campaign activity is mainly the domain of the World Society for Protection of Animals, which started in 1981 and currently has about 700 member societies. Animal welfare campaigns are also becoming global activities, for example the recent campaign, orchestrated in the United States, to persuade worldwide clothing manufacturers not to buy wool from Australian sheep farmers still practising mulesing of their animals. It is also possible that more countries will give sentient animals legal status, following a declaration by the United Nations that animals are sentient beings, which means that their current status as property is inappropriate (WSPA, 2007).

C. Phillips, *The Welfare of Animals*, Animal Welfare 8,
DOI 10.1007/978-1-4020-9219-0_11, © Springer Science+Business Media B.V. 2009

Religious guidance on our treatment of animals has been influential in the past, and will probably still be important for the coming century. However, it will have to evolve to take account of changing human attitudes and aspirations. Guidance on the management of animals that is relevant today is generally not available in the ancient scriptures, because these were written for people living at different times in very different circumstances. The Islamic restrictions on stunning animals before slaughter, for example, appear outdated. However, being deeply embedded in their beliefs, development of alternative stunning procedures that are reversible appear urgent.[1] The religious leaders must address people's concerns about the welfare of animals, and those in the Abrahamic faiths that ignore this issue avoid the fundamental doctrine that humans have responsibility to look after animals. Indeed the failure of these faiths to adequately address such issues may even be partly responsible for the rise in popularity of the major Eastern religions, which place animals and humans on an equal basis. As discussed earlier, this is not necessarily incompatible with humans assuming responsibility for animals, in just the same way as children are our equals but we have responsibility for them. A just society does not allow the abuse of children or animals, and the popular demand for improved standards will probably grow over the course of the century.

Farm Animals

Meat consumption may decline in developed countries because of concerns about the cost, consumer health, animal welfare and the environment, and the meat that is consumed will be in smaller portions and with little fat. However, meat consumption is likely to increase in many rapidly developing countries, including India and China, because it was previously unaffordable to many people. An increasing number of people in developed countries are questioning methods used for food production from animals, but these doubts do not emanate from the traditional moral leaders in society, but from changing attitudes in a wealthier, better fed and materially richer society. In a recent Australian survey nearly one half of the population were either eating or contemplating eating a predominately plant-based diet (Lea et al., 2006), a trend which some believe represents a more moral approach to eating behaviour (Berndsen and van der Pligt, 2004). If this trend continues this pattern of behaviour will have significant consequences for our requirements for farmed livestock. Consumers are now better educated and require more information on the items available for purchase. More comprehensive and informative food labeling is starting to fulfil that need, together with an ability to trace products from the farm to the supermarket, using electronic coding. To avoid

[1] Conventional stunning is irreversible and animals that have been stunned are not therefore killed by a knife cut to the throat, which the Islamic Qur'an requires.

unnecessary labeling complexity, the branding of food products by certifying bodies is gaining in popularity, although many consumers do not yet recognize the certification schemes (Hoogland et al., 2007). Flexible schemes will allow the consumer to select goods produced to the welfare standard that they wish to support, but pressure from the major retailers could improve farm animal welfare standards relatively rapidly. Consumers are likely to increasingly support organic farming methods, which represent a certified standard of production in all the major areas of concern – animal welfare, food safety and care for the environment. Eventually organic products may be universally accepted in retail outlets, with little demand for conventional products, making the retailers the arbiters of animal welfare standards, in conjunction with the certifying bodies.

Competition for the consumer market will increasingly be between global companies, rather than between countries (Toulmin, 1999). The globalization of the world's food markets and harmonization of diet across different cultures will see more animal products exported from countries that can produce them efficiently (Van Dooren, 2006). However, this centralization can have large effects locally, for example waste concentration. Transport of the product over long distances is likely to reduce efficiency. The concern that people have for the welfare impact of long distance transport of live animals is likely to mean that the products, rather than the animals, will be transported wherever possible. The harmonization of the world's cultures, as a result of migration and internationalization of the media, may diminish the demand for live animals to be transported overseas for religious slaughter. More production will be based in developing countries because of the cheap labour available there, but there is already some harmonization of labour costs and standards between developed and developing countries (Frenkel, 2001). India, which has the largest cattle population of any country, allows most cattle to scavenge off refuse in the streets. The refuse may have alternative uses, such as for biofuel production, and it is likely that India will remove cattle from the streets into farms, where their production can be controlled.

Companion Animals

Humans are a very social species and the likely continued rise in popularity of urban living to limit transport time and to increase the opportunities for entertainment and social intercourse, will be at the cost of further estrangement from nature. When people are estranged from nature they express their desire for a natural environment in their art, poetry and music. Urban living and female emancipation has brought opportunities for both members of partnerships to work full-time, and many are choosing to do so to acquire the high standard of living that modern technology offers. This style of living does not easily allow the inclusion of the traditional dog or cat in the household. Dogs

are social animals in need of care, attention and exercise, and they require a considerable time commitment. The emergence of daytime animal care facilities, in its infancy today, is likely to accelerate over the course of the century to meet the demands of modern lifestyles. Cats are also social and they like to hunt. Many welfare agencies now recommend that cats should be kept indoors all day, to protect wildlife (e.g. HSUS, 2008), but if they only interact with their owners for a few hours each day this will be seen as providing insufficient stimulation and activity.

Stray dogs and cats are a cause for concern to many because of their perceived welfare, the spread of disease and the risks to humans and wildlife, therefore compulsory control over their breeding activity is likely to be more common. In the more progressive countries only desexed cats and dogs will be available to the general public, with breeding licences available on application for those that can offer suitable facilities. In the longer term, other less demanding types of companion animal are likely to increase in popularity. Aquaria fish are already growing rapidly in popularity (e.g. NSW DPI, undated), offering attractive animals in a natural setting, that only need a small expenditure of time to be maintained. They do not provide the physical contact of cats and dogs, but it will be increasingly recognized that this can only be obtained alongside strict enforcement of minimum standards for exercise, health provisions and containment of these two species. Health care for companion animals can expect to adopt many of the advances in human medicine, which coupled with breeding for healthier animals, will allow them to live longer and healthier lives. Alongside the medical advances that will improve humans' quality of life, there will be more emphasis on people taking responsibility for a good diet, appropriate exercise and the morality of their behaviour. Animals will always be important contributors to the maintenance of our physical and mental health. However, to achieve this there will be an increased need for skilled animal experts to provide guidance on the management of animals and their interaction with the environment that they share with us.

Wild Animals

Wild animals will be increasingly valued as a vital component in the natural areas in which we relax. Ecotourism will help to preserve this future. However, in regions where the combination of natural areas and urban living is under strain, such as in developing countries with rapidly populations, the survival and welfare of wild animals is likely to become an increasing focus of concern in developed countries. Habitat destruction and global climate change (Marai et al., 2007) will the two major challenges, although the impact of tourism will also be an increasing concern in many regions. The accelerated rate of climate change as a result of human industrial activity may exceed the ability of animals to change their species characteristics. In addition, the possibilities of mass

migration to more suitable regions have been diminished for most of the larger animals by the transition of natural habitat into farming land. The possibility of extinction of wild animal species, partly as a result of global climate change, will increasingly become a reality, which will need to be addressed by politicians, biologists, animal welfare scientists, geographers and a range of scientists from other disciplines. There will be a major emphasis on conservation of biodiversity and maintenance of sustainable ecosystems, with special consideration given to maintaining native animal species that are adapted to the environment.

There is increased awareness of the impact of fishing practices, and the ability to inform the public of the issues through the modern media is likely to lead to more attention being paid to the welfare of fish, not just commercial but also recreational fishing (Davie and Kopf, 2006). Now that it is realized that fish feel pain in similar ways to other animals (Nordgreen et al., 2007), there are many changes to recreational fishing practice proposed that could reduce the welfare impact (Davie and Kopf, 2006).

As wild animals and their habitat become increasingly threatened, their preservation and reproduction in wildlife parks and zoos will be more valued. These will be responsible for holding stocks of endangered animals and for rehabilitating animals into suitable environments when they are available. These sanctuaries can also receive the public to be educated about animals in nature, to learn to respect the animal's form and function and to assist in the process through their donations, however, this should never be their main function. Adopting animals is a good way of ensuring active involvement of the public, which fulfills the need that many have to look after nature. In children it teaches them to care for animals and that they can make a difference. However, welfare standards for animals in many sanctuaries need addressing, and it is likely that global standards will emerge.

Living standards for animals in zoos should ideally be as good as those living standards of the people that visit. Clearly many zoos have a long way to go, but this transition is essential if they are to have a good future.

The Scope of Animal Welfare Concerns

Over the course of the century, it is likely that the emphasis of the public's concern for animals will move away from the current focus on sentient animals that are useful to humans, towards a more holistic view of our responsibilities towards animals, embracing concern for all animals, and extending the focus to genetic integrity, longevity, relationship to the environment, teleos and animal uses. The combination of wellbeing and longevity indicators to create overall indicators of animal welfare would bring the animal sector more in line with human indicators of wellbeing, which usually unite the two components (Perenboom et al., 2004).

Animal welfare science will continue to develop and will increasingly attract top scientists, as well as leading academics from other areas: philosophy,

theology and bioethics in particular. Other countries are likely to follow the United Kingdom's lead establishing tertiary level courses in animal welfare, producing well trained individuals that will contribute to the development of this new science. Progress will continue until there is appropriate attention to the welfare of all animals. Legislative control of animal welfare will almost certainly increase, supported by detailed Codes of Practice. Licensing of animal industry operators, and in particular farm workers and managers, is likely in some developed countries within 50 years.

There may be increased conflict between supporters of improved welfare standards for animals, welfare standards for humans and the welfare of the environment. However, true progress will only be made when the integrated nature of these three objectives is realised and pursued by all. According to the Confucian proverb, we can gain wisdom in several ways, through experience and imitation, but the noblest way is through reflection. Our reflections on the welfare of that silent majority, the animals with whom we share the planet, will guide our thoughts, words and, most importantly, our deeds.

References

Aarssen, L.W. 2005. Why is fertility lower in wealthier countries? The role of relaxed fertility-selection. Population and Development Review 31: 113.

Abbas, E.E. 2007. Industry-sponsored research in developing countries. Contemporary Clinical Trials 28: 677–683.

Abbot, N.C. 2000. Healing as a therapy for human disease: A systematic review. Journal of Alternative and Complementary Medicine 6: 159–169.

Abeyesinghe, S.M., Nicol, C.J. et al. 2005. Can domestic fowl, Gallus gallus domesticus, show self-control? Animal Behaviour 70: 1–11.

Abler, B., Erk, S. et al. 2007. Anticipation of aversive stimuli activates extended amygdala in unipolar depression. Journal of Psychiatric Research 41: 511–522.

Adam, T.C. and Epel, E.S. 2007. Stress, eating and the reward system. Physiology & Behavior 91: 449–458.

Agenäs, S., Heath, M.F., Nixon, R.M., Wilkinson J.M. and Phillips, C.J.C. 2003. A meta-regression and field study aiming to evaluate frequently analysed metabolites as indicators of undernutrition in cattle. Report to the RSPCA, UK, July 2003.

Agenäs, S., Heath, M.F., Nixon, R.M., Wilkinson, J.M. and Phillips, C.J.C. 2006. Indicators of undernutrition in cattle. Animal Welfare 15: 149–160.

Alboga, M.A.B. 2003. Ritual slaughter: Animal friendly slaughter and protection of animals in Islam. Deutsche Tierarztliche Wochenschrift 110: 189–192.

Albright, K. M. 2002. The extension of legal rights to animals under a caring ethic: An ecofeminist exploration of Steven Wise's Rattling the cage. Natural Resources Journal 42: 915–937.

Alcock, J. 1989. Animal Behaviour and Evolutionary Approach. Sinauer Associates, Inc., Sunderland, U.S.A.

Allen, G. 2002. The measure of a Victorian polymath: Pulling together the strands of Francis Galton's legacy to modern biology. Nature 145: 19–20.

Allott, R. 1991. Objective morality. Journal of Social and Biological Structures 4: 455–471.

Ambrose, P. 1992. Conflict over Canadian Seal Cull. Marine Pollution Bulletin 24: 226–226.

American Bird Conservancy. 2007. Domestic cat predation on birds and other wildlife. http://www.abcbirds.org/cats/factsheets/predation.pdf. Accessed February 2007.

American Humane, 1997. Animal Shelter Euthanasia. http://www.americanhumane.org/site/PageServer?pagename = nr_fact_sheets_animal_euthanasia. Accessed 21 January, 2008.

American Humane, 2003. Animal cruelty statutes by State. americanhumane.org/site/DocServer/ta_cruelty_stats_2003.pdf?docID = 442

American Veterinary Medicine Association AVMA undated. Companion Animal/Exotic. http://www.avma.org/membshp/marketstats/comp exotic.asp. Accessed 17 July, 2006.

Anderson, L. C. 2007. Institutional and IACUC responsibilities for animal care and use education and training programs. ILAR Journal 48: 90–95.

Andrabi, S.M.H. and Maxwell, W.M.C. 2007. A review on reproductive biotechnologies for conservation of endangered mammalian species. Animal Reproduction Science 99: 223–243.

Andrews, M. 2005. An Introduction to Egyptian Art. http://touregypt.net/featurestories/artoverview.htm. Accessed 7 January, 2008.

Animal Welfare Centre (AWC). 2002. Final lists of animal welfare issues for each animal industry. In 'Proceedings of a Workshop to Identify Animal Welfare Issues with Animal Industries', pp 5–29. Animal Welfare Centre, Werribee, Australia.

Animals Australia, 2007. Change is Needed. Video. http://www.animalsaustralia.org/media/videos.php?vid=changeisneeded&native=1. Accessed 2 January, 2008.

Anon, 1987. Empathy, pp 220–221. In: R.L. Gregory Ed. Oxford Companion to the Mind. Oxford University Press, UK.

Anon, 1996. Second report on the statistics on the number of animals used for experimental and other scientific purposes in the member states of the European Union. Commission Communication to the Council and the Parliament. Com 99 191. http://ec.europa.eu/environment/docum/99191_en.htm, accessed January, 2007.

Anon, 2006. Australian Standards for the Export of Livestock. http://www.daff.gov.au/content/output.cfm?ObjectID=E23635D3-2B6F-48D9-BFF4C8F52C618BAF. Accessed 1 March, 2006.

Anon, 2007a. www.hen.org/servlets/hcp. Accessed January, 2007.

Anon, 2007b. http://rqriley.com/images. Accessed January, 2007.

Anon, 2007c. The Cave Paintings and Rock Art of Chauvet. http://www.bradshawfoundation.com/chauvet/page10.php. Accessed October, 2008.

Anon, 2007d. The Venus of Willendorf, Fertility Symbol, Pre-Historic Sculpture, 30000-25000 BC. http://www.art.com/asp/sp-asp/_/pd–11725851/The_Venus_of_Willendorf_Fertility_Symbol_PreHistoric_Sculpture_3000025000_BC_Front_View.htm. Accessed October, 2007.

Anon, 2008a. Prayer and Sacrifice. www.roman-empire.net/religion/sacrifice.html. Accessed, 8 January, 2008.

Anon, 2008b. Ashurbanipal II Killing Lions, the Palace of Ashurbanipal II,Nimrud, Iraq, Neo-Assyrian, 668–627 BC. http://www.allposters.com/-sp/Ashurbanipal-II-Killing-Lions-the-Palace-of-Ashurbanipal-II-Nimrud-Iraq-Neo-Assyrian-668-627-BC-Posters_i1951619_.htm. Accessed 8 January, 2008.

Anon, 2008c. Recreational Fishing. http://www.ec.gc.ca/nature/highlights/bc.htm, accessed December, 2008.

Appleby, M.C., Cutler, N. et al. 2003. What price cheap food? Journal of Agricultural & Environmental Ethics 16: 395–408.

Araus, J.L., Febrero, A. et al. 1999. Crop water availability in early agriculture: evidence from carbon isotope discrimination of seeds from a tenth millennium BP site on the Euphrates. Global Change Biology 5: 201–212.

Arave, C.W., Albright, J.L. and Sinclair, C.L. 1974. Behaviour, milk yield and leucocytes of dairy cows in reduced space and isolation. Journal of Dairy Science 59: 974–985.

Arias, A. J., Steinberg, K. et al. 2006. Systematic review of the efficacy of meditation techniques as treatments for medical illness. Journal of Alternative and Complementary Medicine 12: 817–832.

Arluke, A. and Luke, C. 1997. Physical cruelty toward animals in Massachusetts, 1975–1996. Society & Animals 5: 195–204.

Arluke, A., Levin, J. et al. 1999. The relationship of animal abuse to violence and other forms of antisocial behavior. Journal of Interpersonal Violence 14: 963–975.

Ascione, F.R., Weber, C.V. et al. 2007. Battered pets and domestic violence – Animal abuse reported by women experiencing intimate violence and by nonabused women. Violence against Women 13: 354–373.

Asmundson, G.J.G. and Hadjistavropoulos, H.D. 2007. Is high fear of pain associated with attentional biases for pain-related or general threat? A categorical reanalysis. Journal of Pain 8: 11–18.

Astin, J.A., Harkness, E. et al. 2000. The efficacy of distant healing: A systematic review of randomized trials. Annals of Internal Medicine 132: 903–910.

Australian Code of Practice for the Care and Use of Animals for Scientific Purposes, 2004. Seventh edition. National Health and Medical Research Council, Canberra. http://www.health.gov.au/nhmrc/issues/pdf/animcode.pdf, accessed August, 2007.

Australian Pork Industry. Pigs: Welfare Audit for the Pork Industry. http://www.apl.au.com/media/Pork%20Industry%20Welfare%20Audit.pdf. 2004.

Bach, A., Dinares, M. et al. 2007. Associations between lameness and production, feeding and milking attendance of Holstein cows milked with an automatic milking system. Journal of Dairy Research 74: 40–46.

Bagaric, M. 2006. How to Live: Being Happy and Dealing with Moral Dilemmas, University Press of America, Lanham, MD, USA.

Baldock, F.C., Alexander, L. and More, S.J. 2001. Estimated and predicted changes in the cat population of Australian households from 1979 to 2005. Australian Veterinary Journal 81: 289–292.

Barnett, J.L., Hemsworth, P.H. et al. 2001. A review of the welfare issues for sows and piglets in relation to housing. Australian Journal of Agricultural Research 52: 1–28.

Bartussek, H. 1999. A review of the animal needs index ANI for the assessment of animals' well-being in the housing systems for Austrian proprietary products nad legislation. Livestock Production Science 61: 179–192.

Baumans, V. 2004. Use of animals in experimental research: an ethical dilemma? Gene Therapy 11: S64–S66.

Bay, A.H., Hellevik, O. et al. 2007. Does immigration undermine welfare state support? Tidsskrift for Samfunnsforskning 48: 377–408.

Bayvel, D. 2004. Animal use statistics: the Australian and New Zealand experience and perspective. Alternatives to Laboratory Animals, 32, Supplement 1, 287–292.

Beatty, M. Undated. RSPCA recognises cane toad menace. Media release. http://www.rspcaqld.org.au/news/mediareleases/cane_toad_menace.pdf

Beiglbock, C., Steinbeck, T., Tataruch, F. and Rug, T. 2002. Environmental cadmium induces histopathological changes in kidneys of roe deer. Environmental Toxicology and Chemistry 21: 1811–1816.

Belotto, A.J. and Silva, D.F.D. 2006. Major issues affecting companion animals worldwide. Proceedings of the Symposium of the World Society for the Protection of Animals, London, July, 2006.

Berndsen, M. and van der Pligt, J. 2004. Ambivalence towards meat. Appetite 42: 71–78.

Bessei, W. 2006. Welfare of broilers: a review. Worlds Poultry Science Journal 62: 455–466.

Bicalho, R. C., Vokey, F. et al. 2007. Visual locomotion scoring in the first seventy days in milk: impact on pregnancy and survival. Journal of Dairy Science 90: 4586–4591.

Black, E. 2003. War Against the Weak: Eugenics and America's Campaign to Create a Master Race. Four Walls Eight Windows, New York, USA.

Blake, W. 1803. Auguries of Innocence. In: Nicholson & Lee Eds. The Oxford Book of English Mystical Verse. 1917. Oxford, England.

Blaxter, K.L. 1995. From Dearth to Plenty: The Modern Revolution in Food Production. 296 pp. Cambridge University Press, Cambridge.

Bleckmann, C.A. 2006. Evolution and creationism in Science: 1880–2000. Bioscience 56: 151–158.

Blokhuis, H.J., Ekkel, E.D. et al. 2000. Farm animal welfare research in interaction with society. Veterinary Quarterly 22: 217–222.

Bolgov, A.E., Karmanova, E.P. et al. 2002. The influence of different factors on resistance of dairy cows to mastitis. Journal of Animal and Feed Sciences 11: 237–254.

Boneva, R.S. and Folks, T.M. 2004. Xenotransplantation and risks of zoonotic infections. Annals of Medicine 36: 504–517.
Born Free Foundation, 2007. Roadkill Survey. www.bornfree.org.uk/ukroad.htm, accessed January, 2007.
Botreau, R., Bonde, M. et al. 2007. Aggregation of measures to produce an overall assessment of animal welfare. Part 1: a review of existing methods. Animal 1: 1179–1187.
Bracke, M.B.M., Spruijt, B.M. et al. 1999. Overall animal welfare reviewed. Part 3: Welfare assessment based on needs and supported by expert opinion. Netherlands Journal of Agricultural Science 47: 307–322.
Brade, W. 2005. Longevity and reasons for culling of milk yield controlled Holstein cows: Consequences for breeding? Praktische Tierarzt 86: 658.
Bradshaw, I.G.A. 2004. Not by bread alone: symbolic loss, trauma, and recovery in elephant communities. Society & Animals 12: 143–158.
Bradshaw, R.H. 2002. The ethical review process in the UK and Australia: The Australian experience of improved dialogue and communication. Animal Welfare 11: 141–156.
Bradshaw, R.H., Marchant, J.N. et al. 1998. Effects of lavender straw on stress and travel sickness in pigs. Journal of Alternative and Complementary Medicine 4: 271–275.
Brambell, F.W.R. 1965. Report of the Technical Committee to Enquire into the Welfare of Animals Kept under Intensive Livestock Husbandry Systems. HMSO Cmnd. 2836, London.
Brisbane City Council BCC , 2003. Animal Laws and Permits. http://www.brisbane.qld.gov.au/BCC:BASE:544886598:pc=PC_1826#dogs. Accessed 21 January, 2008.
British Museum, 2007. Assyria, Lion Hunts, Room 10a. http://www.britishmuseum.org/explore/galleries/middle_east/room_10a_assyria_lion_hunts.aspx
Broom, D.M. 1986. Indicators of poor welfare. British Veterinary Journal 142: 524–526.
Broom, D.M. 1992. Animal welfare: its scientific measurement and current relevance to animal husbandry in Europe. In: C.J.C. Phillips and D. Piggins Eds. Farm Animals and the Environment, pp 245–253. CAB International, Wallingford.
Broom, D.M. 1999. The welfare of vertebrate pests in relation to their management. In: D.P.F. Cowand Ed. Advances in Vetebrate Pest Management, pp. 309–329. Fürth, Finlander Verlad.
Broom, D.M. 2003. The Evolution of Morality and Religion. Cambridge University Press, Cambridge, UK.
Broom, D.M. 2005. Animal welfare education: development and prospects. Journal of Veterinary Medical Education 32: 438–441.
Broom D.M. and Johnson, K.G. 1993. Stress and Animal Welfare. Chapman and Hall, London.
Brothers, L. 1990. The neural basis of primate social communication. Special issue: Empathy. Motivation and Emotion 14: 81–91.
Brown, D.F. 2007. The spatial and temporal dimensions of a rural landscape: the Yucatec Maya k'ax. Canadian Geographer-Geographe Canadien 51: 91–108.
Brown-Brandl, T.M., Eigenberg, R.A. et al. 2006. Heat stress risk factors of feedlot heifers. Livestock Science 105: 57–68.
Bruckmeier, K. and Prutzer, M. 2007. Swedish pig producers and their perspectives on animal welfare: a case study. British Food Journal 109: 906–918.
Burgdorf, J., Panksepp, J. et al. 2006. Regional brain cholecystokinin changes as a function of rough-and-tumble play behavior in adolescent rats. Peptides 27: 172–177.
Butcher, R. 2006. Companion animal issues: solutions. Proceedings of the Symposium of the World Society for the Protection of Animals, London, July, 2006.
CAB International. 2002. Animal Health and Production Compendium. CAB International, Wallingford, UK.
Carey, G. and DiLalla, D.L. 1994. Personality and psychopathology: genetic perspectives. Journal of Abnormal Psychology 103: 32–43.

Carling, L. 2005. Squirrel Monkey Behaviour Enrichment. Honours' thesis, University of Queensland, Australia.
Carlson, L.W. 2002. Cattle: An Informal Social History. National Book Networks, Lanham, USA.
Carter, D. 1957. The Symbol of the Beast – the Animal Style Art of Eurasia. Ronald Press Co., New York.
Case, J.B., Chomel, B. et al. 2006. Serological survey of vector-borne zoonotic pathogens in pet cats and cats from animal shelters and feral colonies. Journal of Feline Medicine and Surgery 8: 111–117.
Catan, T. 2007. Bullfighting in dock after 14-year old is badly gored. The Times, 18 April, 2007, 33 pp.
Chalmeau, R., Visalberghi, E. and Gallo, A. 1997. Capuchin monkeys, Cebus apella, fail to understand a cooperative task. Animal Behaviour 54: 1215–1225.
Clark, A.C. 1977. Animals and Men, their Relationship as Reflected in Western Art from Prehistory to the Present Day. William Morrow and Company, New York.
Clements, R.J. 2006. Farrer oration – shaking windows; rattling walls. Tropical Grasslands 40: 129–136.
Clinquart, A., Hornick, J.L. et al. 1998. The influence of double muscling on production and quality of meat in Belgian Blue cattle. Productions Animales 11: 285–297.
Clubb, R. and Mason, G. 2003: A review of the welfare of zoo elephants in Europe. Report commissioned by the RSPCA. University of Oxford, Animal Behaviour Research Group, Oxford.
Companion Animal Welfare Council, CAWC, 2003. Report on the Welfare of Non-domesticated Animals kept for Companionship. CAWC, Sidmouth, Devon.
Conard, N. J. 2003. Palaeolithic ivory sculptures from southwestern Germany and the origins of figurative art. Nature 426: 830–832.
Coppinger, R., Glendinning, E, Torop, E, Mattay, C, Sutherland, M and Smith, C. 1987. Degree of behavioural neoteny differentiates canid polymorphs. Ethology 75: 89–108.
Coppinger, R.F. and Smith, C.K. 1983. The domestication of evolution. Environmental Conservation 10: 283–292.
Coruh, B. A., Ayele, H. et al. 2005. Does religious activity improve health outcomes? A critical review of the recent literature. Explore – the Journal of Science and Healing 1: 186–191.
Countryman, M.J. 2006. From protest to politics – Community control and black independent politics in Philadelphia, 1965–1984. Journal of Urban History 32: 813–861.
Cox, B. and Bilkei, G. 2004. Lifetime reproductive performance of sows kept indoors and outdoors in Croatia. Veterinary Record 154: 569–570.
Crafts, N. 1985. British Economic Growth during the Industrial Revolution. Oxford: Clarendon Press.
Cross, N., Wojciechowska, J., Meng, J. and Phillips, C.J.C. 2008a. Perceptions of the importance of different welfare issues in Australian beef cattle production. Submitted for publication.
Cross, N., Wojciechowska, J., Meng, J. and Phillips, C.J.C. 2008b. Perceptions of the importance of different welfare issues in Australian sheep and goat production. Submitted for publication.
Curtis, S.E. and Guither, H.D. 1983. Animal welfare, an international perspective. In Baker, F.D. ed. Beef Cattle Science Handbook, pp 1187–1191. Westview Press, Boulder, Colorado, USA.
da Silva, L.A.F., Fioravanti, M.C.S. et al. 2004. Foot diseases in dairy cows: association with clinical mastitis, metrites and predisposed factors. Pesquisa Veterinaria Brasileira 24: 217–222.
Daly, B. and Morton, L.L. 2006. An investigation of human-animal interactions and empathy as related to pet preference, ownership, attachment, and attitudes in children. Anthrozoos 19: 113–127.
Danbury, T.C., Weeks, C.A., Chambers, J.P., Waterman-Pearson, A.E., Kestin, S.C. 2000. Self-selection of the analgesic drug carprofen by lame broiler chickens. Veterinary Record 146: 307.

Darwin, C. 1859. On the Orgin of Species by Means of Natural Selection. First edition. John Murray Publishers, London.
Davey, G.C., Forster, L., and Mayhew, G. 1993. Familial resemblances in disgust sensitivity and animal phobias. Behavioural Research Therapy 31: 41–50.
Davie, P.S. and Kopf, R.K. 2006. Physiology, behaviour and welfare of fish during recreational fishing and after release. New Zealand Veterinary Journal 54: 161–172.
Davies, P. 2006. Speech of the 10 million signatures petition – Animals matter to me. Proceedings of the Symposium of the World Society for the Protection of Animals, London, July, 2006.
Davis, G.H., Dodds, K.G. et al. 1993. Liveweight, fleece weight and prolificacy of Romney ewes carrying the Inverdale prolificacy gene Fecxi located on the X-chromosome. Livestock Production Science 34 1–2: 83–91.
Dawkins, M.S., Cook, P.A.et al. 2003. What makes free-range broiler chickens range? In situ measurement of habitat preference. Animal Behaviour 66: 151–160.
Dawkins, R. 2006. The God Delusion. Bantam Press, London.
Dayton L. Alverson, D.L., Freeberg, M.H., Murawski, S.A. and Pope, J.G. 1996. A global assessment of fisheries bycatch and discards. FAO Fisheries Technical Paper 339, Food and Agriculture Organisation, Rome.
Degabriele, R. and Fell, L.R. 2001. Changes in behaviour, cortisol and lymphocyte types during isolation and group confinement of sheep. Immunology and Cell Biology 79: 583–589.
Delezie, E., Verbeke, W. et al. 2006. Consumers' preferences toward techniques for improving manual catching of poultry. Poultry Science 85: 2019–2027.
Delezie, E., Verbeke, W. et al. 2007. Consumer perception versus scientific evidence about alternatives for manual catching of broilers in Belgium. Poultry Science 86: 413–419.
Denton, F.T., Mountain, D.C. et al. 1999. Age, trend, and cohort effects in a macro model of Canadian expenditure patterns. Journal of Business & Economic Statistics 17: 430–443.
Deschamps, J.Y., Chaillous, L. et al. 2000. Acceptability of xenograft by patients with type 1 diabetes mellitus and the general French population. Pathologie Biologie 48: 419–421.
Diamond, J. 1997. Guns, Germs and Steel: The Fates of Human Societies. W.W. Norton, USA.
Diez, M. and Istasse, L. 1995. Commercial dog food – characteristics and use in different physiological states. Annales De Medecine Veterinaire 139: 309–316.
Distl, O. 1999. Breeding for soundness of feet and legs in dairy cattle. Zuchtungskunde 71: 446–458.
Dively, G.P., Rose, R. et al. 2004. Effects on monarch butterfly larvae Lepidoptera: Danaidae after continuous exposure to Cry1Ab-expressing corn during anthesis. Environmental Entomology 33: 1116–1125.
Dolmia, N.M., Calenge, C. et al. 2007. Preliminary observations of elephant Loxodonta africana, Blumenbach movements and home range in Zakouma National Park, Chad. African Journal of Ecology 45: 594–598.
Duffy, R., Fearne, A. et al. 2005. Reconnection in the UK food chain - bridging the communication gap between food chain producers and consumers. British Food Journal 107: 17–33.
Duncan, I.J.H. and Fraser, D. 1997. Understanding animal welfare. In: M.C. Appleby and B.O. Hughes Ed. Animal Welfare, pp 19–31. CABI, Oxford, UK.
Dwyer, C.M. 2004. How has the risk of predation shaped the behavioural responses of sheep to fear and distress? Animal Welfare 13: 269–281.
Edwards, S.A. 2007. Experimental welfare assessment and on-farm application. Animal Welfare 16: 111–115.
Eisenberg, N. and Strayer, J. 1987. Critical issues in the study of empathy. In N. Eisenberg and J. Strayer ed. Empathy and Its Development, pp 3–16. Cambridge University Press, Cambridge.
El-Ghoul, W. and Hofmann, W. 2002. Influence of claw diseases of varying degrees on measurable stress reaction with special consideration of cortisol and lactate in bovine blood serum. Praktische Tierarzt 83: 354.

Ellison, T. 2006. Xenotransplantation – ethics and regulation. Xenotransplantation 13: 505–509.
English, P., Gurgess, G., Segundo, R. and Dunne, J. 1992. Stockmanship. Improving the Care of the Pig and other Livestock. Farming Press, Ipswich.
Eurobarometer, 2007. Attitudes of EU citizens towards Animal Welfare. russels. http://ec.europa.eu/public_opinion/archives/ebs/ebs_270_en.pdf. Retrieved 13 November 2004.
Evans, E.P. 1896. Animal Symbolism in Ecclesiastical Architecture. 105 pp. Heinemann, London.
Evans-Pritchard, E.E. 1940. The Nuer: A Description of the Modes of Livelihood and Political Institutions of a Nilotic People. Oxford University Press, Oxford.
Ewbank, R. 1992. Stress: a general overview. In: C.J.C. Phillips and D. Piggins Eds. Farm Animals and the Environment, pp 255–262. CAB International, Wallingford.
Feddema, J.P.H. 1995. The lesser violence of animal sacrifice – a somewhat hidden and overlooked ignored reality in Sinhala Buddhism. Anthropos 90: 133–148.
Feige, S., Nilsson, K., Phillips, C.J.C. and Johnston, S. 2007. Heterosexual and homosexual behaviour and vocalisations in captive female koalas (Phascolarctos cinereus). Applied Animal Behaviour Science 103: 131–145.
Fernie, K.J., Bortolotti, G.R., Smits, J.E., Wilson, J., Drouillard, K.G. and Bird, D.M. 2000. Changes in egg composition of American kestrels exposed to dietary polychlorinated biphenyls. Journal of Toxicology and Environmental Health – Part A 60: 291–303.
Fiege, M. 2007. The atomic scientists, the sense of wonder, and the bomb. Environmental History 12: 578–613.
Florida Fish and Wildlife Conservation Commission, 2007. http://research.myfwc.com/deatures/view_articlw.asp?id = 19870, accessed January, 2007.
Flugge, M. 2004. Australian wool and sheep industry – leaders in sheep care pdf. Australian Wool Innovation Ltd. http://www.woolisbest.com/documents/wool_industry%20update_Nov_2004.pdfAccessed 15 January, 2008.
Fölsch, D.W. 1984. Determinants on the man-animal relationship. In Unshelm, J., van Putten, G. and Zeeb, K. ed. Proceedings of the International Congress on Applied Ethology in Farm Animals, pp 257–263. International Congress on Applied Ethology in Farm Animals, Kiel, Germany.
Food and Agriculture Organisation (2002). http://www.fao.org/ag/aga/index_en.htm.
Forbes, M.J. 1998. Dietary awareness. In special issue on 'Animal Awareness, Concepts and Implications for Domesticated Animals' ed D. Piggins and C.J.C. Phillips. Applied Animal Behaviour Science 57: 287–298.
Ford, J. 1986. The great kangaroo cull begins. New Scientist 109 1494: 27–27.
Fraser, D. 2006. Animal welfare assurance programs in food production: a framework for assessing the options. Animal Welfare 15: 93–104.
Fraser, D. 2005. Animal welfare and the intensification of animal production. Food and Agricultural Organisation Readings in Ethics, 2. FAO, Rome.
Fredrikson, M., Annas, P., Fischer, H. and Wik, G. 1996. Gender and age differences in the prevalence of specific fears and phobias. Behavioural Research Therapy 34: 33–39.
Freedom Against Animal Cruelty in Europe FAACE, 2001. Frequently asked questions. http://www.faace.co.uk/faqs2.htm. Accessed 8 January, 2008.
Frenkel, S.J. 2001. Globalization, athletic footwear commodity chains and employment relations in China. Organization Studies 22: 531–562.
Freudenberg, K., Plefka, C. et al. 2007. Osteochondrosis dissecans in a growing bull. Tieraerztliche Praxis Ausgabe Grosstiere Nutztiere 35: 11.
Furnas, J.C. 1948. Anatomy of Paradise: Hawaii and the Islands of the South Pacific. 542 pp. Sloan Association, New York.
Gandhi, M.K. 1927. An Autobiography. Penguin Books, Hamondsworth, England.
Gandhi, M.K. 1948. The Seven Blunders of the World. List given by Mahatma Gandhi to his grandson Arun Gandhi, written on a piece of paper, on their final day together, shortly

before his assassination. http://en.wikipedia.org/wiki/Seven_Blunders_of_the_World, accessed 31/01/07
Gandhi, M.K. undated. http://en.wikiquote.org/wiki/Mahatma_Gandhi, accessed 31/01/07
Garbarino, E.J., Hernandez, J.A. et al. 2004. Effect of lameness on ovarian activity in postpartum Holstein cows. Journal of Dairy Science 87: 4123–4131.
Garfinkel, A.P. 2006. Paradigm shifts, rock art studies, and the Coso sheep cult of eastern California. North American Archaeologist 27: 203–244.
Garolera, M., Coppola, R. et al. 2007. Amygdala activation in affective priming: a magnetoencephalogram study. Neuroreport 18: 1449–1453.
Gauthier, C. 2004. Overview and analysis of animal use in North America. Alternatives to Laboratory Animals, 32: Supplement 1, 275–285.
Geist, V. 1971. Mountain Sheep: A Study in Behaviour and Evolution. University of Chicago Press, Chicago.
Gintzburger, G., Le Houerou, H.N. et al. 2005. The steppes of Middle Asia: Post-1991 agricultural and rangeland adjustment. Arid Land Research and Management 19: 215–239.
Glass, C.A., Hutchinson, W.G. et al. 2005. Measuring the value to the public of pig welfare improvements: a contingent valuation approach. Animal Welfare 14: 61–69.
Gold Coast City Council. 2007. Dog Laws: How many Dogs Can you Keep? http://www.goldcoast.qld.gov.au/t_standard.aspx?pid=22. Accessed 21 January, 2008
Goldsmith, H.H. 1983. Genetic influences on personality from infancy to adulthood. Child Development 54: 331–355
Grandin, T. 1993. Management and economic factors of handling and transport. In: T. Grandin ed Livestock Handling and Transport. CAB International, Wallingford, UK.
Great Ape Project 2008. GAP, 2008. Spanish Congress Announces Support for the Great Ape Project and Great Apes. http://www.greatapeproject.org/news.php. Accessed July, 2008.
Green, P.C. and Gullone, E. 2005. Knowledge and attitudes of Australian veterinarians to animal abuse and human interpersonal violence. Australian Veterinary Journal 83: 619–625.
Greens, 2007. Greens put the chicken before the egg. http://www.act.greens.org.au/988. Accessed 21 January, 2008.
Greer, T. 2006. Observations of the behaviour of the mahogany glider (Petaurus gracilis). Honours' thesis, University of Queensland, Australia.
Griffin, D.R., 1976. The Question of Animal Awareness. Rockefeller University Press, New York.
Groenewegen, P.P., den Berg, A.E. et al. 2006. Vitamin G: effects of green space on health, well-being, and social safety. British Medical Council Public Health Report No. 6.
Groth, C.G. 2007. Prospects in xenotransplantation: a personal view. Transplantation Proceedings 39: 685–687.
Groves, J.M. 1995. Learning to feel – the neglected sociology of social movements. Sociological Review 43: 435–461.
Hagelin, J., Hau, J. et al. 2001. Religious beliefs and opinions on clinical xenotransplantation – a survey of university students from Kenya, Sweden and Texas. Clinical Transplantation 15: 421–425.
Hall, S.J.G. and Hall, J.G. 1988. Inbreeding and population-dynamics of the Chillingham cattle Bos taurus. Journal of Zoology 216: 479–493.
Hardy, J. 1874. Far from the Madding Crowd, Cornhill Magazine, London.
Harris, J.I., Schoneman, S.W. et al. 2005. Preferred prayer styles and anxiety control. Journal of Religion & Health 44: 403–412.
Harrison, R. 1964. Animal Machines. Robert Cunningham and Sons Ltd, London.
Hatziminaoglou, Y. and Boyazoglu, J. 2004. The goat in ancient civilisations: from the Fertile Crescent to the Aegean Sea. Small Ruminant Research 51: 123–129.
Hawkins, P., Playle, L, Golledge, H., Leach, M., Banzett, R. et al. 2006. Newcastle Consensus Meeting on Carbon Dioxide Euthanasia of Laboratory Animals. 27, 28th February, 2006.

University of Newcastle upon Tyne. http://www.nc3rs.org.uk/downloaddoc.asp?id = 416&page = 292&skin = 0. Accessed 21 December, 2007.
Heffner, H. 1998. Auditory awareness. In special issue on 'Animal Awareness, Concepts and Implications for Domesticated Animals' ed D. Piggins and C.J.C. Phillips. Applied Animal Behaviour Science 57, 259–268.
Hegelund, L. and Sorensen, J.T. 2007. Developing a HACCP-like system for improving animal health and welfare in organic egg production – based on an expert panel analysis. Animal 1: 1018–1025.
Heleski, C.R., and Zanella, A.J. 2006. Animal science student attitudes to farm animal welfare. Anthrozoos 19: 3–16.
Heleski, C.R., Mertig, A.G. and Zanella, A.J. 2004. Assessing attitudes toward farm animal welfare: A national survey of animal science faculty members. Journal of Animal Science 82: 2806–2814
Heleski, C.R., Mertig, A.G., and Zanella, A.J. 2005. Results of a national survey of US veterinary college faculty regarding attitudes toward farm animal welfare. Journal of the American Veterinary Medicine Association 226: 1538–1546.
Heleski, C.R., Mertig, A.G., and Zanella, A.J. 2006. Stakeholder attitudes toward farm animal welfare. Anthrozoos 19: 290–307.
Hemsworth, P. H., Barnett, J. L. et al. 1995. The welfare of extensively managed dairy-cattle – a review. Applied Animal Behaviour Science 42: 161–182.
Hemsworth, P.H. and Coleman, G.J. 1998. Human Livestock Interactions: The Stockperson and the Productivity and Welfare of Intensely Farmed Animals. CAB International, Wallingford, Oxon, UK.
Henning, J., Davies, P.R. et al. 2006. Seropositivity to rabbit haemorrhagic disease virus in non-target mammals during periods of viral activity in a population of wild rabbits in New Zealand. Wildlife Research 33: 305–311.
Henry, B.C. and Sanders, C.E. 2007. Bullying and animal abuse: Is there a connection? Society & Animals 15: 107–126.
Hensley, C. and Tallichet, S.E. 2005. Animal cruelty motivations – assessing demographic and situational influences. Journal of Interpersonal Violence 20: 1429–1443.
Hensley, C., Tallichet, S.E. et al. 2006. Exploring the possible link between childhood and adolescent bestiality and interpersonal violence. Journal of Interpersonal Violence 21: 910–923.
Hermes, R., Goritz, F. et al. 2007. Assisted reproduction in female rhinoceros and elephants – current status and future perspective. Reproduction in Domestic Animals 42: 33–44.
Herzog, H.A. 2007. Gender differences in human-animal interactions: a review. Anthrozoos 20: 7–21.
Herzog, H.A., Betchart, N.S. and Pittman, R.B. 1991. Gender sex role orientation and attitudes towards animals. Anthrozoös 4: 184–191.
Hibbert C. (editor) 1984. Queen Victoria in Her Lletters and Journals. Hammondsworth, UK.
Higgins, K.F., Naugle, D.E. et al. 2002. A case study of changing land use practices in the Northern Great Plains, USA: an uncertain future for waterbird conservation. Waterbirds 25: 42–50.
Higgs, A., Norris, R.T. et al. 1999. Mortality of sheep exported by sea: evidence of similarity by farm group and of regional differences. Australian Veterinary Journal 77: 729–733.
Higgs, A.R.B., Norris, R.T. and Richards, R.B. 1991. Season, age and adiposity influence death rates in sheep exported by sea. Australian Journal of Agricultural Research 42: 205–214.
Hill, C.A. 2000. The Garden of Eden: a modern landscape. Perspectives on Science and Christian Faith 52: 31–46.
Hill, P.C. and Pargament, K.I. 2003. Advances in the conceptualization and measurement of religion and spirituality – implications for physical and mental health research. American Psychologist 58: 64–74.

Hills, A.M. 1995. Empathy and belief in the mental experience of animals. Anthrozoös 8: 132–142.
Hodge, D.R. 2007. A systematic review of the empirical literature on intercessory prayer. Research on Social Work Practice 17: 174–187.
Hoffman, M.L. 1987. Empathy, its limitations, and its role in a comprehensive moral theory. In W.M. Kurtines and J.L. Gewitz Eds. Morality, Moral Behaviour, and Moral Development, pp. 283–302. New York: John Wiley.
Hoffmann, I. 2005. Research and investment in poultry genetic resources – challenges and options for sustainable use. Worlds Poultry Science Journal 61: 57–70.
Hogan, J.P. 1996. Options for manipulating nutrition if feed supply is immutable. Australian Journal of Agricultural Research 47: 289–305.
Hogan, J.P., Petherick, J.C. and Phillips, C.J.C. 2007. The nutritional impact on sheep and cattle of feed and water deprivation prior to and during transport. Nutrition Research Reviews 20: 1–13.
Holloway, L. 2001. Pets and protein: placing domestic livestock on hobby-farms in England and Wales. Journal of Rural Studies 17: 293–307.
Hoogland, C.T., de Boer, J. et al. 2005. Transparency of the meat chain in the light of food culture and history. Appetite 45: 15–23.
Hoogland, C.T., de Boer, J. et al. 2007. Food and sustainability: Do consumers package information and do customers recognize, understand and value production standards? Appetite 49: 47–57.
Hopster, H., Oconnell, J.M. et al. 1995. Acute effects of cow-calf separation on heart-rate, plasma cortisol and behavior in multiparous dairy cows. Applied Animal Behaviour Science 44: 1–8.
Houpt, K.A., Goodwin, D. et al. 2007. Proceedings of a workshop to identify dog welfare issues in the US, Japan, Czech Republic, Spain and the UK. Applied Animal Behaviour Science 106: 221–233.
Howard, C. and Parsons, E.C.M. 2006. Attitudes of Scottish city inhabitants to cetacean conservation. Biodiversity and Conservation 15: 4335–4356.
Hubrecht, R. 2000. Advancing rabbit and rodent housing and husbandry research. In Progress in the Reduction, Refinement and Replacement of Animal Experimentation. Proc. 3rd World Congress on Alternatives and Animal Use in the Life Sciences, Bologna, Italy ed. M. Balls, A.-M. van Zeller, and M.E. Halder, pp 1257–1267. Amsterdam, Elsevier Science B.V.
Hudson, M. 2007. Why do the numbers of laboratory animal procedures conducted continue to rise? An analysis of the Home Office Statistics of Scientific Procedures on Living Animals: Great Britain 2005. Alternatives to Laboratory Animals 35: 177–187.
Hui, V.K.Y., Bond, M.H. et al. 2006. General beliefs about the world as defensive mechanisms against death anxiety. Omega-Journal of Death and Dying 54: 199–214.
Humane Society of the United States (HSUS). 2005. [http://www.hsus.org/pets/issues_affecting_our_pets/pet_overpopulation_and_ownership_statistics/hsus_pet_overpopulation_estimates.html] cited by White, 2005
Humane Society of the United States (HSUS). 2008. Keeping your cat happy indoors. hsus.org/pets/pet_care/cat_care/keeping_your_cat_happy_indoors.html, accessed 30 January, 2008.
Hume, D. 1957. An Inquiry Concerning the Principle of Morals Vol. 4. Liberal Arts Press, New York original work 1751.
Humphrey, N. 2006. Seeing Red: A Study in Consciousness. The Belknap Press of Harvard University Press, Cambridge, Massachusetts, USA.
Hunting Act, 2004. http://www.opsi.gov.uk/acts/acts2004/ukpga_20040037_en_1. Accessed 8 January, 2008.
Illius, A.W., Clark, D.A. et al. 1992. Discrimination and patch choice by sheep grazing grass-clover swards. Journal of Animal Ecology 61: 183–194.

IUDZG/CBSG IUCN/SSC 1993. The World Zoo Conservation Strategy: The Role of Zoos and Aquaria of the World in Global Conservation. The Chicago Zoological Society, Chicago.

James, P.J. 2006. Genetic alternatives to mulesing and tail docking in sheep: a review. Australian Journal of Experimental Agriculture 46: 1–18.

Jarvis, A.M., Harrington, D.W.J. and Cockram, M.S. 1996. Effects of source and lairage on some behavioural and biochemical measurements of feed restriction and dehydration in cattle at a slaughterhouse. Applied Animal Behaviour Science 50: 83–94.

Kalenda, C. 2005. Ecological ethics: origins, principles, and applications. Problemos 68: 135–147.

Karpov, K. and Albin, D.P. 1995. The marine recreational fishery in northern and central California. Fish Bulletin, 176. State of California, the Resources Agency, Department of Fish and Game. http://www.psmfc.org/~wvanbusk/pub/bull176/bull176.htm, accessed January 2007.

Kellcher, K. 2005. Discards in the world's marine fisheries – an update. FAO Fisheries Technical Paper no. 470. Food and Agriculture Organisation of the United Nations, Rome.

Kellert, S.R. and Wilson, E.O. 1984. The Biophilia Hypothesis. Shearwater Book, Island Press, USA.

Kemp, J. 1996. Collecting medical specimens in South America: a dilemma in medical ethics. Anthropological Quarterly 69: 142–148.

Kendler, K.S., Neale, M.C., Kessler, R.C., Heath, A.C. and Eaves, L.J. 1993. Major depression and phobias: the genetic and environmental sources of comorbidity. Psychological Medicine 23: 361–371.

Kennedy, H., Little, M., Pell, G., Sommerville, H.D. and Jacobsen, L. 2007. Ethically Challenged – Big Questions for Science. Miegunyah Press, Melbourne.

Kerr, S.G.C., Woodgush, D.G.M., Moser, H. and Whittemore, C.T. 1988. Enrichment of the production environment and the enhancement of welfare through the Edinburgh Family Pen System of Pig Production. Research and Development in Agriculture 5: 171–186.

Kerwick, C., Meers, J. and Phillips, C.J.C. 2008. The training of veterinary personnel for effective identification and diagnosis of an exotic animal disease. Journal of Veterinary Medical Education, 35, 255–262.

Kiessling, L.L. 2002. Investigating and manipulating responses to the major antigen in xenotransplantation: The galactosyl-alpha 1-3 galactose epitope. Abstracts of Papers of the American Chemical Society 224: U259–U259.

Kildal, N. and Kuhnle, S. 2002 The Principle of Universalism: Tracing a Key Concept in the Scandinavian Welfare Model. Paper presented at the 9th Basic Income Economic Network International Congress, Geneva, 12–14 September. http://www.etes.ucl.ac.be/BIEN/Resources/Congress2002.htm, accessed 30 January, 2008.

Kirkcaldie, M.T.K. and Kitchener, P.D. 2007. When brains expand: mind and the evolution of cortex. Acta Neuropsychiatrica 19: 139–148.

Kjaer, J.B. and Sorensen, P. 2002. Feather pecking and cannibalism in free-range laying hens as affected by genotype, dietary level of methionine plus cystine, light intensity during rearing and age at first access to the range area. Applied Animal Behaviour Science 76: 21–39.

Klocker, U., Croft, D.B. et al. 2006. Frequency and causes of kangaroo-vehicle collisions on an Australian outback highway. Wildlife Research 33: 5–15.

Knapska, E., Nikolaev, E. et al. 2006. Between-subject transfer of emotional information evokes specific pattern of amygdala activation. Proceedings of the National Academy of Sciences of the United States of America 103: 3858–3862.

Knight, A. 2007. Intervening effects of knowledge, morality, trust, and benefits on support for animal and plant biotechnology applications. Risk Analysis 27: 1553–1563.

Kohut, H. 1977. The Restoration of the Self. International Universities Press: New York.

Kurpad, A.V., Khan, K., Calder, A.G. et al. 1994. Muscle and whole body metabolism after norepinephrine. American Journal of Physiology 266: E877–E884.
Kurtines, W.M., and Gewirtz, J.L. eds. 1984. Morality, Moral Behavior, and Moral Development. New York: John Wiley.
Lana, S.E., Kogan, L.R. et al. 2006. The use of complementary and alternative therapies in dogs and cats with cancer. Journal of the American Animal Hospital Association 42: 361–365.
Landau, R.E. 1999. A survey of teaching and implementation: the veterinarian's role in recognizing and reporting abuse. Journal of the American Veterinary Medical Association 215: 328–331.
Landry, D. 2001. Horsy and persistently queer: Imperialism, feminism and bestiality. Textual Practice 15: 467–485.
Lassen, J., Sandoe, P. et al. 2006. Happy pigs are dirty! Conflicting perspectives on animal welfare. Livestock Science 103: 221–230.
Layard, R. 2005. Happiness: Lessons from a New Science. Penguin Press, London.
Lea, E. J., Crawford, D. et al. 2006. Consumers' readiness to eat a plant-based diet. European Journal of Clinical Nutrition 60: 342–351.
Lea, J. 2005. Down the Cobbled Street, Memories of a Cheshire Farmer. Isis Publishing Ltd., Oxford.
Leak, G.K. and Christopher, S.B. 1982. Empathy from an evolutionary perspective. Journal for the Theory of Social Behaviour 12: 79–82.
Lectric Law Library's Lexicon LLL 2008. Cruelty. http://www.lectlaw.com/def/c332.htm, accessed January, 2008.
Leslie, T.K., Dalton, L. and Phillips, C.J.C. 2004. The preference of domestic rabbits for pasture and concentrate feeds. Animal Welfare 13: 57–62.
Lesniak, K.T. 2006. The effect of intercessory prayer on wound healing in nonhuman primates. Alternative Therapies in Health and Medicine 12: 42–48.
Levine, F.D., Mills, D.S. and Houpt, K.A. Attitudes of veterinary students at one US college towards factors relating to farm animal welfare. Journal of Veterinary Medical Education 32: 481–490.
Lewis, J.E. 2005. Statement of John E. Lewis, Deputy Assistant Director, Counterterrorism Division, Federal Bureau of Investigation, before the Senate Committee on Environment and Public Works, May 18, 2005. www.fbi.gov/congress/congress05/lewis051805.htm. Accessed 2 January, 2008.
Lewis-Williams, J.D. 1997. Agency, art and altered consciousness: a motif in French Quercy upper Palaeolithic parietal art. Antiquity 71: 810–830.
Li, C.H. 2000. A union of Christianity, humanity, and philanthropy: The Christian tradition and the prevention of cruelty to animals in nineteenth-century England. Society & Animals 8: 265–285.
Li, Z.-Y. 2004. Pet Related Trade has Exceed Ten Billion Yuan in China XinHua online. 03 November, 2004. http://news.xinhuanet.com/fortune/2004-11/03/content_2173277.htm. Retrieved 12 September 2006
Lin, W.J., Wang, W.W. et al. 2003. New animal model of emotional stress: Behavioral, neuroendocrine and immunological consequences. Chinese Science Bulletin 48: 1565–1568.
Lindeman, M. and Vaananen, M. 2000. Measurement of ethical food choice motives. Appetite 34: 55–59.
Lomas, C.A., Piggins, D. and Phillips, C.J.C. 1998. Visual awareness. In special issue on 'Animal Awareness, Concepts and Implications for Domesticated Animals' ed D. Piggins and C.J.C. Phillips. Applied Animal Behaviour Science 57, 247–257.
London, J. 1939. Jack London and His Times. New York, Doubleday.
Longuet-Higgins, C. 1994. Guest editorial: 150 words on consciousness Perception 23: 1265–1266.
Lorblanchet, M. 2007. The origin of art. Diogenes 54: 98.

Mader, T.L. and Davis, M.S. 2002. Wind speed and solar radiation corrections for the temperature–humidity index. American Meteorological Society. 15th Conference Biometereology and Aerobiology, Joint with 16th International Congress on Biometereology 2002.
Marai, I.F.M., El-Darawany, A.A. et al. 2007. Physiological traits as affected by heat stress in sheep – A review. Small Ruminant Research 71 1–3: 1–12.
Margerison, J.K., Phillips, C.J.C. and Preston, T.R. 2002. Restricted suckling of tropical dairy cows by their own calf or other cows' calves. Journal of Animal Science 80: 1663–1670.
Masters, K.S. and Spielmans, G.I. 2007. Prayer and health: review, meta-analysis, and research agenda. Journal of Behavioral Medicine 30: 329–338.
Matsuno, A.Y. and Thibault, L. 1995. Effect of sucrose and fructose macronutrient diets on feeding-behavior of rats. Physiology & Behavior 58: 1277–1280.
Matthews, B. 1937. The World in which Jesus Lived. pp 49–53. Oxford University Press, London.
Matthews, K.B., Wright, I.A. et al. 2006. Assessing the options for upland livestock systems under CAP reform: Developing and applying a livestock systems model within whole-farm systems analysis. Agricultural Systems 90 1–3: 32–61.
Mattison, E.H.A. and Norris, K. 2007. Intentions of UK farmers toward biofuel crop production: Implications for policy targets and land use change. Environmental Science & Technology 41: 5589–5594.
McCance, I. 1995. Assessment of statistical procedures used in papers in the Australian Veterinary Journal. Australian Veterinary Journal 72: 322–328.
McDermott, J.J., Randolph, T.F. et al. 1999. The economics of optimal health and productivity in smallholder livestock systems in developing countries. Revue Scientifique et Technique de l'Office International des Epizooties 18: 399–424.
McGuinness, K., Allen, M. et al. 2005. Non-accidental injury in companion animals in the Republic of Ireland. Irish Veterinary Journal 58: 392–396.
McKenna, J.E. and Melzack, R. 2001. Blocking NMDA receptors in the hippocampal dentate gyrus with AP5 produces analgesia in the formalin pain test. Experimental Neurology 172: 92–99.
Mehrotra, R. editor. 2005. The Essential Dalai Lama, His Important Teachings. Penguin Books, New York, USA.
Mehta, M.D. 2001. Pornography in Usenet: A study of 9,800 randomly selected images. Cyberpsychology & Behavior 4: 695–703.
Melendez, P., Bartolome, J. et al. 2003. The association between lameness, ovarian cysts and fertility in lactating dairy cows. Theriogenology 59 3–4: 927–937.
Melzack R. and Wall, P.D. 1965. Pain mechanisms: a new theory. Science 150: 971–979.
Melzack, R. 1987, Pain. In The Oxford Companion to the Mind, by O. L. Zangwill Author, Richard L. Gregory Editor. Oxford University Press, Oxford, United Kingdom.
Melzack, R. 1993. Pain: past, present and future. Canadian Journal of Experimental Psychology 47: 615–629.
Mercer Human Resources Consulting MHRC , 2007. World-wide quality of living survey http://www.mercerhr.com/pressrelease/details.jhtml/dynamic/idContent/117310. Accessed 1 August, 2007.
Miller, G. 2006. Animal behavior – signs of empathy seen in mice. Science 312: 1860–1861.
Modell, S.M. 2007. Approaching religious guidelines for chimera policymaking. Zygon 42: 629–641.
Mollenhorst, H., Rodenburg, T.B. et al. 2005. On-farm assessment of laying hen welfare: a comparison of one environment-based and two animal-based methods. Applied Animal Behaviour Science 90 3–4: 277–291.
Montonen, J., Knekt, P. et al. 2005. Dietary patterns and the incidence of type 2 diabetes. American Journal of Epidemiology 161: 219–227.
Moreland, J.P. 2001. Intelligent design psychology and evolutionary psychology: a comparison of rival paradigms. Journal of Psychology and Theology 29: 361–377.
Mori, Y., Ma, J.Y. et al. 2001. Hypothalamically induced emotional behavior and immunological changes in the cat. Psychiatry and Clinical Neurosciences 55: 325–332.

Mowatt, F. 1963. Never Cry Wolf. McClelland and Stewart Ltd., Toronto.
Mundkur, B. 1984. The bicephalic animal style in northern Eurasian religious art and its Western Hemispheric analogs. Current Anthropology 25: 451–482.
Munro, H.M.C. and Thrusfield, M.V. 2001a. 'Battered pets': features that raise suspicion of non-accidental injury. Journal of Small Animal Practice 42: 218–226.
Munro, H.M.C. and Thrusfield, M.V. 2001b. 'Battered pets': Munchausen syndrome by proxy and factitious illness by proxy. Journal of Small Animal Practice 42: 385–389.
Napolitano, F., De Rosa, G. et al. 2007. Bridging consumer perception and on-farm assessment of animal welfare. Animal Welfare 16: 249–253.
New South Wales, Department of Primary Industries NSW DPI, undated. Aquarium fish. http://www.fisheries.nsw.gov.au/aquatic_habitats/aquatic_habitats/aquarium_fish. Accessed 30 January, 2008.
Newell, G.A. undated. Samoyede; the People and their Dog. http://www.samoyed.org/samoyede_people.html. Accessed 8 January, 2008.
Newman, M. 2006. City Living. SASI Group University of Sheffield and Mark Newman University of Michigan http://www.sasi.group.shef.ac.uk/worldmapper/posters/worldmapper_map189_ver5.pdf. Accessed 9 January, 2008.
Nissenbaum, A. 1994. Sodom, Gomorrah and the other lost cities of the plain – a climatic perspective. Climatic Change 26: 435–446.
Nordgreen, J., Horsberg, T.E. et al. 2007. Somatosensory evoked potentials in the telencephalon of Atlantic salmon (Salmo salar) following galvanic stimulation of the tail. Journal of Comparative Physiology A – Neuroethology, Sensory, Neural and Behavioral Physiology 193: 1235–1242.
Norris, R.T. and Gorman, G.J. 2007. National Livestock Exports Mortality Summary 2006. 36 pp. Report B.LIV.0241 to Livecorp/Meat and Livestock Australia MLA. MLA, Sydney, Australia.
O'Connell, S.M. 1995. Empathy in chimpanzees – evidence for theory of mind. Primates 36: 397–410.
O'Brien, S.J., Troyer, J.L. et al. 2006. Plagues and adaptation: Lessons from the Felidae models for SARS and AIDS. Biological Conservation 131: 255–267.
O'Callaghan, K.A., Cripps, P.J. et al. 2003. Subjective and objective assessment of pain and discomfort due to lameness in dairy cattle. Animal Welfare 12: 605–610.
Office of the Queensland Parliamentary Counsel (OQPC). 2001. Animal Care and Protection Act 2001. Reprint 2A. OQPC, Brisbane.
Optimum Population Trust, 2007. Transport. www.optimumpopulation.org/opt.more.traffic.html. Accessed January, 2007
Ory, M.G. and Goldberg, E.L. 1984. An epidemiological study of pet ownership in the community. In: R.K. Anderson, B.L. Hart and L.A. Hart Eds. The Pet Connection: its Influence on Our Health and Quality of Life, pp. 320–330. Minneapolis: CENSHARE, University of Minneapolis.
Oviedo-Rondon, E.O., Ferket, P.R. et al. 2006. Understanding long bone development in broilers and turkeys. Avian and Poultry Biology Reviews 17: 77–88.
Parnell, S., Kettle, C. and Williamson, J. 2000. Sea fisheries – a renewable resource. http://helios.bto.ed.ac.uk/resman/nrm/Projects%201999/sea_fisheries.htm, accessed January 2007.
Passantino, A., Panichi, M., Russo, M.R. and Passantino, M. 2004. Ethics for research using animals in Italy. Alternatives to Laboratory Animals, 32, Supplement 1, 303–306.
Paul, 1994. Letter to the Romans, 8: 22. Good News Bible, pp 197. Harper Collins, London.
Paul, E. S. 1996. The representation of animals on children's television. Anthrozoos 9: 169–181.
Paul, E.S. 2000. Love of Pets and Love of People. In: A.L. Podberscek, E.S. Paul and J.A. Serpell Eds. Companion Animals and Us, pp 168–186. Cambridge University Press, Cambridge.
Peel, L.J. 1986. History of the Australian pastoral industries. Chapter 2 In: G. Alexander and O.B. Williams Eds. The Pastoral Industries of Australia, pp 41. Sydney University Press, Sydney.

Perenboom, R. J. M., L. M. Van Herten, et al. 2004. Trends in life expectancy and wellbeing. Social Indicators Research 65: 227–244.
Petcare Information & Advisory Service (PIAS). undated. The metropolitan cat. A survey of the population characteristics and hunting behaviour of the domestic cat in Australia. http://www.petnet.com.au/reark/reark.html. accessed 8 January, 2008.
Peters, J., Helmer, D. et al. 1999. Early animal husbandry in the Northern Levant. Paleorient 25, 27–47.
Phillips, C.J.C. 1990. Adverse effects on reproductive performance and lameness of feeding grazing dairy cows partially on silage indoors. Journal of Agricultural Science, Cambridge, 115, 253–258.
Phillips, C.J.C. 1994. El futuro rol de los animales de crianza en el medio ambiente rural. (The future role of farm animals in the rural environment). In Proceedings of the First Buiatrics' Conference of Latin America, Osorno, Chile, 25–27 November, 1993, pp.11–21.
Phillips, C.J.C. 2001. Principles of Cattle Production, 286 pp. CAB International, Wallingford.
Phillips, C.J.C. 2002. Cattle Behaviour and Welfare, 264 pp. Blackwell's Scientific, Oxford.
Phillips, C.J.C. 2004. Animal welfare matters: editorial. Australian Veterinary Journal 82: 63–64.
Phillips, C.J.C. 2005a. How animal welfare science assists in defining cruelty to animals. Proceedings of the 2005 RSPCA Australia Scientific Seminar, Canberra, 22 February 2005, pp 29–37. http://www.rspca.org.au/events/seminars05_proc.PDF
Phillips, C.J.C. 2005b. Meta-analysis – a systematic and quantitative review of animal experiments to maximise the information derived. Animal Welfare 14: 333–338.
Phillips, C.J.C. 2008b. The welfare of livestock during sea transport. In: Appleby, M., Cussen, V., Garces, L., Lambert, L.A. and Turner, J. Ed., Long Distance Transport and Welfare of Farm Animals. pp 137–156. CAB International, Wallingford.
Phillips, C.J.C. and Kitwood, S.E. 2003. The effects of feed supplements on the production, metabolism and behaviour of dairy cows fed low levels of concentrates during lactation. Journal of Applied Research in Veterinary Medicine, 1, 187–195.
Phillips, C.J.C. and Lomas, C.A. 2001. The perception of color by cattle and its influence on behavior. Journal of Dairy Science 84: 801–813.
Phillips, C. J. C. and McCulloch, S. 2005. Attitudes of students of different nationalities towards animal sentience and the use of animals in society, with implications for animal use in education. Journal of Biological Education 40: 17–24.
Phillips, C.J.C. and Morris, I.D. 2000. The locomotion of dairy cows on concrete floors that are dry, wet or covered with a slurry of excreta. Journal of Dairy Science 83: 1767–1772.
Phillips, C.J.C., Morris, I.D. and Lomas, C.A. 2000. The locomotion of cattle in passageways with different light intensities. Animal Welfare 9: 421–431.
Phillips and Prankel, C.J.C. 2008. A review of the effects of cadmium on the welfare of animals. In: Encyclopedia of Environmental Health, in press. Elsevier Press.
Phillips, C.J.C. and Sorensen, J.T. 1993. Sustainability in cattle production systems. Journal of Agricultural and Environmental Ethics 6: 61–73.
Phillips, C.J.C. and Youssef , M.Y.I. 2003. The effects of previous grazing experience and ewe presence on the response to novel grass species by weaned lambs. Animal Science 77: 335–341.
Pifer L., Shimizu K., and Pifer R. 1994. Public attitudes towards animal research: some international comparisons. Society and Animals 2: 95–113.
Piggins, D. and Phillips, C.J.C. 1998. Awareness in domesticated animals – concepts and definitions. In special issue on 'Animal Awareness, Concepts and Implications for Domesticated Animals' ed D. Piggins and C.J.C. Phillips. Applied Animal Behaviour Science 57: 181–200.
Pinkerton, J.M. 1807. Modern Geography. A Description of the Empires, Kingdoms, States and Colonies with the Oceans, Seas and Isles in all the most Recent Discoveries and Political Alteration. Volume 2, Cadell and Davies: Longman, Hust, Rees and Orme, London.

Plutchnik, R. 1987. Evolutionary basis of empathy. In N. Eisenberg and J. Strayer Ed. Empathy and Its Development pp 38–46. Cambridge University Press, Cambridge.
Pocard, M. 1999. Origin of animal experimentation legislation in the 19th century. Annales De Chirurgie 53: 627–631.
Pongratz, H. and Schmitt, M. 1990. Prospects for Professional-Training in Farming. Berichte Uber Landwirtschaft 68: 567–581.
Poole, T. 1997. Happy animals make good science. Laboratory Animals 31: 116–124.
Popkin, B.M. and S.F. Du 2003. Dynamics of the nutrition transition toward the animal foods sector in China and its implications: A worried perspective. Journal of Nutrition 133: 3898S–3906S.
Poresky, R.H. 1990. The young children's empathy measure: reliability, validity and effects of companion animal bonding. Psychological Reports 66: 931–936.
Poresky, R.H. 1996. Companion animals and other factors affecting young children's development. Anthrozoös 4: 159–168.
Poresky, R.H. and Hendrix, C. 1990. Differential effects of pet presence and pet bonding on young children. Psychological Reports 67: 51–54.
Poss, J.E. and Bader, J.O. 2007. Attitudes toward companion animals among Hispanic residents of a Texas border community. Journal of Applied Animal Welfare Science 10: 243–253.
Powell, D. 2004. Chimera contemporary: The enduring art of the composite beast. Leonardo 37: 332–340.
Preece, R. and Fraser, D. 2000. The status of animals in biblical and Christian thought: a study in colliding values. Society and Animals 8: 245–263.
Preston, T.R. and Willis, M.S. 1974. Intensive Beef Production. Second Edition. Pergamon Press, Oxford.
Pretty, J., Peacock, J. et al. 2007. Green exercise in the UK countryside: Effects on health and psychological well-being, and implications for policy and planning. Journal of Environmental Planning and Management 50: 211–231.
Price, E.O. 1984. Behavioural aspects of animal domestication. Quarterly Review in Biology 59: 1–32.
Pruimboom, L. and van Dam, A.C. 2006. Chronic pain: A non-use disease. Medical Hypotheses 68: 506–511.
Radford, M. 2001. Animal Welfare Law in Britain. Oxford University Press, Oxford.
Ragin, C. 1994. A qualitative comparative analysis of pension systems, In: T. Janoski and A.M. Hicks Ed. The Comparative Political Economy of the Welfare State. Cambridge University Press, Cambridge.
Rahmann, G. 2000. Marketing analysis for meat from nature conservation in the Biosphere Reserve Rhon. Berichte Uber Landwirtschaft 78: 248–261.
Ravindran, V., Thomas, D.V. et al. 2006. Performance and welfare of broilers as affected by stocking density and zinc bacitracin supplementation. Animal Science Journal 77: 110–116.
Regan, T. 1983. The Case for Animal Rights. Paperback Edition. University of California Press, Berkeley, California, USA.
Regan, T. 1990. Christianity and animal rights: the challenge and promise. In: C. Birch, W. Eaken and J.B. McDaniel Eds. Liberating Life: Contemporary Approaches in Ecological Theology. Chapter 6, pp 73–87. Orbis Books, Maryknoll, New York.
Rifkin, J. 1994. Beyond Beef: The Rise and Fall of Cattle Culture, 353 pp. Thorsons, London.
Ritvo, H. 1992. Race, breed, and myths of origin – Chillingham cattle as ancient Britons. Representations 39: 1–22.
Ritvo, H. 2001. Ch 12. The natural world. In: J.M MacKenzie Ed. The Victorian Vision, pp 281–295. Victoria & Albert Publications, London.
Rizov, M. 2003. An essay on the agricultural production organization in former communist countries. Social Science Journal 40: 665–672.
Rochlitz, I. 2004. The effects of road traffic accidents on domestic cats and their owners. Animal Welfare 13: 51–55

Roels, L. 1999. Opt out registers for organ donation have existed in Belgium since 1981. British Medical Journal 318: 399–399.
Rojas, M. 1999 The Rise and Fall of the Swedish Model. Social Market Foundation, London
Roland, A. 2007. Technology and War. American Diplomacy 2: http://www.unc.edu/depts/diplomat/AD_Issues/amdipl_4/roland.html. Accessed December, 2007.
Rollin, B.E. 2003. Foreward. In: S.J. Armstrong and R.G. Botzler Eds. The Animal Ethics Reader, Routledge, New York.
Rollin, B.E. 2006. An Introductory to Veterinary Medical Ethics. Theory and Cases. Second Edition. Blackwell Publishing, Oxford.
Roman, R.M., Wilcox, C.J. et al. 1999. Genetic trends for milk yield of Jerseys and correlated changes in productive and reproductive performance. Journal of Dairy Science 82: 196–204.
Rost, D.H. and Hartmann, A. 1994. Children and their pets. Anthrozoös 7: 242–254.
Rousing, T., Jakobsen, I.A., Hindhede, J., Klaas, I.C., Bonde, M., and Rensen, J.T. 2007. Evaluation of a welfare indicator protocol for assessing animal welfare in AMS herds: researcher, production advisor and veterinary practitioner opinion. Animal Welfare 16: 213–216.
Royal Society for the Protection of Cruelty to Animals RSPCA 2002a. RSPCA Australia National Statistics 2001–2002 http://www.rspca.org.au/resource/stats2002.pdf. Accessed January, 2008.
Royal Society for the Protection of Cruelty to Animals RSPCA 2002b. Kangaroo shooting compliance. A survey of the extent of compliance with the requirements of the Code of Practice for the Humane Shooting of Kangaroos. Department of Environment and Water Resources, Australian Government, Canberra.
Royal Society for the Protection of Cruelty to Animals, RSPCA 2006. RSPCA research confirms public believe live export is cruel. www.rspca.org.au/media releases/MRShow.asp, accessed January 2007.
Russell, W.M.S. and Burch, R.L. 1959. Principles of Humane Experimental Technique. Methuen, London.
Savolainen, P., Leitner, T. et al. 2004. A detailed picture of the origin of the Australian dingo, obtained from the study of mitochondrial DNA. Proceedings of the National Academy of Sciences of the United States of America 101: 12387–12390.
Schmid, J., Heistermann, M. et al. 2001. Introduction of foreign female Asian elephants (Elephas maximus) into an existing group: Behavioural reactions and changes in cortisol levels. Animal Welfare 10: 357–372.
Schoenemann, P.T. 2006. Evolution of the size and functional areas of the human brain. Annual Review of Anthropology 35: 379–406.
Schulte, B. A. 2000. Social structure and helping behavior in captive elephants. Zoo Biology 19: 447–459.
Schuppli, C.A. and Fraser, D. 2005. The interpretation and application of the Three R's by Animal Ethics Committee members. Alternatives to Laboratory Animals 33: 487–500.
Schuppli, C.A. and Fraser, D. 2007. Factors influencing the effectiveness of research ethics committees. Journal of Medical Ethics: 33: 294–301.
Schuppli, C.A. and McDonald, M. 2005. Contrasting modes of governance for the protection of humans and animals in Canada: lessons for reform. Health Law Review 13: 97–106.
Schuppli, C.A., Fraser, D. and McDonald, M. 2004. Expanding the 3Rs to meet new challenges in humane animal education. Alternatives to Laboratory Animals 32: 525–532.
Schwartz, S. H. 2007. Universalism values and the inclusiveness of our moral universe. Journal of Cross-Cultural Psychology 38: 711–728.
Seabrook, M.F. and Wilkinson, J.M. 2000. Stockpersons' attitudes to the husbandry of dairy cows. Veterinary Record 147: 157–160.
Seamer, J.H. 1998. Human stewardship and animal welfare. Applied Animal Behaviour Science 59: 201–205.

Sedlackova, M., Bilcik, B. et al. 2004. Feather pecking in laying hens: Environmental and endogenous factors. Acta Veterinaria Brno 73: 521–531.
Serpell, J. 1986. In the Company of Animals, pp 66–68. Blackwell, Oxford.
Severinghaus, L.L. and Chi, L. 1999. Prayer animal release in Taiwan. Biological Conservation 89: 301–304.
Shanahan, E.W. 1925. The world's cattle situation and prospects. In: G.F. Finlay Ed Cattle Breeding, pp 482–488. Oliver and Boyd, Edinburgh.
Shannon, G., Page, B. et al. 2006. African elephant home range and habitat selection in Pongola Game Reserve, South Africa. African Zoology 41: 37–44.
Sharpe, M.S. and Wittum, T.E. 1999. Veterinarian involvement in the prevention and intervention of human violence and animal abuse: A survey of small animal practitioners. Anthrozoos 12: 97–104.
Sheldrick, D. 1966. The Orphans of Tsavo, Pp 90–92 and 159. Collins and Harvill Press, London.
Shook, G.E. 2006. Major advances in determining appropriate selection goals. Journal of Dairy Science 89: 1349–1361.
Sidhom, P. 2003. Welfare of cattle transported from Australia to Egypt. Letter to the Editor. Australian Veterinary Journal 81: 364–365.
Siepe, M., Martin, J. et al. 2007. Anatomical study on the surgical technique used for xenotransplantation: Porcine hearts into humans. Journal of Surgical Research 143: 211–215.
Sillence, M.N. 2004. Technologies for the control of fat and lean deposition in livestock. Veterinary Journal 167: 242–257.
Simpson, J. 2004. The Wars against Saddam, pp 55. Pan Books, London.
Singer, P. 1975. Animal Liberation. Avon Books, New York, USA.
Singer, P. (ed.) 2005. In Defense of Animals: the Second Wave. Blackwell Publishing, Oxford.
Singer, P. and Cavalieri, P. Editors 1993. The Great Ape Project: Equality beyond Humanity. Fourth Estate publishing, London, England.
Smith W., 1880. A Concise Dictionary of the Bible, Its Antiquities, Biography, Geography and Natural History. Murray, London.
Smith, F.M. 2000. Indra goes west: Report on a Vedic soma sacrifice in London in July 1996 (regarding Western European hierarchies and modes of sectarian Hindu worship). History of Religions 39: 247–267.
Sneddon, L.U., Braithwaite, V.A. and Gentle, M.J. 2003. Novel object test: examining nociception and fear in the rainbow trout. Journal of Pain 4: 431–440.
Solti, L., Crichton, E.G. et al. 2000. Economical and ecological importance of indigenous livestock and the application of assisted reproduction to their preservation. Theriogenology 53: 149–162.
Sommerville, B.A. and Broom, D.M. 1998. Olfactory awareness. In special issue on 'Animal Awareness, Concepts and Implications for Domesticated Animals' ed D. Piggins and C.J.C. Phillips. Applied Animal Behaviour Science 57: 269–286.
Stacey, C. 2003. Development of a heat stress risk management model. Livecorp Report no. 116 to Meat & Livestock Australia, North Sydney NSW.
Starr, C.G. 1973. Early Man, Prehistory and the Civilizations of the Ancient Near East. New York, Oxford University Press.
Stein, E. 1964. On the Problem of Empathy. Martinus Nijhoff, The Hague.
Steiss, J.E., Schaffer, C. et al. 2007. Evaluation of plasma cortisol levels and behavior in dogs wearing bark control collars. Applied Animal Behaviour Science 106: 96–106.
Stoyanchev, K., Sotirov, L. et al. 2007. Study on the level of natural humoral immunity in turkey-broilers with muscular dystrophy, reared under conditions of either animal welfare or stress. Revue de Medecine Veterinaire 158: 314–319.
Stull, C.L. 1996. History of US equine welfare and legislation. Pferdeheilkunde 4: 391–392.
Swaisgood R.R., Ellis S., Forthman D.L., Shepherdson, D.J. 2003. Commentary: Improving well-being for captive giant pandas: Theoretical and practical issues. Zoo Biology 22: 347–354.

Sylvester, S.P., Stafford, K.J. et al. 2004. Behavioural responses of calves to amputation dehorning with and without local anaesthesia. Australian Veterinary Journal 82: 697–700.
Tatara, M.R. 2006. Current methods for in vivo assessment of the skeletal system in poultry. Medycyna Weterynaryjna 62: 266–269.
Taylor, A.A., and Weary, D.M. 2000. Vocal responses of piglets to castration: identifying procedural sources of pain. Applied Animal Behaviour Science 70: 17–26.
Taylor, K.F. 1994. Architectural empathy and the renaissance of French classicism. Journal of the Society of Architectural Historians 53: 239–242.
Thackeray, J.F. 2005. The wounded roan: a contribution to the relation of hunting and trance in southern African rock art. Antiquity 79: 5–18.
Thatcher, M. 1986. In Defence of Freedom, Speeches on Britain's Relations with the World, 1976–1986, pp 115. Aurum Press, London.
Thatcher, M. 1995. Margaret Thatcher, the Downing Street Years, pp 733. Harper Collins Publishers, London.
The Koran, 1990. Translated with notes by N.J. Dawood. Fifth Revised Edition. Penguin Books, London.
Thomas, J. 2003. The symbolic interpretation of rock engravings from Mont Bego. Anthropologie 107: 271–290.
Thompson, P.B. 1997. Ethics and the genetic engineering of food animals. Journal of Agricultural & Environmental Ethics 10: 1–23.
Thompson, P., Harris, C. et al. 2007. Livestock welfare product claims: The emerging social context. Journal of Animal Science 85: 2354–2360.
Titchener, E. 1924. A Textbook of Psychology. Macmillan, New York.
Tomkins, S. 1963. Affect, Imagery, Consciousness Volume 2: The Negative Affects.Springer, New York.
Tomkins, S. 1991. Affect, Imagery, Consciousness Volume 3: The Negative Affects: Anger and Fear. Springer, New York.
Toro, M., Azcon, R. et al. 1998. The use of isotopic dilution techniques to evaluate the interactive effects of Rhizobium genotype, mycorrhizal fungi, phosphate-solubilizing rhizobacteria and rock phosphate on nitrogen and phosphorus acquisition by Medicago sativa. New Phytologist 138: 265–273.
Toulmin, S. 1999. The ambiguities of globalization. Futures 31: 905–912.
Trevelyan, G.M. 1949. An Autobiography and Other Eessays. Longman Green, London.
Tuchscherer, M. and Manteuffel, G. 2000. The effect of psycho stress on the immune system. Another reason for pursuing animal welfare Review. Archiv Fur Tierzucht-Archives of Animal Breeding 43: 547–560.
Tucker, A., Belcher, C. et al. 2002. The production of transgenic pigs for potential use in clinical xenotransplantation: microbiological evaluation. Xenotransplantation 9: 191–202.
UNESCO, 2001. Unesco seminar: Democracy and World Governance in the 21st Century, Porto Alegre Brazil, 29–30 January 2001 http://www.unesco.org/most/wsfunesco.htm, accessed 15 January, 2008.
United Egg, 2007. US Egg Industry. http://www.unitedegg.org/useggindustry_generalstats.aspx. Accessed 20 January, 2007
United States Department of Agriculture USDA , undated. Poultry Production in the United States Economic Research Service/USDA; Broiler Farms. Organization, Management, and Performance/ AIB-748. http://www.ers.usda.gov/publications/aib748/aib748b.pdf. Accessed 20 January 2008.
University Federation for Animal Welfare (UFAW). Undated. A History of Improving Animal Welfare. http://www.ufaw.org.uk/history.php. Accessed 15 January, 2008.
Uzogara, S.G. 2000. The impact of genetic modification of human foods in the 21st century: A review. Biotechnology Advances 18: 179–206.
Vaarst, M., Jensen, M.B. et al. 2001. Behaviour of calves at introduction to nurse cows after the colostrum period. Applied Animal Behaviour Science 73: 27–33.

Valladas, H., Cachier, H. et al. 1992. Direct Radiocarbon-Dates for Prehistoric Paintings at the Altamira, El-Castillo and Niaux Caves. Nature 357: 68–70.
Valladas, H., Tisnerat-Laborde, N. et al. 2001. Radiocarbon AMS dates for paleolithic cave paintings. Radiocarbon 43 (2B): 977–986.
Van Dooren, R. 2006. La Laguna: of exporting jeans and changing labour relations. Tijdschrift Voor Economische En Sociale Geografie 97: 480–490.
Vannuccini, S. 2003. Overview of fish production, utilization, consumption and trade. Food and Agricultural Organization of the United Nations, Fishery Information, Data and Statistics Unit. FAO, Rome.
Verhulst, A. 1993. Lessons from field experiences in the development of monogastric animal production, 271 pp. FAO Animal Production and Health Papers – 107. FAO, Rome.
Vitulli, W.F. 2006. Attitudes toward empathy in domestic dogs and cats. Psychological Reports 99: 981–991.
Walvin, J. 2007. Abolishing the slave trade. www.history.ac.uk/ihr/Focus/Slavery/articles/walvin.html. Accessed, 9 January, 2008.
Wang, H. and Kuang, Y. 2007. Alternative models for cyclic lemming dynamics. Mathematical Biosciences and Engineering 4: 85–99.
Warnes, M.L. 1995. Field studies on the effect of cattle skin secretion on the behavior of tsetse. Medical and Veterinary Entomology 9: 284–288.
Warner, R.F., Ferguson, D.M., Cottrell, J.J., and Knee, B.W. 2007. Acute stress induced by the preslaughter use of electric prodders causes tougher beef meat. Australian Journal of Experimental Agriculture, 47:782–788.
Webster A.J.F. 1995. Animal Welfare: A Cool Eye towards Eden. Oxford, U.K., Blackwell
Webster, A.J.F. 2002. Rendering unto Caesar: welfare problems in Belgian Blue cattle. Veterinary Journal 163: 228–229.
Webster, A.J.F., Main, D.C.J. et al. 2004. Welfare assessment: indices from clinical observation. Animal Welfare 13: S93–S98.
Wemelsfelder F., Hunter T.E.A., Mendl M.T., and Lawrence A.B. 2001. Assessing the 'whole animal': a free choice profiling approach. Animal Behaviour 62: 209–220.
Westhoek, H.J., van den Berg, M. et al. 2006. Scenario development to explore the future of Europe's rural areas. Agriculture Ecosystems & Environment 114: 7–20.
Westhoek, H., van den Berg, R. et al. 2004. Economic and environmental effects of the manure policy in The Netherlands: synthesis of integrated ex-post and ex-ante evaluation. Water Science and Technology 49: 109–116.
Whay, H.R., Main, D.C.J., Green, L.E. and Webster, A.J.F. 2003. Animal-based measures for the assessment of welfare state of dairy cattle, pigs and laying hens: consensus of expert opinion. Animal Welfare 12: 205–217.
Whistance, L., Arney, D.R., Sinclair, L.A. and Phillips, C.J.C. 2007. Defaecation behaviour of dairy cows housed in straw yards or cubicle systems. Applied Animal Behaviour Science 105: 14–25.
Whitley, D.S. 1994. By the hunter, for the gatherer – art, social relations and subsistence change in the prehistoric Great-Basin. World Archaeology 25: 356–373.
Wiebers, D.O., Barron, R.A., Leaning, J. and Ascione, F.R. 1994. Ethics and animal issues in United States medical education. Medical Education 28: 517–523.
Wiese, M. 1996. Searching for the biological roots of self-care and care behaviour. 1. The evolutional importance of self-care and care. Pflege 9: 105–112.
Wiese, R. J. and Willis, K. 2004: Calculation of longevity and life expectancy in captive elephants. Zoo Biology 23: 365–373.
Wildlife Information and Rescue Service. 2007. Protect your cat, protect your wildlife. http://members.tripod.com/wires_msc/page8.html. Accessed February, 2007.
Wilkinson, J.M., Hill, J. and Phillips, C.J.C. 2003. The accumulation of potentially toxic metals by grazing ruminants. Proceedings of the Nutrition Society 62, 267–277.
Wilson, A. 2003. RSPCA baulks on horse cruelty , The Australian, 29 July 2003, pp 3.
Wilson, E.O. 1975. Sociobiology: The New Synthesis. Belknap, Cambridge, MA.

Wilson, H.D., Boyette-Davis, J. and Fuchs, P.N. 2007. The relationship between basal level of anxiety and the affective response to inflammation. Physiology and Behaviour 90: 506–511.

Wilson, M.L., Bloomsmith, M.A. et al. 2004. Stereotypic swaying and serum cortisol concentrations in three captive African elephants (Loxodonta Africana). Animal Welfare 13: 39–43.

Wispe, L. 1986. The distinction between sympathy and empathy: to call forth a concept, a word is needed. Journal of Personality and Social Psychology 50: 314–321.

Wispe, L. 1987. History of the concept of empathy. In N. Eisenberg and J. Strayer ed., Empathy and its Development, pp 17–37. Cambridge University Press, Cambridge.

Wojciechowska, J., Meng, J., Cross, N. and Phillips, C.J.C.2006. Industry perceptions of animal welfare in the red meat industry. Report to Meat and Livestock Australia, Sydney, Australia

Woodgush, D.G.M. 1983. Elements of Ethology. Chapman and Hall, London.

World Association of Zoos and Aquariums 2005. Building a Future for Wildlife, World Zoo and Aquarium Conservation Strategy. http://www.waza.org/conservation/wzacs.php. Accessed February 2007.

World Society for the Protection of Animals (WSPA). 2007. Animals matter to me. http://www.animalsmatter.org/downloads/UDAW_Text_2005.pdf. Accessed 21 January, 2007.

Yang, Y.G. and Sykes, M. 2007. Xenotransplantation: current status and a perspective on the future. Nature Reviews Immunology 7: 519–531.

Yeates, J. and Main, D.C. 2008. Assessment of positive welfare: a review. The Veterinary Journal, 175, 293–300.

Young, A.W., 1994. Neuropschology of awareness. Chapter 8 In: A. Revonsuo and M. Kamppinnen, Consciousness in Philosophy and Cognitive Neuroscience. Erlbaum, Hillsdale.

Zimmerman, M. 1986. Behavioural investigations of pain in animals. In: Duncan I.J.H. and Molony, V. Eds Assessing Pain in Farm Animals, pp 30–35. Commission of the European Communities, Luxembourg.

Index