David H. Levy

The Sky in Early Modern English Literature

A Study of Allusions to Celestial Events in Elizabethan and Jacobean Writing, 1572-1620

Springer

The Sky in Early Modern English Literature

David H. Levy

The Sky in Early Modern English Literature

A Study of Allusions to Celestial Events in Elizabethan and Jacobean Writing, 1572–1620

Springer

David H. Levy
Jarnac Observatory, Inc.
Vail, AZ
USA
david@jarnac.org

ISBN 978-1-4419-7813-4 e-ISBN 978-1-4419-7814-1
DOI 10.1007/978-1-4419-7814-1
Springer New York Dordrecht Heidelberg London

Library of Congress Control Number: 2011920803

For Wendee. May you always reach for the stars with me.

Abstract

This investigation is a study of allusions to events in the sky in English writing from 1572, the year of Tycho Brahe's great supernova, to a time shortly after the first use of the telescope in astronomy in 1610. It is a period during which specific phenomena of the night sky increasingly appear in early modern English Literature. Although much has been written about the changing cosmic philosophies of the time, I will explore a different line of inquiry – a selection of actual events in the sky as they appear in the literature of the time.

I emphasize a selection of events, like new stars or supernovae, comets, meteors, and eclipses, which took place between the autumn of 1572, when the first "blazing starre" in over 500 years dominated the night sky, and Galileo's discoveries with his telescope in 1610. I chose this period because it offered an unusually large number of such events, specifically two supernovae within our home galaxy and 20 comets, whereas during the last 30 years of our own time – a more typical period – there were seven comets and no supernovae within our galaxy. These unusual events are referred to amid a rich background of allusions to more common events like sunrises, sunsets, and meteors.

I will approach this topic by selecting passages in works of literature that might correspond to specific events. This study will take advantage of recent technological advances that have given us a much clearer understanding of what events actually took place in the sky and how they were exploited by contemporary authors. Computer programs have recently become quite sophisticated in taking us back into time to show us the positions and magnitudes of supernovae, the paths of comets as they crossed the sky, and where, when, and to what extent eclipses were visible over specific cities. I will use this information in my discussion of well-known references to eclipses such as Shakespeare's *King Lear*, but also in little-known writings like Thomas Nashe's *A Wonderful, strange, and miraculous, Astrological Prognostication for this year of our Lord God, 1591*, in which an eclipse of the moon that December is described. As a specific study in English literature, this research might appear to begin as an exercise in annotation; i.e., a series of explanations of the astronomical references that appear in the literature. But it offers much more: when seen in the context of literature *and* astronomy, the connections between literature and the sky that it reveals will open the offerings of the night sky of that period to the people of our own time.

Preface

Imagine a mostly cloudy October morning in southern England. In busy London, people were going about their daily business, and far out of town, James I was probably enjoying a hunt (Jeayes, 161–62, Harrison, 235). A slight lessening of sunlight began in the late morning, but it did not attract much notice until noon when the sky began to darken noticeably and rapidly, much more deeply and rapidly than it would have from the onset of clouds. Between 12:40 and 1:00 PM the land was bathed in a twilight hue. Through breaks in the clouds, the Sun peeked through not as a bright yellow ball but as a thin curved line of light. The date, according to the Julian calendar then used in England, was 2 October 1605, (12 October by the then-new Gregorian Calendar, not yet in use in England,) and southern England was experiencing a solar eclipse. As the Moon continued moving eastward across the Sun, it lessened and then abandoned its apparent grip on the Sun just after 2:00 PM (Espenak, Pingre). Many Londoners were not surprised at the occurrence of this near-total solar eclipse over their city; they might have read of it in Dade's Almanac (n.p.). It is also possible that some Londoners realized that the event was coming after watching a performance of *King Lear*, complete with a remark about "these late eclipses in the sun and moon," earlier that year in the Globe Theatre (Schoenbaum, 253).

The October eclipse was the last of a series of three eclipses, two lunar and one solar, to occur over London in 1605, and it offers a focus point for this investigation of convergence between the two fields of endeavor of English literature and the study of the night sky. That eclipse also provides an impetus to follow Robert Recorde's advice from 1552 to understand the sky:

> If Reasons reach transcend the Skie,
> Why should it then to earth be bound?
> The wit is wronged and led awrie,
> If mind be married to the ground.
>
> (Recorde, 3)

The eclipse, which is discussed more thoroughly in Chap. 3, also represents one of those rare times in history when literature, culture, and science come together. It allows a reconstruction of a few hours of time almost 400 years ago with the help of a variety of scientific and literary sources. The solar eclipse did happen at the time specified. Literature and events in the sky are subjects not normally studied together in University programs, but their occasional linking together offers a

unique investigative opportunity. We can imagine the person watching *King Lear* suddenly being drawn by its references to celestial events to talk of eclipses and memories of new stars he or she has seen in the sky.

In examining the extent to which the phenomena of the night sky between 1572 and 1620 appear in early modern English Literature, I am guided by an axiom that events in the sky, like comets, novae, and eclipses, can help us understand the literature of the time, and that conversely, the literature of the time can aid in our understanding the events of the sky. Literature and the sky complement each other. Moreover, this work is not specifically about the changing cosmic philosophies of the time, a subject that has been covered by critics since Marjorie Hope Nicolson.

From an interest based on observation more than philosophy, I will explore a different line of inquiry – a selection of actual events in the sky as they appear in the literature of the time, with a view to studying them in order to shed light on both fields. The events chosen took place between the autumn of 1572, when the first "blazing starre" in over 500 years exploded into the night sky, and the early telescopic discoveries that began from 1610 to 1620.

I chose this period because it offered an unusually large number of such events, specifically two supernovae, 20 comets, and several well-observed eclipses, whereas during the last 30 years of our own time – a more typical period – there were only seven comets and no galactic supernovae. These unusual events are recognized by English students of the early modern period amid a rich background of allusions to common events like dawn, sunrises and sunsets, meteors, and the general appearance of the night sky. Frequent notice of celestial events by pre-modern English writers resonates with my own long career as a "night watchman," a searcher of the night sky.

Over the centuries, astronomy has evolved to the point that professional astronomers and many amateur astronomers as well, have so narrowed their own fields of inquiry that they no longer directly look at the sky at all. In the sixteenth century, an era without electricity and light pollution, television, and computers, skywatching was more common and democratic. Educated people were rather expected to know something of the night sky, even as Francis Bacon's *Advancement of Learning* (125, 141, 158) was encouraging them to do so. Writers might include the most simple sky events, like a meteor or a bright planet in the evening sky, even a sunset, in their writings, and they could expect their readers to enjoy and understand these references.

I approach this topic by selecting passages in works of literature that allude or refer to specific events. The study takes advantage of recent technological advances that have given us a much clearer understanding of what events actually took place in the sky and how they were exploited by contemporary authors. Computer programs have recently become quite sophisticated in taking us back in time to show us the positions and magnitudes of supernovae, the paths of comets as they crossed the sky, and where, when, and to what extent eclipses were visible over specific cities. I will use this information in my discussion of well-known references to eclipses as well as in lesser-known writings. For example, the "late eclipses in the sun and moon" in Shakespeare's *King Lear* should be better known to most high school students than Thomas Nashe's *A Wonderful, strange, and miraculous,*

Astrological Prognostication for this year of our Lord God, 1591, in which a rare total eclipse of the Moon that December is described. That particular event turns out to involve an exceptional coincidence; in addition to entering the shadow of the Earth, the Moon also passed in front of the planet Saturn at the same time.

This book offers more than a series of explanations and interpretations of the astronomical references that appear in the literature. When seen in the context of literature *and* astronomy, the connections between literature and the sky that it reveals will open the night sky of that period to the people of our own time, and broaden our understanding of the literary works studied as well.

Examples of the primary sources I use focus mainly on Shakespeare, whose celestial references apparently surpass all the other authors put together. Nowhere do we find a statement by Shakespeare that he enjoyed observing the night sky, but his works undeniably testify to such an interest. For example, *King Lear's* discussion of eclipses could refer to the extraordinary pair of eclipses that occurred in the early autumn of 1605. Eclipses are referred to explicitly in the play (*KL* 1.2.99–127), and although some critics propose that he had no particular eclipses in mind, I provide evidence that he did mean at least the two eclipses in the autumn of 1605.

With these events as a basis, Shakespeare proposes the idea that humanity has a cosmic relation. Part of that relation involves the public debate between astronomy, the study of the stars, and astrology, which was defined as the use of the stars to predict human events. Since Shakespeare intended his plays, and the ideas contained within them, to be presented before wide and diverse audiences, he not only spoke to his time but also helped to shape it. Shakespeare's plays were to his time as the most popular television shows are to ours. Thus, in *King Lear* Shakespeare took advantage of his viewers' familiarity with the eclipses and the new star to debate their possible effects on humanity and the affairs of state.

The Major Celestial Events of the Period

That this period is a rich one for the sky is evidenced by the following parade of celestial events:

1. The supernova of 1572: We now know that Tycho's star, as it is called, was the first supernova in more than 500 years, the result of a star whose central core collapsed, sending the rest of its matter hurtling into space and shining as brightly as 100 billion suns.
2. Tycho's comet of 1577: Discovered by the Danish astronomer Tycho Brahe (among others) on 13 November 1577, this comet was brighter than any seen in the previous century. The comet was followed by a procession of 20 other comets, all visible to the unaided eye.
3. The Great Conjunction of 1583: This event occurring once every 20 years is a closing together of Jupiter and Saturn.
4. The Lunar Eclipse of December 1591: While the eastward-moving Moon was still in partial eclipse, it passed in front of Saturn, an event which has not occurred since then.

5. Eclipses, particularly in 1598 and 1605: While clouded out in London, the effects of the darkening of the sky during the 1598 eclipse were recorded by Elizabeth's aide John Dee. More than 90% of the Sun was covered at maximum eclipse; it was closer to total in Shakespeare's home town of Stratford, and it was total 160 miles away near Neath, England: From London, Dee wrote: "Feb. 25th, the eclips. A clowdy day, but great darkness abowt 9½ mane" (Dee 61). There were actually three eclipses in 1605: a total lunar eclipse on the evening of April 3 (N.S.), a partial lunar eclipse on September 27, and a near-total solar eclipse on October 12.
6. A heavy shower of meteors in November 1602: The Chinese text *Thien-Wen-Chih* records that on November 6, "Hundreds of large and small stars flew, crossing each other." The Korean text *Munhon-Piko* records that on November 11, "Many stars flew in all directions" (http://www.amsmeteors.org/comets/meteors.showers/leonidancient.htm). Although this was a significant event in some parts of the world, it was not visible to as great an extent over England. It is possible that the shower was also seen from England; in much the same way as the 1998 Leonid meteor shower was intense, for more than 36 h, all over the world.
7. A second supernova in 1604: This *stella nova* in Ophiuchus outshone every other star in the sky and was brighter even than the planet Jupiter. It remained bright throughout 1605. The appearances of two supernovae in our own galaxy within a single human lifetime are unprecedented; the only other supernova in recorded history occurred in 1054.
8. The Telescope: Although there is controversy over who actually was the first to point a telescope to the sky, no doubt exists that Galileo was the first to observe the Moon, Jupiter, Venus, and the Sun, to record carefully these observations, and then to publish them widely. Galileo made the sky more democratic; anyone with a telescope could see what he saw. But he also started astronomy's road to where it is now, where a class of professional astronomers no longer "looks" at the sky but digests it in the form of computerized data.

The Emerging Role of Compilatio

In her article "Lover, Poet, or Astronomer: Collecting Stars and Poems with David H. Levy," Janine Rogers of Mount Allison University posits that literature can influence the way the night sky is read. Building on philosophers like Plotinus and Marsilio Ficino, who wrote that "The celestial configurations are like the letters in a book which explain the divine concepts" (Garin, 67) she expanded on the idea of "reading" the night sky as a book, for it provides a rallying point for the ideas of observation, and supports my rationale for interpreting appropriate fragments of literature that help us "read" a particular aspect of the contemporary night sky.

Rogers introduces the term *compilatio*; along with the related *complication* which represents "the action of folding together" (OED) two disparate fields of study that would, on each surface, appear to have little in common. *Compilatio* is seen as a way of "building a greater understanding of the world through layering of several texts

together." As a specific medieval concept, the term invites a collection of material from different sources, and then reassembles them in a new and different framework. (Rogers, personal communication, January 2008, 13 July 2008, 16 July 2008).

Benefits from this research work both ways; sky references reveal new meanings in the literature, and taken out of the literature in context or in fragments, they also help us understand the sky as it appeared at the time of writing.

Was Shakespeare interested in the night sky? We do not know. But the frequency and depth of his references make it hard to argue that he was not. In attempting to interpret these references, I suggest contexts that complement more traditional approaches; in some cases I can point to a specific sky event, like an appearance of Venus in the evening sky that follows or precedes the accepted date of composition. Besides helping to interpret the works themselves, these interpretations are designed to nurture comparisons between literary passages and night sky objects or events.

Compilatio can be seen as a creative act of interpretation. As annotative as it appears, it is more than a passive collection of historical and literary facts, but a recompilation of a series of experiences that the writers of that distant time shared with their readers.

Spiritus Mundi

> From four centuries in the future comes a hazy image of
> A shape with lion body and the head of a man,
> A gaze blank and pitiless as the sun …
> (Second Coming 14–16)

The idea of *Spiritus Mundi* emerging from Yeats's "The Second Coming" is intended as a "universal subconscious" or source of meaningful images or poetry. Although it is a twentieth-century term, the idea is forged from the past, where common images used in plays and poetry have a common provenance. The eclipses and storm in *King Lear* (1.2.101), the star "westward from the pole" at the opening of *Hamlet* (1.1.35–38), the image of Romeo cut into little stars in *Romeo and Juliet* (3.3.21–25), and even the "rotten humidity" of *Timon of Athens* (4.2.1–2), are all natural images apparently emerging from nature's grand repository. They are not personal; nor are they specific to a single writer; they appear to be available to anyone with the temerity to explore the natural world. Shakespeare, Spenser, Sidney, Jonson, and Fletcher all possessed this skill.

A Personal Note

If one must choose a different sky from ours to pursue, why this one? It is the height of good fortune that two supernova events – those of 1572 and 1604 – and a parade of comets dotted the sky during the same period that produced the works of Shakespeare and Marlowe, even more so considering there had not been a similar

nova since 1054, nor has one been so brightly visible since then. My research measures the effect that these stars had on contemporary creative literature. One of its challenges is to put myself, as a passionate lover of the night sky, into what my world would have been like had I lived in that earlier time. In 1605, the year of the three eclipses, the 1604 supernova in Ophiuchus was still bright in the night sky, and Galileo's first use of the telescope was but 5 years away. Who would my observing partners have been? I had always thought that Francis Bacon would have been one of them, but he spent almost of all the leisurely months before Parliament opened on 5 November 1605 (in the shadow of Guy Fawkes) writing *The Advancement of Learning*. Considering that Bacon is almost universally credited with developing the scientific method with its emphasis on rigorous observation and experimentation, I was surprised to find no reference to the rare series of eclipses during the year of its writing, or to the 1604 supernova, which both offered evidence of knowledge that could be gleaned from direct observation; instead I found only Bacon's nonspecific sentence that "The astronomer hath his predictions, as of conjunctions, aspects, eclipses, and the like" (Bacon, 112).

Other authors in 1605 did, however, refer to these events. While Samuel Rowlands joked over how seriously some people took the unusual astronomical events, I suspect he would have made an excellent observing partner in those last exciting years between the supernova of 1572 and the first turning of a telescope to the sky in 1610:

> His dinner he will not presume to take
> Ere he aske counsell of Almanacke
> Perhaps he spake it when the Moone did change
> And thereupon no doubt th'occasion sprung
> Unconstant *Luna* over-rul'd his tongue.
> Astronomers that traffique with the skie
> By common censure sometime meet the lie;
> Although, indeed, the blame is not so much
> Where Stars and Planets fail, and keep not tutch.
> (Rowlands, n.p.)

By taking this relatively new interdisciplinary field as its topic, this effort departs from deep interpretation in a narrow branch of English literature to a more overarching set of insights spread over a broad segment. It is my hope that these pages will help inspire this book's readers to explore more fully these ideas.

Vail, AZ David H. Levy

Acknowledgments

The idea of relating astronomy to literature has been in my mind for almost as long as my interest in astronomy. I owe that interest perhaps to my brother Richard, with whom I lost an argument back in 1957, when I was 9 years old. My response was to pick up a copy of the nearest book I could find, which happened to be a copy of *Hamlet*, and throw it at him. If Dad hadn't walked in at just that moment, the incident would likely have ended there. But he calmly picked up the small blue book from the floor, handed it to me, and said, "Books are friends. It is as if this author invited you into his living room, ushering you into a far-off time and place." I have never forgotten those words, and when I began this project I stepped back into time, under the sky of early modern England, just as Dad suggested.

Dr. Lawrence Besserman, my thesis advisor at the Hebrew University of Jerusalem, was extraordinarily helpful throughout the long and challenging proposal process and even more so during the research and writing phases. Working with him was a sheer pleasure. Other people have taken time off their own busy lives to help move my project along. Specifically, Frederick Williams of Southern Illinois University of Carbondale did a superb job as associate dissertation advisor. I also wish to thank Janine Rogers of Mount Allison University, Karen Bamford and Robert Lapp also of Mount Allison, Larry Lebofsky of the University of Arizona, Martin Rice of the University of Pittsburgh at Johnstown, Eli Maor of Loyola University in Chicago, David Mowry of the State University College at Plattsburgh, Allan Chapman of Wadham College, Oxford University, David DeVorkin of the National Air and Space Museum, and Ilan Manulis, all provided copious amounts of valuable help and advice. And they all encouraged me to keep going even as I slowly recovered from a stroke early in 2007. Three people deserve special thanks. Eli Maor expertly translated the opening pages into Hebrew, and Roger Lewis, now professor emeritus at Acadia University's Department of English, gave detailed help and guidance at every stage. I also wish to thank Elka Turnover, at Hebrew University's Authority for Research Students, for guiding me through the sometimes complicated official process of proceeding through the program. Finally, as the dissertation evolved into a published book, I thank Jeanine Burke at Springer Press for her steadfast support and enthusiastic assistance.

Finally, this project would never have been started, let alone completed, had it not been for my wife Wendee's constant encouragement throughout the years and active assistance in formatting and in catching typing errors and inconsistencies. Especially, without her critical eye during these last few months, the project simply could not have been completed.

Contents

General Introduction

1 Purpose

This book aims to uncover a cultural interest in the night sky that was integral to the culture of the day. To accomplish this, I will explore passages involving the night sky by both canonical and obscure writers, with an aim to contextualizing those passages as they relate to astronomical events and objects. Ultimately, these passages shall illustrate how the literature of the time acts as a mirror that reflects the interest of the people of that time in the sky and its special events; also they will help show how an understanding of cosmic events can lead to a better appreciation of the literature that uses them.

This is a study of historical genesis that fits into the two disciplines of literature and astronomy in several ways. One involves using the literature to help us see the sky through the eyes of the people who lived under it. Another, though not the most important, involves dating: In writing about the influence of external factors upon the creation of literature, much has been noted about underlying political and social conditions. These circumstances can be used to help date plays in the same sense that the Porter's speech in *Macbeth* (2.3.1-20) alludes to the trial of Guy Fawkes in 1606 and helps to determine the play's date of composition. However, much less attention has been paid to the influence of natural events that can be pegged to a specific time just as accurately, like the two eclipses in the fall of 1605 that help date *King Lear*.

Beyond dating, events in the sky can help us interpret specific passages of literature and help us to a clearer understanding of what was in the creator's mind. As an example, Shakespeare's vivid description at the opening of *Hamlet* of a "star that's westward from the pole…" (1.1.35-38) is consistent with the appearance of the very bright *stella nova* that appeared in November 1572. In this sense, this research will enable students of the period to see the literature in the context of actual events in the night sky.

In trying to visualize the night sky, I see English literature as a window that allows those of us familiar with the sky of our own time to visit and understand the sky of an earlier time. While it is possible to build a comprehension of the details

of an event by looking it up in a contemporary almanac, we can gain a coherent sense of how these events were perceived by the general population through its literature. For example, the eclipse scene in *King Lear* (1.2.99-127), together with King James's Letter to Robert Cecil about the 1605 solar eclipse (Akrigg, 264–266), provides such insights.

Using this approach, I discuss various works of literature in which references to the sky appear. In some cases (i.e., the lunar eclipse of 1591), I will show how a particular reference will shed light on how a particular aspect of the sky was perceived; in others (*King Lear*'*s* eclipses), I will show how events in the sky are a major factor in character and plot development. In both senses, this project will add to our understanding of the night sky, through the literature that references it, at a time when an impressive series of comets, new stars, and eclipses were drawing attention to its physical nature.

This book offers a selection of allusions to the sky. It is certainly incomplete in that readers can find other examples and references that I have omitted. Even an automated search might uncover some furtive examples, although some of the best allusions do not even include the word being searched for. As an example, my source for the wonderful and commanding passage from *Macbeth* (2.4.6-10) was a casual after-dinner conversation with a fellow passenger on the cruise ship *Regal Empress* after we witnessed the 11 August 1999 total eclipse of the Sun. Nowhere in that quote soes the woerd "Sun" or "Moon" appear; instead we learn only of a "traveling lamp" being strangled to darkness. The best way to find these is to read the material, as I did during the 10 years from 2000 to 2010 and during the decades that preceded my focused effort.

2 The Authors of this Time

Since the period of time, this book considers most of the lifespan of William Shakespeare, it would seem obvious that the Bard would be the most prominent author in this study. Indeed, he is, but not just because he is the most famous. During the research, I did for the dissertation that preceded this book, I discovered that Shakespeare's direct references and allusions to the sky outnumbered all the others I was able to find from all of the other writers put together. This does not mean that there was a paucity of interest in the sky at this time; I believe it signifies instead that Shakespeare had a special lifelong interest in the natural world. Shakespeare's interests in planets and birds have occupied other books, just as his interest in the sky takes up the major portion of this one.

Other writers of that period shared some of this interest. A writer may be included if he or she has made at least one notable reference to the sky. All the writers considered follow, in approximate birth order:

Leonard Digges (b. 1520) was a scientist and optical expert who, according to his son Thomas, developed the perspective lens that foretold the telescope.

John Dee (b. 1527) was a "science advisor" to Queen Elizabeth I, and a conjuror of occult matters. His writings offer a rare insight into how humanity perceived the Universe at that time.

William Bourne (b. 1535) was a mathematician who wrote inspiringly about devices that ship captains could use. His writings included a clear description of how perspective lenses worked in the years and decades preceding the telescope.

Thomas Digges (b. 1546), son of Leonard, wrote vividly about perspective lenses, which he claimed were invented by his father Leonard and what they could accomplish. Rumor suggests that Shakespeare lived just a short distance from the Dugges family while he stayed in London.

Gabriel Harvey (b. 1550?) achieved literary fame through his publication of a series of pamphlets related to the Marprelate debate that took place in 1588 and 1589.

Richard Harvey (b. 1550?) also wrote pamphlets regarding the Marprelate scandal.

Abraham Fleming (b. 1552) wrote directly about scientific matters, especially the series of comets that appeared from 1577 onwards.

Edmund Spenser (b. 1552) was clearly one of the great forces in English Literature, and is best known for his epic *The Faerie Queene*. As we shall see, however, some of his richest astronomical allusions come from earlier works, like *The Shepherd's Calendar*.

George Chapman (b. 1559) is primarily famous because a poet who, two centuries later, wrote 14 lines about his 1605 translation of Homer from Latin into English of Homer's epics *The Iliad* and *the Odyssey.* John Keats's *Chapman's Homer* sonnet achieved instant popularity at the time and remains just as fashionable today.

Robert Greene (b. 1560?) is best known for a pamphlet written on his deathbed in 1592 *entitled Greene's Groats-worth of Wit*, in which he attacked an "upstart courtier," almost certainly referring to William Shakespeare (Fig. 1).

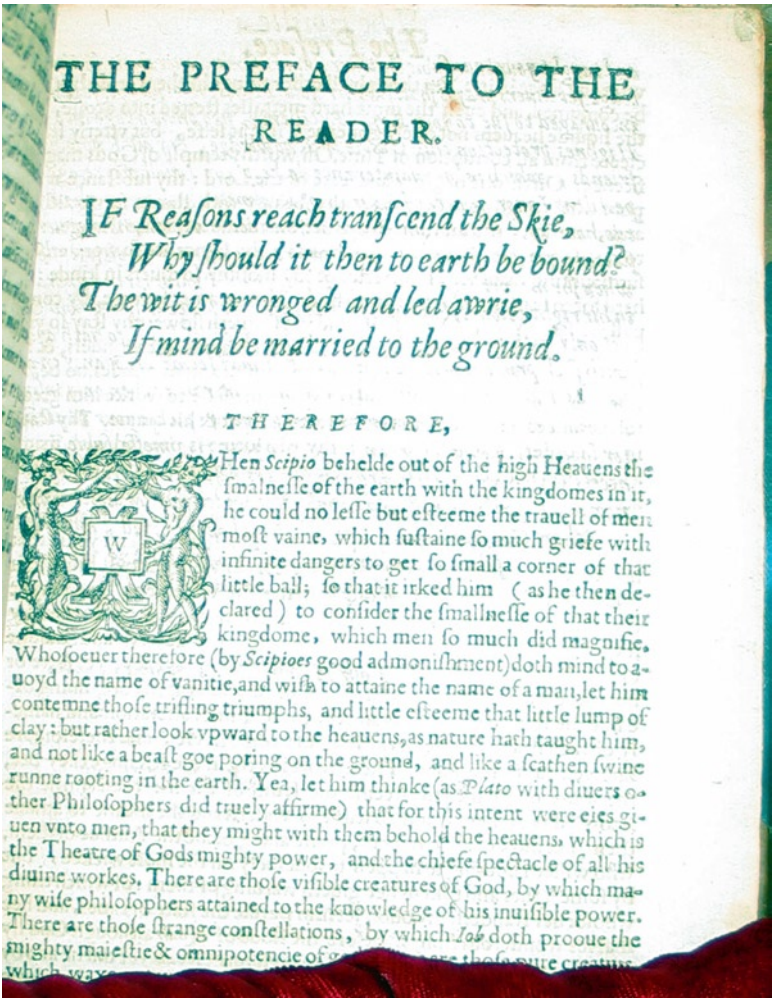
Mary Sidney (b. 1561) developed an important literary circle based on a place called Wilton House, the site of an important chemistry laboratory. That she used the Chemistry building as a site for a literary circle, now known as the Wilton Circle, is no coincidence because she had passions in both the sciences and the arts.

Francis Bacon (b. 1561) was a politician and philosopher whose Bacon's contribution was enormous. He wrote three particularly important works, *The Advancement of Learning* in 1605, *Novum Organum* in 1620, and *New Atlantis* in 1626.

John Dowland (b. 1563), who wrote at much the same time as Griffin and co-authored with him, was known for his "dejected" poetry.

Christopher Marlowe (b. 1564). The author of *Tamburlaine* and *Doctor Faustus* was perhaps England's most promising young writer when he died in a tavern scrap in 1592.

William Shakespeare (b. 1564). By far the most prolific author of this period and the writer with the most allusions to the night sky, William Shakespeare's allusions to the sky utterly dominate this book and the research that preceded it. While it is likely that Shakespeare's interest in the sky might have started with a look at the Supernova of 1572 when he was 8 years old, the writers preceding him probably observed it as well.



THE PREFACE TO THE READER.

IF Reaſons reach tranſcend the Skie,
Why ſhould it then to earth be bound?
The wit is wronged and led awrie,
If mind be married to the ground.

THEREFORE,

WHen *Scipio* behelde out of the high Heauens the ſmalneſſe of the earth with the kingdomes in it, he could no leſſe but eſteeme the trauell of men moſt vaine, which ſuſtaine ſo much griefe with infinite dangers to get ſo ſmall a corner of that little ball; ſo that it irked him (as he then declared) to conſider the ſmallneſſe of that their kingdome, which men ſo much did magnifie. Whoſoeuer therefore (by *Scipioes* good admoniſhment) doth mind to auoyd the name of vanitie, and wiſh to attaine the name of a man, let him contemne thoſe trifling triumphs, and little eſteeme that little lump of clay: but rather look vpward to the heauens, as nature hath taught him, and not like a beaſt goe poring on the ground, and like a ſcathen ſwine runne rooting in the earth. Yea, let him thinke (as *Plato* with diuers other Philoſophers did truely affirme) that for this intent were eies giuen vnto men, that they might with them behold the heauens, which is the Theatre of Gods mighty power, and the chiefe ſpectacle of all his diuine workes. There are thoſe viſible creatures of God, by which many wiſe philoſophers attained to the knowledge of his inuiſible power. There are thoſe ſtrange conſtellations, by which *Iob* doth prooue the mighty maieſtie & omnipotencie of

Fig. 1 This photograph shows Robert Recorde's advice that the value of reason is so great that it can transcend the sky

Thomas Nashe (b. 1567) wrote engagingly about many issues, including the star of 1572. He was also a major participant in the Marprelate controversy over Bishop John Whitgift's policy of strict censorship of publications. He might have been hired to enter it by officials anxious to promote the Crown's position (Fig. 2).

Ben Jonson (b. 1572). Shakespeare's friend and contemporary criticized the older writer's lack of understanding of Latin and Greek, but he gave the Bard a wonderful sendoff in his poetic remarks at the front of the First Folio:

Sweet swan of Avon! *what a fight it were*
To see thee in our waters yet appeare,
And make those flights upon the bankes of Thames,

Fig. 2 The Bloomberg Library of the Hebrew University of Jerusalem, where the author received his Ph.D. in 2010, is one of the best research libraries in the world. Photograph by David Levy

That so did take Eliza, *and our* James!
But stay, I see thee in the Hemisphere
Advanc'd, and made a Constellation there!
Shine forth, thou Starre of Poets, *and with rage,*
Or influence, chide, or cheere the drooping Stage;
Which, since thy flight fro' hence, hath mourn'd like night,
And despaires day, but for thy Volumes light.

John Donne (b. 1572). More than any other author in this book, Donne reacted strongly and negatively to the changing astronomical philosophy that followed Galileo's telescopic observations of Jupiter in 1610.

Robert Burton (b. 1577) enjoyed a more theoretical interest in astronomy and mathematics.

Bartholomew Griffin (b. around 1579), who wrote primarily in the last quarter of the sixteenth century, is best known for his *Fidessa* sonnet sequence.

John Fletcher (b. 1579). When one compares the lyricism and beauty of the passages of Beaumont and Fletcher's plays with those of Shakespeare, it is often hard to tell which is superior. Shakespeare himself must have been pleased with this writing, for he may have collaborated with Fletcher in some of his works.

John Webster (b. 1580) appears primarily because of his play *The Duchess of Malfi,* which deals sensitively with the astrology-astronomy issues of that time.

Francis Beaumont (b. 1584) was a dramatist and poet who collaborated with John Fletcher during the early years of the seventeenth century.

Henry More (b. 1614) wrote vividly about the changing cosmic philosophies, particularly in 1647 with the publication of his *Philosophical Poems*.

3 How Elizabethan England Viewed the Sky

Although much has been written about the changing astronomical philosophies that were growing during the early modern period, the actual events taking place in the sky has been largely ignored. These events included two major exploding stars, one brighter than Venus, the other exceeding Jupiter in magnitude, a precession of comets, and eclipses. These events might have drawn writers like Shakespeare into a more general enthusiasm for the sky in general – meteors, the movement of planets, and other effects like sunrises and sunsets that are as common to our age as they were to theirs. The biggest difference in their experiences from ours is that for the most part, they did not have telescopes, while we do. Nor did they have artificial satellites circling their globe, nor did they really know when meteor showers would occur. When clear, in the absence of artificial lighting their sky was considerably darker than ours.

What the two ages did have in common seems far more important than what they did not. People from both ages were able to enjoy some beautiful nights, with auspicious views of the Milky Way and the same constellations that we see. We can use spacecraft today to see the remnants of Tycho's great star of 1572, but those who lived in Tycho's time saw the brilliant star for themselves.

The astronomical timeline in the period 1572–1620 is the foundation for structuring this project. The chapters are organized according to type of event (stars, comets and meteors, eclipses, conjunctions, and the telescope) but within each chapter the references generally begin with Shakespeare, whose work consistently points to nature in general, and the night sky in particular, and then proceeds to the works of his contemporaries.

4 Structure and Approach

Two subjects – English literature and the night sky – can be merged into a single book to produce results that would be useful and enjoyable to other readers. I approach this topic by selecting passages in works of literature that respond to specific events in the sky. I began this survey by reading the material of the period with a view to finding nuggets of astronomical references buried in many works of the period. No such survey can possibly be thorough, and I am certain that I have left out good references that others have found or will find. For example, in Titus Andronicus, Titus's brother Marcus, a tribune, inquires of his niece

> Yet do thy cheeks look red as Titan's face
> Blushing to be encountered with a cloud,
> Shall I speak for thee? (TA.2.3.31-33)

My research missed this reference to Titan as the Sun, probably near the horizon, turning red by the passing of haze or a light cloud, as I am certainly missed many other allusions.

5 Sources

My primary sources include such astronomical works as Abraham Fleming's *Prognostication of Blazing Starres*, a creative translation of a Pontanus poem that emphasizes the differences between stars that "offer not to change" their positions in the sky (novae) and those that "take their course unto the east" (comets) (Nausea A.v.). Fleming's work appears to follow directly a series of comets that appeared in the sky between 1577 and 1602. Other sources include Tycho Brahe's treatise on the Supernova of 1572, Shakelton's discourse about the comet of 1577 and its significance, Nausea's discussion on comets, and Bainbridge's thesis also on comets. These sources are wonderful examples of writers who have tried, in ages past, to inspire their readers to dig more deeply into the unusual events occurring at the time, they have rarely been cited in earlier documents on science and literature, but they were important contributors to this literary culture of thinking about the sky.

My literary sources begin with Shakespeare as the keystone author. *King Lear*, to cite an important example, contains passages that appear to respond to a series of three specific eclipses in 1605 (*KL* 1.2.99-127). In addressing these events, Shakespeare helped open the minds of his audience to new ideas about humanity's relation to the cosmos. As a shareholder in his company, Shakespeare most likely intended his plays, and the ideas contained within them, to be presented before wide and diverse audiences; he not only spoke to his time but also helped to shape it. Thus, in *King Lear*, Shakespeare took advantage of his viewers' puzzlement over the eclipses to consider that *Lear*, as John Danby suggested years ago, is a drama of ideas, a play specifically dramatizing possible effects on humanity and the affairs of state.

In *King Lear*, the meaning of the word "Nature" evolves to a Baconian *Novum Organum* of Elizabethan thought brought to life through drama (Danby, 15). Danby is outdated by today's standards, but some of his ideas have become current again. Edmund is animated by the idea of nature as he announces

> Thou, Nature, art my goddess; to thy Law
> My services are bound. (1.2.1-2)

In this early moment of the play, notes Dan Brayton more recently, "what Lear cannot see, and what is perhaps glimpsed by Cordelia and Kent in their reactions to Lear's living will, is that the process of division initiated with the display of the map will become uncontrollable, as the play proceeds to leave nearly all of its major characters property less, bereft, or dead" (Brayton, 402–403).

The eclipses were not the only extraordinary celestial events taking place in 1605. A "blazing starre" or *stella nova* that appeared in 1604 was still bright in 1605 and was referred to specifically by Jonson in a passage outlining a series of unusual (and real) contemporary events used as omens in *Volpone* (2.1.47-50).

We now know that Kepler's star, as it is now called, was a supernova, the result of a star whose central core collapsed, sending the rest of its matter hurtling into space and shining as brightly as the combined light of all the other stars in our galaxy combined. Although no one was aware of the true nature of the star at the time, it was easy to be aware of its presence as it shone brightly enough to be visible "like a burning light" (Christianson, 275). It is a further contention that the two fields relating to the stars, what we now refer to as astronomy and astrology, became recognized as different fields during Shakespeare's time, partly because of the unusual celestial events going on, and also due to the introduction of the telescope. There were two ways of studying and interpreting these events, that of *astrologia naturalis* and the other of *astrologia judicialis*. The former holds that heavenly bodies have influence on physical manifestations of our lives, like weather and physical matter. The latter suggests that these bodies influence human destiny (Sondheim, 243–259).

Today, we are still debating the relationship that humanity has with the cosmos, though at a different level. Eclipses do not affect our futures, to be sure, but comets colliding with the Earth might well have brought the building blocks of life – the carbon, hydrogen, oxygen, and nitrogen. If that is true, then humanity indeed has extra-terrestrial origins. As a practitioner of science in a time of deeply rooted beliefs in the power of cosmic forces, Kepler was a pivotal figure in defining the role of astrology at that time; he prepared horoscopes at the same time that his observations of the supernova of 1604 and his development of the laws of planetary motion were being taken seriously throughout England and Europe. Kepler accepted the prevailing ideas of judicial astrology and the idea that some events had metaphysical causes. His vision of astrology, however, had less room for the idea of signs than for the simplicity and elegance of the solar system (North, 313, 318). He also objected strongly to the spiritualism and demonic magic that was practiced at the time by John Dee (Casaubon 22, Woolley 1) and by Lewes Lauaterus (83) in his book *Of Ghosts and Spirits Walking by Nyght* in 1572.

6 Celestial Events Taking Place During this Period

The sky was particularly active during the period of history during which William Shakespeare was alive. Tycho's great star appeared in the northern sky when Shakespeare was but an 8-year-old boy, and I find it difficult to imagine his family not going outside to see this wonder in the night. Tycho's star was the first new star seen in a very long time, possibly since the previous great supernova of 1054. Both these objects were supernovae, visible in our own galaxy. A supernova is an event that marks the death of a massive star that has exhausted its supplies of hydrogen, helium, oxygen, and carbon, and then tries to fuse its supply of iron. At that instant, the star runs into a cosmic dead-end. Iron will not undergo nuclear fusion. The star's core then collapses, and its shell gives way, erupting in a massive explosion that for a time can result in the star outshining the combined total of light of every star in its galaxy. A supernova is an example of something in astronomy in

which the science is about as exciting as the magic. Inside the explosion, the core of what was once the giant star has collapsed, in some cases to form a neutron star the size of Earth; in other cases to crease a black hole, in which all that is left of the star is its gravity. In human history, we have seen only a handful of these supernovae, in 1054 (see Fig. 1.2), 1572, 1604, and (in a neighboring galaxy) in 1987. There were others during that time, for example, around 1680 in Cassiopeia, but huge amounts of intervening dust within our own galaxy prevented us from seeing them.

7 Comets

Comets were another extraordinary phenomenon of the time. In our time (say between 1965 and 2007), there were about ten comets easily visible without a telescope. In Shakespeare's time, however, that number more than doubled. Since the numbers of bright comets are always small, statistical variations can be strong from one time to another. The most famous comet of that time was observed by Tycho in 1577, only 5 years after the supernova. By obtaining positional measurements of this comet from his colleagues across Europe, Tycho demonstrated that this comet, and probably all others, is farther from Earth than the Moon is.

Eclipses were a third phenomenon of great interest. Although these events are caused by relationships among the Sun, the Earth, and the Moon, they were widely viewed at that time were thought by many to influence the lives of individual humans.

Because exploding stars, comets, and eclipses are the most obvious of changing events in the sky, this book offers a chapter on how writers of the time perceived each type of event.

8 Sky-Related Writings at this Time

It seems likely that specific major events in the sky, like blazing stars and eclipses, generated an increased interest in other, less important events in the sky. Sidney's *Countess of Pembroke's Arcadia*, completed around 1580, contains Klaius's hymn to the planet Mercury as seen at different times in the evening and in the morning (Sidney *OA*.4.7-10). The celestial clock is used in the literature of the time, and examples of it, as well as their significance, are part of this endeavor. One particular example is Spenser's use of lunar phases as a clock in *The Faerie Queene*:

> Now haue three Moones with borrow'd brothers light,
> Thrice shined faire, and thrice seem'd dim and wan (*FQ* 3.3.16);

again in Book 4: "But till the horned moone three courses did expire" (4.6.43); and once more in Book 5: "As the faire Moone in her most full aspect" (5.5.3). Since Virgo rises at dawn only at one particular time in the year, it is useful as an indicator

of the time of year of a particular incident. The Moon's orbit around the Earth, on the other hand, is a timepiece that measures either the passage of months (three courses) or the particular time of a month (most full aspect.).

9 Astronomy Versus the Night Sky

Although general discussions of the use of astronomical references in Shakespeare and his contemporaries have appeared from time to time, it is far less common to find investigations that emphasize the literary reaction to actual events in the sky as opposed to theories about it. During the late sixteenth century, the sky was an unusually busy place. There were comets making their appearances from the edge of the solar system, eclipses of the Moon and Sun, exploding stars that would appear out of nowhere from the blackness of space, big meteor showers, beautiful sunrises and sunsets, and even displays of the northern lights.

In his 1922 study on astronomy and poetry, Cumberland Clark's *Astronomy in the Poets* does go beyond traditional references to stars and astral influence, pointing out less obvious but important references to the night sky. "Galileo read the open volume of the sky," wrote Clark, "while Shakespeare described its beauties to enrich his verse." These references include some of the celestial moods that are so evocative, including the many descriptions of dawn and sunrise that appear throughout Shakespeare (*Hamlet* 1.1.166-167, *Romeo and Juliet* 1.1.116, 130–134, 2.1.1-6, *Venus and Adonis* 1-2, 856). These poetic allusions cover a broad range of seasons and weather patterns, and offer the casual reader a way to relate to the sky of the time.

If Bacon's 1605 treatise *The Advancement of Learning* was a call to arms to learn about nature through direct observation, the invention of the telescope, and its use as a tool to increase humanity's appreciation of nature, fortified that call. The use of the telescope to study the sky, and its immediate consequences during the following decade, are events that delimit the terminal point of this investigation. This study builds on the general references provided by reviewers like Albanese, who painted a picture of humanity's appreciation of the sky from that time and how it led to the creation of new interests in extant forms of literature.

Studies about conditions, appearances, or events in the sky as described in the literature of the time seem relatively sparse in comparison to research about the astrology of the time. Garin's *Astrology in the Renaissance*, Grant's *Planets, Stars, and Orbs,* Meadows' *The High Firmament*, Russell's *The Copernican System in Great Britain*, and Alan Weber's dissertation *Shakespeare's Cosmology* are among the sources available. "Shakespeare – for or against astrology" (Whitfield, 178–179) notes that Shakespeare, though not a fatalist, suggested that "the rise and fall of great men was subject to some external power." Whether he actually believed that is unknown, but what is important is that he respected the fact that his audiences did. The result is a richer collection of allusions to the night sky.

In relating to astronomical events to the literary works of this period, I intend to use both astronomical and literary sources. Astronomical sources will include works dating from both recent and Shakespearean times, plus letters, diary entries, and other evidence that astronomical events taking place in the early years of the seventeenth century were noticed and commented upon by the population, from James I down to his lowliest subjects.

10 Criteria for Identification of Astronomical References or Allusions

My method for identifying astronomical references or allusions will subject them to the following criteria:

1. Can the reference be connected to:
   (a) A specific event in the sky? or
   (b) A kind of event in the sky (like an eclipse) with which readers would be familiar? or
   (c) A more general cultural belief about the sky?
2. How can the reference help us to understand an aspect of the contemporary night sky?
3. Can the reference help us to appreciate the author's intent within a particular passage?
4. How does the reference function within the context of the writing?

This is the study of a time, not of a specific author; it is an investigation of the relationship of two fields of endeavor, and not of a single aspect of literature. It focuses on how a series of actual events in the sky, rather than theories about the Universe, was an important motivating factor in the creation of new literature. The extent to which there are accurate representations of celestial phenomena in early modern English Literature has hitherto been underestimated. This study will explore these celestial events as they are described, alluded to, or imagined, in different texts by different authors.

Chapter 1
The *Stella Novae* of 1572 and 1604

> *A star, a daystar, a firedrake rose at his birth. It shone by day in the heavens alone, brighter than Venus in the night, and by night it shone over delta in Cassiopeia, the recumbrant constellation which is the signature of [Shakespeare's] initial among the stars. His eyes watched it, lowlying on the horizon, eastward of the bear, as he walked by the slumberous summer fields at midnight …*
>
> (Joyce, 210)

On one November evening in 1572, a Stratford father and his impressionable 8-year-old son stood outside their home looking incredulously at a brilliant star just atop the "W"-shaped figure of Cassiopeia. Far brighter than any other, this "blazing starre" shone even in daylight. Could William Shakespeare have been that boy? Although he left no documentation of his observation, it would have been hard for Shakespeare to miss it; even the following summer the star would have shone brightly low in the northeastern sky, and if James Joyce is correct, the independent lad would have sacrificed sleep for a midnight peek at the sky. The idea that the new star might have left an impression on him might be traced to a suggestion by Donald Olsen that Shakespeare had the nova in mind when he wrote these lines at the opening of Hamlet:

> Last night of all,
> When yond same star that's westward from the pole
> Had made his course that part of heaven
> Where it now burns, Marcellus and myself,
> The bell then beating one … (*Ham.*1.1.37-39)

There is no bright "Yond same star" (1.1.36) between the pole and the western horizon on late November evenings. It is apparent, however, that Joyce expressed a similar idea in *Ulysses*, although he did not relate it directly to the lines in *Hamlet.* Although further evidence that Shakespeare had this star in mind is probably not forthcoming, it seems plausible to me. One can learn much about the night sky from those writers of English Literature who have thought about it and seen it.

As seen from a certain time, the sky can be appreciated vicariously through the literature of that time. James Joyce had the thought when he suggested that a

D.H. Levy, *The Sky in Early Modern English Literature*,
DOI 10.1007/978-1-4419-7814-1_1,

youthful Shakespeare might have seen the supernova of 1572 "as he walked in the slumberous summer fields at midnight." (Joyce, 210) Although the star was brighter when it first appeared in November 1572, it would have still been visible the following summer, "eastward of the bear" and low in the sky.

If we take a literal interpretation of the weather descriptions in the opening of *Hamlet*, we can infer that this scene is set on a frigid winter night. Hamlet's father had been dead for at least 2 months, killed while napping outdoors presumably on a warm afternoon, but this night is "bitter cold" (1.1.8). If Hamlet's father lost his life in late summer, and if the play opens at 1 AM on a cold night, that night could well have fallen in winter, perhaps in January when the constellation of Cassiopeia would have appeared between Polaris, the pole star, and the western horizon. As noted by Olson et al. (68–73), no star lies westward from the pole; all stars are south of it; however, Shakespeare was probably thinking of a star between the pole and the western horizon) (*Sky & Telescope*, November 1998, 68). Although it can be argued that Shakespeare had no particular star in mind, the supernova of 1572 happens to fit remarkably well within the parameters of Bernardo's speech if the event took place in midwinter.

Although there is no written evidence for this particular observation, there is much evidence throughout the canon that Shakespeare's great curiosity about the natural world extended to the sky, and it seems likely that he would have followed the star as it slowly faded during the 2 years it was visible. It seems also appropriate, in an introductory chapter that links English literature to the night sky, to show that this link frequently appears. Shakespeare's time, with its reliance on what could have been viewed with the naked eye, saw few astronomical discoveries, but later centuries were times of increasingly numerous finds that changed humanity's basic understanding of the sky. John Keats, for example, compared his own revelation of reading George Chapman's translation of Homer to

> …some watcher of the skies
> When a new planet swims into his ken; … (Chapman's Homer, 9-10)

Composed in October 1816, this Petrarchan sonnet is canonically interpreted to invoke William Herschel's discovery of the planet Uranus in 1781, although I connect the reference instead to the discovery by Flaugergues of the Great Comet of 1811 (Kronk, 27). Six decades later, to use a prose example, Mary Anne Evans's *Middlemarch* (a.k.a. George Eliot) asked probing questions about the kind of person who would make an astronomical discovery:

> Does it seem incongruous to you that a Middlemarch surgeon should dream of himself as a discoverer? Most of us, indeed, know little of the great originators until they have been lifted up among the constellations and already rule our fates. But that Herschel, for example, who "broke the barriers of the heavens" – did he not once play a provincial church-organ, and give music-lessons to stumbling pianists? Each of those Shining Ones had to walk on the earth among neighbors who perhaps thought much more of his gait and his garments than of anything which was to give him a title to everlasting fame: each of them had his little local personal history sprinkled with small temptations and sordid cares, which made the retarding friction of his course towards final companionship with the immortals. (Eliot, 108–109)

Eliot's vivid prose harks back to the early modern period's obsession with astrology, lifting Herschel up to the constellations where he already rules our fates. It can be compared favorably with *Julius Caesar*, whose sky was "a tempest dropping fire" (*JC*.1.3.10) during the dark hours before Caesar was assassinated.

1.1 Literature Preceding the Time of the Star

In February 1570, John Dee published his Preface to The *Elements of Geometrie of the most ancient Philosopher Euclide of Megara*. It outlines the shape of the sky as it was understood at the time:

> The *Sonne*, when he is fardest from the earth (which now, in our age, is when he is in the 8.degree, of Cancer) is, 1179 semidiameters of the Earth, distante. And the *Mone* when she is fardest from the earth, is 68 Semidiameters of the earth and 1.3. The nearest, that the *Mone* cometh to the earth, is Semidiameters 52 ¼. The distance of the Starry Skie is, fró vs, in Semidiameters of the earth 20081 1/8[illegible]. Twenty thousand fourscore, one, and almost a halfe. So thicke is the heauenly Palace, that the *Planetes* haue all their exerciuse in, and most meruailoufly perfourme the Commandement and charge to them giuen by the omnipotent Maiestie of the king of kings. This is what, which in Genesis is called *Ha Rakia*. Consider it well. (Dee, b2)

1.2 Literature After the Supernova's Appearance

The "blazing starre" was bright enough to be seen in daylight. On its opening night, 6 November 1572, it was first recorded at Horatio's Wittenberg (Olsen, 68). Tycho Brahe used the sextant he had just built to learn how to measure star positions, including that of the new star, whose unchanging position proved to him that it was part of the "eighth sphere" of fixed stars (Brahe, 3–4, Dreyer, 38–41, Thoren, 58). His measurements, showing that the star, unlike a comet, never moved among the stars, demonstrated that change could occur in that sphere (Christianson, 17). The appearance of this new star was especially important because it called attention to the idea that the eighth sphere might not be so fixed as had been thought. It was likely of great interest to Queen Elizabeth I herself, since her own close friend and science advisor John Dee wrote a pamphlet about it (Dee 1572).

When Tycho, along with anyone else who looked up at the sky, first saw the supernova, it was at least as bright as Venus, bright enough that it could be detected in daylight if one knew where to look. It remained visible throughout 1573 until February 1574. But in the literary world it remained visible for years as writers tried to connect its significance to their lives and those of their readers. This literature ranged from direct attempts, both scientific and theological, to understand the star's significance to references in poetry and different forms of prose, including satire.

Even though some literary critics define a "blazing star" as being either a comet or a nova, it seems that the difference in appearance was well known in this time.

Hamilton (308) defines blazing starre as a comet in *Faerie Queene* (3.i.16) because of the context of the object's "hearie beams and flaming lockes"; however, both Shakespeare and Jonson refer separately to comets (*JC.* 2.2.30*)* and stars (*Volpone.* 2.1.50) as separate objects. The best known tract specifically about the new star was written by Tycho himself. *Learned Tico Brahe his Astronomicall Cometur of the new and much admired* [*] *Which appeared in the Year 1572* did not appear in English until 1632, but it was widely available in Latin at its publication in 1602 (Brahe). Its effect on English astronomical literature is offered by its translator "V.V.S.," who considered his achievement of bringing Tycho's new star to the wide English readership to be as significant as the star itself: Yet here the Reader shall most amply find

> Renowned Tycho's owne *Prognostication*
> Of the new *Starre* in this same new Translation …
> But wee make Tycho speake even word for word.
> Yet with that leave which [*] Horace doth afford,
> Who thinks it merits a Translators name
> To change the words, and yet the sense retaine,
> For this same Starre it selfe before did shroud
> Within the Latine, hid as in a Cloud,
> But now it is unvayl'd, and here in sight
> It shineth forth againe, as cleere and bright
> As when it first appeared in the *Skie*,
> And was the object of each wandering *Eye*. (Translator to Brahe, n.p.)

The translator's offering may not have been the best representation of contemporary English verse, but it correctly identifies the idea that Tycho's insights on the star would be available to a great variety of readers, including this brief "elegy" by Scotland's James VI the year before he ascended the throne of England as James I.

> What Phaeton dar'd, was by Apollo done
> Who rul'd the fiery horses of the Sunne.
> More Tycho doth; hee rules the Starres above
> And is Urania's favorite, and Love. (Brahe, n.p.)

Tycho wrote that the star of 1572 "shined without a taile or any scattered beams (for then it had beene a Comet) yet neverthelesse it might be likened to some of those appearances …" (Brahe, 4). Brahe correctly discerns that the star is "coelestiall, not differing from the matter of the other Starres, but yet in this it did admit of some diversitie, that it was not exalted to such a perfection … as appeareth in the everlasting and continuing Starres" (Brahe, 9). Essentially, Tycho was saying that the star was the same, yet not the same, as the other stars; this was a good way toward our present day understanding that the object was indeed a massive star at the very end of its life. Throughout his work he was also using the "numbers" of astronomical and astrological calculation to depict the star's position in the sky and the possible influence of that star on the Earth's northern hemisphere. Tycho's discussion of the possible astrological effects of the star was somewhat reticent: "I think it not fit," he concluded, "to proceed any further in unfolding these mysteries, having promised to handle them sparingly; also in regard, that these Prophesies, are not to be declared

by humaine conjecture, neither can be Geomertically demonstrated, as those matters which belong to the knowledge of Astronomie." Although Tycho's words were not published in English until 1632, they were well known in their original Latin in time for Shakespeare to consider them in Hamlet's letter to Ophelia:

> Doubt that the stars are fire;
> Doubt that the sun doth move;
> Doubt truth to be a liar;
> But never doubt I love
> O dear Ophelia, I am ill at these numbers; I have not art to reckon my groans: but that I love thee best, O most best, believe it. Adieu (*Ham*. 2.2.115-121)

Shakespeare was possibly familiar with the words of the scientist whose name was tied to the great star of 1572, and whose work inspired the elegy by King James, and that his words in *Hamlet* may have been inspired from Tycho. There is some evidence that Shakespeare was aware of the details of Tycho Brahe's life and family. Olson (68) points out that Tycho's observatory at Uraniborg was not far from Hamlet's castle in Elsinore; on a clear day Tycho could look out across the water and see it. One of Tycho's books, printed at his observatory in 1596 and titled *Epistolarum astronomicarum*, boasted a portrait of Tycho surrounded by the coats-of-arms of his ancestors, which included Rosenkrans and Guldensteren, names nearly identical with those of Hamlet's two fellow students hired by Claudius to snoop on Hamlet. Shakespeare might have seen the book or borrowed it from Digges, and possibly he enjoyed the unusual names enough to make use of them (Gingerich, 394–395).

The author of one of Shakespeare's most prominent sources, *Holinshed's Chronicles*, wrote of the star in his narrative of the events of 1572

> The eighteenth of November in the morning was seene a star northward verie bright and cleere, in the constellation of Cassiopeia … appearing bigger than Jupiter, and not much lesse than Venus when she seemeth greatest. Also the said starre never changing his place, was carried about with the daily motion of heaven, as all fixed stares commonlie are … (Olson, 70; Holinshed 1257)

The *Chronicles* properly note that the star was brighter than Jupiter and almost as bright as Venus at greatest brilliancy. They also record correctly that Venus varies in magnitude depending on its distance from Earth and its phase.

Other writers noted the great star. In 1580, Francis Shakelton's pamphlet *A blazyng Starre or Burning Beacon* recorded that "On the 18th day of November in the morning, a Starre was sene Northward, verie bright and cleare in the constellation of Cassiopeia, and it seemed so strange" (Shakelton, D3).

Other writers described the wonderful star in Cassiopeia; In his historical log of English events to 1604, Harison describes:

> The 18. of November was seene at that Northward very bright and cleare in the constellation Cassiopeia, which with three chiefe fixed stars of the said constellation, made a geometricall figure … This starre in bigness at the first appearing seemed bigger than Jupiter, and much less than Venus when she seemed greatest, also the said starre never changing his place, was carried about with the daily motion of heaven as all fixed starres commonly are, and so, continued almost five months. (Harison, 302)

The supernova of 1572 which Harison clearly describes as being about magnitude -3, and the following one in 1604, only 32 years later, were remembered by writers who were not yet alive at the time of its appearance. (There have been no supernovae observed in our Milky Way galaxy since then.) In 1647 Henry More posed questions that reflected popular concerns of the time. How did a new star manage to appear in a sky full of ordinary, permanently placed stars, and then how did it disappear; where did it go?

> And new fixt stares found in that Circle blue,
> The one espide in glittering Cassiopie,
> The other near to Ophiuchus' thigh,
> Both bigger than the biggest stares that are,
> And yet as farre remov'd from mortall eye
> As are the farthest, so those Arts declare
> Unto whose reaching sight Heavens mysteries lie bare. (More, 210)

1.3 Indirect References to the Star

A search for possible indirect references to the star of 1572 can provide some insight to its connection to human thought and perception, particularly concerning the journey of the soul after death. In Spenser's account of the battle between Cambell and the three brothers in *Faerie Queene*, the soul after death is given choices (*FQ* 4.3.13; Hamilton, 445), one of which is to change "into a starre in sky." But no nova brightens with this death, as the soul moves into a brother to continue the battle. In *Nosce Teipsum*, Davies echoes the role of the sky in the opening explanation to the soul's progress after death: "The lights of heav'n (which are the World's faireies) Looke down into the World," and in "An Acclamation" the soul appears with starlike beams. Donne's *First Anniversary* describes how "in these constellations then arise: New starres, and old do vanish from our eyes." (*First Ann.* 260)

New stars appear in Christopher Marlowe's works as well. "Why addest thou stars to heaven, leaves to green woods? And top the vast deep sea fresh water floods?" Marlowe might have recalled the bright star in Cassiopeia as he was translating Ovid's elegies (2.10.13). In this elegy to Graecinus, Ovid (as translated by Marlowe) treats temporary` stars in the sky as casually as leaves growing on trees; the transience of the great new star of 1572 was obvious by the time of the appearance of Marlowe's translation in 1594, for although it never changed position, by then it had completely vanished from view.

Marlowe wrote *Tamburlaine* around 1587 about the glories in battle and death of a fourteenth century Scythian shepherd who became a great conqueror. Marlowe's Tamburlaine wishes that

> Over my zenith hang a blazing star,
> That may endure till heaven be dissolv'd
> Fed with the fresh supply of earthly dregs,
> Threat'ning a death and famine to this land! (*2 Tamburlaine* 3.2.6-9)

Fig. 1.1 This image shows the two towers standing prominently over the Edgbaston Waterworks Towers in Birmingham, England. Although these real towers might have inspired J.R.R. Tolkien's *The Two Towers*, the second installment of his famous trilogy *The Lord of the Rings*, here I imagine the scene several hundred years earlier, during the great solar eclipse of 1605. More than 85% of the Sun was covered from Birmingham; about 90% from London

The idea that this particular blazing star endure forever indicates that Marlowe is thinking of a star apparently fixed to a spot in the heavens relative to other stars, rather than a comet (Fig. 1.1). That he probably was thinking of the Supernova of 1572, rather than a comet as some writers take blazing stars to mean, is evidenced by his specific invocation of different types of objects and phenomena: He considers "fiery meteors" (3.2.4) and two acts later he writes of "comets and blazing stars" as different types of heavenly objects. In the play's final act Marlowe describes the "sturdy Governor of Babylon" about to go to his death by hanging upon the ruins of the town he rules. "Go, bind the villain!" Tamburlaine orders amidst a view of a battlefield more terrifying than if the skies

> Were full of comets and of blazing stars
> Whose flaming trains should reach down to Earth
> Could not affright you. No, nor I myself,
> The wrathful messenger of mighty Jove,
> That with his sword hath quail'd all earthly kings … (*2 Tamburlaine* 5.1.89)

Tamburlaine can be considered an early example of science fiction, a play about a foreign monster growing up peaceably in the towns of Renaissance England. It is science fiction in the sense that the lifestyles, morals, and even the spirit of the plays are set in a place thousands of miles away from the play's audience, an audience that was facing a new world whose creatures were, as Kirschbaum notes,

"utterly abnormal emotionally, ethically, and religiously to the citizens of Shakespeare's London" (Kirschbaum, 28–29).

Just as in our time, the appearance of an unusual star or comet triggered an increased interest in other, less important events in the sky. Sidney's *Countess of Pembroke's Arcadia*, completed around 1580, contains Klaius's hymn to the planet Mercury as seen at different times in the evening and in the morning sky:

> O Mercury, foregoer to the evening;
> O heavenly huntress of the savage mountains;
> O lovely star, entitled of the morning;
> Vouchsafe your silent ears to plaining music,
> Which oft hath echo tired in secret forests. (*Old Arcadia Fourth Eclogues*)

The hymn has increased meaning to readers who are aware of the changing positions of the planet Mercury as a result of its orbit around the Sun. Since Mercury is closer to the Sun than Earth, whenever it appears in the sky it is near to the horizon in either evening or morning twilight. Occasionally, Mercury climbs higher in the sky and becomes more easily visible, as it did on 3 November 1579, in the morning sky and again in the evening sky 21 June 1580 (Mercury Chaser's Calculator). Both Mercury and Venus appear alternately in the evening sky for several weeks, then not at all as they get too close to the Sun to be seen; then each appears for a new period in the morning sky. Rarely during that middle period of invisibility, Mercury and Venus can actually pass in front of the Sun in an event called a transit; the most recent transit of Mercury occurred on 8 November 2006.

1.4 The Star and the Harvey–Nashe Controversy

Buried in the rich body of early modern literature of the late Elizabethan period is a collection of satirical pamphlets by Thomas Nashe and other writers. Although they are not commonly read today, their lively styles and insulting tones were popular in contemporary England, reaching an ever-widening readership with each successive (and nastier) creation. Originally written by an author using the pseudonym Martin Marprelate, the pamphlets began as a criticism of Archbishop John Whitgift's 1586 decree banning the publication of any book or pamphlet not authorized by him. In 1589, Nashe was hired by the government as a propagandist to defend the ban (Nicholl, 62). In probably the only paid writing job Nashe ever had, he had his first opportunity to earn his keep the following year, when Richard Harvey attacked the anti-Marprelate faction. A brilliant satirist, Nashe often used the night sky as a means of accenting the barbs he wished to throw, especially against those who are "so privy to the secrets of the Almighty that they should foretell the tokens of his wrath … no star he seeth in the night but seemeth a comet." (*Anatomy of Absurdity* 1589) (Fig. 1.2)

In 1592, Robert Greene's *A Quip for an Upstart Courtier* launched a subset of the Marprelate hullabaloo, a peculiar collection of nasty pamphlets tossed between Gabriel Harvey and Thomas Nashe. (Greene apparently liked using "upstart";

Fig. 1.2 NGC 6946, a galaxy 23 million light years away. It is best observed in summer and fall in the northern hemisphere. Although there are no supernovae in this galaxy at present, exploding stars often appear here. Examples have appeared within this galaxy in 1917, 1939, 1948, 1968, 1969, 1980, 2002, 2004, and 2008. Photo by Wendee Wallach-Levy. This picture served as the back cover photograph for the Royal Astronomical Society of Canada Observer's Handbook for 2010

history remembers his calling Shakespeare an "upstart crow" in his *Greene's Groatsworth of Wit). Upstart Courtier* talks of those arrogant courtiers – possibly including Gabriel Harvey – who "lifted their heads so high as if they had been bred to look no lower than stars." After Greene's death that year, Gabriel Harvey and Thomas Nashe launched their own set of pamphlets directed against each other, a conflict that became personal and bitter, and took up the rest of their lives. Harvey's last letter of *Foure Letters, and certaine sonnets* offers friendship to Nashe in exchange for ending the feud and ceasing his hotheaded style. Harvey alludes generally to the sky, first to the *ignis fatuus*, or mirage, of a "sky never so spritishly busy; never so many threatening comets, never such a terrible sky of blazing and falling stars" and too, in sonnet 11, the "resplendent lights of Milky Way to sing."

Nashe's response is the pamphlet *Strange Newes* [1593] to which Gabriel Harvey replied with *Pierce's Supererogation, or A New Praise of the Old Ass* (1593) the attack on his nemesis gets more personal. His fame, which can be inferred not in a positive light to mean evil reputation (OED), is given a persona: "When his necessary defence hath sufficiently accleared him whom it principally concerneth to acquit himself, she [Saint Fame] shall no sooner appear in person, like a new star in Cassiopeia, but every eye of capacity will see a conspicuous difference between her, and other, matters of eloquence, and the woeful slave of St. Fame must either blindfold himself with insensible perversity, or behold his own notorious folly with most shameful shame." Harvey accuses Nashe of having an ego as big as a supernova.

Nashe gets his comeuppance in his 1596 pamphlet, *Have with you to Saffron-Walden* (4535), a satire about a fictional imbecile who substitutes for the real Harvey, and in which Nashe accuses Harvey of behaving almost maniacally. *Saffron-Walden* marks the pinnacle of Nashe's battle with Harvey, who lived some 15 miles from Cambridge in a town called Saffron Walden. In it Nashe notes the character's "hateful scribbling" about a number of natural events, including "the fearful blazing star." Nashe even revisits the supernova issue as part of a list of how he referred to Saint Fame: "In one place he [Gabriel Harvey] calls her [the "sweet gentlewoman"] Saint Fame *the one she,* in another *the credible gentlewoman*, in a third *the heavenly plant,* and the fourth *a new star in Cassiopeia*, in the fifth *the heavenly creature*, in the sixth *a lion in the field of Minerva* …" and later compares Harvey and his gentlewoman to Jupiter and the Moon.

Saffron-Walden was one of the books ordered destroyed, and never reprinted, by the archbishop of Canterbury in 1599 in an attempt to put the literary skirmish between the two writers to rest. Even though the star had appeared 24 years earlier and had long since faded away in the sky, it lived on as a starry culmination to this footnote of early modern literary history. However, the supernova allusions appear as a doorway to a rich body of celestial allusion. The night sky, and particularly the attempts of judicial astrologers to interpret it in artificial ways, offered a primary source of fodder for Nashe's satirical pen. The more one delves into this material, the better one appreciates the depth to which Nashe has done his homework (Fig. 1.3).

In *Summer's Last Will and Testament*, Nashe refers obliquely to Tycho Brahe, whose precise mathematical measurements of the sky led to his determination that the Supernova of 1572 belonged to the most distant celestial sphere.

> Sky-measuring mathematicians,
> Gold-breathing alchemists we also have,
> Both which are subtle witty humourists,
> That get their meals by telling miracles.
> Which they have seen in travelling the skies;
> Yalm boasters, liars, make-shifts, they are all,
> Men that, removed from their inkhorn terms,
> Bring forth no action worthy of their bread. (Nashe, 189)

In his blanket condemnation of all judicial astrologers and alchemists, Nashe includes Tycho, whose *Astronomicall Cometur* on the supernova paraded some ideas about the supernova's sudden appearance foretelling the end of the Earth.

Fig. 1.3 The bright "star" in the center of this photograph is in almost the precise position of the great supernova of 1054 in our own Milky Way, but it is not the supernova of 1054. Instead, it is Saturn, that just happens to be very close to the position of the Crab Nebula, the remnant of that supernova. This photograph, taken by the author, does offer an impression of what the sky looked like on a clear night over a thousand years ago

To use the material of astrology as a basis for satire, Nashe needed to know it thoroughly, from true soothsaying to the borderline prognostications of Tycho, as part of his otherwise scientific treatise.

Tycho did indeed consider the star's judicial astrological implications at the end of his epistle: "As this Starre appeared in the highest heavens, to the view of the whole world, so it is credible, that there shall happen a great Catastrophe and universall change throughout all the chief Nations of the Earth, especially those which are situated Northward from the Equinoctiall" (Brahe, 16). His discussion then turns to the possibility that the star is somehow related to the Great Conjunction coming in 1583 between Jupiter and Saturn, an apparent meeting of planets in the sky that occurs once every 20 years. It is a celestial event of great interest and which Shakespeare wrote about in *All's Well that Ends Well,* as we shall explore in Chap. 4.

The new star of 1572 was not just an unusual object in the sky. As historian William Camden expressed in his *Annales*, "in the month of November a new Starre, or if you will, a *Phaenomenon*, was seene in the Constallation of *Cassiopeia*, which (as I my selfe observed) in brightness excelled Jupiter …" (Olson, 70). A phenomenon , this star's appearance and ramifications affected, as I have tried to show by these examples, the writing of a generation. Although we will never know how the star might have inspired the 8-year-old Shakespeare, it is surely possible that a youthful view of a strange star in the night sky could have inspired him, and other writers, to look beyond daily life to develop a cosmic vision for their time.

Chapter 2
Comets and Meteors: A Rich Harvest from 1573 to 1607

When I discovered a comet on the morning of 14 June 1991 (Comet Levy P/1991 L3), I had no idea that this "brave new world (*Tempest*.5.1.183-184)" would actually take me on a cometary journey into the sky of a distant time and place. As the comet's motion was documented over the next weeks, it was possible to determine its orbit over many years. In the past, it turned out that this comet might have visited us before, and it could be the same body that appeared in September 1499 (IAUC 5306, 13 July 1991). Near that ancient time the Italian poet Jovianus Pontanus was writing *Urania*, a Latin work about the night sky written in hexameters, that he would read at an Academy meeting in 1501. Pontanus's words appeared again in Latin around the middle of the sixteenth century, as part of Friedrich Nausea's *A Treatise of Blazing Starres in Generall*. The small portion of Pontanus's work that relates to comets was translated into English by Abraham Fleming at the end of the sixteenth century. Thus, the comet of 1499 might have encouraged Pontanus to write about comets. When his words appeared in English a century later, they might have been inspired by a spectacular parade of 15 comets (Yeomans 1991) that appeared between 1573 and 1607. This increased frequency of comet apparitions is important for literary reasons, since references to them abounded in the writings of the time:

> Of whistling winds, with blustering blasts which blow,
> Of bloody broyles, by force in fatall sight:
> Of peoples pompe, the pitious overthrow.
> Of Potentates the death, in wofull plight:
> The Blazing Starres aloft like lamps of light
> In th' Est or West of azure coloured skies,
> Forewarnings and signes when they arise.
> If still they stand, and offer not to change
> The place, where first in sight they cast their beames,
> Then shall insue much mischiefe rare and strange:
> As gaping wounds, and sluzing bloody streams,
> In foughten field, twixt nigh adioyning Realmes,
> Such civill stormes shall overrunne the land,
> That some shall bath in kindreds blood their hand.
> And if they take their course unto the East,
>
> A signe it is that forreigne foes with force
> Prepare apace, to spoyle both most and least:

D.H. Levy, *The Sky in Early Modern English Literature*,
DOI 10.1007/978-1-4419-7814-1_2,

With edge of sword sweet life still to divorce
From panting heart, devoyde of all remorse.
Has East or West in sight, they have their dome,
And signes they are of things in time to come. (Fleming, 1.21)

Brought to life for the English speaking world by Fleming, these words depict the passage of a "Shakespearean" series of comets that began at the same time that Tycho's great star was still bright. The interpretation is astrological; "blazing stares" appear as "signes" alongside "stirring winds." A comet in 1573, and a second appearing in 1576, was followed by the great comet of 1577, another in 1580, yet another in 1581, and two more in 1582. Other comets disturbed the sky in 1585, 1587, 1590, 1591, 1592, 1593, 1596, 1600, 1601, 1602, and 1607 (see Table 2.1). A more typical frequency for comets visible without a telescope is found during the same period of our own time, during which only 7 bright comets appeared, in 1974, 1976, 1983, 1986, 1990, 1996, and 1997. Except for a remarkable series of three comets in 1618, comets appeared far less frequently after 1607 (Yeomans, 414–418).

In a time immediately preceding the first use of the telescope, this number is extraordinary, and it is hardly surprising that Fleming chose to publish his translation "A Prognostication of Blazing Starres, according to the opinion of the Poet Pontanus." Especially noteworthy is the poet's emphasis that "blazing starres" are either stationary or moving, an indication that Fleming took advantage of the appearances of the real new stars that appeared in the sky, and the comets, and wished his readers to understand that these two types had very different appearances and should be interpreted differently. The poem begins with the "stirring winds" and the blasts of storms that forecast "civill stormes" just as *King Lear*'s storm scene is preceded by a series of eclipses that presage, as Gloucester suggests, "in palaces, treason …" (*KL* 1.2.103).

Stanza three considers the direction of cometary motion. The series of events that sparked Fleming's translation offered two stars "still they stand, and offer not to change," (possibly the new stars of 1572 and 1604) plus a selection of comets that "take their course unto the East" and others that could appear "East or West in sight, they have their dome, /And signes they are of things in time to come." If they appear in the evening sky, then comets will be in the west and will "take their course unto the east" (move eastward) as they depart the vicinity of the Sun. As the sky began to darken after sunset on the night of 13 November 1577, Tycho Brahe, already famous for his observations of the new star of 1572, saw what appeared like a long, white, softly luminous cloud in the northwestern sky. Intrigued, he noticed that it brightened as it neared the western horizon. As the sky grew darker, it quickly became obvious that this was no cloud but the tail of the mightiest comet he, or anyone else alive at the time, had ever seen. According to J. Harison, "The 11. of November at night was seen a blazing starre with a long [train] which was nightly seene till eight of the clocke" (Harison, 324).

A cloud or a comet? Just as the fading light made the difference unclear at first, Tycho was aware that the prevailing theory of comets belonged to Aristotle, who opined that they were exhalations in the upper atmosphere not unlike ordinary clouds. Believing that this theory was wrong, Tycho made accurate

Table 2.1 Comets and cometary references in early modern English literature

Comet of	Literary reference
1573	
1576	
1577	*A blazyng Starre or burnyng Beacon, Seene the 10. of October laste (and yet continewyng) set on fire by Gods providence, to call all sinners to earnest and speedie repentance*, (1578) compares the comet of 1577 to the view over Jerusalem 2,500 years earlier: "No lesse than the Starre that stood over Jerusalem like unto a Sworde, and also the strange Comet which endured for the space of a whole yere: The Devill in the figure and shape of a man …." "Also in the yere of our Lorde 1577 the tenth daie of November at night," Shakelton added, "there appeared a blazyng Starre in the firmament with a long streame (or taile) proceadying from the Same, and stretching the beames thereof directly towards the Easte, verie wonderfulle to beholde." (Shakelton, D4) Shakelton attaches these events to *Revelations* 6.13 and 14.7, where stars fall to Earth, and to the idea of darkening the Sun, Moon, and stars (8.12). (Shakelton (circa 1588), D4)
1579	Spenser's *Shepheardes Calender* (though possibly this harks further back to the comet of 1577, which was far brighter) "stird vp that vnkindly heate, That reigned (as men sayd) in *Venus* seate." (Bainbridge 1618)
1580	
1582	
1585	George Peele, *Araygnement of Paris* "The water-flowers and lilies on the banks …" Like blazing comets, burgeen all in ranks; Under the hawthorn and the poplar-tree Where sacred Phoebe may delight to be …" (Peele 1585)
1588	Nashe's *Anatomie of Absurditie* He falleth asleep; no star he seeth in the night but seemeth a Comet; he lighteth no sooner on a quagmire, but he thinketh this is the foretold earthquake, whereof his boy hath the ballad.
1590	First 3 books of *FQ*
1591	*1 Henry VI (although this reference may be generic to the several comets of the preceding years* "Comets, importing change of times and states,) Brandish your crystal tresses in the sky." (*I Henry VI*.1.1.2-3)
1592	frozen meteors *Summer's last will* (1592) I could bark the sun out of the sky, Turn moon and stars to frozen meteors And make the ocean a dry land of ice; … (*Summer's Last Will,* 201) vapours before the Sun (*Pennilesse* 1592)
1593	
1594	Nashe *Terrors of the Night* brains are like meteors (*Terrors* 1594, 241)
1596	
1599	Shakespeare: *Julius Caesar* "When beggars die there are no comets seen, The heavens themselves blaze forth the death of princes." (2.2.29-30)
1600	circa 1600: Fleming
1601	
1602	
1607	Halley's Comet. My lord, that ne'er before invited eyes, But have been gaz'd on like a comet." (*Pericles* 5.1.83-85)

observations of the comet's changing positions over time, and compared them with those made at the same time from other observers across Europe. When he discovered that positions made at the same time from different locations found the comet in the same place in the sky, he concluded that the comet had to be farther from Earth than the Moon is.

Although Tycho proved this point in 1577, John Bainbridge (in 1619, some months after the appearance of 3 comets in 1618) credited Seneca, in the *De Cometis* segment of his *Quaestiones Naturales,* with suspecting it 1500 years earlier. "Let this Comets regular and ordinate motion (for a month together) never deviating from one right line, keepe you in the way of verity," he wrote "This very reason alone many ages agoe persuaded divine *Seneca* … to place all Comets above the elementary regions [meaning Earth's atmosphere], wherein only inconstant and momentany [sic] Meteors make their fickle vagaries" (Bainbridge, 18). Bainbridge's science is correct, his attribution not entirely so. Seneca did not believe that comets were solar system objects beyond the moon; however, he quoted Appollonius who did, and his *Quaestiones Naturales* is probably the only surviving source of Appollonius's view (Seneca, *De Cometis.* XV11.1).

> Look how a comet at the first appearing
> Draws all men's eyes with wonder to behold it …

2.1 Comets and Meteors in Shakespeare

Around 1590, Shakespeare opened *1 Henry VI* with these lines:

> Comets, importing change of times and states,
> Brandish your crystal tresses in the sky. (1.1.2-3)

In a single three-line passage Shakespeare invokes much that changes in the sky; the opening line implies a solar eclipse (see Chap. 3), where day involuntarily yields to night, followed by a precession of comets. Note again the plural form; by 1590 Shakespeare might have seen as many as eight comets, using the word that derives from the Greek "long-haired star," and he decorates his comets with tresses like crystal. I doubt that the crystalline image could have entered Shakespeare's mind had he seen a comet only through the description of another, whether verbal or artistic. The words suggest that he saw more than one of the comets, perhaps including the mighty Tychonian comet of 1577 whose tail stretched a quarter of the way across the sky.

The bright comets continued through these years, especially the great summer comet of 1596 which might have been in Shakespeare's memory as he composed *Julius* Caesar around 1599. Calpurnia warns her husband not to venture outdoors after her dream of seeing comets in the night: "When beggars die there are no comets seen," Calpurnia warns her husband, "the heavens themselves blaze forth the death of princes" (2.2.29-30). Shakespeare's invocation of a comet in *Julius Caesar* is historically significant, for during the Octavian games in the summer of 44 BC,

held in memory of Caesar, a bright comet tracked through the northern sky and was widely believed at the time to represent the Praetor's soul on its way to heaven.

The comets of Calpurnia's dream were premonitions that appeared before her husband's assassination, but the historical comet appeared 2 months afterwards, with a tail perhaps 12 degrees long – half the length of the Big Dipper – moving through the northern sky, according to Plutarch; "among the divine portents there was also the great comet; it appeared very bright for seven nights after the murder of Caesar, then disappeared." Calpurnius Siculus went further, blaming the comet for the civil war that followed: "when, on the murder of Caesar, a comet pronounced fatal war for the wretched people."

> By being seldom seen, I could not stir,
> ut like a comet, I was wond'red at; (*IHIV* 3.1.46-47).
> … … …
> That men would tell their children "This is he" … (*IHIV* 3.2.47-48)

If *I Henry IV* was completed by 1596 (Oxford, 188), Shakespeare might have been thinking of the comet of that summer; the monarch and his subjects wonder at the majesty of a comet, but the allusion is inverted so that the King himself gets wondered at like a comet. The comet of 1596 was clearly visible in the northern sky throughout Europe for the first 2 weeks of August, seen first in Auriga, in the northeast, in mid-July and then moved eastward through Gemini and finally into northwestern Leo.

> Some airy devil hovers in the sky
> And pours down mischief. (*KJ*.2.2.2-3)

King John is particularly rich in cometary allusions. The *airy devil* implies a comet, since a quickly flashing meteor would not hover and airy summons the image of a bearded star." If *King John* was completed in 1596 (Oxford, 240), then this line might have been inspired by the Great Comet of that summer.

2.2 Meteors

> No natural exhalation in the sky,
> No scope of nature, no distemper'd day,
> No common wind, no customed event,
> But they will pluck away his natural cause
> And call them meteors, prodigies, and signs,
> Abortives, presages, and tongues of heaven,
> Plainly denouncing vengeance upon John. (*KJ.* 3.4.153-159)

Meteors were thought of as "natural exhalations" and, in a strange twist of interpretation, still are. Although they are not related to exhalations of breathing, they offer a rare example of a fundamental aspect of astronomy that has not changed much over four centuries; even our current understanding of meteors is rooted in the idea that they are events within Earth's atmosphere. Each meteor is an event during which a speck of cometary dust that heats to incandescence as it races through

Earth's upper atmosphere. We see only the interaction of the meteoroid, or dust speck, as it encounters Earth's atmosphere. To the early modern mind they could certainly have been seen as portents. But in *King John* these portents do not forecast this vengeance. Meteors are here invoked by name and linked to the "prodigies and signs" that denounce, not pronounce, vengeance upon John, as if to suggest that John's actions, presumably done in his role as monarch and for the benefit of the people of England, will return to haunt his future:

> This show'r, blown up by tempest of the soul,
> Startles mine eyes and makes me more amaz'd
> Than had I seen the vaulty top of heaven
> Figur'd quite o'er with burning meteors,
> Lift up thy brow, renowned Salisbury,
> And with a great heart heave away this storm… (*KJ*. 5.2.50-55)

This allusion is not just to a single meteor but to a shower of them, and more likely a philosophic al, *Revelations*-type shower where actual stars fall from heaven, than a physical one. However, it seems possible that Shakespeare witnessed, or more likely heard travelers' tales of a night during which several meteors per minute fell from the sky. The Leonid meteor shower of 1602, for instance, featured rates as high as several per second, but those were observed over China, not England. (Thien-Wen-Chih notes that On November 6, "hundreds of large and small stars flew, crossing each other"; the Korean text *unhon-Piko* notes that on November 11 of the same year, "many stars flew in all directions." We do not know if the shower lasted long enough to gain visibility worldwide, as did the Leonid meteors of 1998, which maintained high rates for sufficient number of hours to be seen around the world.

> Meteors fright the fixed stars of heaven;
> The pale-faced moon looks bloody on the earth, (*RJ.* 2.2.4.10-11)

Meteors may be portents here, but not as in *Revelations* since there is a differentiation between meteors and fixed stars; meteors are called upon to fright. Similarly,

> Those oppos'd eyes,
> Which, like meteors in a troubled heaven
> All of one nature, of one substance bred,
> Did lately meet in the intestine shock
> And furious close of civil butchery (*1 HIV* 1.1.8-12)
> Yond light is not daylight; I know it, I:
> It is some meteor that the sun exhales
> To be to thee this night a torch-bearer,
> And light thee on thy way to Mantua; (*RJ.* 3.5.12-15)

Here seen as an exhalation of the Sun, a meteor in Shakespeare is a portent, in this reference a natural "torch-bearer."

> Now, see thy glory like a shooting star
> Fall to the base earth from the firmament! (*R2* 2.4.19-20)

Meteor references in the early modern period allude to their astrological portents much more often than to celestial events; In *All is True* Henry 8 predicts that

I shall fall
Like a bright exhalation in the evening,
And no man see me more. (*AIT* 3.2.225-227)

Seneca believed that comets are formed "by very dense air, and since the most sluggish air is in the north, they appear in greatest number" in that direction. Although comets are distributed across the sky almost at random, in Seneca's own experience the small-number statistics of comets happened to favor the sky in the north (Fig. 2.1).

"Also in the yere of our Lorde 1577 the tenth daie of November at night," Shakelton added, "there appeared a blazyng Starre in the firmament with a long streame (or taile) proceadying from the Same, and stretching the beames thereof directly towards the Easte, verie wonderfulle to beholde" (Shakelton, D4). Shakelton attaches these events to Revelation 6.13 and 14.7, where stars fall to Earth, and to the idea of darkening the Sun, Moon, and stars (8.12) (Shakelton, D6).

Shakelton also references directly the Comet of 1580, as a further example of writing that recalls events actually seen in the sky: "And now hath the lord God kindled any other Starre, this late tenth of October 1580, the first appearing whereof (with his continuance) which hath been in Aquarius …" (Shakelton, D5).

In 1579, the December portion of Spenser's *Shepheardes Calender* followed this initial string of five bright comets. As part of a reflection on life and death that defines a relationship between man and nature, Spenser invokes the appearance of a comet that, in the *Calendar*'s argument for December, says "his manhoode to the

Fig. 2.1 For by these blessed candles of the night… (*Merchant of Venice 5.1.220*).
Of all the comets I have seen, this one most closely represents a view of some of the great comets of the past. This is Comet Hyakutake (C/1996 B2) which straddled a substantial portion of the sky in March 1996, surrounded by many "blessed candles." Photograph by David H. Levy

sommer, which he sayth, was consumed with great heate and excessiue drouth caused through a comet or blasinge starre, by which he meaneth loue, whose passion is comenly compared to such flames and immoderate heate." The comet he meant was probably one that appeared in 1578, although he could have recalled also the comet of 1577:

> stird vp that vnkindly heate, That reigned (as men sayd) in *Venus* seate. (*Shep. Cal.* December 10.5-6)

Cynthia appears shrouded like a comet, as she arrives to observe her surroundings, but she shines so brightly that it can "far outcast" her own shape, lighting the ground and casting a shadow.

2.3 Comets and Meteors of Our Time and Theirs

Comets can be the most stunning of celestial objects as those of us who saw the spectacular sights of two bright comets in 1996 and 1997 can attest. In March, 1996, I observed Comet Hyakutake's ethereal, filmy tail stretching for 110 degrees, almost across the entire visible sky. As the comet moved through space, gas and dust erupted from its nucleus. How would such cometary sights have been interpreted by the seventeenth-century English people in particular? Most important, the appearances of comets were so unusual that those who viewed them kept detailed records of their paths across the sky. Those records date back possibly to biblical times. The first book of *Chronicles*, for example, describes what could be a comet which might have been seen as a rebuke for an ill-advised census that King David had ordered. That biblical passage is read every year at the Passover Seder: "And David lifted up his eyes, and saw the angel of the Lord standing between the earth and the heaven, having a drawn sword in his hand stretched out over Jerusalem." (1 *Chr*. 21:16., cf.) *And with an outstretched arm:* this refers to the sword, as it is said, "And a drawn sword in his hand outstretched over Jerusalem." (C. Roth, *Haggadah* 26)

If the end of David's reign occurred about 971 BCE, then two comets, recorded by Chinese sources, are candidates to shed light on the "drawn sword … over Jerusalem." During the war between two Chinese kings Wu-Wang and Chou, around 1059 BC, a comet with an eastward-pointing tail dominated the evening sky. Another, appearing in the north polar region some time between 974 and 959 BCE, is within a few years of an estimated date of the enumeration of 965 BCE. (Yeomans 362, Bible Timeline 1254 BC-1004 BC, Pinsky (2005, 2006), Ken Wade (2006)).

Shakelton defines a nova as being different from a comet although Spenser ignores that difference in *Faerie Queene* (3.1.16), where a blazing star is clearly a comet:

> All as a blazing starre doth farre outcast
> His hearie beams, and flaming locks dispred (*FQ* (1590) 3.1.16)
> And when faire *Cynthia*, in darksome night,
> Is in a noyous cloud enueloped,
> Where she may find the substaunce thin and light,

> Breakes forth her silver beames, and her bright hed
> Discouvers the world discomfited … (*FQ* (1590) 3.1.43).

Like a comet, Cynthia appears shrouded as she arrives to observe her surroundings, but if it is as bright as the comet of 1577, it shines so brightly that it can "far outcast" its own shape, lighting the ground and casting a shadow.

In 1579, the December portion of Spenser's *Shepheardes Calender* followed this initial string of five bright comets. As part of a reflection on life and death that defines a relationship between man and nature, Spenser invokes the appearance of a comet that "stird up that unkindly heate" of both natural meteorology and human love (MacCaffrey, 554–556). But even Spenser's words are presaged by the words of Fleming, who delicately blended comet literature with science.

2.4 Comets and Thomas Nashe

Our discussion of the remarkable, and freshly acknowledged astronomical insight of Thomas Nashe, continues from Chap. 1. "In all points our brains are like the firmament," he records in *The Terrors of the Night (1594) "*and exhale in every respect the like gross mistempered vapours and meteors, of the more foeculent combustible airy matter thereof …." In Nashe's simile, the human mind is a multifarious free-flowing amusement park where ideas and images are born, fly about, and either disappear or evolve into other images. Nashe's comparison of such complexity with the atmosphere of the Earth is original and insightful, even by today's standards. To this cauldron he adds comets and meteors, which we have already seen were considered, despite Tycho's conclusions from the comet of 1577, to be Aristotelian creations of the atmosphere. One could suspect that by vapours, Nashe is referring to Aristotle's theory that comets can be thus explained, as paraphrased from *Meteorologia 7*: The dry, warm exhalation of air is the outermost part of the terrestrial world which falls below the circular motion. In the course of this motion it often ignites, and this he maintained was the cause of the "shooting" of scattered "stars." In the very next sentence, Aristotle continues: if the upper motion introduces a kind of fiery principle not so strong as to burn up the material quickly, nor so weak as soon to be extinguished, then a comet is formed. Aristotle's explanation seems to fit well with Nashe's phraseology of "mistempered vapours (for comets) and meteors." Nashe is using Aristotle's explanations as a scientific basis to begin his criticism of the soothsayer who would imagine our brains creating "monstrous images" of the night.

Nashe's *Anatomy of Absurdity* was published in 1588 (Steane, 824–828), shortly after the appearance in October 1587 of a bright comet with a tail that stretched over more than a quarter of the sky (Yeomans, 416). Nashe seems to criticize those who study Nature, but the examples of Nature that permeate his writings show at least that he is more than casually aware of natural events, especially

earthquake and celestial event phenomena. As an example, Nashe captures a dream of many comets: "He falleth asleep; no star he seeth in the night but seemeth a Comet; he lighteth no sooner on a quagmire, but he thinketh this is the foretold earthquake, whereof his boy hath the ballad." Nashe alludes to the ideas of one of the earliest astronomers, Thales Milesius (b. circa 624 BCE): "they see not what is under their feet, searching more curiously into the secrets of nature, whenas, in respect of deeper knowledge, they seem mere naturals." Perhaps this can be taken as a prelude to the discussion of the predictive value of eclipses in *Lear*, (see Chap. 3). Thales the judicial astrologer is criticized, not Thales the great natural astrologer.

Three centuries later, the American astronomer Barnard, in the midst of the apparition of the great comet of 1882, would experience a similar dream. When Barnard went to sleep early in the morning of 14 October, he dreamt about seeing many comets. When he awoke some hours later he turned his telescope to the great comet, then moving his telescope to the southwest and discovered a group of a half-dozen small comets accompanying the great one. Barnard wondered whether he had fallen asleep on his feet and had resumed his dream. The comets were genuine enough, and Barnard's report was confirmed by observers in Europe. But although the little comets moved at the same rate and direction as the great comet, they all faded within a day and eventually vanished. The Barnard dream harks back to Nashe in the sense that both writers imagined a celestial page filled with comets.

In 1594 Nashe's *Terrors of the Night* (530–531) includes references to "blazing Comets" and the "fiery streaks" of meteors. Nashe's frequent references to meteors are included in this chapter because of the old Aristotelian idea that they like comets, belong to our atmosphere. At the end of the sixteenth century the relation between the two was based on that principle. Four hundred years later, we understand that while meteors are engendered within our atmosphere, the dust that forms them comes from comets. These comets might well be references to the comets that appeared in 1592 and 1593 (Yeomans, 416). In *Summer's Last Will and Testament* (circa 1592) Nashe offers a look at inevitability of death, especially in his plague-ridden time. Autumn asks "Who treadeth not on stars, when they are fallen?" (*Summer's Last Will*, 198) and the "rough and stern" Winter's son Backwinter wishes that

> I could bark the sun out of the sky,
> Turn moon and stars to frozen meteors
> And make the ocean a dry land of ice; … (*Summer's Last Will*, 201)

Nashe's allusions to meteors in *Summer's Last Will* comes just 2 or 3 years before Shakespeare's *Richard II* (1595). In successive lines, the Captain invokes meteors and a lunar eclipse to assert the judicial power of the cosmos (2.4.7-11):

> Captain: 'Tis thought the king is dead; we will not stay.
> The bay-trees in our country are all wither'd
> And meteors fright the fixed stars of heaven;
> The pale-faced moon looks bloody on the earth
> And lean-look'd prophets whisper fearful change …

A few years later, *Hamlet's* Horatio recalls a scene from the earlier *Julius Caesar*, then adds further lore to it (*Hamlet* 1.1.114-120):

> … A little ere the mightiest Julius fell,
> The graves stood tenantless and the sheeted dead
> Did squeak and gibber in the Roman streets;
> As stars with trains of fire and dews of blood …

Either comets or meteors could have "trains of fire," though the reference functions better if the image conjures up a rushing meteor rather than a comet parading slowly and majestically. The sheeted dead moving aimlessly through the streets of Rome is a better match for meteors falling from the sky.

All these references were too early to have been inspired by the great Leonid meteor storm of November 1602 (Kronk, *Comets and Meteor Showers*), though Shakespeare's meteor images "fight the fixed stars of heaven" and "stars with trains of fire" are so vivid that I suspect they emanate from his personal observation. There are few contemporary references to sixteenth-century meteors. *Yollsong Sillok,* a 1554 Korean text, reports that on 24 October "meteors appeared at intervals," and the Korean Munhon-Piko reports an 26 October 1566 shower in which "meteors flew like a shower in all directions." The next available record is dated on 6 November 1602, when the Chinese text Thien-Wen-Chih reported that "Hundreds of large and small stars flew, crossing each other." The absence of scientific reports of heavy meteor activity in the 1590s does not preclude activity elsewhere over the world, of course. If a major shower of meteors did take place or perhaps a series of a few bright meteors or fireballs in the early 1590s, it is supported only by an increased number of references to meteors by Nashe and Shakespeare.

The idea that comets and meteors are physically related stems from Comet Swift-Tuttle, which was discovered by Ignatius Kegler in the eighteenth century, and by Swift and Tuttle in 1862, and whose orbit closely matched those of the Perseid meteors which add eloquently to the beauty of the August night sky each year. Three centuries earlier, that connection was understood in a different way, as John Bainbridge tells us in his *Astronomicall Description of the late Comet from the 18. of Novemb. 1618 to the 16. of December following*:

> … let this Comets regular and ordinate motion (for a month together) never deviating from one right line, keepe you in the way of verity. This very reason alone many ages agoe persuaded divine *Seneca*, and in our Fathers daies that ingenious and subtle *Cardane* to place all Comets above the elementary regions, wherein only inconstant and momentany [sic] Meteors make their fickle vagaries.

In Bainbridge's world, comets and meteors are related in that both are meteorological, with comets inhabiting the atmosphere's upper regions and the inconsequential meteors decorating the air closer to the ground.

Nashe's friend George Peele, whose works Nashe praised as *primus verborum artifex*, lets comets brighten up his *Araygnement of Paris* (1585). By comparing the plant life that grows along the banks of "bubbling brooks" like water-flowers and lilies, to the mighty comets, he invokes a unity in Nature that brings together the infinitesimal and the infinite. The lines compare the tiniest of objects that requires

a keen eye for detail to spot, to one of the great comets that slid across the sky between 1573 and the poem's probable date of composition of 1585. At the start of the passage Iris is invoked – "Iris adornes her arch" – i.e., the arch of the heavens, perhaps with "pride and bravery." The comparison begins with the cosmic – "milk – white way" of course the Milky Way that

> in frosty night
> Appear so fair and beautiful in sight,

which then is focused inward to

> these fields, and groves, and sweetest bowers
> Bestrew'd and decked with parti-colored flowers.

Now that the poet has us focusing inward, he suggests motion: The flowers are not just appearing, but gliding and sliding. They

> Along the bubbling brooks and silver glide,
> That at the bottom do in silence slide;

Watching this motion are

> The water-flowers and lilies on the banks …

The poet thence takes us outward again. Small as they are, the water-flowers and lilies shine

> like blazing comets, burgeen all in ranks;
> Under the hawthorn and the poplar-tree
> Where sacred Phoebe may delight to be … (Peele 1585)

The microcosmic scene, with flowers standing guard next to a flowing stream, contrasts with the macrocosm, where blazing comets move across the sky as they stand guard next to the fixed stars. The movement from micro to macro is instantaneous; in a single word, "shine," the focus shifts to the vastness of the heavens. Although the simile is reversed, it is the comets that move in the sky, but the flowers to which they are compared do not move. The comparison is beautiful and accurate, apt, and precise in its details. Note also that Peele refers to comets, in the plural.

2.5 Comets After 1602

A search for comet references in literature reveals as much about the nature of comets by what is not discovered as by what is found. My search for comet references in literature shows a decline in the first years of the seventeenth century compared to the prior decade. Comets appear less often in the sky, and are harder to find in literature, after 1602. After a 5-year hiatus, the sky was altered again by the visitation of a great periodic comet which would, two revolutions later, be named for Edmond Halley, the man who calculated its orbit and discovered its periodicity. The next year Shakespeare probably wrote *Pericles*, which offers a tribute:

> My lord, that ne'er before invited eyes,
> But have been gaz'd on like a comet. (5.1.84-85)

Pericles functions indirectly as a telescope through which we can look back at a sky graced with an unusually high frequency of comet appearances. We read in Charles Fitzgeoffrey's *Sir Francis Drake His honorable Life*,

> Where he a new-made star eternallie
> Shall shine, transparent to spectatours eie:
> A fearefull comet in the sight of Spaine,
> But shall to us a radiant light remaine. (15.11-14)

Drake, who died in 1596, is remembered for his writing on both the supernova of 1572 and the "fearfull comet" whose appearance over Spain presaged defeat for their Armada. From the viewpoint of observation, the comet seen in 1499, but possibly not again for five centuries, can hearken us back to that earlier time. Scientists record the apparitions of these comets, but poets and playwrights bring them to life.

Chapter 3
These Late Eclipses

Hung be the heavens with black, yield day to night!

(*I Henry VI.*1.1.1)

In building a picture of a magnificent sky, a "majestical roof fretted with golden fire," (*Ham.*2.2.302-303) Shakespeare's opening lines suggest the wonders both of eclipses, and, in the following lines, comets. The sky was a busy place in the seventeenth century's opening years, but of the string of celestial events, the passing of great shadows closest to the Earth that we call eclipses, generated the most interest. Eclipses of the Sun and Moon were (and are) specific events that could be predicted and traced to particular dates. Whether *King Lear,* with its ominous debate about the predictive value of eclipses, had already been completed and performed in London, or whether Shakespeare was completing it at the time, is less certain.

This opening line of the *Henry VI* trilogy, cited above, invites Shakespeare's audiences to conjure up a sky. I do not believe that Shakespeare intended the transition in the first line, from day to night, to be the gradual one that we see at day's end. Besides the obvious connection to the design of his theater, where a black curtain literally hung from the ceiling and could be thrust into position (Greenblatt et al., 86), in Shakespeare's art, day hurtles into night, typical of his ideal or heroic nature passages where his focus is on his characters, not his setting; "it is as though the poet-dramatist goes to the extent of personifying natural phenomena when he dwells at any length upon them" (Spencer, 43–46).

I offer two examples of heroic word paintings; the first comes from Edward III, a play with which Shakespeare was but marginally involved. If we accept the idea that he did compose scene 13 (according to the editors of *The Oxford Shakespeare*, 257), then we are treated to a magnificent Shakespearean allusion to the appearance of a landscape during a deep partial solar eclipse:

King of France: A sudden darkness hath defaced the sky,
The winds are crept into their caves for fear,
The leaves move not, the world is hushed and still,
The birds cease singing and the wand'ring brooks
Murmer no wonted greeting to their shores.

D.H. Levy, *The Sky in Early Modern English Literature*,
DOI 10.1007/978-1-4419-7814-1_3, © Springer Science+Business Media, LLC 2011

Silence attends some wonder and expecteth
That heaven should pronounce some prophecy.
Where or from whom proceeds this silence, Charles?
Dauphin: Our men with open mouths and staring eyes
Look on each other as they did attend
Each other's words, and yet no creature speaks,
A tongue-tied fear hath made a midnight hour,
And speeches sleep through all the waking regions.
King of France: But now the pompous sun in all his pride
Looked through his golden coach upon the world,
And, on a sudden, hath he hid himself,
That now the under earth is as a grave,
Dark, deadly, silent and uncomfortable. (Edw. III.13.1-18)

This allusion comes close to describing a scene during the maximum stage of a deep partial eclipse of the Sun, or even a total eclipse just before the onset of the total phase. The "sudden darkness" thrusts itself more suddenly than a thick cloud deck does before a thunderstorm, and I have seen the wind drop precipitously so that the world, indeed, "is hushed and still," and birds literally "cease singing." These changes appear suddenly as the crescent Sun continues to thin.

However, this play has been dated at 1594, which is almost two decades before the deep partial eclipse of 1605. It is not likely that Shakespeare had witnessed such an eclipse before he wrote these lines. I suggest that he based the analogy either on his wide reading (Holinshed's *Chronicles* documents at least four such eclipses), or perhaps that some traveler reported his experiences to him of the brief total eclipse on the Atlantic during the afternoon of 29 April 1585, or the longer total that crossed the south Atlantic Ocean on 30 May 1593 in the path of English sailing ships (Espenak, http://eclipse.gsfc.nasa.gov/SEcat5/SE1501-1600.html).

The opening of *I Henry VI* is a second example of a heroic word painting. The sky descends to black as though a celestial curtain, in this case the shadow of the Moon, has suddenly been thrust upon it. It could be interpreted as an ideal or emblematic image of the sudden darkening of the sky due to an eclipse that accompanied the death of Henry V.

Not many years later, Shakespeare summons this image again, this time in a slide to the darkness of eclipses in the second scene's opening line in *King Lear*: "Thou, Nature, art my goddess," Edmund declares, "to thy law/ My services are bound" (1.2.1-2). As Gloucester complains of the deteriorating situation in Lear's palace, he cites Kent's banishment as his instigation, then goes on to France's anguished departure and the King's unpredictable behavior, and finally demands to read Edgar's letter from Edmund's hand. As he scans it, Gloucester uncovers Edgar's suave delight in finding a perverse satisfaction in "aged tyranny." Edmund probably forged the letter himself, blaming its instigation on his brother and thereby leading to Gloucester's damning his son as a villain. Edmund then conveniently offers to intervene, to learn about Edgar and report back to the Earl.

Gloucester then undergoes a profound change. From anger toward Edgar, as he peers across the stage his mind begins to focus on the consequences of the recent eclipses. He has almost reached a state of panic as he intones: "These late eclipses in the Sun and Moon portend no good to us. Though the wisdom of nature can

reason it thus and thus, yet nature finds itself scourged by the sequent effects: Love cools, friendship falls off, brothers divide" (1.2.101) – all thoughts that refer to obvious motifs from the play that include Lear's rage at Cordelia and Kent, and the developing rift between Edmund and Edgar. After Gloucester exits, Edmund dismisses his father's reasoning, countering the older man's "portent" with his own "conceit": "This is the excellent foppery of the world, that when we are sick in fortune, often the surfeits of our own behavior, we make guilty of our disasters the sun, the moon, and stars, as if we were villains on necessity" (1.2.115-127).

Edmund's skeptical-rationalist perspective solidifies the eclipse theme that reached an audience that had the recent lunar and solar eclipses in mind, and suggests that astral influence is not at work during this play. The discussion reads like a sixteenth-century precursor of a modern radio talk program; Edmund's speech characterizes the English people who believe in the predictive power of eclipses as "fools by heavenly compulsion, knaves, drunkards, and treachers [sic] by spherical predominance." In those two adjacent speeches, Shakespeare offers us ideas about the nature of eclipses and their effects on humanity. However, his conclusion is, like so many aspects of Shakespeare, left unwritten.

It could be said that the events in the play itself supported a conclusion that the eclipses did portend the disaster in the following acts, the blinding of Gloucester, and the deaths of Cordelia and of Lear. I suspect that Shakespeare left the argument hanging purposefully, considering it sufficient that the issue is raised between Gloucester and his sons in a time just before or after the eclipses in England. Shakespeare, as he should, posed many questions about solar, lunar, planetary, and astral influence, then left them unanswered. It is my belief that the playwright simply wished to open up possibilities for his audience. As a playwright, it was not Shakespeare's job to define public views on various matters, but instead to tell a story that might illustrate the fates at work.

In the 1930s a series of letters to the *Times Literary Supplement* considered the eclipses in King Lear, but the subject has not been considered actively since then despite the recent advent of far more accurate maps showing precisely how the eclipses were viewed from London. One of the *TLS* letters, for example, diminishes the importance of the October 1605 solar eclipse as a small partial eclipse (Harrison et al. 836, 78, 96). We now know (Espenak) that the event was a major one in which approximately 90% of the Sun was covered by the Moon as seen from London, and that the lunar eclipse that preceded it was a deep partial eclipse which, at maximum, covered the entire Moon in either the Earth's umbral or penumbral shadow. A new look at these early modern celestial event benefits from the more precise models that are available today.

The three eclipses that made 1605 so special were not thoughts of philosophers like Francis Bacon, whose opus that year discussed eclipses only in their theoretical sense, but actual events seen in the sky over parts of Europe. By the early seventeenth century their mechanics were well understood. As the Moon orbits the Earth once each month it can pass once, at its new phase, between Earth and Sun, and at that time a solar eclipse can occur. Two weeks later, the Moon, now full, can pass into the shadow of the Earth causing a lunar eclipse. Because these eclipses repeat every 18 years, 11.3 days, one can predict accurately the occurrence of eclipses far into the future.

The rich sequence of eclipses in 1605 began during the evening of 13 April (OS) with a long total eclipse of the Moon. There was a second lunar eclipse, a partial one, during the morning of 27 September (17 OS); finally there was a deep partial solar eclipse on 12 October (2 OS). That event was total in a narrow path that began at sunrise over Baffin Island in the north Atlantic, crossed over southern France then through the area around Barcelona, Spain, Nicosia in Cyprus, and left the earth at sunset over the western shore of the Caspian Sea, all within about 2 h.

King Lear invokes at least the final pair of a lunar and a solar eclipse, or possibly all three events, and in Sonnet 35 Shakespeare notes how "Clouds and eclipses stain both moon and sun," where even the order of the autumn 1605 pair of eclipses is correct. The uncertain date of Sonnet 35 casts doubt on which eclipse he might have been referring to, although we do know from John Dee (61) that the solar eclipse of 1599 was completely obscured by clouds, and from Pingré (37) that the end of the 1605 solar eclipse, at least, was observed from London.

The October 1605 eclipse was not total in London, but it was close enough that the following effects should have been observed: as mid-eclipse approached the Sun would have appeared as a rapidly thinning crescent, the location of the crescent rounding the center of the Sun, like a minute hand on a giant celestial clock in a clockwise direction from east to west. As it thinned, the sky darkened rapidly and noticeably, indeed as if "dark night strangles the traveling lamp" (*Macb*.2.4.10). The eclipse did not have to be total for Shakespeare's powerful imagery to work. In the absence of a total eclipse, dark night would strangle, then as quickly withdraw.

Although the solar eclipse of October 1605 was not the strongest or longest of this series, it attracted more attention by far than any other eclipse during that period. In early October the sky over London was likely to be less cloudy than at other times during the year, allowing a greater number of people to see the eclipse.

Dade's 1605 almanac predicts malicious but unspecific effects from this eclipse that might be contradicted or nullified by appropriate lifestyle changes: "I omit to speake of, onely beseeching God to direct us with his holy spirit, that we may live as true Christians, faithfully processing the Gospell of Jesus Christ …" (Dade, B3 + 7). Gloucester's speech goes further, delineating the kinds of disasters to which an eclipse can lead, beginning with the same strife between parents and children that Lear is feeling. In February 1606, Edward Gresham told of strange events in Croatia that included a report of a woman giving birth to a boy who had four heads, a "confirmation" of the events that followed the eclipse series that ended four months earlier. The extent to which a belief in *astrologia judicialis* influenced these observations will be explored in Chap. 4.

The eclipses in *King Lear* offer an entrance to studying *King Lear* from a New Historicist point of view. We know that New Historicism connects a work of literature to the culture in which it was written and by inference its politics and chambers of power; in the time of *King Lear*, judicial astrology was a major part of that power. Shakespeare wrote *King Lear* at a time when judicial astrology was deeply frowned upon but also at a time when this type of astrology was flourishing among England's general population. Throughout Europe, astrologers were a fixture in courts that were often decorated with symbols portraying the Zodiac. Greenblatt developed his new historicism ideas to reflect his own "tendency … away from a

criticism centered on 'verbal icons' toward a criticism centered on cultural artifacts" (Greenblatt, 3). Greenblatt is vague as to what defines a cultural artifact; the idea of astrology is one, and the Moon, Sun, and their eclipses taking place in his time are another. In his speech, Gloucester offers good examples of how these eclipses, and their "sequent effects" can change our lives. Love cools as eclipse-associated darkness diminishes the intensity of interpersonal relationships, and treason arises in palace courts, especially that of James I, whose 1605 parliament is threatened to within an inch of its life by the gunpowder plot of 5 November. Even though the threat was deadly serious, James's letter from a month earlier was lighthearted, even teasing, in its tone, and he admitted that his own sense of humor was affecting his ideas that day, as he wrote:

> But now will I go to higher matters, and tell you what I have observed anent the effects of this late eclipse, for as the troglodytes of the Nile that dwelt in caverns, the shepherds of Arcadia dwelling in little cabins, the Tartars harbouring in their tents like the old patriarchs, so I, having now remained a while in this hunting cottage, am abler to judge of astronomical motions than yew that lives in the delicious courts of princes. The effects then of this eclipse for this year are very many and wondrous. It shall make divers noblemen at the Court loathe their wives and wish they were better married, such as Lennox, Pembroke, and Roxburghe. It shall make some widowers loath to marry again. (Akrigg, 265)

The letter ends with his wish to return to London and get on with the opening of parliament on 5 November. Considering that he barely escaped that opening with his life in the wake of the gunpowder plot, he might have preferred staying at his cottage.

Gloucester relies on the judicial astrology of the time to buttress his argument about malevolent eclipses. Even now, astrologers tend to view eclipses as large-scale signals of coming danger. Some astrologers followed a narrow application of their craft to eclipses, one blaming a single undated lunar eclipse for the devastation of all the land of Chaldea (MacNeice 110). Later believers of Gloucester's view would cite two solar eclipses in 1781, an annular eclipse in April and a total in October, as leading to the critical environmental damage to islands off the western coast of India.

Edmund's disagreement with his father was as unmitigated as a total eclipse. His speech confirms Danby's inferring Shakespeare's interest in Nature in light of the words spoken by characters such as Edmund. By ascribing our difficulties to the eclipses, we deny ourselves the opportunity to atone for sins which are far more often "the surfeits of our own behavior" and mistaken actions. This is not evidence that Gloucester's illegitimate son has any sympathy for the misadventures that have already occurred, such as Kent's being banished, and the more disastrous ones to come. Returning, Edgar inquires what his brother has been up to, and Edmund admits: "I am thinking, brother, of a prediction I read this other day what should follow these eclipses." With some surprise Edgar asks, "Do you busy yourself with that?" Yes, the answer comes both from Gloucester and Edgar, but in opposite ways; Gloucester's shock over Edmund's independent view, and Edgar's feigned brotherly concern that Edmund will interfere with his plan. Another philosopher of the time, Francis Bacon (112), notes peripherally how "the astronomer hath his predictions … of eclipses" in a phrase echoed in *Faerie Queene*:

> But true it is, that when the oyle is spent
> The light goes out, and wicke is throwne away … (*FQ* 2.10.30)

Some critics, notably Arden, suggest that the eclipses can be used to date the play more accurately than between 1603, when Samuel Harsnett's *Declaration of Egregious Popish Imposture* appeared, and Christmas 1606, when the play was performed before King James (Greenblatt, 2326). In his biography *Shakespeare Unbound*, René Weis cites the evidence of the eclipses as positive dating of the play at late 1605. "Gloucester is unmistakably referring to those" in his "late eclipses" speech; "the play can be dated to after the eclipses …" (Weis 334). I think that Weis's evidence is skimpy; Shakespeare could just as well have been consulting an almanac by Dade or someone else, and that would date the play just as easily *before* the eclipses.

3.1 Other Contemporary References to the Eclipses of 1605

My search of contemporary references to the eclipses of 1605 found few surviving examples other than those in Holinshed and Shakespeare. The three eclipses were announced in Dade's *Almanac* (n.p.) which was widely available by the early part of 1605. The spring total eclipse was trumpeted as an "Eclipse of the moone appearing the 24 day of March at 7 of the clocke at night …" The September eclipse was "appearing, and being seene unto us, above our horizon the 17 day of September at 3 of the clock, 37 minutes in the morning, She being darkened almost 9 points, and from the beginning of her darknesse into the recoverie of her former light, will be about one houre and a halfe …. The influence of this Eclipse will begin to worke and take effect the 17 day of August the next following, and shall continue until the 5 day of October then next ensuing."

The October solar eclipse appears thus: "The Sun eclipsed the second day of October, at one of the clocke 20 minutes in the afternoone, whose obscuritie and darkness, will be 9 poynts and 10 whose obscuritie and dark beginning to the end one hour … ." (Dade, n.p.)

There has been commentary on the idea that these two eclipses could have been, but were not necessarily, the events Shakespeare had in mind when he wrote *King Lear* (Parr and Harbage 1060, Foakes 91, Kermode 1250). Johnstone Parr and others suggest that all of the three solar eclipses that occurred around the writing of *Lear* – in 1598, 1601, and 1605 – were the events Shakespeare had in mind. These commentaries typically end with the conclusion that since eclipses were not uncommon, Shakespeare's reference could have been to the phenomenon in general, not to any specific eclipses, or that Shakespeare intended a general reference to the sudden occurrence of several eclipses after a half-century lull.

I disagree. Just as it is unlikely that a play written today would make much of the great European solar eclipse of 1999, I doubt that in 1604 or 1605 Shakespeare would have invoked his audience's memory of eclipses that had occurred in 1601 and 1599, especially since John Dee tells us that the 1599 eclipse was clouded out. The reason I believe that the eclipses of the Sun and Moon in 1601 were not a factor is that it has been established that both Harsnett's *Declaration of Egregious Popish*

Impostures and Montaigne's *Essays,* translated by Florio, had an effect on *King Lear's* language (Foakes, 91). These books were both published in 1603, which would have made the specific remarks about eclipses of both the Sun and Moon appear dated even if the play had been written and performed during that year (Furness, 186, 377).

There are difficulties in trying to use specific astronomical references, especially those about eclipses, to date Shakespeare's writings. For example, in his 1938 article in *Shakespeare Quarterly*, Alfred Harbage proposes that Sonnet 107's "mortal Moon" alludes not to an eclipse at all but to the crescent-shaped battle formation of the Spanish Armada, and then cites earlier sources claiming that the allusion is to the Armada's defeat in 1588. Citing that the Moon was the symbol of Elizabeth (Cynthia's imperial vot'ress), Harbage proposes that the "mortal Moon" actually refers to Elizabeth (Harbage, 59). He goes on to cite how other factors in the sonnet encourage a much later date, perhaps including Queen Elizabeth's death in 1603. I agree with this interpretation, particularly since an actual lunar eclipse was visible from England on 24 May 1603 (Espenak).

3.2 Other Eclipses

During the predawn hours of 10 February 1598 (OS), a total eclipse darkened the Moon over England. Only 2 weeks later, an almost total eclipse of the Sun passed near England. John Dee's marginal notes detail his attempt to see that event: "Feb. 25th, the eclips. A clowdy day, but great darkness abowt 9½ mane" (Dee, 61). The darkness was understandable; had the sky been clear Dee would have observed a crescent Sun so thin that only a tiny sliver of sunlight could be detected behind the dark sphere of the Moon. On 10 July 1600, London experienced a noon hour partial solar eclipse during which almost half the Sun was obscured from the Moon. Eighteen months later, on 24 December 1601. London was near the path of an "annular" solar eclipse during which the Sun would have appeared as a sickle of light, almost a complete ring of light in the sky. I have found no reports about this event, but I did note writing about stormy weather at the time, indicating that the eclipse was probably completely clouded out. The almost total lunar eclipse of 1601 was one of the darkest on record. In the early evening hours of December that year, almost the entire Moon was enmeshed in the Earth's shadow, and the dark portion simply disappeared (Fig. 3.1).

Written around 1600, *Hamlet's* opening lines are replete with night sky imagery. The star "westward of the pole" has been discussed in Chap. 1, but later in the same scene Horatio invokes the memory of those events that could accompany the visitations of ghosts:

> stars with trains of fire, and dews of blood,
> Disasters in the sun, and the moist star
> Upon whose influence Neptune's empire stands
> Was sick almost to doomsday with eclipse. (*Hamlet* 1.1.117)

Fig. 3.1 This is certainly one of the most photographed houses in the world. It is the birthplace and boyhood home of William Shakespeare. Toward the west lies a modern Shakespeare research building. Photograph by David H. Levy

Stars with trains of fire are more likely interpreted as meteors than comets, and the moist star, or the Moon, is "sick… with eclipse" as it was in 1598 and again in 1600.

Written circa 1603 or 1604, *Othello* is rich with references mostly to lunar eclipses. There is a good chronological reason for this: Between 1600 and 1605, no solar eclipse reached England, but a partial lunar eclipse took place in the late evening hours of 14 May 1603 (OS). Just past 11 in the evening the Moon faded dramatically, and over half of it was a ruddy red color. Six months later, an early evening November partial eclipse darkened a small portion of the Moon over England.

Othello's references to eclipses begins with the protagonist's plan, "To follow still the changes of the moon with fresh suspicions" (3.2.130-133). I suspect that combined with the other references to eclipses that occur through this play, the "changes" do not allude merely to the ordinary change of lunar phase but to eclipses. This suspicion is strengthened in Act 4, when he watches heaven as it "stops the nose at it, and the moon winks … (4.2.76), fading and then brightening again as during an eclipse."

The almost total eclipse of the Moon on 9 December 1561 was listed as one of darkest eclipses on record. Visible from London the evening of December 9 (*Sky & Telescope* 142, March 1964, 142–146), the eclipse became an "error of the moon [that] comes more nearer earth than she was wont

> And makes men mad. (5.2.112)

And as Othello nears death, he

> thinks it should be now a huge eclipse
> Of sun and moon, and that th' affrighted globe
> Did yawn at alteration. (5.2.101-103)

Eclipses come in 18-year cycles (Greek *saros*) that last hundreds of years. The saros that included the 1605 eclipse repeated itself 18 years, 11 1/3 days later in 1623 and at equal time intervals after that. In 2002 I witnessed the twenty-second repetition of that 1605 solar eclipse. What I saw was a much shallower partial eclipse than the one visible over southern England four centuries earlier. The sky still darkened significantly so that during the central portion of the eclipse the Sun's light was considerably dimmed, shadows were sharper than usual, and the landscape adopted a strange unearthly quality of light. The preceding lunar eclipse occurred on 26 May 2002 followed by the solar eclipse on 10 June 2002. Because of the Earth's rotation during the additional third-of-a-day, however, neither of these eclipses was visible from England.

Londoners would have seen an even more dramatic spectacle if the sky were clear on that 1605 afternoon, when more than 90% of the Sun was covered by the Moon. Within just 5 years, eclipses would take on a different meaning for those who had the means to view an eclipse through a telescope. The deep partial eclipse during the morning of 30 May 1612 provided an opportunity for Londoners to revisit *King Lear* with the aid of a telescope.

Shakespeare's most eloquent description of an eclipse does not even mention the word (*Macbeth* 2.4.20). An eclipse seemed to be associated with the word "disaster," which has astrological connotations of "bad star" and occurs elsewhere in Shakespeare (e.g., *Macbeth* 3.1.110-112). Shakespeare apparently reasoned that by taking advantage of contemporary astronomical events, he could engage his audiences' interest in the narratives; by the fall of 1605 the English public would not have been shocked by the eclipses, though perhaps they took note that there were so many of them, particularly after a dearth of eclipses that had stretched over much of the previous half century. If *Macbeth* was indeed composed in 1606, after the 1605 solar eclipse, this description would be consistent with the idea that Shakespeare might have seen a near-total eclipse in October 1605, as seen in the thane of Ross's speech after Duncan's murder:

> By the clock, 'tis day,
> And yet dark night strangles the traveling lamp:
> Is't night's predominance, or the day's shame,
> That darkness does the face of earth entomb,
> When living light should kiss it? *(Macbeth* 2.4.6-10)

How exactly does dark night strangle? A dark cloud or approaching storm would not "strangle" the Sun as much as it would generally and more gradually darken the sky. Shakespeare's heroic imagery calls up a vision that explicitly affects the Sun by suddenly cutting off its light. In the half hour preceding and following the maximum phase of the eclipse on 2 October 1605, the onset of a twilight glow unlike that of any approaching storm would easily fit the conditions to which Shakespeare alludes. The dark night does not descend quickly *because* of a natural fall from sunset or from a rapidly approaching storm; it follows in an instant from the Moon's passing in front of the Sun. Discussion about the meaning of these eclipses begins with astrology: Moberly was still grieving over the loss of Queen

Elizabeth I, who died in 1603. If we are to believe any of the critics of that time, then we can understand how the loss of the Sun, even for a short time, was seen as catastrophic. The allusion to the darkness of an eclipse can be carried one step further. When Macbeth learns of his wife's death he utters one of the most famous speeches in Shakespeare:

> Out, out, brief candle.
> Life's but a walking shadow, a poor player
> That struts and frets his hour upon the stage,
> And then is heard no more. It is a tale
> Told by an idiot, full of sound and fury,
> Signifying nothing. (5.5.22-27)

This speech can be interpreted in relation to Ross's earlier notion about a solar eclipse. Macbeth magnifies the allusion; the shadow envelops not just a portion of Earth but all human life. Instead of moving swiftly and efficiently the shadow, as life, now "struts and frets." As A. D. Nuttall points out, "While the great mystics speak of a world suddenly enhanced, blazing with fresh significance, Macbeth describes the draining away of all meaning from the universe" (Nuttall, 287–288). This eclipse allusion, metamorphosed from the shadow of the Moon to a definition of human life, is called on once again as a metaphor to mirror the cheapness of a life that has lost all meaning (Fig. 3.2).

Antony and Cleopatra, also written around 1606, shows how

> Our terrene moon
> Is now eclips'd, and it portends alone
> The fall of Antony. (Ant. 3.13.154)

Fig. 3.2 Shakespeare probably went to school in this building, which still stands in Stratford not far from his boyhood home. Photograph by David H. Levy

3.3 A Treasure of Eclipses in Holinshed's Chronicles

Virtually every high school student of Shakespeare knows that Raphael Holinshed's *Chronicles* was one of the Bard's most important sources. Published in 1577, the three-volume work is a detailed account of the history of England, Scotland, and Ireland. Eclipses are mentioned frequently within its pages. Although no eclipses are mentioned in Holinshed's account of Macbeth, who ruled from 1040 to 1057, (Holinshed II, 168ff) there was a 3-min-long total eclipse in Scotland on 24 January 1023. (There is a "darke night" in Holinshed [II, 172], but it commemorates not an eclipse but the night of Banquo's murder.)

The "black" curtain in the first line of *I Henry VI* harks back to Holinshed's "black hour" in his account of the year 1433 of *The Historie of Scotland.* "In the same yeere the seventeenth day of June, was a terrible eclipse of the Sunne, at three of the clocke at after noone, the day being darkened over head for the space of one halfe houre together, as though it had been night, and thereupon it was called the blacke hour." There was indeed an eclipse over Scotland on 17 June 1433. The eclipse had a long total phase lasting 4½ min and traversed the entire northern half of Great Britain. Can an eclipse yield day to night that quickly? In all 11 total eclipses of the Sun I have witnessed, day yielded to night as quickly as if someone were adjusting a dimmer-style light switch. When Shakespeare wrote these lines around 1591, however, he had not seen a total eclipse. Although it is possible he glimpsed, in his youth, a partial eclipse at sunset on 29 April 1585, it would not have been hard for him to have read about one. Interest in eclipses was substantial in Shakespeare's time, both as natural events and as portents. Anyone interested in historical eclipses of the Sun and the Moon that were successfully viewed from Britain could have found them in the *Chronicles*, which offered several easily accessible accounts of eclipses dating back to the 1100s. I have reconciled Holinshed's dates and times with those of NASA's eclipse site (http://sunearth.gsfc.nasa.gov/eclipse/eclipse.html), and most of them are accurate to the day and hour. Reading the ancient *Chronicles* provides a human perspective to the NASA data and maps of these events.

Shakespeare and his contemporaries did not have access to NASA, but they certainly could have studied the eclipse stories in Holinshed as easily as we can. Each volume has an index giving the location of information (like eclipses) to within a few lines on a page; one enthusiastic sixteenth-century typesetter even substituted a sketch of the 1430 partially eclipsed Sun for the letter "c" in the index entry for the "eclipse of the Sunne terrible." (II, index n.p.). One further reads that on 14 May 1230, "a marvelous eclipse of the Sunne … immediatelie after the rising thereof so that the earth seemeth as it had beene covered againe with darke of night. On that morning dawn came, then pushed itself back as the eclipse deepened until the Sun rose in total eclipse." The NASA website, prepared four centuries later, confirms that the shadow of the Moon dropped from the sky at sunrise over Scotland on that memorable day. Later that year, "On the 22nd daie that November, the Moon was … eclipsed (Holinshed 3, 212). Holinshed's detailing of eclipses ends with the eclipses of 1544: "This yeare chanced four eclipses, one of the Sunne the fourteenth of January, and three of the Moone." From London, the solar eclipse happened on the

24th, not the 14th (OS) of January, and was nearly total. It was preceded by an hour-long total eclipse of the Moon, and followed by another total lunar eclipse at moonrise on July 4, and yet a third total lunar eclipse before dawn on 29 December.

Besides its rank as likely the richest source of information about some great eclipses in English history, the *Chronicles* also cites several examples of eclipses being associated with other unusual phenomena like a storm or earthquake. The "black houre" eclipse already mentioned was over Scotland. In its third volume, the *Chronicles* gives Shakespeare access to three sources for ancient eclipse information that were followed by other natural events. During the time of Henry I, on 2 August 1133, there befell (Fig. 3.3)

> a wonderfull and extraordinarie eclipse of the Sunne and Moone appeared, in so much that Wil. Malmef, who then lived, writeth that he saw the starres plainlie about the Sunne at the verie time of the eclipse. On the Friday after such an earthquake also happened in this realme, that manie houses and buildings were overthrowne. This earthquake was so sensible; or rather so visible, that the wall of the house wherein the king then sat, was lift up … & at the third it settled it selfe againe in his true place. Moreover at the verie same time also fire burst out at certaine riffes of the earth, in so large flames, that neither by water nor otherwise it could be quenched (III, 44).

Additionally, there was a partial solar eclipse on 13 September 1178 that was total in southern France. In England

> the bodie thereof appeared as it were horned, shooting the horns to the west as the moone doth … the horns at length were turned toward the west, and so the blacknesse awaie, the Sunne received his brightness againe. In the meantime, the air being full of clouds of

Fig. 3.3 Shakespeare's adult home in Stratford, New Place, no longer stands, but its grounds are still delightful, in our time surrounded by a rapidly growing town. Photograph by David H. Levy

> diverse colours, as red, yellow, greene, and pale, holpe [sic] the people's fight with more ease to discerne the manner of it. (That eclipse is part of a Saros cycle, 121, which repeated as an annular eclipse over Antarctica in 2008.)

That historical event was preceded by a unique vision which involved the Moon the previous June, when the

> new moon shone forth very faire with his hornes towards the east, streightwais the upper horne was divided into two, out of the mids of which division a burning brand sprang up, casting from it a farre off coles and sparks, as it had beene of fire. The bodie of the [Moon] in the meanetime that was beneath, seemed to wrest and writh in resemblance to an adder or snake that had beene beaten, and anon after it came to its old state againe (III, 102). (This story appears also in *Gervasii Cantuariensis Opera Historica: Chronica Gervasii, Rerum Britannicarum Medii Aevi Scriptores*, London (1879), 73a.)

Geologist Jack Hartung has made the controversial suggestion that those who viewed this event had actually witnessed an impact of a comet or an asteroid on the Moon, and the formation of a new crater (Hartung, 187ff).

Finally, the eclipse of 16 July 1330 relates eclipses and storms directly, as would later appear in *Lear.* It begins with a "great eclipse of the Sunne, and for the space of two months before, and three moneths after, there fell exceeding great raine, so that through the great intemperance of weather, corne could not ripen, by reason whereof, in manie places they began not harvest til Michaelmas …" (Holinshed III, 348) (Fig. 3.4).

"On Christmas even, about the breake of day, a marvelous … and terrible wind came forth of the west, which overthrew houses and buildings, overturned trees by the roots, and did much hurt in diverse places" (III, 348). There was another eclipse on 21 July 1255, which was connected to Henry III's Earl of Gloucester: On 21 July 1255, the moon "suffered a marvelous eclipse … it began afore midnight, and continued foure hours. The king [Henry III) in the behalfe of his daughter the queene of Scots raised a power, and drew northwards, sending before him the Earle of Gloucester …" (III, 251).

In *Macbeth* (1606) the third witch completes a cauldron that includes a …

> gall of goat, and slips of yew,
> Sliver'd in the moon's eclipse (4.1.17-18)

Probably because of astrological fears about their nature, the listing and detailed descriptions of eclipses in Holinshed is an indication that natural events appeared to play a more important role in the study of history than they do today. However, Shakespeare's persistent use of them probably stems from his own innate interest in eclipses.

3.4 Shakespeare, Nashe, and the Eclipses of 1591

In his 37 plays, poetic stories, and sonnet sequence, Shakespeare invokes eclipses more often, and in greater depth, than any other writer in this investigation. Even when he uses "eclipse" as a verb, unrelated to the specific experience of an astronomical eclipse, the word invokes a sense of sadness or loss. In *3 Henry VI* written about 1591, a year

Fig. 3.4 Shakespeare's grave, pictured here, has changed little since 1616. Photograph by David H. Levy. Perhaps the lighthearted warning inscribed in the stone has helped protect it over the centuries:

Good friend, for Jesus sake forbeare
To digg the dust enclosed here.
Bleste be the man that spares these stones
And cursed be he who moves my bones.
Photograph by David Levy

with two total eclipses of the Moon, King Henry bemoans that his "joy of liberty is half eclips'd" by Margaret and Edward's failure to return from France (*3 Henry VI*.4.6.63) when King Richard, Hastings, and Stanley rescue Edward while he is hunting and depart for Flanders to seek aid. In *1 Henry VI* (written around 1591) as Talbot takes leave of his son, his metaphor is of the Sun and Moon engaging each other in eclipse:

> Born to eclipse thy life this afternoon.
> Come, side by side together live and die;
> And soul with soul from France to heaven fly. (*I Henry VI*.4.7.53)

The eclipses of 1591 provided plenty of fodder for Thomas Nashe to use in a satirical essay. Nashe was scripting a belated response to Richard Harvey's

Astrological Discourse, which in January 1583 predicted dire effects from the "great conjunction" of Saturn and Jupiter and which will be treated more fully in the next chapter (Nicholl, 23). The conjunction passed on 28 April 1583 without any ill effect, with the result that Harvey was embarrassed and shamed (Nicholl, 34). But beyond the conjunction, the *Discourse* also considered the effects of "the Eclipse of the Sunne, which happened the last yeare, 1582 … the bodie of the Moone at hir chaung, being directly put betweene the Sunne and the Earth, or between our sight, and the Sunne, and thereby depriving us of the full light of his beames, there appeared within our horizon at Cambridge (as you remember) a small Eclipse of the Sunne …" (*Discourse* 54). Harvey's point was not so much that there was an eclipse in 1582, but that the eclipse took place with the Sun in the constellation of Cancer. (Actually, on 20 June 1582, the Sun was not in Cancer, but in Gemini. The error in astrology was caused by a slow wobbling motion of the Earth, called precession, unknown at the time, that the Earth spins in its orbit like a slowly moving top.)

Harvey's booklet embraced judicial astrology: "there never happeneth any Eclipse of the Sunne, which doth not presignify and foreshow some great Accident to come to passe." As evidence, he cites the solar eclipse of 26 June 1424, (when the Sun also was also in Gemini) "at which time Charles the King of France being valiantly set upon in battaile by the English men and Burgundians, was expelled his owne realme. …" Harvey then mentions the more recent eclipse of 18 June 1536 (June 8 OS) after which there followed "at Rome, a most fearfull, and horrible thundering in the aire, being also the more extraordinarie for the very time of the yeare." He cites moreover the eclipse of 9 July 1564 (June 9 OS) "and effects whereof continued two years …" including the Turkish invasion of Hungary and Syria." When the Sun is in certain signs, particularly Cancer, Harvey insists, eclipses are invariably followed by dire events.

Harvey's Discourse apparently remained unchallenged until 1589, when the Crown hired Thomas Nashe as a propagandist (Nicholl, 62). Two years later, Nashe struck back with a pamphlet by one "Adam Fouleweather, Student in Ass-tronomy" a pseudonym widely believed to represent Nashe (Nicholl, 62). In *A Wonderful, strange, and miraculous, Astrological Prognostication for this year of our Lord God, 1591*, the conjunctions were dismissed thus: "Saturne and Iupiter prov'd honester men than all the World tooke them for, whereupon the poor prognosticator was ready to run himselfe through with his Jacob's staffe" (Nicholl, see above, 34) (Fig. 3.5).

In his energetic rebuttal, Nashe concentrates not on conjunctions but on the eclipses expected in 1591. "The Moon this year shall be eclipsed," the author predicts, "which shall happen in one of the 12 months and some of the four quarters

Fig. 3.5 Quite likely, Shakespeare employed Holinshed's famous *Chronicles* to learn about eclipses. Note here that the compositor assigned to the index had some fun here with the "eclipse" entry, replacing the traditional lower-case letter "c" with a hand-drawn sketch of a crescent Sun. In order to know what the eclipsed Sun looked like, he possibly was one of the observers of this eclipse

of the year, whose points as they shall be totally darkened, so the effects shall be wondrous and strange." He states that the first eclipse "is little visible in our horizon" (actually the 9 January 1591 eclipse begins just as the Moon clears the eastern horizon). The solar eclipse next listed might have occurred on 25 January 1591 and which was visible only in Antarctica; "but because the Eclipse chanceth Southerly, it is little to be feared that the effects shall fall in England: yet somewhat it is to be doubted that divers Children shall be born, that when they come to age shall not know their own Fathers …, like "the bond crack'd 'twixt son and father … there's father against child (*Lear* 1.2.98ff). As Fouleweather, Nashe points his satire against the astrology of the time "discovering such wonders to happen this year, as never chanced since Noah's flood. Wherein if there be found one lie, the Author will lose his credit for ever (Fouleweather 1–7). The tract ends with a description "Of the second Eclipse of the Moon, which is like to fall out when it chanceth, either before the 31 of December or else not at all, this present year, 1591" (Fouleweather, 7).

The eclipse did take place and it turns out, was one of the most unusual in history; shortly after leaving the shadow of the Earth, the Moon also passed directly in front of Saturn. The eclipse and occultation took place on 30 December 1591 (December 20 OS). The rarity of this event was understood to some extent by contemporary observers. Both the eclipse and the occultation of Saturn are described in Watkins and Robertes' *A Triple Almanacke for the yeere of our Lorde God 1591* (66). "The Moone this yeere shal be Eclipsed the 20 day of December, at iii. Of the clocke in the morning, and almost a quarter, she being then in her proper motion Cancer, almost corporally conjoined with the malignant planet Saturn … which what it may presage, I leave it to others to discusse." Nashe's essay was not nearly as accurate with event dates and times as was Holinshed, but as satire it was not intended to be. As a result of the eclipse, Nashe predicted that "the Danes shall this year be greatly given to drink, insomuch that English Beer shall there be worth five pence a stoup …" (Fouleweather, 11). This was part of the "mocking prognostication" Nashe intended to extend the satire, especially as the "prophecy" about price seems a chuckling gesture to the brewers.

Even as Nashe would be branded a "restless, shifty moonlight-flitter" (Nicholl, 40, 41), Nashe's satires became popular as his bitter feud with Harvey accelerated. He died in disgrace, poverty, and anonymity around 1600. Specific minor references to eclipses appear also in two of Shakespeare's sonnets:

"The mortal moon hath her eclipse endur'd" (Sonnet 107.5) could enjoin any one of several lunar eclipses Shakespeare might have seen. The other denotation, "Crooked eclipses 'gainst his glory fight" (Sonnet 60.7), is an astrological one aimed at the eclipse event in general. Eclipses do not fight, nor are they crooked, although one has the sense that time does seem to slow down, or speed up, during an eclipse. The frequency of eclipse allusions in early modern writing suggests that these sky events were not ignored, either as astrological portents or as simple celestial events. Particularly, following a dearth of major solar eclipses during the second half of the sixteenth century, the celestial convergences of Sun and Moon acted to reignite interest in the sky and in literature (Figs. 3.6–3.8).

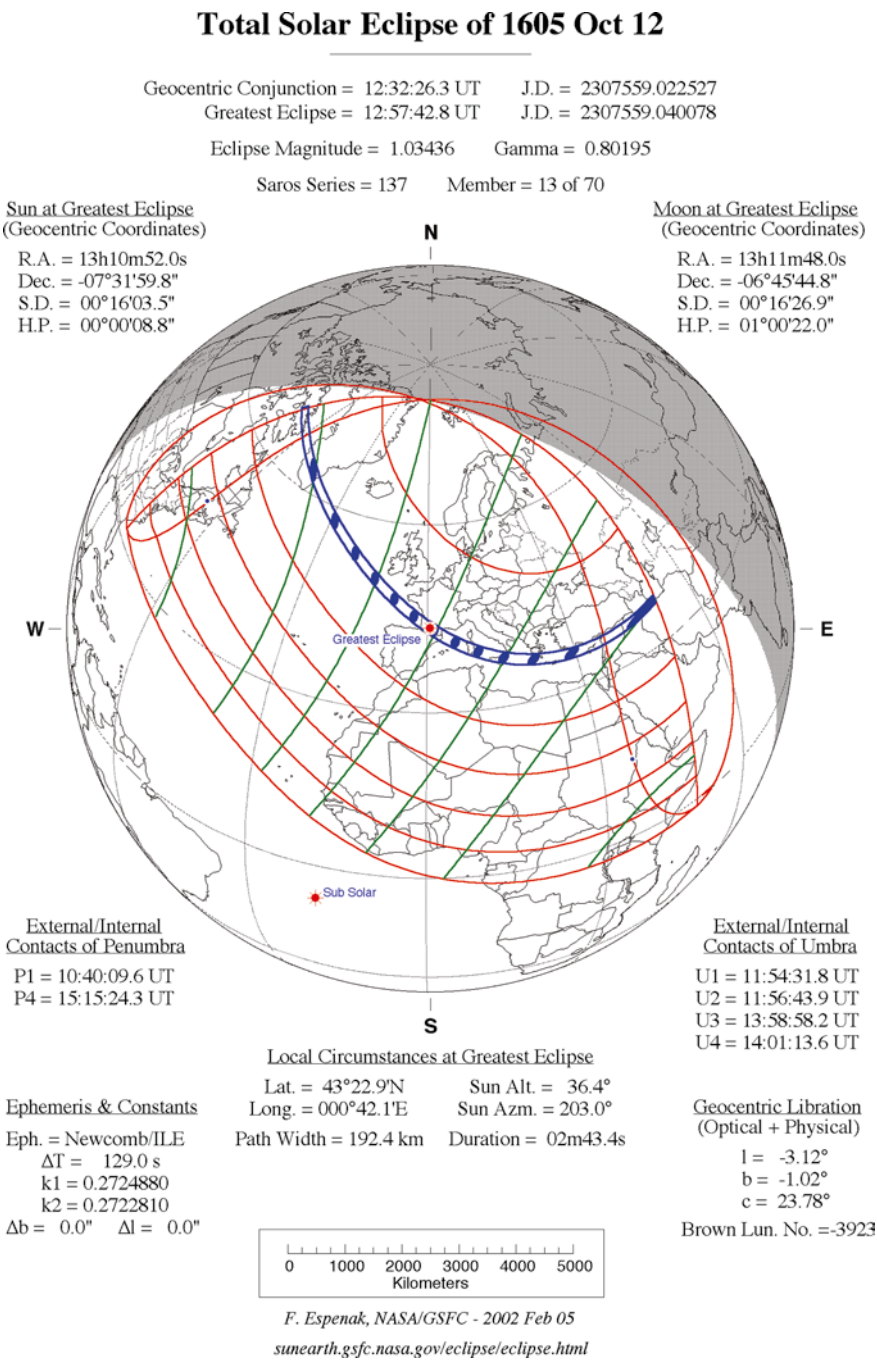


Fig. 3.6 It is still possible to understand the precise trajectory of eclipses that took place centuries ago, as shown in this map prepared courtesy of Fred Espenak of NASA's Goddard Space Flight Center. While all England witnessed a partial eclipse, the path of totality traveled through parts of Madrid, Spain, on October 12 (2 O.S.), 1605

Fig. 3.7 This view of the thin crescent Sun was taken just before totality during the eclipse of 26 February 1979. It also represents what the Sun looked like during the partial phases of the eclipse of 2 October (O.S.) 1605

Fig. 3.8 Had Shakespeare or his colleagues visited Madrid, Spain, on the day of the 1605 solar eclipse, they might have seen something like this view of the total eclipse of 26 February, 1979. Photograph by David H. Levy

Chapter 4
Of Signs and Seasons

Not from the stars do I my judgment pluck,
And yet methinks I have astronomy…

(Sonnet 14.1-2)

Part of the ease with which many Elizabethans accepted the tenets of astrology is explained by the exquisite order that the Sun, Moon, and planets show in their courses, an order so delicate it deserves the label of dance. The ballet is represented by the natural and judicial aspects of astrology, a subject familiar to virtually every writer we encounter in this time. It would seem easy to conclude from the opening couplet of Sonnet 14 that Shakespeare was aware of the tenets of natural astrology but did not follow its judicial precepts. But how much of this sonnet represents Shakespeare's real view? At a fundamental level, Sonnet 14 starts with that strong assertion, but it is more of a guideline than a real goal; its opening thought evolves differently with every succeeding line (Sondheim, 243–259; Clark, 257). The opening two lines seem to confirm Shakespeare's belief that while he understood the aspects of the sky, he did not plan his days according to some perceived meaning of planetary positions in the sky.

Clark cites this as the strongest evidence of Shakespeare's rejection of judicial astrology that resolution or catastrophic endings of all his tragedies are determined by the characters and the events they originate or in which they are involved, and not by the stars and planets. However, clearly he appears to satisfy his own view in the first two lines, Shakespeare admits later to certain sightings, or omens, in the night sky that would seem to contradict the opening theme, in fact ascribing his future not to aspects of the stars but to those of the young man he addresses. Moreover, in the very next sonnet, Shakespeare claims "that men as plants increase, Cheered and check'd even by the self-same sky." Both Sidney and Shakespeare sideline astrology "as a poetic image" (Sondheim, 249), appreciating all the while the orderly procession that the planets occupy in the sky. However, it can be argued (weakly) that Shakespeare appears to reject the judicial aspect of astrology while Sidney accepts it as we shall see. This rejection is far from complete, however, and even in sonnet 14 we are left with an indefinite version of Shakespeare's judgment on the causes of major events of his time. The distinction between astronomy and

D.H. Levy, *The Sky in Early Modern English Literature*,
DOI 10.1007/978-1-4419-7814-1_4, © Springer Science+Business Media, LLC 2011

astrology, as we now use those terms, was not sharp. We can infer from their inclusion in play after play, by Shakespeare and others, that contemporary audiences enjoyed the astrological content in the Quixote.

In early modern thought, *astrologia naturalis* and *astrologia judicialis* were the two accepted ways of studying and interpreting celestial events. The former holds that heavenly bodies have influence on physical manifestations of our lives, like weather and physical matter. The latter insists that these bodies influence human destiny (Sondheim, 243–259). That portion of the old debate survives to this day, though in different form: Eclipses never did affect our futures, but the sky has been shown to have a real connection with human evolution; comets and asteroids colliding with the primordial Earth might well have brought the building blocks of life 2 (Marcus, 449). Although Joseph Marcus et al. base their research upon Halley's Comet during its most recent passage in 1986, the theory's roots lie deep in the astronomical-astrological traditions of the early seventeenth century. Demon stars and eclipses are replaced with comets, collisions, and many observations by ground-based telescopes and spacecraft (Marcus, 449).

As a practitioner of science in a time of deeply rooted beliefs in the power of cosmic forces, Johannes Kepler was a pivotal figure in defining the role of astrology at that time; he prepared horoscopes at the same time he was completing observations of the supernova of 1604. His development of the laws of planetary motion was taken seriously throughout England and Europe. Kepler accepted the prevailing maxim of judicial astrology that some events have metaphysical causes. His vision of astrology, however, had little room for the idea of signs, relying instead on his understanding of the simplicity and elegance of the solar system (North, 313, 318). Kepler also lacked patience for the spiritualism and demonic magic practiced at the time by such prominent astrologers as John Dee (Casaubon, 22; Woolley, n.p.), and Lewes Lauaterus (83), who, in his 1572 book *Of Ghosts and Spirits Walking by Nyght*, revisits the ominous image that "Castor and Pollux have been often seene in battailes sitting on white boxes, valiantly fighting against enemies campe." Beyond the mythological allusion to the battle of Lake Regillus, the twins are also the brightest stars in Gemini, a prominent winter constellation.

There is logic in assigning opinions expressed in the sonnets to Shakespeare himself, just as in Sonnet 26 of *Aristophel and Stella*, Sir Philip Sidney indicates a belief in astrological signs and seasons:

> For me I nature every deale doth know,
> And know great causes, great effects procure
> And know those bodies high, reign on the low.

Sidney's beliefs seem all too apparent here. Shakespeare might "have astronomy" in the natural sense as understood in that time to mean that he accepted the influence of the stars and planets on the four elements.

Early modern audiences probably varied widely in their own astrological judgments; viewers of Shakespeare's theater shared the enjoyment of readers of *Faerie Queene*, while others took the astrological implications more literally. *King Lear* might have appeared the same year as Bacon's *Advancement of Learning*, but in *Lear*, Shakespeare deposited that anti-judicial astrology rhetoric mostly to the

account of Edmund, one of his most malevolent characters. In *Julius Caesar*, it is the conspirators who mock Calpurnia's fear of the repercussion of the stormy night:

> This dream is all amiss interpreted;
> It is a vision fair and fortunate.
> Your statue spouting blood in many pipes, …
> Signifies that from you great Rome shall suck
> Reviving blood, and that great men shall press
> For tinctures, stains, relics, and cognizance.
> This by Calpurnia'd dream is signified. (*JC.* 2.2.83-90)

Influence from the stars and planets fills Renaissance literature, not just Shakespeare but most of his contemporaries. It is just one more line evidence that suggests that astrology was a flourishing subject in the Renaissance; it could be added that astrologers were a common feature of Renaissance courts, but they occasionally appear in government up to recent times; when he was Canadian Prime Minister, MacKenzie King allegedly used both a crystal ball and a Ouija board, and Nancy Reagan, frequently called on the services of astrologer Joan Quigley.

A central Jacobean play involving astrology is John Webster's macabre tragedy *The Duchess of Malfi [1612–1613]*. Antonio, the Duchess's husband, directs the casting of a horoscope at the birth of their son. In a scene reminiscent of the handkerchief in *Othello*, Antonio loses the horoscope, only to have it found by his enemy Bosola, the man summoned by her brothers to spy on the Duchess:

> Antonio hereabout did drop a paper,
> Some of your help, false friend. O, here it is:
> What's here? A child's nativity calculated! (*Duchess* 2.3.75-78)

The horoscope becomes central to the plot of this play, but its significance is more than that; Webster uses its loss and rediscovery to highlight the play's theme of human destiny versus happenstance. Lurking in the background is that question, is human destiny predetermined by the stars? In *The Duchess of Malfi*, Webster accommodates the belief of much of his audience that judicial astrology is a real force, but he does not insist that his audiences adopt this view. Indeed, his characters, like those in Shakespeare's *Hamlet*, *Julius Caesar*, *King Lear*, and other plays, often present opposing views.

Shakespeare, who was still writing in 1612, offered a similar message. If we go strictly by what appears in his plays, we cannot avoid the inference that Shakespeare took judicial astrology seriously. Edmund's nativity "under *Ursa Major*" would share the spots occupied by Mars and Venus as indicating a "rough and lecherous" disposition, a characteristic that may indeed have been sired by astrological influence, but which has to be borne out in Edmund's behavior particularly at the opening of Act II. It may well be that according to Ptolemy's thinking, Edmund's role in *Lear's* subplot is predetermined, whether by the positions of Mars and Venus in the night sky or by that of Ursa Major (Rusche, 163), but more likely by the twists of fate of Shakespeare's pen. Edmund begins by quoting his own horoscope; after being conceived under a portion of one constellation (Draco's tail) he was born under Ursa Major, the Greater Bear. Neither constellation is even close to the zodiac where characters figure in all births.

As humorous and absurd as it appears now, the complexity of judicial astrology means that the mere existence of houses for Mars and Venus condemns Edmund to a sorry existence. However, had Draco's tail not been involved, Edmund could have emerged a reasonable man. These evil astrological omens shaped his "rough and lecherous" demeanor, but Edmund disregards the entire horoscope with his very next word "Fut!" Tossing out the entire astrological approach to his behavior, he insists instead that "I should have been that I am had the maidenliest star in the firmament twinkled on my bastardizing." (KL. 2.1.127-129) Edmund strengthens that view in his argument with Gloucester about the alleged predictive powers of eclipses (1.2.110-117).

4.1 Turning Observation into Theory

As we have seen, Galileo was not the first to use a telescope, but he was almost certainly the first to acquire a large dataset of observations, and then publish them widely. However, if Shakespeare knew of the astronomical works and theories of Thomas Digges, then Peter Usher's contention that Hamlet contains allegorical hints about Copernican astronomy would be worth investigating. Usher's idea that the entire play is an allegory pitting the Copernican theory against that of Ptolemy is unconvincing, but Usher does make good points regarding some details of Hamlet's troubles. For example, Laertes uses the term "blastments" in *Hamlet* 1.3.42. Although this word refers to wounds on plants, Usher extends its meaning to the large craters on the Moon that were blasted out billions of years ago by impacts from passing asteroids or comets. If this is Shakespeare's intended meaning, which I doubt, then the playwright has predated Eugene Shoemaker's impact theory by almost four centuries (Shoemaker, 70–89). In our time, not only have we walked across small craters of the Moon, but we have witnessed also the process by which craters on terrestrial planets can be formed (the collision of a comet with a planet in 1994), and in 2005 we experienced the actual making of a crater on a celestial body when the Deep Impact spacecraft collided purposefully with Comet Tempel 1 (Levy, 218).

As we have seen from Edmund's answer to his father's fear of the "late eclipses," Shakespeare was aware of the official sanction against judicial astrology. There are other crucial references to the alleged power of the cosmos over human destiny in later plays, such as Cassius's plea in *Julius Caesar*, "The fault, dear Brutus, is not in our stars. But in ourselves…" (1.2.139-141), and Macbeth, whose anticipation of his ill-gotten royalty led him to command the stars to "hide your fires," rather than being commanded by them (1.4.50-51). The distinction between astronomy and astrology would grow after the early use of the telescope in 1610, but throughout most of Shakespeare's career it was not very pronounced.

In *Troilus and Cressida* (ca. 1602), Ulysses describes (1.3.85-94) how

> The heavens themselves, the planets, and this centre,
> Observe degree, priority, and place…. (TC 1.3.85-89)

"This centre" seems deliberately vague; it could refer to Earth, as in the Ptolemaic cosmic view, or to the Copernican Sun. Shakespeare typically avoided discussing cosmic theory in his plays, possibly out of consideration that his audiences had come to see a play, not a tome. Moreover, although his leading villains often ascribe their courses of action to astral influence, not a single one of Shakespeare's plays achieves its resolution directly from the stars and planets, even if the characters believe they are so controlled. I make this statement despite the interpretation common among scholars that in most Shakespearean tragedies, the protagonists fail because of a combination of their own failings and cosmic forces. However, in virtually every Shakespearean Tragedy, the protagonists' fates result partially from circumstance, which they seem often to attribute to the fate of the stars and planets; i.e., judicial astrology. These characters claim influence from among three types of astrological influence; expressing a mood like the comets at the opening of *1 Henry VI*; as a symbol of elation or misfortune, as in *Titus Andronicus* whose protagonist, like Don Quixote chasing windmills, shoots arrows at the planets after his betrayal by his friends and colleagues (4.3.62-75); and as direct evidence for or against astrological *power*. In the vast majority of examples, like the "huge eclipse" in *Othello* (5.2.100-102), the star-crossed love between Romeo and Juliet, and the "five moons" traditional prophecy of royal death in *King John*, the "evidence" turns in favor of that power. In Shakespeare's comedies, particularly *All's Well that Ends Well*, astrology has the additional role of adding humor, as in the Clown's remark about "a good woman born before every blazing star, or at an earthquake" (*AW*. 1.3.81-83).

Shakespeare filled his plays with the kinds of characters his audiences wanted to see; witches and faeries that made astral prognostications come true, evil characters who denounced astrology and who also practiced the cold and demanding rules of modern science and logic (Clark, 257). The conflict over double meanings of eclipses in *King Lear*, whether they be portents or scientific events alone, heralds the larger issue of how Nature works in this play. The eclipses mirror a larger argument about the doctrine of natural law that claims Nature as being moral versus the Machiavellian-Hobbesian credo that Nature is amoral (McAllindon, 163).

It is not really possible to come to a definitive conclusion about Shakespeare's own belief, notwithstanding his own statement in Sonnet 14's first line. Like most of his contemporaries, Shakespeare presumably accepted the order presented by natural astrology (Clark, 258–259). He enriched his stories with axioms from judicial astrology even though, based on the first line of Sonnet 14, he probably did not follow them.

Replete with end-of-world predictions, Richard Harvey's *Astrological Discourse* threatened a Noachian flood-like "great abundance of waters" and other misfortunes reminiscent of Gloucester's later prediction in *Lear*. Despite Harvey's conformity with traditional astrological views of the time, his efforts were met with ridicule and scorn from the public, and more privately from his brother Gabriel, whose unconvinced response led to a more tentative pamphlet 5 years later entitled *A Discoursiue probleme concerning prophesies*, which lists many examples of "successful" forecasts. Long on perceived past success but short on prediction, such kinds of writing persist to the present day.

It is interesting to see how some of the best premodern literature, by authors as diverse as Shakespeare, Spenser, and Davies, combines its treatment of contemporary astrology with bold looks into the major developments in the night sky. If Usher's hypothesis is correct, then Shakespeare was far more aware of the night sky than I give him credit for. I see *Hamlet* primarily as a play intended for a contemporary audience, but its story can be read as allegory. In Usher's words, Hamlet personifies Copernicus, Claudius harks back to the Ptolemaic Earth-centered system, and Rosencrantz and Guildenstern reflect Tycho's compromise. I doubt that any telescope built prior to the middle seventeenth century would have been good enough to allow Shakespeare to view details as small as Jupiter's Great Red Spot, and it is in such details that Usher's argument fails. Nevertheless, the evidence Usher offers does outline a rich body of knowledge in astrology, where characters and plots reflect an increasing comprehension of the night sky of their time.

4.2 Astrology and the Digges Family

That Shakespeare's reading in astrology was sophisticated comes from considerable circumstantial evidence. His lodgings in London were not far from those of Thomas Digges, one of the most learned scientists of his day, and from the home of Elizabeth's "science courtier" John Dee. Of previous investigators who have tried to portray the works of the Digges family, Francis R. Johnson is probably the best known. However, a few clarifications to his classic 1938 paper on Copernicus are in order (Johnson, 390–410). Johnson's first sentence assigns the beginning of modern astronomy to Copernicus. Actually this is true for modern astronomical theory, but the equivalent in modern observational astronomy dates back to Tycho Brahe, whose observations of the Supernova of 1572 were as precise as the instruments of his time would allow. In England, Thomas Digges was right behind Tycho Brahe in reporting the supernova of 1572 (Johnson, 391).

Notwithstanding the probability that Leonard Digges (Thomas's father) constructed a sixteenth century telescope (see Chap. 5), prior to 1610 night sky observations were generally accomplished and recorded without optics (Fig. 4.1). Galileo's telescopes would spark a basic alteration not only in what objects could be studied, but also in how they could be studied. In 1605, there were essentially no telescopes, although it would not have been impossible to imagine Thomas Digges using some modification of his father's periscopic lens, actually the major portion of a small telescope, to view the October solar eclipse over London. After 1610, contemporary ideas in judicial astrology would add four new Jovian moons to keep up, along with the changing positions of the signs over time due to precession of the Earth. The telescope offered a renewal and an expansion of humanity's understanding of the cosmic neighborhood, but one that astrologers have generally not taken advantage of in the last 400 years. The reason for this is that astrologers have not generally paid attention to precession, the result of Earth's wobble, like a slow-moving top, once every 22,000 years. Precession was understood in

Fig. 4.1 Sunset from Jarnac observatory. This late fall sunset depicts one of the most fascinating attributes of the sky – a beautiful sunset in a clear sky that heralds a perfect night. Photograph by David H. Levy

early modern times. Spenser ambiguously describes it in *Faerie Queene* V (*proem*. 5.6-9):

> For that same golden fleecy Ram, which bore
> *Phrixus* and *Helle* from their stepdames feares,
> Hath now forgot, where he was plast of yore,
> And shouldred hath the Bull, which fayre Europa bore.

Spenser's remark on mythological history implies his awareness that, some 1,500 years after Ptolemy, the constellations had shifted approximately one sign eastward, so that the "fleecy Ram … hath now forgot" his former place. Someone traditionally born under the sign of Ram, for example, is technically now under Taurus the Bull. The major theme of *Octavia*, a work Renaissance writers thought had been written by Seneca but now doubted as such, was a catastrophic war among the stars, reaching its disturbing climax as all the stars fall from heaven, including a final deathlike setting of the Sun.

The English literary Renaissance is hardly trivial compared to Seneca's golden age, but Spenser takes the war among the stars of heaven and recasts it in terms of precession (Bull, 419); it can be claimed that by the 1590s, Spenser had replaced classical mythology with astrometry, or positional astronomy (Bull, 417–419). Because of this interpretation, Spenser's lines are enhanced by his modern view of a developing interplay between science and literature. In his telling of the legend of Artegall, Spenser portrayed "That all the world with goodnesse did abound" in the Golden Age during Saturn's rule (*FQ* 5 *Proem*.9).

In about 1576, well within Spenser's time, Thomas Digges proposed the extraordinary idea that space is infinite. This claim precedes by 7 years the better known claim by Giordano Bruno, who proposed independently the idea of the infinity of space in 1583, and who paid for it with his life at the stake in 1600. This makes Spenser's claim that if all the stars were all to fall from heaven at the time of judgment, then our own star, the Sun, would be among the fallen along with all its worlds. This thought adds a small amount of scientific credence to the idea of the falling of *all* stars, including the Sun. Beyond the orbits of the planets, the stars are increasingly distant from the solar system, spreading out to infinite distances. The idea that not the stars, but the farthest superclusters of galaxies with their stars, might hover at the edge of infinity might be Digges's most important original contribution to knowledge, as well an influence upon the literature of the time.

Sir Henry Wotton also used poetic allusions to the night sky of that time. Although his poetic output was small, it did offer such playfully probing questions as this poetic note flattering King James' daughter:

> You common people of the skies,
> What are you when the sun shall rise?
> (Wotton, "You Meaner Beauties of the Night" 1.4-5)

Marlowe's *Tamburlaine* might be set up by the astrological design of a poorly housed planet like Jupiter, but it ends as a "tragedy of inordinate passions" built not from stars and planets but from the author's development of his plot and characters. The placement of Jupiter might help the plot along, not the reverse. ThomasTomkis's *Comedy of Albumazar* [1614] offers astrology as a virtual co-conspirator with thieves in its narrative, beginning with the smallest planet:

> Your Patron Mercury is his mysterious character,
> Holds all the makes of the other wanderers,
> And with his subtill influence works in all
> Filling their stories full of Robberies … (1.1.11-14)

Simple and elegant descriptions of dusk, dawn, sunrise, the Moon and Sun, and planets offer a window of opportunity to interpretation. Francis Bacon, who in 1605 was developing his modern scientific method, was producing a new kind of reasoning based upon observation rather than on philosophical intuition. Wotton notes the daily fading of the stars as sunrise approaches in this poetic letter to Elizabeth of Bohemia. Edmund offers a modern notion of eclipses in *King Lear* before his father, who detailed his more traditional astrological views in the eclipse scene (KL 1.2.), has his eyes ripped from him. Romeo admires a morning sky where Juliet shines above all as the Sun (*RJ.* 2.2.1-3). Daybreak is a call to action to assassinate in *Julius Caesar* (2.3.75-115) and to discover that an assassination has occurred (*Macbeth*. 2.3.61-78).

In comedies, dawn and sunrise typify the most optimistic parts of a day, as they did in John Fletcher's *The Woman Hater* offering another example of a hitherto unappreciated, thematically significant allusion to a celestial phenomenon visible every morning. Entered into the *Stationer's Register* in 1607 not long after the supernova of 1604 and the eclipses of 1605, this play begins with an elaborate

metaphorical description of the constellation of Virgo rising in a predawn sky. At the lateness of the hour on a December morning, the Duke wonders

> is it so much, and yet the morn not up?
> See yonder where the 'shame-faced maiden comes
> Into our sight, how gently doth shee slide,
> Hiding her chaste cheeks like a modest Bride,
> With a red vaile of blushes. (1.1.3-8)

The predawn rising of Virgo is a form of celestial time-keeping that can track the passage of time in that play, and when connected to the earlier note of the actual time of day as past four in the morning, becomes also a way of synchronizing the celestial clock with artificial timepieces. Since Virgo rises at dawn only at one particular time in the year, i.e., December, that event is also an indicator of the time of year of a particular incident. In *Woman Hater*, that wording is not some vague portrayal of dawn, but a specific picture of the appearance of Virgo rising in the southeastern sky as dawn begins. I suspect that Fletcher actually observed the predawn scene, or at least interpreted it from someone who had seen it. Virgo was low in the southeastern sky "past four" a.m. in mid-December 1605 and at the same time in 1606. Virgo is not a conspicuous pattern of stars. Besides its brightest star Spica, the figure is "shame-faced" and unimpressive, even more so with interference from dawn. Why would an observer's attention be drawn to such a sight? On the morning of 15 December 1605 as Virgo rose, the bright red planet Mars was about a Moon diameter from Spica, forming a pair of bright "eyes" that easily drew attention to the constellation. One can be fairly certain that both the Virgo reference and the time mentioned as 4 o'clock means that if Fletcher actually saw Virgo in the predawn sky, he had to observe it near dawn on a mid-December morning. The Moon's orbit around the Earth, on the other hand, offers a timepiece that measures either the passage of months or the particular time of a month. Spenser uses this clock of lunar phases at least three times in *The Faerie Queene*:

> Now haue three Moones with borrow'd brothers light,
> Thrice shined faire, and thrice seem'd dim and wan (*FQ* 3.3.16)

Both passages measure the passage of 3 months;

> But till the horned moone three courses did expire (4.6.43)

also measures 3 months that begin at a crescent phased Moon; and finally

> "As the faire Moone in her most full aspect" (5.5.3)

defines a full Moon. These lines contrast nicely with those of Sir Walter Raleigh, whose tribute to "Diana's fair and harmless light" sees the Moon not as a means to an end but as an object of beauty by itself, a queen of the sphere of night.

During the 1580s and 1590s, Tycho wrote and published his most noteworthy lines from his observatory about the role of judicial astrology in the interpretation of astronomical phenomena relating to the star of 1572: "Moreover, forasmuch as this Starre was placed in the eighth Spheare, above the Orbes of the Planets, it seemeth that the predictions issuing from it, do not only concerne one peculiar tract

of Land, but all the Nations of the world; and therefore it will bee the longer before the effects will be declared by succeeding events." He suggested that a "Sybils Pophesie" dealing with the end of the world would result from the appearance of a star in the north (the supernova in Cassiopeia) that causes nations worldwide to "lay by their weapons and imbrace peace" (Brahe, 22). In contrast to this seeming good news, the star would be followed by a bellicose comet "with martiall sparkling beames" ushering in a more difficult era.

4.3 The Great Conjunction of 1583

The complex terminology of judicial astrology, with its conjunctions and trigons, found its way into Shakespeare without any obvious contemporary reference except for a view of the two planets, Jupiter and Saturn, slowly closing in on each other early in 1583. The practice of astrology dates as far back as biblical times ("for signs and for seasons," *Genesis* 1: 14). During the early modern period, a basic level of astrological learning was accepted as general knowledge, and a lack of awareness of every nuance would not have prevented a contemporary audience from enjoying the more obvious allusions to the stars (Aston, 160). Iago complains about Cassio and Montano launching "in opposition bloody/as if some planet had unwitted man," simply acknowledges that the stars could offer a guideline for human behavior, without bringing forth any concrete evidence that they actually do so (Sondheim, 246).

In astrology, the signs divide into trigons, three for each of the traditional "elements" of earth: air, fire, and water. An ordinary conjunction invokes a narrowing of the apparent distance in the sky between a planet and the sun, but a "great conjunction" is historically defined as one in which Jupiter closes on Saturn in the sky. Such an episode occurs only once in approximately every 20 years. One such event took place in 1583. Astrologers found it important to know in which constellation such a conjunction took place. If the time of conjunction, or when the two planets are closest to each other, occurs when they are easily visible in the night sky, then determining the constellation through which Jupiter overtakes Saturn is simple. But if the actual conjunction occurs when the planets are so close to the Sun in the sky that no one actually sees them, it is far more challenging.

Most Elizabethan astrologers considered these conjunctions as critical events, the most notorious of which took place in 1583 near the boundary between Cancer and Leo and which led to Richard Harvey's *Astrological Discourse.* Astrologers called Leo one of the signs of the "fiery trigon" whose other two signs are Aries and Sagittarius. The conjunction of 1583, they noted, would be the last for centuries in any of the "watery trigon" constellations. Though the possible effects of the great conjunction were well known to astrologers, they were not impressed upon typical English readers until early 1583, when Harvey's *Discourse* announced the conjunction and foretold of many consequences, such as huge upheavals and even a "Last Judgement" in 1588.

On the date Jupiter and Saturn were closest; both planets were so close to the position of the Sun in the sky that neither could be directly observed. As a result, a dispute arose as to whether the conjunction really took place in the watery trigon sign of Pisces, or the first of a series to occur in a fiery trigon sign, like Aries. Bringing his great observing skills to bear, Tycho made meticulous observations of Jupiter and Saturn, and confirmed that the conjunction had indeed taken place in Pisces, though close to its border with Aries. The conjunction of the two giant planets that followed in 1603 was well within the fiery trigon.

So much was written about trigons that the term became part of the general vocabulary of the time. Astronomer Owen Gingerich notes, for example, that in the tavern scene of *2 Henry IV*, Prince Henry and his comical friend Edward Poins compare Falstaff's tryst with Doll to that of two planets. "Saturn and Venus this year in conjunction?" asks the Prince, "What says th' almanac to that?" We can actually answer that question using contemporary sources like Harvey's *An Astrological Discourse.* Poins adds, "And look whether the fiery Trigon, his man, be not lisping to his master's old tables, his note-book, his counsel-keeper" (*2 Henry IV* 2.4.253-257). The fiery Trigon is Shakespeare's clever allusion to a red-faced Bardolph, who makes advances to the tavern's hostess Mistress Quickly. Shakespeare, who wrote this play around 1598, might have had in mind the great conjunction from 5 years earlier, and the one to come in 1603 (Gingerich, 394–395).

John W. Draper supports the idea that many people were committed to these ideas, adding that Queen Elizabeth herself regularly employed John Dee to compute for her the lucky hours and days for conducting her affairs (Draper, 20). Defying royal custom, Elizabeth observed the Great Comet of 1577, and Dee was considered a Copernican astrologer whose advice was sought more for its informative value than for its predictive power. In any event, at the time there was considerable religious opposition to judicial astrology, since its practice was considered to be a violation of the first of the Ten Commandments (*Exodus* 20.2). According to Warren Smith, the idea that Elizabeth's second parliament passed a series of anti-judicial astrology bills, each one harsher than its predecessor, indicates that part of the British population did practice astrology and that another portion objected to it. In 1550, Smith points out, "Bishop Hooper says belief in astrology is against the first commandment" (Smith, 160). Elizabeth's Act of 1580, in fact, compared judicial astrology to witchcraft and threatened the death penalty for the practice of either. James I also disdained the practice, distinguishing between *astronomia*, the law of the stars, and *astrologia*, the preaching of the stars. Of the latter, James wrote: "It is this part which I called before the devils schole" (Smith, 159–176).

However, none of this prevented Shakespeare and his colleagues from dramatizing the relationships between character and situation. We can never know what Shakespeare's stand on astrology was, if he really had one, but he surely was aware that his audiences shared a belief in its power, and that acknowledgement manifests itself differently in each tragedy. I doubt that anyone in an Elizabethan theater audience would have been scandalized by the announcement in the Prolog that Romeo and Juliet were "star-cross'd lovers; (*RJ*. 6)"; Cassius's famous remark that

"The fault, dear Brutus, lies not in our stars, but in ourselves, that we are underlings" (*JC*. 1.2.140-141) contrasts nicely with Calpurnia's equally celebrated warning

> When beggars die, there are no comets seen
> The heavens themselves blaze forth the death of princes. (*JC*. 2.1.29-30)

Seen against this historical background, Shakespeare's frequent allusions to astrology would be expected to raise questions in his audiences. In *The Two Gentlemen of Verona* (ca. 1594), Julia asserts the influence of the stars on her own destiny when she speaks of her love for Proteus (2.5.73-75). *Romeo and Juliet*, from about a year later, has so many astrological allusions that Shakespeare might have intended to suggest that astral influence was a cause of this tragedy of two "star-cross'd lovers" (*RJ*. Prolog. 6), or to deepen and problematize the tragedy by infusing it with so many vexing astrological markers. Mercutio has the temper of Mercury, for instance, and the Friar, who represents the religious thought of "for signs and for Seasons (*Genesis* 1.14.) blames Capulet's misfortunes on the stars" (4.5.94-95). The Captain in *Richard II* (1595) asserts the judicial power of the cosmos (2.4.7-11), and *Hamlet's* Horatio (ca. 1600) recalls a scene from the earlier *Julius Caesar*, then adds further lore to it (*Hamlet* 1.1.114-120). Both passages allude to meteors, parenthetically "meteors fright the fixed stars of heaven" (*Richard II* 2.4.9) and "stars with trains of fire" (*Hamlet* 1.1.117). These allusions were too early to relate to the great Leonid meteor storm of November 1602 (Kronk. *Comets and Meteor Showers*), which was not reported over England. John Dee's diary notes describe a strange meteor-like object appeared on the evening of 26 August 1581:

> Aug. 26th, abowt 8½ (at night) a strange meteore in forme of a white clowde crossing galaxiam, whan it lay north and sowth over our zenith; this clowd was at length from the S.E. to the S.W. sharp at both endes, and in the west ende it was forked for a while; it was abowt sixty degrees high, it lasteth an howr, all the skye clere abowt, and fayr starshyne.
>
> (Dee, http://www.gutenberg.org/files/19553/19553-h/19553-h.htm)

If it were a meteor, then it had a train that lasted for almost an hour; otherwise it might doubtfully have been a long-lived ray from a display of *aurora borealis*.

In 1594, Sir John Davies' *Orchestra*, *or a poeme of dauncing* combined actual observing of the night sky with its philosophy of interpretation, as a challenge to the magnificent cosmic dance he envisaged. In order to follow this dance, the reader needs to understand the details of the individual pattern of the Moon as it orbits the Earth. In this stanza, conflicting philosophies are in agreement:

> Who doth not see the measures of the Moon
> Which thirteen times she danceth every year?
> And ends her pavan thirteen times as soon
> As doth her brother, of whose golden hair
> She borroweth part and proudly doth it wear.
> Then doth she coyly turn her face aside,
> That half her cheek is scarce sometimes descried. (*Orchestra* 25)

Davies' poetic description of the Moon's phase needs no scientific change after four centuries. He correctly notes that the Moon always points the same face toward

Earth; she faces him at full phase, then turns her face aside as the phase wanes. Would that the rest of the dance be so easily described! Davies cannot sing about the planets so easily:

> Only the earth doth stand forever still:
> Her rocks remove not, nor her mountains meet;
> (Although some wits enrich'd with learning's skill
> Say heaven stands firm and that the Earth doth fleet
> And swiftly turneth underneath their feet)
> Yet, though the earth is ever steadfast seen,
> On her broad breast hath dancing ever been. (*Orchestra* 51)

Davies gives the new ideas three lines in parentheses, and then concludes that the Ptolemaic Earth-centered system fits the order better. The important astronomical theme of *Orchestra* is that celestial bodies are dancing in a pattern dictated by gravity, of the Sun, and of its kingdom of worlds. Dance is echoed throughout the major writing of this period, from the dance fantasies in *A Midsummer Night's Dream* to the cosmic dance in *Orchestra.* Far more than a simple declaration that all's well in the world, the dance theme suggests, in a time of scientific uncertainty, a sense of great order in the sky that one can see each night. It is an order that, as James Miller wrote, "could pacify the tempestuous world of matter by inducing a chorus of airy spirits to dance out the mysteries of world-harmony in the shadows of the cave, but strove instead to heal humanity's distempered soul with celestial music" (Miller, 465).

Chapter 5
The Telescope in Early Modern English Literature

Some 40 years ago, the renowned cosmologist and observatory director Harlow Shapley wrote of Job's interrogation by G-d from Chap. 38 in the biblical *Book of Job*. "This is no elementary quiz," the great astronomer wrote. "I would call it a swift-moving doctoral oral" (Shapley, 143). Shapley gives this ancient parable a modern interpretation of a tortured man struggling to understand his relation to the Universe. "Were you there," asks G-d, "when I created the stars of the Pleiades or Orion?" The birth of a star is one of the most beautiful and violent processes that our galaxy offers: A long period of dark, impenetrable cloudiness (the specific prenatal cloud is called a Bok globule) is followed by an ignition flash as the nascent Sun begins nuclear fusion. At the end of the process, the new star's surrounding nebulosity quickly burns away.

The telescope introduced a sense of democracy to the night sky. The early telescopes were not difficult to fabricate, and anyone with access to lenses and a tube could make one. In those days, the sky visible to the unaided eye offered much more than it does through light-polluted air we have at present. However, the telescope also served to create an "elite" kind of "observer class" of astronomers who could see objects and events beyond what the unaided eye can see. As we comprehend it today, that Universe is vastly different from the idea of stars extending into infinity that Thomas Digges first proposed in 1576. Giordano Buno may have been executed for it, but the Englishman Digges thought of the notion years earlier in a land whose religious heritage did not systematically and aggressively oppose new theories and discoveries. In his *Perfit Description*, Digges's expanded translation of Copernicus's *De Revolutionibus* that exists as part of the English author's *Prognostication Everlastinge*, it was the stars in our visible sky, in our own galaxy, that stretched on endlessly. It is understood currently that the Universe, not the Milky Way galaxy, is infinite, and that its great superclusters of galaxies, not the stars within them, stretch in perpetuity. But in a major way, Digges was on the right track when he wrote as explanation for the space beyond the orbit of Saturn: "This orbe of stares *fixed infinitely up* extendeth hit self" begins his lengthy and detailed caption regarding "the last and highest of all; the immoveable sphere of the starres…" [emphasis added]. (T. Digges [1576])

D.H. Levy, *The Sky in Early Modern English Literature*,
DOI 10.1007/978-1-4419-7814-1_5, © Springer Science+Business Media, LLC 2011

I do not see any conflict between Digges' idea of the sphere of stars extending to infinity and John Dee's theoretical calculation of the actual distance to that sphere. In his *Preface to Euclid* (published some years after his death in 1605), Dee writes that "the distance of the Starry Skie is, frō us, in Semidiameters of the Earth 20,018 [and an illegible fraction]." And to ensure no one missed it, he follows this numerical statement with a repetition in words: "Twenty thousand fourscore, one and almost a half." (Dee, n.p.) The beginning of the "starrie sphere" is only that far, but that beginning does not preclude the stars within the sphere extending on to infinity. I assume that this inner boundary of the most remote sphere was indeed considered fixed at the distance calculated by Dee.

In addition to being at the center of our local system of planets, our Sun sits in the center of our region of the Universe because there is no "better or conueient place than this, from whence vniformely it might distribute light to all, for not vnfitly it is of some called the lampe or light of the world (Digges, 359)." If, as Digges goes on, the Universe is infinite, then there can be no center, or rather every point within it can be seen as the center. Thus, the orb of the stars contains "a central, immotile, finite symbol of temporal power." The stars are natural homes of G-d, as they are the most "conuenient place … from which vniformly it [they] might distribute light to all, for not vnfiutly it is of some called the lampe or light of the world." In this sense, Digges's theory of infinite space has no contradiction with Troilus's words:

> The heavens themselves, the planets, and this centre,
> Observe degree, priority, and place … (*TC* 1.3.85-94)

This statement is commonly interpreted with the centre being the Ptolmaic Earth, but it works equally as well if "this centre" is the Copernican/Diggesian Sun as a central star, even justifying the possibility with Troilus's proviso that, in the years since Copernicus, "The bonds of heaven are slipped, dissolved, and loos'd" as they certainly would have appeared to be in the wake of Galileo's discoveries in 1610 (*TC* 5.2.154, Usher 2).

In its earliest form, Copernicus's theory did not predict planetary positions much more accurately than did the established system of Ptolemy. Kepler's modifications to that theory did; however, in 1605 Tycho's former student introduced three laws of planetary motion that specified that the planets move in elliptical orbits, not circles, with the Sun at one focus of the ellipse. The advent of the telescope in late 1609 and 1610 confirmed these ideas observationally, and ushered in an age of enormous scientific advance.

After thousands of years watching the planets move obediently in their courses, the early telescope opened a universe incredibly bigger and more interesting than the one with which the world was familiar. That opening began in January 1610 when Jupiter reached opposition from the Sun and was brightly visible in the evening sky. Within less than a week, Galileo reported four small "planets" accompanying Jupiter. Not specks of light but large worlds, these moons of Jupiter presaged more scientific advance in an instant than at any other time in history.

In Italy, British ambassador Sir Henry Wotton arranged to get an early copy of Galileo's *Siderius Nuncius* to King James's chief advisor and close friend, Sir Robert Cecil. The copy was accompanied by this enthusiastic letter: "I send

herewith unto his Majesty the strangest piece of news (as I may justly call it) that he hath ever yet received from any part of the world … he [Galileo] hath first overthrown all former astronomers" (678). Obviously intrigued and fascinated, Wotton wanted to spread the news of Galileo's discoveries as quickly as possible. The difference was that Copernicus's mid-sixteenth-century work was theoretical, but Galileo's discoveries were based entirely upon his personal experience of direct observation of the night sky.

"With this instrument we can descry those small stars wheeling as in a dance round the planet Jupiter," wrote Francis Bacon in *Novum Organum*, "whence it may be conjectured that there are several centers of motion among the stars" (Bacon, 193). Bacon goes on in *The New Atlantis:*

> We have also perspective houses, where we make demonstrations of all lights and radiations and of all colors; and out of things uncolored and transparent we can represent unto you all several colors, not in rainbows, as it is in gems and prisms, but of themselves single. We represent also all multiplications of light, which we carry to great distance, and make so sharp as to discern small points and lines. Also all colorations of light: all delusions and deceits of the sight, in figures, magnitudes, motions, colors; all demonstrations of shadows. We find also divers means, yet unknown to you, of producing of light, originally from divers bodies. We procure means of seeing objects afar off, as in the heaven and remote places; and represent things near as afar off, and things afar off as near; making feigned distances. (Bacon, *New Atlantis*, 110)

5.1 New Atlantis

With this passage Bacon considers perspective glasses on a different level. Adding to the body of English literature that describes what these lenses can accomplish, he insists that "we procure means of seeing objects afar off," (Bacon, 110) *specifically* "in the heaven and remote places." These glasses can show "things afar off as near," just as a telescope would later do (Fig. 5.1).

Fig. 5.1 Ewen Whitaker built this perspective lens telescope, which he credits to Thomas Hariot, William Bourne, and Leonard and Thomas Digges. Photograph by David H. Levy

John Donne was probably the first English author to weave the discoveries of 1610 into his *Anatomie of the World*, where

> Tis all in pieces, all cohaerence gone;
> All just supply, and all Relation:
> Prince, Subject, Father, Sonne, are things forgot,
> For every man alone thinks he hath got
> To be a Phoenix, and that then can bee
> None of that kinde, of which he is, but hee. (*Anatomie*, 205–218)

As long as the Sun-centered solar system was only theoretical, there was little need to consider it. But Galileo's discoveries were real and could be viewed and confirmed by anyone with a telescope. Donne uses the death of a single person to present a dying old world. The subjects of royalty and family are forgotten because they are familiar subjects, while the new astronomy, correct as it might have seemed before 1610, seemed now "incoherent" and uncomfortable to fathom. Every man must try to figure it out independently (to be a Phoenix), Donne insists. He offers a personal interpretation of the new philosophy, beckoning it to the theme of utter bereavement that begins his elegy.

The evidence that telescopes were around long before 1609 does not necessarily go as far back as Democritus, whose opinion that the Milky Way is composed of large numbers of stars implies that this Greek scholar actually viewed the sky through a telescope. However, I have seen the Milky Way appear mottled, as if comprised of many stars, on many dark nights lacking any optical aid. Without telescopes, I suspect that some expert observers of old had exceptionally keen eyesight, not to mention an unpolluted night sky. "Shakespeare lived in a world of Time, Milton in a universe of Space," wrote David Masson in 1966. "It happened as suddenly as that" (Devereux, 91). Moreover, Shakespeare alludes to the evolving new technology in several plays.

5.2 Perspective Glass: A Forerunner to the Telescope

The telescope's arrival around 1609 was not without warning; it was preceded by a technology called perspective glass or proportional glass that was formed in such a way that from a particular vantage point was capable of forming a magnified image of a distant object. The technology evolved over some 40 years and was a logical precursor to the telescope. The Digges family reckons prominently among those who experimented with early versions of perspective glasses that could function as telescopes. A modern telescope mirror used without an eyepiece actually functions as a perspective glass. It makes sense to credit Leonard Digges with autonomously inventing the telescope, as his surveying career required him to measure distant objects (Fig. 5.2).

It is important to note that the telescope was used in England before 1610 as the perspective glass, and after 1610 as Galileo's "optic tube." Shakespeare's lodgings in London were not far from those of Digges and Dee, and he might have known

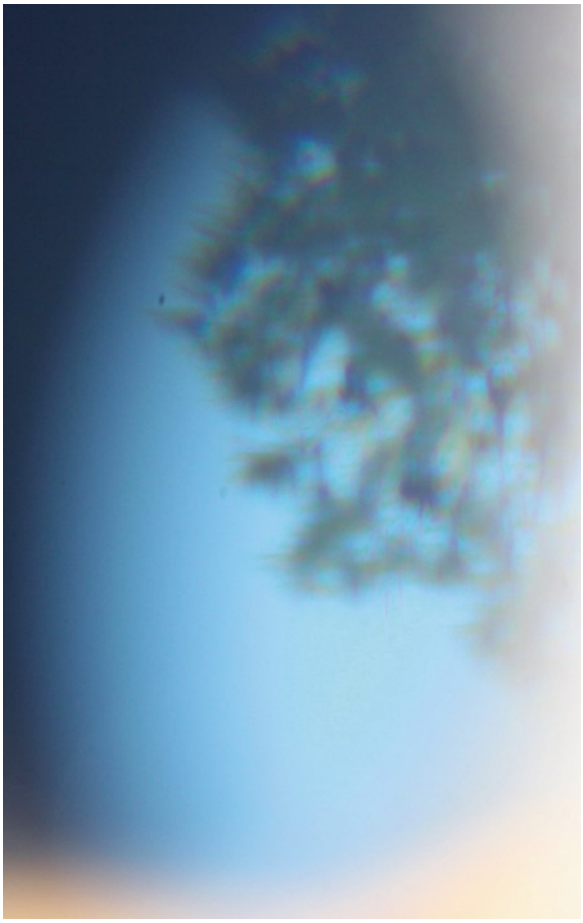


Fig. 5.2 This is a surprisingly wide-field view of a distant tree as seen through Dr. Whitaker's perspective lens. Apparently, it works as advertised! Photograph by David H. Levy

them personally, as Owen Gingerich suggests (Gingerich, 395). That the Bard knew of their work, however, is clearly shown by his allusions to it in three of his plays: *Richard II*, *Henry V*, and *Hamlet*, where Shakespeare alluded to the implausibility of the idea of infinite space in Hamlet's argument to Rosencrantz and Guildenstern: "O God, I could be bounded in a nutshell and count myself a king of infinite space, were it not that I have bad dreams" (*Hamlet* 2.2.253-256).

The expression "proportional glass" implying glass capable of enlarging or shrinking views of objects, appears in Leonard Digges' Pantometria, published posthumously by his son Thomas in 1571, 39 years before Galileo's *annus mirabilis* of 1610. After celebrating the "resplendent heavenly Globes of Sunne, Moone, Planets and Starres fixed," Digges reveals that "my father by his continual painful practices, assisted with Demonstrations Mathematicall, was able, and sundrie times

hath by proportionall Glasses duely situate in convenient angles, not onely discovered things farre off….” Moreover, the elder Digges “by the Sunne beams fired powder, and discharge Ordinance half a myle….” In 1579, Thomas Digges completed his father’s *Stratioticos*, and wrote further that his father “was able by Perspectiue Glasses [glasses apparently able to show objects differently depending on how they are used] duely situate upon convenient Angles, in such font to discover euery particularitie of the Country round about, wheresoeuer the Sunne beames might pearce; as whence Archimedes (Bakon of Oxford onely excepted) I haue not read of any in Action euer able by means natural to performe the like” (Digges, 359). Digges’s friend, mentor, and surrogate father John Dee, doubtlessly also became interested in perspective glasses: “…if you, being (alone) near a certaine glasse, and proffer, with dagger or sword, to foyne at the glasse, you will suddenly be moued to giue back (in maner) by reson of an image, appearing in the ayre, between you & the glasse….” Dee unabashedly credits himself with the invention of “Proportionall and Paradoxall Xompasse [sic] (of me inuented, for opur two Moscouny Master Pilotes)…” (Dee, n.p.). Though he is probably correct in that these glasses were first used in England, Dee was but one member of a team that included the Digges father and son, Leonard and Thomas.

The fact that some major English scientists of that era wrote about perspective glasses is a testament to their popularity. Unfortunately, these lines of evidence did not appear designed to get everyone excited about new ways to admire the night sky, although the glasses might have been used for that purpose. In his treatise *Rare Inventions*, William Bourne describes how these glasses work in words that are really describing a full two-lensed telescope: “For to see any small thing a great distance from you, it requireth the ayde of two glasses, and one glass must be made of purpose, and it may be made in such fort, that you may see a small thing a great distance of, as this, to reade a letter that is set open neare a quarter of a mile from you, and also to see a man four or five miles from you, or view a Towne or Sastell, or to see any windowe or such like thing size or seauen myles from you” (Bourne, 92).

Did Shakespeare actually use perspective glasses? If he did not, he certainly understood their operation well enough to admit them to *Richard II*, composed prior to 1597:

> For sorrow’s eye, glazed with blinding tears,
> Divides one thing entire to many objects.
> Like perspectives which, rightly gazed upon,
> Show nothing but confusion – eyed awry,
> Distinguish form. (2.2.16-19)

Shakespeare’s “perspective glass” was designed so that when an observer looks at it directly, the objects behind are blurred and indistinct; but by looking at a sharp angle, a sort of virtual eyepiece, the view comes into focus. I have experimented with these views using one of my own telescopes. The glass in this simile, however, functions metaphorically not as a reflector of objects but as a reader of emotions (Fig. 5.3). When looked at directly (“rightly gazed”), Bushy sees the Queen’s mind as a jumble of conflicts, but when studied at an angle (“awry”) her all-consuming dejection at the King’s absence becomes clear. Around 1599, the perspective idea

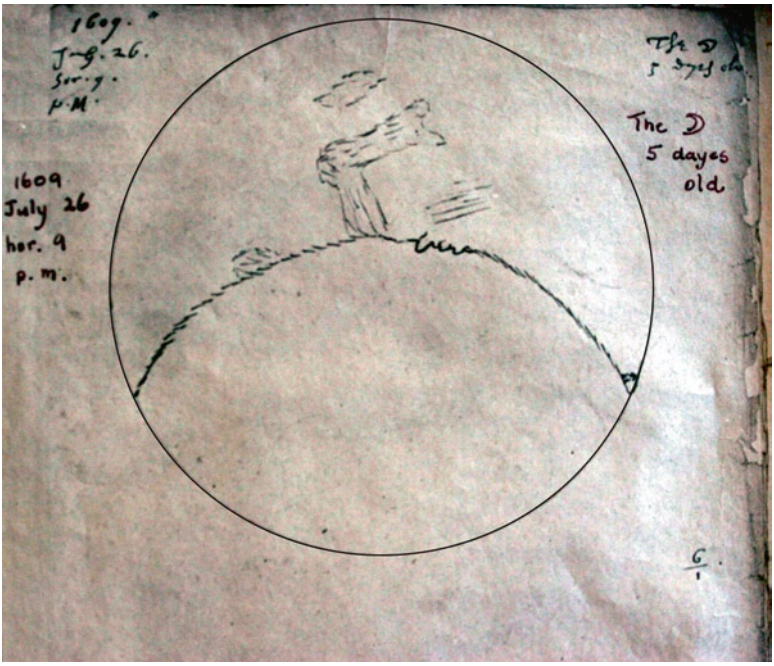


Fig. 5.3 Thomas Hariot's drawing of a 5-day old Moon, on 16 July 1609, a few months before Galileo's drawing. Levy took this photo from Dr. Whitaker's own photographs, which he in turn obtained from Hariot's manuscript in 1970. In this single image, as in the next, we almost physically travel back in time to the very earliest observations made with a telescope

enters the canon again in a brief metaphoric remark in Henry V by the French King who exposes his virgin daughter Kate to a city whose walls have never been breached by an invading army:

> Yes, my lord, you see them perspectively, the cities
> Turned into a maid, for they are all girdled with
> Maiden walls that war hath never ent'red. (5.2.213-316)

The French King sees the cities as though they were a maid like his daughter. Whether any perspective glasses were used as telescopes, however, is another matter. Although no direct evidence exists that they were, perspectives probably were used as telescopes at some point; these lenses and mirrors made possible the magnification of objects over large distances. To write about glasses was nothing new in England at the turn-of-the-seventeenth-century. Lenses of many types populated the land. "The best kinde of glasse for this purpose," wrote Digges in Pantometria (1571).

> is of steele finely polished … neither concave nor convex, but flat and plaine as may be possible. This glasse it behoueth yee to hange up aboue the toppe of the cliffe with the polished side downwarde equidistant to the horizon wherein you must be great distance … This done, let a blumbeline fall from the centre of your glasse to the … ground platte on the toppe of the cliffe: (which ground platte) also you must with some diligence in the chayre thereof that it be … leuell and playne … your Glasse thus situate, turning your

> face towarde the shippe or other marke on the sea … go backwarde, always having your eye fixed on the glasse til such time as ye can see the shippe, or rather the very hull next to the water therein … (Digges, 27)

Although Digges was not describing a telescope, he was writing about a device that does essentially what the telescope does, which is to gather light from a distance. All that remained, after the image was formed by the perspective glass or mirror, was to add a second lens to magnify the image. And this task was devised not just by the children of Hans Lippershey, but by several people working over many years from different lands. In his summary of Digges's work, Bourne writes of "the hollowe or concave glasse: and also that [convex] glasse, as ground and polished rounde, and thickest on the myddle, and thinnest towards the sides or eges" (Bourne, 177). Although there is no written evidence that Digges or his contemporaries used these glasses to look at the sky, nor could I find any in my investigation of English literature of the time, there is some circumstantial substantiation of the possibility that they did.

According to the Canadian astronomer Helen Sawyer Hogg, Digges writes of "late Observations, to ratify and confirme hys [Copernicus's] Theories and Hypothesis. After half a century of research, the nature of these 'late observations' remains unclear, but it is probable that some of these were astronomical." Considering that these observations were designed to study the motions of the Moon, planets, and stars in order to demonstrate the efficacy of the Copernican model, it seems logical to assume that at least some of them involved pointing the perspective glasses toward the sky. We have already shown that this period was extraordinarily rich in celestial offerings. Several comets, particularly the Great Comet of 1577, would have lent themselves to study via perspective glasses (Hogg, 201).

The name of Thomas Hariot appears frequently among those who are credited with being part of the invention of telescopes. His only published work, *A Briefe and true report of the new found land of Virginia* describes the native custom of "staring up into the heavens, uttering therewithal and chattering strange words and noises." To assist in their use, Hariot demonstrated a "perspective glasse whereby was shewed manie strange sights" (Hariot, 22, 27). Hariot also mentions "the Eclipse of the Sunne which we saw the same year before in our voyage thitherward, which unto them appere very terrible" (27). Hariot probably was referring either to the partial solar eclipse of 10 May 1584 or to the eclipse of 29 April 1585. To Hariot, this was a natural phenomenon that he could have watched with the help of his perspective glass. Hariot also notes the passage "of a Comet which beganne to appear a few daies before the beginning of the said sicknesse" (Hariot, 23). Hariot was probably referring to the comet of 1587, which was bright enough to cast a shadow (Yeomans, 416).

If Hariot offers any hints that he used his perspective glass to look skyward, we must find them either in this one published work or in unpublished manuscripts such as the one Allan Chapman (322) was able to retrieve. Hariot left actual drawings of sunspots dominating the face of the Sun, and detailed representations of the Moon that far exceed Galileo's in terms of quality. Considering that these observations were conducted about the same time as those of Galileo, I support

Chapman's suggestion that Hariot be given joint credit with Galileo for discovering the sunspots with a telescope. Chapman also lists Hariot's "first light" of his telescope the first night he used it on the sky as 26 July 1609, some weeks before Galileo tried the same thing. Hariott did not use any of his six telescopes to see Jupiter's moons before 14 December 1610, almost a year after Galileo. Although in his book Hariot comes tantalizingly close to pointing a perspective glass to the sky, either to view the eclipse or the illness-carrying comet, he ultimately failed to publish any observing session using his perspective glass. We can, however, imagine a sort of "English Renaissance Astronomy Club," a loose association of colleagues and friends that included Hariot, Thomas Digges, John Dee, and by extension Shakespeare, who gains admission after writing in *Hamlet* that

> Last night of all,
> When yon same star that's westward from the pole
> Hath made its course to illumine that part of heaven
> Where now it burns. Marcellus and myself,
> The bell then beating one. (*Ham.* 1.1.125-29)

This circumstantial evidence comes from Bernardo describing the appearance of a great star westward from the pole. As Olsen (68) points out, strictly speaking, all stars are south of the pole but it is easy to place Cassiopeia towards the western horizon from Polaris, especially in mid-winter, sometime after King Hamlet was killed while napping in his garden on a presumably mild autumn afternoon. Besides Capella, there are no brilliant stars in that region of the sky; however, the supernova of 1572 was visible in its position near Kappa Cassiopeiae for as much as 2 years after its sudden appearance in November 1572.

One cannot conclude from the material presented in this chapter that telescopes were invented in England, but a great deal of evidence shows us that the recognized early form of telescope called perspective glass was used in England by Leonard and Thomas Digges, John Dee, Thomas Hariot, and probably many others prior to the elder Digges's death around 1574. The literature of the time dealt with this technology in a number of ways. Shakespeare refers directly to them, and other writers, like Nashe, allude to the beauty of their effects; a mere line evokes the great beauty lying in a single piece of cathedral glass

> … which like the sun, that twixt two glasses plays,
> From one to the other casts rebounding rays. (*Choice of Valentines*, 200–202)

Nashe has successfully captured the optical bending of light that takes place, perhaps anticipating Newton's discovery of refraction of light by a prism (Fig. 5.4). Usher proposes that "the front of Jove himself" represents "an eye like Mars, to threaten and command" (Hamlet 3.4.56-57). Usher takes the idea even further, proposing that on the face of Jupiter is an "eye like Mars" (Usher, 1258); he defines the "eye" as Jupiter's Great Red Spot, a feature first published by Robert Hooke around 1664. Even if telescopes were in general use by 1620, I doubt they would have been good enough to allow an observation of Jupiter's red spot. To claim its discovery as early as 1600 strains credulity; Usher offers this as a portion of his "cosmic allegory" that he sees taking place in *Hamlet*. At a more basic level,

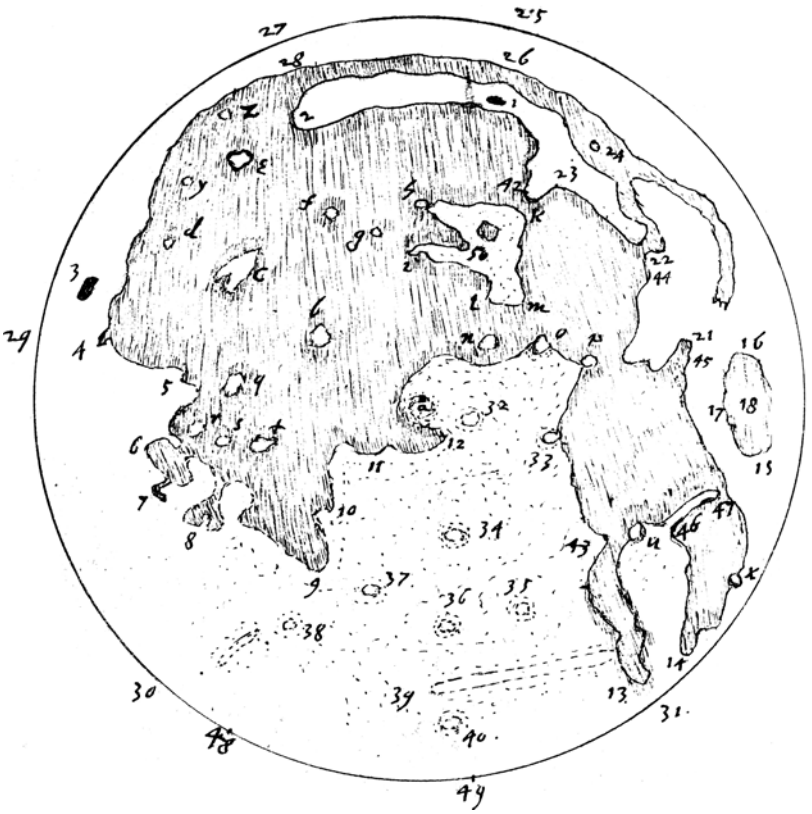


Fig. 5.4 Hariot's full map of the Moon. Image courtesy Dr. Ewen Whitaker, used with his kind permission

particularly in Bernardo's identification of the bright star "westward from the pole" as being Tycho's star, Usher indeed offers the valid point that at a particular time of year, the supernova of 1572, would qualify as the star being pointed out.

5.3 The Telescope in 1610

The children of the Dutch spectacle-maker, Hans Lippershey, allegedly invented the first telescope as they played with their father's lenses. Upon learning of this new device in 1609, Galileo Galilei immediately assembled one with a magnification of ten and used it to discover craters and mountain ranges on the Moon in 1609. Chapman correctly points out that Hariot drew maps of lunar features some weeks, or even months, prior to Galileo (Chapman, 27–33). In 1610, Galileo followed this up with his discoveries of the moons of Jupiter, spots on the Sun, and the phases of Venus. The telescope differed substantially from the older perspective glasses.

Fig. 5.5 This replica of Galileo's telescope rests atop the author's 16-in. diameter reflector, with which he has discovered eight comets. The telescope is pointing towards a 6-ft diameter dome which houses another telescope. Photograph by David H. Levy

Instead of a single slab of glass with a "virtual" eyepiece, the telescope introduced a second lens that users employed as a physical eyepiece. At the close of 2007, the United Nations voted overwhelmingly to celebrate this event: The quadricentennial of Galileo's use of the telescope in the year 2009 became the International Year of Astronomy (UN resolution 61/185, 20 December 2007).

Apparently, no record survives to tell us whether Digges used his perspective glass to study the Milky Way, but it is surely possible that he did. Galileo was doubtless the first person to publish observations using a telescope with an objective lens and an eye lens specifically for astronomical observation and discovery; he recorded and published his discoveries before a wide readership, and he defended (unsuccessfully prior to 1642) the conclusions he derived from his observations before religious authorities (Fig. 5.5). Galileo's published interpretations of these findings as they supported the Copernican theory resulted in his being shown, in 1633, the instruments of torture, tried for heresy, and forced to renounce his conclusions.

Galileo's discoveries galvanized the world, and double-lensed telescopes exploded in popularity. He published his discoveries in clearly understood Italian. Galileo's discoveries helped make the early modern period a time rocked by change not only in English society, but also in the tools that society used to interpret its literature. Galileo discovered in its orbit of the Sun, that Jupiter was accompanied by four moons, the first ever seen other than our own. The moons did not refute Ptolemy's cosmology, but their orbits about Jupiter were easily consistent with a solar system with the Sun at its center. During the fall of 1610, Galileo also made an extensive series of observations of Venus; although that planet had no moons, it did display phases which could be explained only by the Copernican theory.

5.4 Shakespeare and the Telescope

In his closing years, Shakespeare did not ignore the early telescopic finds. *Cymbeline'*s grand ending scene shows the god Jupiter descending to the stage, surrounded by four angels; according to Muisano's "Shakespeare's Last Act" the scene can be interpreted as a representation of the planet Jupiter accompanied by the four moons discovered that year by Galileo. A difficulty with this reading is that the apparitions do not accompany Jupiter so much as they precede him, but it can be resolved by invoking Galileo's sketch of 13 January 1610, which does show all four moons westward (or preceding) Jupiter as it moves diurnally across the sky (Drake, 52).

Had Shakespeare's prime writing years ended a decade later [after 1600], I wrote in 1995, his plays might have reflected a vastly different situation (Levy, 67). After Galileo's crucial observations of Jupiter, Venus, the Moon, and the Sun, philosophers and writers contended with the mounting evidence for the new philosophy of a universe in which the Earth circles the Sun rather than one in which the Sun orbits the Earth. I was wrong; it turns out that Shakespeare's prime writing years ended in plenty of time to allude to the telescope. Besides *Cymbeline*, Shakespeare's great romances *Pericles* (1608), *The Winter's Tale* (probably 1609), and *The Tempest* and *Henry VIII* (1610) all were produced well within the time that they could have been affected by Galileo's discoveries. *Cymbeline*, especially, had appropriate timing, having been completed around the end of 1610.

References to the Sun-centered universe in writing before 1610 are rare, but after that critical year they become more common. (See Donne's *Second Anniversary* and Milton's *Paradise Lost* 5.261-263). Maisano offers good evidence that certain lines in *Cymbeline* hark back directly to Galileo's words in Starry Messenger. Maisano quotes Princess Imogen's lines in her Somnium:

> O learned indeed were that astronomer
> That knew the stars as I his characters;
> He'd lay the future open. (3.2.37-39)

Traditionally, "that astronomer" is interpreted as a judicial astrologer, but those particular lines could be read differently. Could Imogen be looking at someone who is simply watching the sky? The future he lays open is not an astrological prediction (Fig. 5.6). Instead Imogen imagines a watcher of the sky who, like Galileo, "knew the stars." If this was Shakespeare's intention, then it may be his reaction to Galileo, whose discoveries of four moons of Jupiter earlier that same year appear as the ghosts preceding Jupiter in Posthumus's dream. Four apparitions – Posthumus's father Leonatus, his mother, and his two brothers – descend and surround him as he sleeps. As the dream goes forward, Jupiter himself descends and the "ghosts" then "fall on their knees." Paisano (404–405) links the four apparitions that precede Jupiter to the four moons that Galileo has discovered using his telescope, but Jupiter's actual descent is accompanied by an indefinite number of ghosts.

In Maisano's vision, the four apparitions appear at the start of Posthumus's dream. Jupiter does descend accompanied by an eagle and an undetermined number of additional ghosts. Could these ghosts represent still undiscovered moons?

Fig. 5.6 Four hundred years later, amateur telescopes can produce professional results. In this photograph, the author stands next to some of his telescopes, left-right: Obadiah, a 16-in. Schmidt camera with a 7-in. apochromatic refractor on top; Pegasus, the 8-in. reflector he has used since 1964; Samwise, a 10-in. telescope; and Clyde, a Celestron 14-in. telescope. Photograph by Wendee Wallach-Levy

In either case, it is exciting to find Shakespeare possibly responding to Galileo in this positive way. Jupiter lays a tablet on the sleeping Posthumus, who awakes soon after to find that it is actually a book, which Maisano (406, Usher 7–12) suggests, is Galileo's seminal *Siderius Nuncius*. Similarly at the end of *The Tempest*, Miranda speaks of new ideas and new philosophies:

> O brave new world
> That hath such people in't. (*Tempest* 5.1.183-184)

Usher suggests that the terms used in *Cymbeline*, "book" and "label," are "probably mundane references to *Siderius Nuncius*." Although Usher does not provide real evidence to support this claim, Shakespeare may well have thought of Jupiter's moons when he conceived the idea of Posthumus's ghostly family. Furthermore, since *Siderius Nuncius* was an immensely popular book that year, it is a reasonable guess as to what Shakespeare intended. Considering the author's strong interest in the night sky as shown in so many other places, it is easy to conclude that these are references to Galileo's discoveries rather than to assume he ignored them. Moreover, the musical pomp and circumstance surrounding that scene lends credence to Galileo's idea of the dawn of a new age.

If Shakespeare did allude to Galileo in this late play, he may well have extended that insinuation in an even later drama, *The Two Noble Kinsmen*, which he allegedly coauthored with John Fletcher around 1613–1614. It was first performed at Blackfriars in the autumn of 1613 (Bertram, 13), but Bertram uses Thomas Digges's son Leonard's claim that "Shakespeare did not collaborate" (Bertram, 244) as evidence that Shakespeare was the sole author.

Invocations of Jupiter persist in this story. There are five allusions to Jupiter: First, the king of the Roman gods, or the "ruler of planets" acknowledges the honor of the bridegroom's bed (1.1.29). Second, later in the same scene, the First Queen accuses Jupiter of destroying the effects of his actions "before they touch" (1.1.136). Third, the same monarch successfully prevents Jove from a synod or meeting (1.1.177-178). Fourth, after the battle scene in Act 3, Theseus swears by Jupiter's son Castor, that both kinsmen shall die (3.6.135). Fifth, in response, Palomon calls Emilia a "bright star" by Jupiter, which "followed" to the east of the bright star Spica in the predawn sky throughout the first few months of 1614 (3.6.146).

In her soliloquy Emilia, while carrying pictures of both kinsmen, recalls Jupiter's snatching Ganymede from Earth and forming "a shining constellation" with his new cupbearer (4.2.15-18). Simon Marius, who claimed discovery of Jupiter's brightest moons, had proposed the name Ganymede but it did not catch on by the time *Cymbeline* was performed (Mundus Iovialis, 78f). Jupiter and its moons did form a faint and moving asterism, telescopically and poetically a "shining constellation." Since Shakespeare is credited with the composition of all these scenes but 4.2, the multiple references to Jupiter could reflect on his earlier calling on this world in *Cymbeline* (Oxford, 500). In his *Pleasant Dialogues…* Heywood offers a discussion between Jupiter as a mythological god and the servant he snatched while disguised as an eagle. Ganymede wants Jupiter to return him to Earth (Fig. 5.7).

In *Kinsmen*'s fifth act, it is Venus, not Jupiter that plays a decisively judgmental role.

Palomon is warned by Perithous:

> Noble Palamon, he warns,
> The gods will show their glory in a life,
> That thou art yet to leade. (5.4.57)
> Palomon replies:
> Can that be,
> When Venus, I have said, is false. (5.4.57-60)

Palomon probably meant that Venus was false not only in the obvious sense of disloyal but in a judicial astrological sense of being retrograde (Ganent, 435). However, I propose a different interpretation based on Venus's orbital motion. Galileo remarked in *Siderius Nuncius* that "as it [Venus] reaches its maximum departure from the Sun it be semicircular. From 'full Venus,' the planet wanes to a quarter phase and thence into a horned shape, once more becoming thinner as it approaches the sun" (Drake, 93).

Fig. 5.7 What would Shakespeare have had to say about a telescope in space? In this 1997 photograph, the Hubble Space Telescope is shown orbiting the Earth. NASA photograph

A few lines later, Paisano adds:

…to the goddesse Venus
Commend we our proceeding, and implore
Her power unto our partie. [Here they kneele as formerly.]
Haile, Soveraigne Queene of secrets, who hast power
To call the feircest Tyrant from his rage, … and induce
Stale gravitie to daunce …. (5.4.89-109)

A simple reading of *Siderius Nuncius* shows how, in the early fall of 1610, Galileo began his visual studies of Venus, a planet then going through a poor apparition in the southwestern sky in the early evenings (Drake, 93–94). Taking advantage of Venus's presence from the end of August 1610 to early February 1611, and hoping to discover moons like Jupiter's, Galileo was astonished to find something very different. There were no moons. Instead, over several months, Galileo observed the planet's appearance change radically from a full sphere, to an awkward gibbous then half-world, and finally to a crescent. Venus, Galileo concluded, has phases like Earth's moon. Galileo believed that although it was possible to explain Jupiter's moons in an Earth-centered system, it was not possible to explain Venus's phases in any other way than to conclude that Venus orbits the Sun in a closer orbit than the Earth.

Venus is indeed a "queen of secrets." If *The Two Noble Kinsmen* was really composed around 1613 (and most scholars who accept the Shakespeare-Fletcher collaboration ascribe the writing of Act 5 scene 4 to Shakespeare), then Venus may

have played as big a role as a planet as much as an astrological symbol. Venus's judicial astrology is powerful enough to induce dancing by dint of its own gravity, or to calm a tyrant's rage. But in a modern way, it symbolized the greatest of Galileo's discoveries that Venus shows phases. Because it provided solid evidence to discredit the Ptolemaic system, the discovery of the phases of Venus was really Galileo's most important observation.

Because Shakespeare's concluding play was completed 3 years before his death, his collaboration with Fletcher to complete it was accepted by many critics and more important, Shakespeare might have been celebrating Galileo's accomplishment. The wedding scene invokes Mars, a conventional male allusion though Mars the planet was also an ideal subject for telescopic observation during its apparition of September 1610. However, the emphasis on Venus does invite this cosmological interpretation. "Before the alters of Mars and Venus, it is clear that it is two kingdoms for which Arcite and Palomon contend" (Bertram, 278). As Usher is so insistent on a cosmic allegory for *Hamlet*, Mars and Venus imply a more comprehensible extension of the metaphor into this later play.

Allusions to the telescope appear in other works of the period, notably Beaumont and Fletcher's *A King*, *and No King* wherein one citizen thinks he sees the servant Philip in the distance; the other says "Thou wouldst be Philip, if thou sawst it in a glass; it looks so like a Visour" (2.1.100).

We have already seen (see Chap. 4) that John Webster's *The Duchess of Malfi* deals extensively with the astrology of its time. The play also alludes to Galileo and his telescope in one of the Cardinal's speeches:

> We had need go borrow that fantastic glass
> Invented by Galileo the Florentine,
> To view another spacious world i'th' moon
> And look to find a constant woman there. (*Duchess* 2.4.25-28)

The image suggests that we cannot find a constant woman anywhere on Earth, and that we must borrow Galileo's telescope to look for one on the Moon.

In his *Albumazar*, Tomkis refers directly to Galileo's work in the title character's speech:

> Ronca, the bunch of planets new found out
> Hanging at the left of my best perspicill,
> Send them to Galileo at Padua;
> Let him bestow them where he please. But the stars
> Lately discobvered twixt the horns of *Aries*
> Are as a present for Pandolfoes marriage … (1.5.1-7)

However, Albumazar cannot be referring to moons of Jupiter as "the stars lately discovered" since Jupiter was between the horns of Taurus, not those of, not Aries, in January 1610. The planet and its moons would have been in Aries a year earlier.

Nevertheless, these many references illustrate a symbiosis that was forming between the explosively developing science of the time, and the English Literature that accompanied it. Galileo, silenced and sentenced to spend the remainder of his

long life under house arrest, became popular as an English literary figure. Ultimately, he appears to be the *only* person cited by name in *Paradise Lost:*

> Through Optic Glass the Tuscan artist views
> At Ev'ning from the top of Fesol (*PL* 1.288-289)
> ……
> There lands the fiend, a spot like which perhaps
> Astronomer in the sun's lucent orb
> Through his glazed optic tube yet never saw (3.588-590)
> ……

… and finally, by name

> As when by night the Glass
> Of Galileo, less assur'd, observes
> Imagind Lands and regions in the Moon: (*PL* 5.216-263)

Appendix
A Selection of References to the Sky in Writings from 1572 to 1620

This appendix includes references that would normally lie beyond those chosen in the preceding chapters, but which add, in some way, to the overall goal of investigating a relationship between literature and the sky. For example, I have discovered that Shakespeare twice alludes to lunar and solar haloes, mock suns and mock moons, and uses them in astrologically predictive terms as harbingers of adversity.

Within each section, the authors are presented alphabetically, except where a reference from one writer relates to that of another.

Section Codes

A. General references to astronomy
B. Stars
C. Planets
D. Moon and Sun
E. Sunsets, sunrises, and night
F. Haloes
G. Meteors
H. Nonspecific astrological references

Abbreviations

Besides the standard abbreviations for Shakespeare's plays, the following abbreviations refer to specific works, as follows:

A&S	*Astrophil and Stella*, Sidney
Defense	*Defense of Poesie*, Sidney
Malta	*The Jew of Malta*, Marlowe
Faustus	*Doctor Faustus*, Marlowe
OA	*Old Arcadia*, Sidney
FQ	*The Faerie Queene*, Spenser
1Tamb	*Tamburlaine*, *Part 1*, Marlowe
2Tamb	*Tamburlaine*, *Part 2*, Marlowe

D.H. Levy, *The Sky in Early Modern English Literature*,
DOI 10.1007/978-1-4419-7814-1,

A. General References to Astronomy

Marlowe

> Learned Faustus,
> To find the secrets of astronomy…
> Did mount him up to scale Olympus' top…
>
> The topics zones, and quarters of the sky
>
> From the bright circle of the horned moon
>
> Even to the height of *primum mobile:* (*Faustus* (ca. 1592) 2.3.32-42)

This chorus song occurs not long after Faustus receives his powers. At this power, Faustus' satisfaction, expressed by his relaxed smiles in Act I as he reaches from book to book, turns to outright exuberance as his powers become evident.

> *Faustus.* Now that the gloomy shadow of the night,
> Longing to view Orion's drizzling look,
> Leaps from th'antarctic world unto the sky,
> And dims the welkin with her pitchy breath, … (*Faustus* 1.3.1-4)

In a scene forecasting the play's bitter end, Faustus makes his deal under the "gloomy shadow" of darkness where even the bright stars of Orion are denied him.

> That time may cease and midnight never come: (*Faustus* M5.2.138)

As *Faustus* closes, the play's action has come full circle: Faustus's knowledge and abilities are empty and do not help to save him from damnation.

Shakespeare

> What zeal, what fury hath inspired thee now?
> My love, her mistress, is a gracious moon;
> She, an attending star, scarce seen a light… (*LLL* 4.3.225-227)

This metaphor aligns King Ferdinand's "love, her mistress" to the bright Moon dominating the night sky. In line 226, "her mistress" helps compare the King's love to the Moon, but the following line seeks to reduce her to "an attending star" that cannot even see a light, let alone emit light. Browne disputes this seeming dichotomy, insisting that "but for my love, day would turn to night!" (4.3.229) As in *I Henry VI*, where the heavens are hung with black, and as in Macbeth, where night strangled the lamp, this turning is sudden, as in a total eclipse.

Sidney

> I am glad that you approve of my decision to give up the study of astronomy; but as to geometry, I don't know what I ought to do.
> (Philip Sidney, *Letter to Hubert Languet* (4 February 1574), 2–3).

This reference about "giving up" astronomy is the earliest of several found in Sir Philip Sidney's letters. The date of his letter, 4 February 1574, suggests that the supernova that appeared only 2 years earlier might have caught his interest, but that its slow fading caused the author's interest also to weaken. The frequency of

astronomical allusions in Sidney's writing throughout his career does indicate that he was familiar to some extent with the night sky.

On a personal note, as a youth, I could relate to Sidney's desire to "give up" astronomy. On two occasions when I was young, insulting comments toward me by an official of the Royal Astronomical Society of Canada encouraged me to give it up.

> So doth the astronomer look upon the stars, and, by that he seeth, set down what order nature hath taken therein. (*Defense of Poesie* 1595, 160–162)

This report of what the astronomer does, as well as its good advice to maintain good observing records, appears frequently in the *Defence*. This first mention opens a wide door; the astronomer looks at the stars and then records his observations. Each further reference narrows the allusion:

> For some that thought this felicity to be gotten by knowledge, no knowledge to be so high or heavenly as acquaintance with the stars, gave themselves to astronomy… But when by the balance of experience it was found that the astronomer, looking to the stars, might fall in a ditch … (*Defense* (ca. 1581), 300–310)

Alluding to what happens to the philosopher in Chaucer's *Miller's Tale*, Sidney's suggestion is a comical way of criticizing "some" for believing that the simple acquisition of knowledge is sufficient to become familiar with the stars. Sidney echoes Chaucer in suggesting that Plato accused the great astronomer Thales of having tripped and fallen while looking skyward.

> Models such be wood-globes of glistening skies. (*A&S* (1591) 91.11)

The idea of a planetarium or planisphere, in which the stars are represented on a surface, goes back to antiquity. Near the end of *Astrophel and Stella*, Astrophil compares his own agony to that of the heavens reduced to a model made of wood. And much later:

Burton

> There are that observe new motions of the heavens, new stars palantia sidera, comets, clouds, call them what you will, like those Medicean, Burbonian, Austrian planets, lately detected, which do not decay, but come and go, rise higher and lower, hide and show themselves amongst the fixed stars, amongst the planets, above and beneath the moon, at set times, now nearer, now farther off, together, asunder; as he that plays upon a sackbut by pulling it up and down alters his tones and tunes, do they their stations and places, though to us undiscerned; and from those motions proceed (as they conceive) diverse alterations.
>
> (Robert Burton. *Anatomy of Melancholy* (publ. 1621))

Burton here explains a relation between astronomy and geometry to which Sidney alludes earlier, but he adds music to his brew as well. The "new motions" in the heavens include comets, whose orbits can be calculated from their changing positions in the sky and clouds, which never have orbits, as well as the traditional and well-known orbits of the planets, which Kepler published in 1605.

B. Stars

Chapman

> But, far above the loveliest, Hero shin'd,
> And stole away th' enchanted gazer's mind;
> For like sea nymphs' inveigling harmony,
> So was her beauty to the standers by;
> Nor that night-wandering, pale, and watery star
> (When yawning dragons draw her thirling car)
> From Latmus' mount up to the gloomy sky,
> Where, crown'd with blazing light and majesty,
> She proudly sits more over-rules the flood
> Than she the hearts of those that near her stood.
> (Chapman, *Hero and Leander*, First Sestiad (ca. 1611))

The "watery star" is the Moon, often visible even in a "gloomy sky" covered with thin clouds. Latmus could be referring to an eclipse.

Donne

> Goe and catch a falling star … (Donne (ca. 1612), *Song* 1)

A simple, wistful, romantic command that survives to this day in Perry Como's 1957 hit song "Catch a falling Star"; thus, the theme of looking upwards on a starry evening is ancient and valid. Donne's song continues with several impossible goals, concluding that each of these is easier to attain than the love of a good woman.

Fletcher

> Seven are the lights that wander in the skies,
> And at these seven I wonder in my love:
> So see the moon, how pale she doth arise … (Giles Fletcher, *Licia* (1593?), 1–3)

This sonnet opens with the number seven, a traditional celestial number since it relates to the five moving planets plus Sun and Moon. Only six objects are listed, however, and only one, the Sun, is a real star. The other five are the Moon, Mercury, Mars, Venus, and Saturn. It is possible that Fletcher means none of these in his sonnet, rather the seven stars of the Plough, or Big Dipper, or possibly the traditional "seven sister" stars of the Pleiades.

Jonson

> Who heav'd Hercules
> Unto the Stars? or the Tyndarides?
> Who placed Jasons Argo in the Sky?
> Or set bright Ariadnes Crown so high?
> Who made a Lamp of Berenices Hair?
> Or lifted Cassiopea in her Chair?
> But only Poets, rapt with Rage divine?
> And such, or my hopes fail, shall make you shine.
> (Jonson. *Forest* 57–64 (ca. 1610))

Reminiscent of the biblical story of Job, *Forest* demands who built the sky, and answers that divinely inspired poets did.

Marlowe

Soldan: Nay, could their numbers countervail the stars,
or ever-drizzling drops of April showers,
Or withered leaves that autumn shaketh down … (*I Tamb*. (1587) 4.1.31-33)

This comparison of the numbers of soldiers to stars in the sky, or individual droplets of rain, harks back to *Genesis* 22:17; "…I will multiply thy seed as the stars of the heaven, and as the sand which is upon the seashore." See also Mary Sidney's *Antonie* above.

But stay, what star shines yonder in the east?

The lodestar of my life, if Abigail. (*Malta* (1590) 2.1.41-42)
A "lodestar" or guiding star is a frequent allusion in this period (see below).
That kiss again! She runs division of my lips.
What an eye she casts on me! It twinkles like a star. (*Malta* 4.3.131-132)

The kiss reminds Barabas when his daughter was alive; but even in death her eye resembles a star.

Mary Sidney

Clear stars they seem'd, which did a sun unclose
(Who, hiding none, yet all did beautify),
With coronets deck'd, with violet and rose. (Mary Sidney *The Triumph of Death* (1595) 25–27)

In her long poem, Mary Sidney, Countess of Pembroke (and arguably England's first established female poet) evokes a sky full of stars, appearing with majesty and beauty after sunset, and decked with flowers. It is a strong way to open a poem whose theme is the triumph of Death over life. Indirectly, the passage also relates the night sky to the permanence, and thus to the ultimate triumph, of death.

Sooner moist currents of tempestuous seas
Shall waue in heauen, and the nightly troopes
Of starres shall shine within the foming waues… (*Antonie* 1595, 533–535)

In this 1595 account of Antony, Sidney compares the general's war with a battle in heaven, whose troops are stars shining within waves of battle. Although it is easy to see stars reflected in still water, it is virtually impossible to see starlight reflected on rolling ocean waves.

Right as some Pallace, or some stately tower,
which ouer-lookes the nighbour buildings round
In scorning wise, and to the starres vp growes,
Which in short time his owne weight ouerthrowes. (*Tragedie of Antonie* 1411–1412)

Mary Sidney constructs here a Tower-of-Babel-like palace soaring to the sky but quickly collapsing under its own bulk.

Sidney

Those lamps of heav'nly fire to fixed notion bound,
The ever turning spheres, the ever moving ground;
What essence destiny hath … (Sir Philip Sidney, *O.A.* (ca. 1580) 4.44-46)

In Sidney's era, the stars are driven by theory, according to the theory of Ptolemy rather than Copernicus; the spheres are "ever turning" but each of the stellar "lamps" are "of fixed notion bound," despite the obvious change in magnitude, though not in position, of the great star of 1572.

Spenser

> Like as a ship, whose Lodestarre suddenly
> Couered with clouds, her Pilot hath dismayed … (*FQ* (1590) 3.53.3-4)

Spenser's *Faerie Queene* is rich in celestial allusions. This example compares the loss of the ship's guiding star to Britomart's apparently aimless wanderings. A ship uses a specific lodestar that, on a clear night, will assist in its navigation, but Britomart, like the star covered by clouds, lacks that anchor as she struggles on her own journey.

Lodestarre appears again at the end of Canto 6 in *FQ* (1596) 3.6.52.5:

> She brought her forth ino the worldes view,
> To be th'ensample of true loue alone,
> And Lodestarre of all chaste affectione
> To all faire ladies …

The Lodestarre here has a broader meaning – not a guiding star for a ship but that of a nymph called Pleasure, the daughter of Cupid and Psyche (3.6.50). See also Sonnet 34.5,10.

> So I whose star, that wont with her bright ray …
> My *Helice* the lodestar of my lyfe …

Here Spenser directly assigns the role of his personal guiding star (actually a comet with her "bright ray") to Helice, whose tail points his direction.

> Night was far spent, and now in *Ocean* deepe
> Orion, flying fast from hissing snake … (*FQ* (1590) 2.2.46.1-2)

Hamilton (191) proposes that Orion sets in the west pursued by his slayer; they are never together in the same hemisphere. Although this appears to be the best interpretation of the line, Scorpius is not a serpent. Serpens, however, rises at about the same time but to the north, also with the ability to "chase" Orion.

> …like starry light
> Which sparkling on the silent waves, does seeme more bright. (*FQ* (1590) 2.12.78.8-9)

Spenser accurately observes that stars seem brighter when reflected, along with the accompanying general sky glow, against the silent waveless waters of a calm ocean.

> The promist ayde the tempest to withstand:
> Whose loftie trees yclad with summers pride,
> Did spred so broad, that heauens light did hide,
> Not perceble with power of any starre. (*FQ* (1590) 1.1.7.3-6)

Spenser paints a summer storm scene; the swaying trees and thick leaves ("summers pride") completely cut off light from "any starre" (Hamilton, 31).

…And the moist daughters of huge *Atlas* stroue
Into the *Ocean* deepe to driue their weary droue. (*FQ* (1590) 3.1.57.8-9)

Jupiter, "high Jove," lit the sky, while the "moist daughters" of Atlas, the Hyades star cluster (Hamilon, 315) are setting into the sea toward the west. Early in 1586, 4 years before initial publication of the first three books of *Faerie Queene*, Jupiter actually passed just one degree, or two moon-diameters, to the east of the Hyades star cluster.

Now when *Aldeboran* was mounted hie
Above the shynie C*assiopeias* chaire… (*FQ* (1590) 1.3.16)

When both constellations are prominent on clear winter evenings, at the latitude of England, Aldeboran (Spenser's alternate spelling of Aldebaran, or Alpha Tauri) typically rises higher in the sky than does more northern Cassiopeia (Hamilton, 58). The fact that Spenser chose Cassiopeia for this particular passage raises the possibility that he saw, as a young man of 20, the supernova there in 1572.

According to F.R. Johnson, Aldebaran can be "mounted hie" over Cassiopeia only during the winter months, which contradicts the summer setting of this Canto (Johnson, 194). However, I consider this contradiction resolved since Aldebaran does rise high in the sky late in August, towards the end of summer.

Shakespeare

Pistol: Sweet knight, I kiss thy neaf. What! We have seen the seven stars. (*2HV* 2.4.176)

The "seven stars" are the Pleiades, No. 45 in Charles Messier's catalog, although seven other bright stars form the Plough or Big Dipper. The rising of the Pleiades on early November evenings is traditionally a harbinger of winter storms, which is likely the intended meaning here. Since the other seven stars of the Plough are circumpolar over England, neither rising nor setting, it is less likely that Pistol had them in mind.

Juliet: Come, gentle night; come, loving, black-brow'd night,
Give me my Romeo; and when he shall die,
Take him and cut him out in little stars,
And he will make the face of heaven so fine
That all the world will be in love with night,
And pay no worship to the garish sun. (*RJ* 3.3.21-25)

Juliet's legendary soliloquy summons the image of night in a novel and powerful way. Her comparison of Romeo to night is complex, because night and darkness are generally unhappy times. Unlike other invocations, this soliloquy turns night into a peaceful time where stars contrast with a blinding, dazzling sun. The stars of this night are little and innocent, not violent or malicious. The night is black-browed, or completely dark with no interference from day or twilight. This metaphor shows a meticulously crafted Romeo whose dead body is cut up into a pattern of little stars. Incidentally, these particular lines rest on the Moon's south pole, along with some ashes of the geologist E.M. Shoemaker, as a tribute to his work (Levy, 262–266).

C. Planets

Griffin and Dowland

See also the 1596 sonnet

> Until it did approach my sun too near,
>
> And then, alas, untimely was it blasted … (B. Griffin, *Fidessa* 35.10)
> where, like a comet hurtling into the Sun, the writer's flower is killed. Also
> But my sun's heavenly eyes
> View not your weeping … (John Dowland (ca. 1600) *Lyrics* I.15.5-6)

As earlier, "my sun" reflects the writer's personal voice, instead of

> Doth not the sun rise smiling
> When fair at even he sets? (*Lyrics* 15.12-13)

In this passage, it is the general Sun that rises "smiling" and not the writer's personified Sun.

Sidney

> Shall such high planets tend to the loss of a worm? (Sidney, *OA* 4.38)

Sidney asks if the planets of the higher spheres (i.e., Saturn and Jupiter) concern themselves with trivial earthly matters. Moreover:

> Nay, to the heav'ns your just complainings send,
> And stay the stars' inconstant constant rave
> Till that they do unto our colours bend;
> And ask the reason of that special grace
> That they, which have no lives, should live so long,
> And virtuous souls so soon should lose their place? (*OA*. Agelastus 4.37-42)

Even though there is no answer, Sidney here asks why stars, which are really not "alive" or sentient in a human sense, live so long while humans die almost at a whim. The ancient idea that stars possess souls derives from Origen, the influential second century CE theologian. "Plaint is the only pleasure," Sidney's ultimate point in *Eclogues* hammers through the tragic brevity of human lives, epigrammatic as the daily "light of sun"; in fact "this vaulty sky" looms large as "a stately tomb to cover him deceased."

> Which to their eyes the bowls of Venus brought,
> For they seemed made even of sky-metal best (Sidney, *Lamon's Tale* (pub. ca. 1598) 99–100)

The notion of the "bowls of Venus" being made of strong metal hints toward a prominent apparition of Venus in the evening sky during the spring and summer of 1580. Sky-metal implies either a substance of great strength or of sky-blue color.

> She, lightning love, displaying Venus's skies … (*A&S* (1591) 63.7)

This rare image shows Astrophil, the lover of the stars, imagining the sky of Stella, the star he loves. In this line, he may be imagining Venus not as a mythological goddess but as a geographical place in the sky. Venus, *as a planet*, has a sky which

to Sidney is brighter and more beautiful even than that seen from Earth. Sidney might have been inspired by observing Venus shining so brightly during its 1580 visit to Earth's evening sky (*A&S* 63.7).

> Sweet garden nymph, which keeps the cherry tree,
> Whose fruit doth far th'Hesperian taste surpass… (*A&S* 79.5-6)

Like Spenser, as we shall see, Sidney uses Hesper to acknowledge the presence of Venus in the evening sky. Mythologically, Hesper's fruit lacks the taste of the cherry tree encountered by Aristophil.

Spenser

> Like Hesperus among the lesser lights … (*FQ* (1590) 1.7.30.4)

Spenser compares "a ladies head" to Venus, an evening star far brighter than any "lesser light" in the sky. The only star to claim that distinction is the Supernova of 1572, which outshone Venus, the brightest object in the evening sky after Sun and Moon, in 1572. These singular astral allusions follow a series of earlier ones; the first speaks of a "fearfull Doue" clearing the sky after rain (3.4.49), and a second during which the evening star, Venus or Hesper, appears in mid-heaven as an ascendancy "over Arthur's thoughts" (3.4.51, Hamilton, 344); Venus, it turns out, was a bright evening object in late 1589, just prior to the publication of *FQ*'s first three books (Hamilton x). However, Spenser breaches the tradition of separate names for Hesper as the evening Venus, and Phosphor as the morning Venus:

> At last faire Hesperus in highest skie
> Had spent his lampe …
> Then up he rose, and clad him hastily … (*FQ* (1590) 1.2.6.6-8)

Spenser variously uses Hesperia, or Hesper, or Venus itself, to represent Venus, and never Phosphor.

> he whyles his Lord in silvr slomber lay,
> Like to the evening starre adorn'd wth deawy ray. (*FQ* 6.7.19.8-9)

Hamilton (669) annotates that Venus is summoned as it "rises out of the ocean," but Venus never rises in the evening; it must set in the ocean instead. In 2.12.65.1-2,

> As that faire star, the messenger of morne,
> Her deawy face out of the sea doth reare:

Venus as Phosphor does rise in the predawn sky, though Spenser does not refer to it by any name other than as a harbinger of morning. Hamilton (45) notes how Spenser uses Hesperus to signal Venus as both an evening and a morning star, "both Venus; here named with obvious irony." I do not see the irony as so obvious, but there appears some confusion over the roles of Hesper and Phosphor which apparently remained unresolved until Alfred, Lord Tennyson settled the issue centuries later near the close of *In Memoriam:*

> *Sad Hesper o'er the buried sun*
> *And ready, thou, to die with him…*
>
> *Bright Phosphor, fresher for the night…*
> *Behind thee comes the greater light…*

Finally, Tennyson reveals, in the simplest English, that the dual evening and morning star are really one:

Sweet Hesper Phosphor, double name
For what is one, the first, the last,
Thou, like my present and my past,
Thy place is changed; thou art the same.[2]
(Tennyson, *In Memoriam* (1850) 121.1-2, 9, 12, 13-16)

D. Moon and Sun

Chapman

…take nature's arm,
And pluck into his search the circuit
Of Earth and heaven, the sea's space and the spirit
Of every star … (George Chapman, *Learning*, 18–21)

Chapman's philosophical poem is a metaphor that relates learning as being both fundamental and universal, to an understanding of all of nature. The circuit of Earth is different from the circuit of heaven. It includes periods of planetary rotation and revolution about the Earth in a Ptolmeic sense, as opposed to a distant sphere of fixed and possibly infinite numbers of stars. But Chapman offers more; within each one of those infinite suns is a spirit that goes beyond contemporary science, repeating the ancient belief in souls "equal in number to the stars" (cf. Plato. *Timaeus*).

Marlowe

Theridamus: Before the moon renew her borrowed light,
Doubt not, my lord and gracious sovereign, (*1Tamb.* (ca. 1587) 1.1.69-71)

The Moon is used here as a clock; speaking before the King, Theridamus promises victory in battle within 2 weeks, by which time the waning Moon, shining by light reflected from the Sun, would have passed its new phase and begun waxing again.

Shakespeare

Heaven stops the nose at it, and the moon winks … (*Othello* 4.2.78)

A winking Moon could imply a briefly passing cloud or an eclipse; if the latter, there was a fine partial lunar eclipse over London late in the evening of 24 May 1603, about a year before the play was completed ca. 1604. From Spenser's *Faerie Queene* to Tennyson's *In Memoriam*, there is no shortage of examples of Venus (or Phosphor and Hesper) acting at different times as a morning and as an evening star, but because Mercury is normally too close to the Sun to observe, references to it in this sense are rare. The Moon appears frequently in Shakespeare especially in *A Midsummer Night's Dream* where Snout, Bottom, and Quince, while planning their play, try to find the phase of the Moon on the night it is to be performed (3.1.44-51). Since the Moon is to have a role in that performance, choosing the right date to perform the play is a significant part of the drama.

> O, swear not by the moon, the inconstant moon
> That monthly changes in her circled orb,
> Lest thy love prove likewise variable. (*RJ.* 2.2.109-111)

Juliet has just chastised Romeo for swearing his love "by yonder blessed moon." She represents the Moon as inconstant; Juliet claims either seriously or teasingly, that she does not trust that love because the Moon undergoes changes each night in its monthly lifetime as it circles the Earth. The Moon subtends a higher than earthly love (cf. Donne's "dull sublunary lover's love" *Valediction* 13) but Juliet suggests that Romeo's love will prove "likewise variable." As the Sun rises and sets on lunar features, the Moon changes in shape and in brightness like the "variable star" that appeared in a different sphere in 1572. Not only was the supernova widely observed to have appeared suddenly, but it was also observed to vary in brightness from week to week as it faded slowly over the course of more than a year.

> As a symbol of inconstancy in love, the inconstant Moon appears often in Shakespeare. Rosalyn claims "My face is but a moon, and clouded too." (*LLL* 5.2.203)
>
> A few lines later she speaks to the King suggesting that the full Moon experienced an eclipse: "You took the moon at full; but now she's changed." (*LLL* 5.2.214)
>
> The King responds dismissively "Yet still she is the Moon, and I the man." (*LLL* 5.2.2.215)
>
> The King represents constancy as the Moon signifies variability.
>
> In *The Tempest*, Trinculo brushes off fears of Caliban's monster by comparing it to a ethereal image without substance, like "The man i' the moon!" (*Tempest* 3.1.135)

Finally, Desdemona begins to sense trouble with Othello as she plans "To follow still the changes of the moon with fresh suspicions" (*Oth.* 3.3.182-183)

Considering that eclipses of the Moon play a role in *Othello*, the "changes of the moon" that Desdemona plans to follow could include eclipses as well as phases; the "changes of the moon" blossom into Othello's "huge eclipse" of sun and moon (5.2.102-103).

Sidney

> I said thine eyes were stars, thy breasts the milken way … (*A&S* (1591) 5th song 10)

Stella spurns Astrophil's love in this fifth song.

Spenser

> His werie ghost assoyld from fleshly band,
> "Did not, as others wont, directly fly"
> Vnto her rest in Pluto's grisly land,
> Ne into ayre did vanich presently,
> Ne changed was into a starre in sky;
> But through traduction was eftsoones deriued (*FQ* (1596) 4.3.13)

Hamilton points out the four choices that Priamon's soul had dismissed after death: it did not join Pluto in the underworld, nor fly in the air or become a "star in sky" or join with another soul in a new body.

Or when the flying heuens he would affray;
For so exceeding shone his glistering ray,
That *Phoebus* golden face it did attaint,
As when a cloud his beames doth over-lay; (*FQ* (1590) 1.7.34.4-7)

The "golden face" of Phoebus has power even over the constellations, as constellations rise and set or circle the pole.

For now three moones have changed thrice their hew, (*FQ* (1590) 1.8.38.6)

Three Moons signify the passage of 3 months, and the following line, "haue been thrice hid underneath the ground," also clearly indicates the passage of time.

And huge *Orion*, that doth tempests still portend. (*FQ* (1596) 4.11.13.9)

The big constellation Orion, like the asterism of Capella, the goat with her three kids, has historically risen at the start of winter and was seen as a harbinger of winter storms.

…Return'd to heauen, whence she deriu'd her race;
Where she hath now an euerlasting place,
Mongst those twelue signs, which nightly we doe see
The heauens bright-shining baudricker to ench;
And is the *Virgin*, sixt in her degree,
And next her selfe in righteous balance hanging bee. (*FQ* (1596) 5.1.11.4-9)

Spenser here refers to Virgo as the sixth sign of the zodiac, and Libra, "righteous balance," follows. Hamilton (531) is correct about the "twelve signs" being the celestial zodiac, but not in comparing it to the Milky Way, which does not house most of the zodiac constellations, but which shares only two constellations, Sagittarius and Gemini, with the zodiac.

The which, more earth it were for mortall wight,
To tell the sands, or count the starres on high… (*FQ* (1596) 4.12.53.1-2)

Spenser is saying that it is easier to describe the sands on every beach, or count all the stars, than to think clearly in this crisis. These lines echo G-d's hyperbolical injunction to do the impossible – i.e., to count the number of the stars, and call them all by their names (Genesis, 22.17; Psalm, 147.4; Hamilton, 518).

Look how the Crowne, which Ariadne wore
Vpon her ivory forehead that same day
That Theseus her vnto his bridale bore
When the bold Centaurus made that bloody fray … (*FQ* (1596) 6.10/13.1-4)

Hamilton (690) offers the insight that after Theseus abandoned Ariadne, "Bacchus placed her crown among the stars as Corona Borealis," the same crown that, centuries later, Gerard Manley Hopkins would note as "the circle-citadels there" in *The Starlight Night* (MacKenzie, 139–140, 363–365).

…And twixt the twinkling of her eye-lids bright,
To sparke out little beams, like starres in foggie night. (*FQ* (1596) 6.11.21.8-9)

The simile hints that Spenser has seen the sky on a slightly foggy night, when stars appear and vanish quickly and repeatedly in large sections of sky.

E. Sunrises, Sunsets, and Night

Donne

> Busy old fool, unruly sun,
> Why dost thou thus,
> Through windows and through curtains call on us? …
> I could eclipse and cloud them with a wink … (*The Sunne rising* 1–3, 12)

A favorite high school poem, "The sun rising" anthropomorphizes the Sun as an interfering fool. It is, however, a valid, energetic, and passionate reference to sunrise. The metaphor operates directly in that the mighty Sun, in its greatness, dares to interfere with trivial human bedtime pursuits. On a loftier plane, the Sun's greatness contrasts with human activities, but human beings can choose to "eclipse" the Sun by simply shutting their eyes.

Marlowe

> *Zenocrate*: As looks the Sun through Nilus flowing stream,
> Or when the Morning holds him in her arms,
> So looks my lordly love, fair Tamburlaine! (Marlowe, *1Tamb*. 3.2.57-59)

Marlowe uses the Nilus waters as a lens. Unusual to discover in this pretelescopic era, the stream waters are seen to refract light from the morning Sun, like the rebounding rays in Nashe's *Choice of Valentines* (200–202), casting the light across the water almost as a spectroscope would.

Shakespeare

> the all-cheering sun
> Should in the farthest east begin to draw
> The shady curtains from Aurora's bed … (*RJ* 1.1.132-134)

Two related sunrise allusions, one in *Romeo and Juliet*, the other in *Faerie Queene*, precursor entwines a "happy earth" to Tennyson's *Ulysses* (72) during which "It may be we shall touch the Happy Isles, …"

> The grey-eyed morn smiles on the frowning night,
> Check'ring the eastern clouds with streaks of light;
> And fleckel'd darkness like a drunkard reels
> From forth day's path and Titan's fiery wheels. (*RJ* 2.3.1-2)

In painting a picture of a partly cloudy summer morning, Montague invokes the first "sunrise" reference in *Romeo and Juliet*, describing how the "all-cheering sun" evaporates the morning dew. However, as the narrative moves forward these references darken; the "all-cheering sun" evolves to Friar Lawrences threatening "grey-eyed morn":

> The Day begins to break, and night is fled
> Whose pitchy mantle over-veil'd the earth,
> Here sound retreat and cease our hot pursuit. (*H6.1.2.1-3*)

This progressive darkening does not infect the comedies as much as the tragedies, but it does occur in *I Henry* VI, as well as in *Two Gentlemen of Verona*:

At first I did adore a twinkling star,
But now I worship a celestial sun. (*TGV* 2.6.9-10)

Proteus worships not "the Sun" which provides heat and light to our world, but "a celestial Sun," again one of the infinite numbers of "suns" posited by Thomas Digges in his "Perfect Description." The couplet also suggests that every one of these infinite twinkling stars is actually a sun.

The sun begins to gild the western sky,
And now it is about the very hour … (*TGV* 5.1.1-2)

Another of the many powerful sunset references in Shakespeare; "gild" (describes an ominous color change in the sky as the Sun descends).

Sidney

By what eclipse shall that Sun be defaced
What mine hath erst thrown down so fair a tower? (*OA 2. Histor*. 95–96)

If Sidney wrote this passage in 1580, then he possibly was recalling the 15 February (OS) 1579 partial solar eclipse.

What sacrilege hath such a saint defaced? (*OA* 2.95-97)

This was a possible reference to the partial solar eclipse visible from London near sunset on 19 April 1585 (OS), or more likely a stronger partial eclipse visible during the morning hours of 21 July 1590 (OS). Sidney's notion is that the Sun itself is "defaced" by the Moon during a solar eclipse; it is, as anyone who has witnessed an advancing Moon obliterating sunspots can attest.

Towards Aurora's court a nymph doth dwell, … (*A&S* 37.5)

This painting of Stella dwelling in the court of dawn and sunrise turns a mundane image into something extraordinary in which Stella dwells in majesty.

Soul's joy, bend not those morning stars from me … (*A&S* (1591) 48.1)

Here, Stella lives in a state of passion. Her "soul's joy" seems defined as a predawn sky whose "morning stars" need to be seen as they are.

The shading woods seem now my sun to dark,
And stately hills disdain to look so low. (Sidney, *Sonnet* 18, 7–8)

Sidney's astronomical references include this one to the setting sun. Unlike those of Spenser and Shakespeare, and other writers of this period, Sidney's references tend to be personal: "my sun" instead of "the sun."

Thus to my sun do I yield, such looks her beams do afford me. (*OA* First Eclogues 133)
But now the stars with their strange course do bind
Me one to leave… (*Sonnet* 20, 5–6)

Sidney intends an astrological inference here; the sphere of stars binds "me" to leave a portion of his life.

"And so behind foul clouds of fair stars do lie hidden." (Sidney, *OA* 1.154)

The permanence of the stars, as separate bodies far from the atmosphere, is acknowledged. It is often not obvious that the sky consists of both temporary "foul clouds" and permanent "fair stars."

> If sunny beams shame heav'nly habitation … (*OA* 2.22)

Not only do the stars shine despite clouds, but also, Sidney points out, they do exist during daylight. The Sun's intrinsic brightness blocks our view only of the stars; the stars are in the sky during daylight.

> Is she in rage? So is the sun in summer hot,
> Yet harvest brings. Does she, alas, absent herself?
> The sun is hid; his kindly shadows cumber not,
> But when to give some grace she doth content herself,
> O then it shines; then are the heavens distributed,
> And Venus seems, to make up her, she spent herself. (*OA* 2.61-66)

Dorus speaks of the Sun as male when it is "encumbered" behind clouds, but female when it shines brightly and unencumbered. Venus, hermaphroditic and able to assume either a male or female gender, follows the Sun in the evening sky. Venus was an "evening star" during the summer and fall of 1578. It is the permanence of the distant stars that apparently drives Sidney's thinking in this passage.

> O if I had a ladder for the skies,
> I would climb up, and bring a pretty star
> To wear upon her neck that open lies. (*OA* 2.16-18)

Preminiscient of haiku, these three lines show a Donnean passion that merges an allusion to biblical story of Jacob's ladder with the fun of comparing a star with a precious stone. The thought evolves further in:

> Erona die? O heaven, (if heav'n there be)
> Have all thy whirling course no small effect?
> See all thy starry eyes this shame to see? (*OA* 2.59-62)

Sidney apparently blends a modern definition of heaven with an old query from judicial astrology, inquiring if the course of stars does not have some influence.

> She comes, and straight therewith her shining twins do move
> Their rays to me …
> She comes, with light and warmth, which like Aurora prove
> Of gentle force … (*A&S* (1591) i.76.1-2, 5-6)

The "shining twins" are part of the constellation of Gemini, rising near dawn in late summer; I wonder if Sidney did not actually see that pattern one late August or early September morning. Like Juliet, Stella is portrayed as the dawn and the sunrise.

> O Mercury, foregoer to the evening,
> O heav'nly huntress of the savage mountains,
> O lovely star, entitled of the morning,
> While that my voice doth fill those woeful valleys … (*OA* 4.7-10)

Mercury was visible several times during the late sixteenth century, as Sidney was building *Arcadia.* To list just a few favorable appearances of Mercury, the planet

was easily visible in the evening sky in July 1570, August 1575, July 1576, and August 1581; favorable morning sky appearances include January and December 1570, April 1571, March 1572, March 1573, February 1574, and April 1578. (Mercury Chaser's Calculator).

> Since thou from me (oh me) O sun didst pass.
> Therefore esteeming all good blessings toys,
> I joy in grief, and do detest all joys. (*OA* 4.98-100)

This final line is a self-referential pun that cannot be correct; if Klaius really disowns all joy, how can he accept a joy in grief? Once again, his personal Sun has passed from him.

> Now was our heav'nly vault deprived of the light
> With sun's depart, and now the darkness of the night
> Did light those beamy stars which greater light did dark. (*OA* 4.2.1-3)

A poetic description of twilight; Sidney notes how the night has its own surreal form of lighting. A combination of starlight and "airglow" (scattered sunlight on dust or water particles in the atmosphere) casts a dim glow over the darkened landscape.

Spenser

> After long stormes and tempests ouerblowne,
> The sunne at length his ioyous face doth clere: (*FQ* 5.3.1.1-2)

As an optimistic way of starting a new canto, few meteorological phenomena are as encouraging as a clearing sky at the end of a series of "long stormes." Similarly, Forimell after her sorrows, can "tast of ioy." (5.3.1.9)

> By this the drouping day-light gan to fade,
> And yield his roome to sad succeeding night,
> Who with her sable mantle gan top shade
> The face of earth … (*FQ* (1590) 1.11.49.5-8)

Spenser's allusive description of twilight ushering a "sad" night is typical of a central theme of light vs. dark and day vs. night in *Faerie Queene.*

> But first him seemed fit, that wounded Knight
> To visite, after this night's perilous passe, … (*FQ* (1596) 6.3.14.1-2)

After his injurious night, the wounded knight looks forward to better times as he enjoys his Lady's visit.

> There by th'vncertaine glims of starry night … (*FQ* 6.8.48.1)

Vision seems hindered because the only light, besides the fire under the altar (Hamilton, 680), is that from the sky.

> His onely daughter, and his onely heyre …
> As bright as doth the morning starre appeare
> Out of the East, with flaming lockes bedight … (*FQ* (1590) 1.11.21.1.4-6)

Una appears as bright as Venus. The "flaming lockes" could imply the Comet of 1580, whose "flaming lockes" of tail rivaled Venus in brightness. One of the

comet's discoverers, Michael Moestlin of Batang, Indonesia, claimed that the comet was round and that it was brighter than Venus (Kronk, 8).

> In widest Ocean she her throne does reare
> That ouer all the earth it may be seene;
> As morning Sunne her beams dispredden cleare… (*FQ* (1590) 2.2.6-8)

One of Spenser's frequent allusions to sunrise over the ocean masks a tribute to Queen Elizabeth.

> And her embracing said, O happie earth,
> Whereon thy innocent feet doe euer tread,
> Most virtuous virgin borne of heauenly berth … (*FQ* (1590) 1.10.9.1-3)

F. Haloes, Parhelia, and Parselenae

Shakespeare

In *3 Henry 6* Edward cries out,

> Dazzle mine eyes, or do I see three suns? Richard agrees:
> Three glorious suns, each one a perfect sun,
> Not separated with the racking clouds,
> But sever'd on a pale clear-shining sky … (*3H6* 2.1.26-30)

As Richard builds an argument designed to predict a victory via a celestial event, he invokes a genuine atmospheric effect known as a parhelion, where a bright circular glow, or mock sun, brightens a portion of a solar halo or ring around the Sun. The description is consistent with the early morning setting when ice crystals in high clouds refract light in the upper atmosphere. What is seen ranges from a circular halo to a complex of light patterns, including parhelia or mock suns which can rival the true sun in brightness. Richard goes on to attach a judicial astrological portent: "In this, the heaven figures some event."

Also as Richard explains, these effects dissipate as the Sun rises higher in the sky:

> See, see they join, embrace, and seem to kiss,
> As if they vow'd some league inviolable. (*3Hen.VI* 2.1.29-30)

In this interpretation of Richard's lines, this particular halo is as much a spiritual as a scientific event; just as a halo is an effect of a partially clouded sky in motion; it also presages the joining of a couple in love.

I Henry VI works from night to the end of night, as if celestial objects themselves starred in it. The "Comets branding their tails" image returns, two scenes later, a comet "of revenge" as "a prophet to the fall of all our foes!" (3.2.30-31)

> My lord, they say five moons were seen to-night;
> Four fixed, and the fifth did whirl about the other four in wondrous motion. (*KJ* 4.2.182-184)

Holinshed's report may have inspired Shakespeare to use it: "There were seene in the province of Yorke five moons, one in the east, the second in the west, the third in the north, the fourth in the south, and the fifth as it were set in the middest of the other, having manie stars about it." (Bullough, IV, 29) In his notes on *King John*, Irving Ribner (623) records that the allusion to "five moons is a type of natural phenomenon believed to herald disaster to a kingdom." This explanation may be accurate, but the metaphor is based on a complex aerial phenomenon called a lunar halo. It is rare but possible for such a halo to produce as many as four moon parselenae. The arrangement in the sky involves two "mock moons," one on either side of the real moon, plus one above and a fourth below it, all interconnected in a bright halo that forms a perfect circle around the true Moon. Using this explanation, it is possible to imagine the lunar haloes hiding a fifth Moon whirling about the other four along the "highway" of halo light, helped along by a vivid imagination. The entire allusion functions as an astrological portent.

The Moon's light pales as it rises and sets: "To pluck bright honour from the pale-faced moon" (*IH4*.1.3.202) has similar meaning, unless Shakespeare intends a lunar eclipse, during which the full Moon's reddish glow is also pale.

Sidney

> This small light the moon bestows
> Serves thy beams but to disclose … (*A&S* (1591) 4th song 19–20)

Unless the Moon is near its full phase, the light it "bestows" is small indeed, but a tiny fraction of the light emitted by the Sun.

> With how sad steps, O moon, thou climbest the skies,
> How silently, and with how wan a face
> ……
> O moon, tell me,
> Is constant love deemed there but want of wit? (*A&S* (1591) 31.1, 9-10)

The Moon "silently" climbs the sky in a dance that has not changed over the centuries between Sidney's time and that of Thomas Hardy, who wrote "At a Lunar Eclipse" after viewing one in London in the spring of 1903. Sidney's Astrophil inquires of the Moon about love, and about lovers there and here.

Spenser

> Thence, to the Circle of the Moone she clambe … (*FQ* (1609) 7.6.8.1)

Phaeton's climb into the heavens travels at least to the Moon's sphere, if not the higher spheres of the planets and fixed stars.

> Eftsoones the sonne of Maia forth he sent
> Downe to the Circle of the Moone … (*FQ* (1609) 7.6.16.1-2)

Mercury, the son of Maia (Hamilton, 717) worked his way *down* to the Moon's sphere to meet Phaeton who worked *up* to it.

> Vpoon her thigh her cemitaire was tide … (*FQ* (1596) 5.5.3.4)

In celebrating a joining of body art and poetry, this passage likens "cemitaire" (a curved scimitar to a crescent Moon) (Hamilton, 558).

The trumpets sound, and they together run
With greedy rage, and with their faulchins smot … (*FQ* (1596) 5.12.29.2)

G. Meteors

Bacon

> We have high towers, the highest about half a mile in height, and some of them likewise set upon high mountains, so that the vantage of the hill with the tower is in the highest of them three miles at least. And these places we call the upper region, account the air between the high places and the low as a middle region. We use these towers, according to their several heights and situations, for insulation, refrigeration, conservation, and for the view of divers meteors – as winds, rain, snow, hail, and some of the fiery meteors also. And upon them in some places are dwellings of hermits, whom we visit sometimes and instruct what to observe. (Bacon, *The New Atlantis*, 32)

This story considers the earliest voyages to America. Proposing that science, in the early modern period, can lead to a more evolved, Utopian society, Bacon offers a collection of towers, one of whose specific uses is to observe the night sky with "the fiery meteors also." In the pre-telescopic era, meteors were a prime observing target.

Chapman

The sun still gracing us; when now (the air
Inflamed with meteors) we discovered fair
  The skipping Goat; the Horse's flaming mane;
  Bearded and trained comets, stars in wane;
The burning sword …
  And all else meteors, that did ill abode … (Chapman *The Tears of Peace*)

Chapman's superb address to the whimsy of time specifically mentions two kinds of comets, "bearded" and "trained," indicating his understanding of the different types of comets that have graced the sky over time, some of which he had the opportunity to view during his lifetime. "Stars in wane" appears to acknowledge that when a new star appears, it is always at its brightest at first, and then always begins to wane. Chapman's eloquent allusions to the constellations of Capricornus the goat and Pegasus the horse are surrounded by meteor showers that appear to emanate from these constellations – the Capricornids of early July, The Pegasids of early July, and the Orionids of late October (Edberg and Levy, 219).

Marlowe

My sword struck fire from his coat of steel,
Even in Bithynia, where I took this Turk –
As when a fiery exhalation
Wraps in the bowels of a freezing cloud,
Fighting for passage, makes the welkin crack,
And casts a flash of lightning to the earth. (*I Tamb.* 4.2.40-45)

The "exhalation" is a comet or a meteor; probably a meteor as it is compared with lightning; in fact a "flash of lightning" is the only evidence offered for the existence

of this particular meteor. The passage also suggests a cold time of year, as the meteor apparently struggles to pass out of a "freezing cloud." The meteor is personified as "fighting for passage" through the freezing cloud; all we see of it is the explosive flash as it breaks apart. On the morning of 18 November 1997, I witnessed a single, brilliant flash that appeared in a sky covered with thin cirrus clouds. Because the clouds were hardly thick enough to produce lightning, I concluded that the flash was probably the result of a bolide, or exploding meteor, from the Leonid shower that was active that night.

> … so shall our swords, our lances, and our shot
> Fill all the air with fiery meteors:
> Then when the sky shall wax as red as blood,
> It shall be said I made it red myself,
> To make me think of nought but blood and war. (*I Tamb*. 4.2.51-55)

Tamburlaine takes credit for producing a storm of meteors to focus his thoughts to fiercer battle. I do not recall any meteor shower turning the whole sky red, though haze, dust, volcanic ash, or a display of the aurora borealis could make the phenomenon theoretically possible.

> In silence of thy solemn evening's walk,
> Making the mantle of the richest night,
> The moon, the planets, and the meteors, light
> There angels in their crystal armors fight
> A doubtful battle … (*I Tamb.* 5.1.146-150)

As *I Tamburlaine* closes, a quiet walk under the stars reveals light from the moon, planets, and meteors, all camouflaging a great and losing "doubtful" battle for Egypt.

> A meteor that might terrify the earth
> And make it quake at every drop it drinks … (*I Tamb*. 5.1.462-463)

This particular meteor allusion is puzzling. Even at the close of a play rich in great battles, Marlowe could have no conception of the idea of a fireball so brilliant that it would "terrify the earth and make it quake." It could evoke the great falling of a star in *Revelations 9.1*. This possible allusion precedes by more than a century Georges Cuvier's theory of catastrophic events having shaped the course of Earth and precedes by almost four centuries the discovery that great objects, like the comet or asteroid that struck the Earth 65 million years ago, have indeed tumbled from the sky in Earth's remote past.

> … kindle heaps of exhalations,
> That bring fiery meteors may presage
> Death and destruction to th' inhabitants!
> Over my zenith hang a blazing star,
> That may endure till heaven be dissolv'd … (*2Tamb.* 3.2.3-7)

These lines convey another apocalyptic suggestion, with both meteors and a comet hanging permanently over the zenith. Note also Tamburlaine's personal use of "my" zenith (cf. Sidney) rather than "the" zenith, as if the "blazing star" is a fleecy

cloud not far above the observer; the object hanging there is closer than the fixed stars, so that someone standing miles away would presumably not see the object directly overhead.

Mary Sidney

> The *Comets* flaming through the scat'red clouds
> With fiery beams, most like unbroaded haires: (*Antonie* 301–302)

Mary Sidney's metaphor represents the quick passages of meteors, rather than the sedate crossing of comets. The allusion is astrological, i.e., "by signes in earth, by signes in starry spheres …" (298)

Shakespeare

> Brutus: The exhalations, whizzing in the air,
> Give so much light that I may read by them. (*JC* 2.1.44-45)

These lines are part of an extended metaphor where various aspects of the night sky add to the conspiracy against Caesar, much like

> Look, how a bright star shooteth from the sky, (*VA* 815)

Brutus's exhalations are meteors, but there are also Calpurnia's comets:

> "*Calpurnia:* When beggars die there are no comets seen;
> The heavens themselves blaze forth the death of princes." (*JC* 2.2.30-31)

Near the close of Henry VIII, the porter and his man share a tale of how the man involved in a fight missed the meteor (actually a flaming brazier):

> I miss'd the meteor once, and hit that woman … (*H8* 5.4.49-50)

H. Nonspecific Astrological References

Shakespeare

> Caesar: But I am constant as the northern star,
> Of whose true-fixed and resting quality
> There is no fellow in the firmament. (*JC* 3.1.50-52)

Ignoring the presages of the night that just ended, Caesar likens himself to the constancy of the northern star. Although it was much in its same position in the sky at the time of the writing of *Julius Caesar* as it is now, the North Star sank closer to the northern horizon in 44 BCE and was not the "north star" during the time of action set in this play. In 44 BCE, it circled the pole more widely, which allowed much of the Southern Cross to be visible from the latitude of Rome, a sight quite invisible in Shakespeare's time, and in ours.

> A calendar, a calendar! Look in the almanack; find out moonshine, find out moonshine.
> *Quin.* Yes, it did shine that night.
> *Bot.* Why, you may then leave a casement of the great chamber window, where we play, open: and the moon may shine in at the casement. (*MSD* 2.2.44-50)

In raising the intricacies of the calendar, this exchange treads lightly upon one of the great English debates of the time: should the nation switch, as the rest of Europe did following Pope Gregory XIII's order in 1582, or stay with the older Julian calendar? The change, which involves a loss of 11 days, actually was not approved in England until 1752.

> O brave new world, that hath such people in't! (*Tempest* 5.1.183-184)

Miranda's triumphant announcement of a brave new world climaxes her story on the island; finally enjoying vision for the first time, Miranda's first view is optimistic (in contrast to the mournful and sadistic attestation of a hanging that ends Aldous Huxley's *Brave New World*.) (Partly to celebrate Miranda's awakening at the end of *The Tempest*, I named my 16-in.-diameter comet discovery telescope Miranda when I relocted to Tucson, Arizona, in 1979.)

> I never saw
> The heavens so dim by day. (*TN* 3.3.55-56)

This was probably a reference to an anomalously stormy day, unless Shakespeare recalled the darkness of the solar eclipse of 14 December 1601 (OS), or the near-total solar eclipse of 27 February 1598 (OS).

> To solemnize this day the glorious sun
> Stays in his course and plays the alchemist,
> Turning with splendour of his precious eye
> At the meager cloddy earth to glittering gold,
> The yearly course that brings this day about
> Shall never see it but a holiday. (*KJ* 3.1.77-82)

This interruption in the action is probably a reference to the winter solstice.

> To pluck bright honour from the pale-fac'd moon … (*1HIV* 1.3.20)

The descriptor "pale-faced" infers a hazy Moon near the horizon, or less likely a lunar eclipse.

> *Timon*: O blessed, breeding sun, draw from the earth
> Rotten humidity! (*TA* 4.2.1-2)

Timon emerges from his cave long enough to feel a breath-stopping humid English summer day.

> The sun's a thief, and with his great attraction
> Robs the vast sea; the moon's an arrant thief,
> And her pale fire she snatches from the sun … (*TA* 4.3.435-436)

Postscript

The relationship between literature and science is a new and increasingly robust field of enquiry. As part of my research, in the spring of 2004, I offered a course in astronomy and literature at Arizona State University where, for one semester, I worked closely with a group of undergraduate students studying ideas in this field. The course was called "From Shakespeare to Space" and took a broad look at how different writers used the ideas of astronomy. For example, did Shakespeare have specific celestial events in mind when he wrote *King Lear*? Was Vincent Van Gogh's *Starry Night* inspired by a scientific observation of a distant galaxy? This course explored the union of two of the most basic areas of study that a university can offer in the arts and the sciences through a discussion of specific instances in astronomy and literature. The course also included seminar presentations by each student. I was impressed at how adept these students were in linking their own studies to discrete arenas in English Literature. By bringing together the arts and sciences, this course tried to inspire its students to see "the big picture" in planning their future, whether that future is to be in arts, science, or in teaching young children to live in our complex world.

The course I gave helped to inspire my students to probe more deeply into the broader interpretations that are possible when English Literature is related to some other field, particularly a scientific one. Astronomy is a broad field, but the night sky subset is narrow enough to provide a benchmark to focus these interpretations. At the undergraduate level, I encouraged my students to let their minds wander, focusing as far afield as the Victorian and modern periods. The frequent references to the Moon in *Jane Eyre*, as well as similar references in Tolkien's *The Two Towers*, provided a good sense of thematically relevant coloring to those narratives. Most students chose a specific period of literature on which to prepare a seminar, although some students went even farther afield, relating the literature to painting and music.

This course was complemented by a public lecture I gave as part of my role as John Rhodes Chair in Public Policy and American Institutions at ASU. My topic, "Space Policy and America's Future: Igniting the Imagination" was designed to show how literature relates to scientific endeavors like the night sky, and even to space travel. The lecture was structured to show that, as the United States pondered

its future in space after the loss of the space shuttle Columbia in 2003, it would be advantageous to take a broad view of what typical Americans are interested in. The result of that process was the beginning of the Constellation program to retire the space shuttle completely by 2010, and replace it with fresh vehicles and rockets designed to return humans to the Moon and to send them further into space. More recently, that plan was amended; now the United States hopes to visit an asteroid as it flies past Earth.

The dream of going to visit other worlds lies deep in human literary history. It takes us back in time to the ideas expressed by writers and scientists dating at least as far back as Lucretius, whose *De Rerum Natura* was a guide to how the natural world works, and an anthem on why it is important to explore that world. In the world of politics, that means a physical exploration, using vehicles and other technology to whisk humans from the Earth to the Moon to Mars. But there are other ways to conduct that explorative journey.

In 1970, as an undergraduate at Acadia University, I was inspired by Roger Lewis to seek out a connection between the night sky and poetry through an essay "Elements of Science in Tennyson's *In Memoriam*." Years later, Norman MacKenzie, at Queens University, directed me to Gerard Manley Hopkins's small poem about a comet that formed the basis of my Master's thesis *The Starlight Night: Hopkins and Astronomy*. This current project has expanded those earlier studies to include a broader array of English authors from the premodern era. While *In Memoriam* directs us specifically to the discovery of Neptune and to the then-popular nebular hypothesis of the formation of our solar system, generally the allusions in the early modern period are less specific.

I began this journey in a spirit of learning and fun, with the obvious references to "these late eclipses" of the Moon and Sun in 1605. I quickly found a confirming letter from King James to his close friend and advisor, Sir Robert Cecil, in which he playfully discussed the effects of the eclipse as seen in England. King James had a serious policy against the practice of astrology. The Stuart King also presided over two of the most important books ever published in the English language, the translation of the Bible into English in 1611, and the First Folio edition of Shakespeare's works in 1623. In a sense, these two books testified to the emergence of England's leadership in the arts and in religion that cemented the nation as a global power.

I shared these ideas as a guest lecturer in astronomy and literature at other universities, notably Southern Illinois University at Carbondale, Mount Allison in Canada, and at a return visit to Acadia University. Those three institutions afforded me the opportunity to share my passion for literature and the night sky with students who were just starting their own career paths. Those lectures differed in some fundamental respects. At SIUC, I interacted with students through their honors program, tried to connect literature and the night sky in the early modern period to the areas in which they were interested. At Mount Allison and at Acadia, where the students were specifically studying science and literature, I brought my perspective to them. In this context, I admit that this perspective was more per-

sonal than scholarly, and it did trace my early attempts at a union of literature and astronomy.

Teaching literature and astronomy is not about teaching the canon, any more than it is about teaching the cosmos. While this book has concentrated on night sky observation rather than the changing aspects of astronomical theory, future courses may not always have that luxury. At the undergraduate level, a course in astronomy and literature needs to inspire, inform, and critique at the same time: Inspire, because some students will be unsure of what they need or want in a college curriculum; inform, because any literature course must provide sufficient information about the works covered to allow the student to emerge with a clearer understanding of the authors' intent; and critique, to train the student to delve more deeply into the works, to find parallels with other works, and to develop an appreciation of what the author intended.

What makes this period so interesting is not so much the changing theory as much as the intense nature of the observations. The supernova in Cassiopeia was the first one in over five centuries, and the brightest one in recorded history. The comet that followed only 5 years later was one of the brightest ever, and that in turn was followed by other comets and a second supernova in 1604.

The next step was for the students to help determine how these two events were described or alluded to in contemporary literature; for example, Henry More specifically mentioned SN 1572:

> The famous Star nail'd down in Cassiopee,
> How was it hammer'd in your solid sky? (More, *Immortality of the Soul*. 49.1-2)
> … and later, a reference to both the 1572 and 1604 supernovae, and as many comets:
> Witness ye Heavens if what I say's not true,
> Ye flaming Comets wandering on high,
> And new fixt starres found in that Circle blue,
> The one espide in glittering Cassiopee,
> The other near to Ophiuchus thigh.
> Both bigger than the biggest starres that are,
> And yet as farre remov'd from mortall eye,
> As are the furthest, for those Arts declare
> Unto whose reaching sigh Heavens mysteries lie bare. (More, *The Infinity of Worlds* 77.1-9)

Published in 1647, these lines can be seen as a door that opens the world of the night sky. They emphasize that these new stars were "bigger" (meaning brighter) than all the other stars normally seen in the sky. These two passages from a work taken some decades past my major field of interest are useful because they were written by an author who could view the early modern period with a little hindsight. They are designed to stimulate discussion, with a view to open a window of dialog that allows for different thoughts about the role that the new stars and comets were fulfilling in the literature of the time a few decades prior. I chose that passage because its direct reference to the star in Cassiopeia harks back to Nashe, who also referred to it directly in *Saffron Walden*, and to Ben Jonson who reminds his audience of the "new star" or second supernova in *Volpone* (2.1.51). The parade of new comets found voice throughout several of Shakespeare's plays, including *I Henry VI* and *Julius Caesar.* Ultimately, these references support my larger point that literature

does not exist in a vacuum; it is supported and improved by its inclusion of content from other fields of endeavor. I focused on the early modern period and its relation to the sky, simply because some of those who wrote during that period were familiar with that sky.

As stated in the Preface, I began this research because I felt that as vast and striking as our current sky remains, it isn't enough for me. I wanted to enjoy a second sky whose stars, planets, and comets existed in a far-off place and time. What better choice than the sky seen by Shakespeare and his contemporaries? The fact that Shakespeare's works contain more celestial allusions than all the other writers of the time put together might go back to his roots in rural Stratford-upon-Avon, where the night sky was unblemished by the polluted air over London; even without lights, the sky in the big city would have been diminished by dust and smoke. Especially today, the increase in light pollution is hurting our ability to appreciate the night sky we have. Going back to this earlier and simpler time allows us to value the nature of the sky that was available to the writers of the early modern era.

On a personal level, this book is intended to provide a new and different direction for people who appreciate English Literature. It remains my concluding wish that this work will help inspire future students to use their knowledge of different fields to improve humanity's understanding of what these writers wished to convey, and their efforts to connect the universe in which they lived to the passion inspired by the literature they created.

Bibliography

Akrigg, G.P. Ed. *Letters of King James VI and I*. Berkeley: University of California Press, 1984.

Albanese, Denise. *New Science: New World*. Durham: Duke University Press, 1996.

Allen, Don Cameron. *The Star-crossed Renaissance: The Quarrel About Astrology and Its Influence in England*. 1941. New York: Octagon Books, 1973.

Allen, Richard Hinckley. *Star-Names and Their Meanings*. 1899. New York: Dover, 1963.

Aston, Margaret E. "The Fiery Trigon Conjunction: An Elizabethan Astrological Prediction," *Isis* 61, 2 (1970): 158–187.

Bacon, Francis. *The Advancement of Learning*. 1605. Philadelphia: Paul Dry Books, 2001.

Bacon, Francis. *New Atlantis*. 1626. Los Angeles: Philosophical Research Society, 1985.

Bainbridge, John. *An Astronomical Description of the Late Comet from the 18 of Novemb. 1618 to the 16 of December Following*. London, 1619.

Bertram, Paul. *Shakespeare and the Two Noble Kinsmen*. New Brunswick, New Jersey: Rutgers University Press, 1965, 244.

Bible World History Timeline. 23 March 2006. Timeline. http://agards-bible-timeline.com/bible_study_aid_12BC.

Bourne, William. Inuentions or Deuices (London: 1590?), 92, 177.

Bradley, A.C. *Shakespearean Tragedy*. 1904. 2nd ed. London: Macmillan, 1964.

Brahe, Tycho. *Epistolae*. Hven, Denmark, 1596.

Brahe, Tycho. *Astronomiae instauratae progymnasmata*. Prague, 1602.

Brahe, Tycho. *Epistolarum astronomicarum libri*. Uraniburgi, 1596.

Brahe, Tycho. *Learned Tico Brahe His Astronomicall Cometur of the New and Much Admired * Which Appeared in the Year 1572*. London: M. and S. Nealand, 1632.

Bronte, Charlotte. *Jane Eyre*. 1847. Toronto: Rinehart, 1958.

Bruce, Susan. *William Shakespeare: King Lear*. New York: Columbia University Press, 1998.

Buchanan, Roberdeau. *The Mathematical Theory of Eclipses*. Washington: Library of Congress, 1904.

Bullough, Geoffrey. Ed. *Narrative and Dramatic Sources of Shakespeare*. London: Routledge and Kegan Paul, 1957–73.

Burgess, Anthony. *Shakespeare*. 1970. New York: Penguin, 1972.

Burton, Robert. *Anatomy of Melancholy*. London: Everyman's Library, 1621.

Byse, Fanny. *Milton on the Continent: A Key to L'Allegro and Il Penseroso*. Folcroft, PA: The Folcroft, 1903, 1969.

Casaubon, Meric. Ed. *A True and Faithful Relation of What Passed for Many Years Between Dr. John Dee and Some Spirits...* London: D. Maxwell, 1659.

Chapman, Allan. "Thomas Harriot: The First Telescopic Astronomer," *Journal of the British Astronomical Association* 118, 6 (2008): 315–325; cf. *Astronomy and Geophysics* 50, 1 (2009): 1.27–1.33.

Christianson, John Robert. *On Tycho's Island: Tycho Brahe and His Assistants, 1570–1601*. Cambridge: Cambridge University Press, 2000.

Clark, Cumberland. *Shakespeare and Science*. 1929. Honolulu: University Press of the Pacific, 2005.
Clark, Cumberland. *Astronomy in the Poets*. Folcroft, PA: Folcroft Press, 1969.
Clark, David H., and F. Richard Stephenson. *The Historical Supernovae*. Oxford: Pergamon Press, 1977.
Dade, John. *An Almanacke and Prognostication in Which This Yeere of Our Lord God...* 1605 ed. London, 1605.
Dade. *Almanacke 1605*. London, 1604.
Danby, John. *Shakespeare's Doctrine of Nature: A Study of King Lear*. London: Faber and Faber, 1948.
Davies, Sir John. *Orchestra, or A Poem of Dancing*. Ed. Eustace M.W. Tillyard. London: Chatto and Windus, 1947, 27.
de Santillana, Giorgio. *The Crime of Galileo*. 1955. Chicago: University of Chicago Press, 1976.
Deacon, Richard. *John Dee: Scientist, Geographer, and Secret Agent to Elizabeth I*. London: Frederick Muller, 1968.
Dee, John. *Asterismo,caelitus demissa ad orbem que Veneris: Iterumque in Caeli penetralia perpendiculariter retracta, post decimum fextum fuae apparitionis mensem.* In A Letter, Nine years since, written and first published 1604.
Dee, John. Ed. *The Elements of Geometrie of the Most Ancient Philosopher Euclide of Megara. With a very fruitful Preface by M. J. Dee*. London: H. Billingsley, 1570.
Dee, John. *De Stella admirada, in Cassiopeae Asterismo,caelitus demissa ad orbem que Veneris: Iterumque in Caeli penetralia perpendiculariter retracta, post decimum fextum fuae apparitionis mensem Anno 1572*. London, 1572.
Dee, John. *The Private Diary of John Dee*. 1581 August 26. http://www.gutenberg.org/etext/19553.
Devereux, E.J. "Review," *Renaissance Quarterly* 21, 1 (1968): 89–91.
Digges, Thomas A. *Perfit Description of the Celestiall Orbes According to the Most Aunciente Doctrine of the Pythagoreans, Lastly Renewed by Copernicus and by Geometrical Demonstrations Approved*. London: 1576.
Digges, Thomas. *Pantometria*. London: Henrie, 1571, 27.
Digges, Thomas. *Stratioticos*. London: Henry Bynneman, 1579, 359.
Donne, John, "The First Anniversary," (lines 205–218). *The Complete Poetry of John Donne*. Ed. J.T. Shawcross. Garden City: Anchor Books, 1967.
Drake, S., trans. *Discoveries and Opinions of Galileo*. New York: Anchor, 1957, 51–53, 93.
Drake, Stillman. *Essays on Galileo and the History and Philosophy of Science*, Vol. 1. Toronto: University of Toronto Press, 1999.
Draper, J.W. "Shakespeare's Star-Crossed Lovers," *Review of English Studies* 15 (1939): 20.
Dreyer, John L.E. *Tycho Brahe: A Picture of Scientific Life and Work in the Sixteenth Century*. Edinburgh, 1890.
Edberg, S. and Levy, D. *Observing Comets, Asteroids, Meteors, and the Zodiacal Light*. Cambridge: Cambridge University Press, 1994.
Eisler, Robert. *The Royal Art of Astrology*. London: Herbert Joseph Limited, 1946.
Ellis, Oliver. *Shakespeare as a Scientist; His Philosophical Background*. Folcroft, PA: Folcroft Press, 1970.
Espenak, Fred. Eclipse Home Page. http://sunearth.gsfc.nasa.gov/eclipse/eclipse.html.
Evans, Mary Anne (a.k.a. George Eliot), *Middlemarch*. 1871. Cambridge: Riverside Press, 1956.
Falconer, Alexander Frederick. *Shakespeare and the Sea*. New York: F. Ungar, 1964.
Fantoli, Annibale, and George V. Coyne. *Galileo: For Copernicanism and for the Church*. 2nd ed. Rome: Vatican Observatory Foundation, 1996.
Fitzgeoffrey, Charles. *Sir Francis Drake His Honorable Life's Commendation, and His Tragical Deaths Lamentation*. London, 1596.
Fleming, Abraham. *A Bright Burning Beacon, Forewarning All Wise Virgins to Trim Their Lamps Against the Coming of the Bridegroom*. London, 1580.
Foakes, R.A. Ed. *King Lear*. Erhardt: Arden Shakespeare, 1997.

Furness, Horace Howard. Ed. *King Lear: The New Variorum Edition*. 1908. Toronto: Dover, 2000.
Garin, Eugenio, *Astrology in the Renaissance: The Zodiac of Life*. Trans. Carolyn Jackson, June Allen, and Clare Robertson. London: Routledge & Kegan Paul, 1983, 67.
Genest, J. *Some Account of the English Stage: From the Restoration in 1660 to 1830*. Bath: Carrington, 1832.
Gingerich, Owen. "Great Conjunctions, Tycho, and Shakespeare," *Sky & Telescope* 61 (1981): 393–395.
Gottschalk, Paul A. "The Universe of Madness in King Lear," *Bucknell Review: A Scholarly Journal of Letters, Arts and Science* 19 (1971): 51–68.
Grafton, Richard. *Abridgement of the Chronicles of Englande, Newly Corrected and Augmented to Thys Present Yere of Our Lord 1572*. London: Richard Tottyll, 1562, 1572.
Grant, Edward. *Planets, Stars, and Orbs: The Medieval Cosmos, 1200–1687*. Cambridge: Cambridge University Press, 1994.
Greenblatt, S. *Learning to Curse: Essays in Early Modern Culture*. London: Routledge, 1990.
Greenblatt, S., Cohen, W., Howard, J. En, and Maus, K.E. *The Norton Shakespeare Based on the Oxford Edition*. New York: W.W. Norton, 2005.
Gresham, E. *Strange Fearful and True News, Which Happened at Carlstadt, in the Kingdome of Croatia*. London: G. Vincent and W. Blackwal, 1606.
Grierson, Sir Robert. *The Poems of John Donne*. Ed., Vol. 1. London: Oxford University Press, 1933, 237–238.
Guillory, John. *Poetic Authority: Spenser, Milton, and Literary History*. New York: Columbia University Press, 1983.
Hamilton, A.C. Ed. *Edmund Spenser: The Faerie Queene*. London: Longman, 1977.
Harbage, A. "Dating Shakespeare's Sonnets," *Shakespeare Quarterly* 1, 2 (1950), 57–63.
Hariot, Thomas. *A Brief and True Report of the New Found Land of Virginia*. London, 1588.
Harrison, G.B. *A Second Jacobean Journal*. Ann Arbor: University of Michigan Press, 1958.
Harrison, G.B. Ed. *A Jacobean Journal, Being a Record of Those Things Most Talked About During the Years 1603–1606*. London: George Routledge and Sons, 1941.
Harrison, G.B., et al. "These Late Eclipses (and Further Letters)," *Times Literary Supplement* [London] 30 November 1933: 856.
Harison, J. *The Summarye of the Chronicles of Englande unto 1604*. London: J. Harison, 1604, 302, 324.
Hartung, J.B. "Was the Formation of a 20-km-Diameter Crater on the Moon Observed on June 18, 1178?" *Meteoritics* 11, 3 (1976): 187–194.
Harvey, John. *A Discoursiue Probleme Concerning Prohecies how Far They Are To Be Valued, or Credited…* London: John Jackson, 1588.
Harvey, Richard. *An Astrological Discourse upon the Great and Notable Conjunction of the Two Superiour Planets, Saturne & Jupiter, Which Happen the 28 Day of April, 1583...* London, 1583.
Heywood, Thomas. *Pleasant Dialogues and Dramas…* London: R Oulton, 1637.
Hogg, Helen Sawyer, "Out of Old Books: The Introduction of the Copernican System to England," *Journal of the Royal Astronomical Society of Canada* 46 (1952), 195–201.
Ibsen, Lawrence. *Galsworthy: Naturalist Drama and Environmental Influences*. Ed. Catherine Cooper. April 2001. http://www.english-literature.org/essays/ibsen.html. 22 May 2004.
Jeayes, Isaac Herbert. Ed. *Letters of Philip Gawdy 1579–1616*. London: J. B. Nicols and Sons, 1906.
Johnson, Francis R. *Astronomical Thought in Renaissance England*. 1941. New York: Octagon Books, 1968.
Johnson, Francis R. "The Influence of Thomas Digges on the Progress of Modern Astronomy in Sixteenth-Century England," *Osiris* 1 (1936): 390–410.
Johnson, Maureen. "'What's in a Name': Astrology and Onomastics in Romeo and Juliet," *Dissertation Abstracts International* 44 (1984): 3072A.
Jonson, Ben. *Volpone*. Dover ed. 1605; rpt. New York: Dover, 1994.

Joyce, James. *Ulysses*. 1922. New York: Penguin, 1968.
Kennedy, Edward. *Astronomy and Astrology in the Medieval Islamic World*. Hants, England: Adershot, 1998.
Kermode, Frank. "King Lear," *The Riverside Shakespeare*. Ed. G. Blakemore Evans. Boston: Houghton Mifflin, 1974.
Kirschbaum, Leo. *The Plays of Christopher Marlowe*. Cleveland: World Publishing, 1962.
Knight, G. Wilson. *The Wheel of Fire: Interpretations of Shakespearian Tragedy*. 1930. London: Methuen, 1972.
Kronk, Gary W. *Comets: A Descriptive Catalog*. Hillside, NJ: Enslow, 1984.
Kronk, Gary W. Comets and Meteor Showers. 08 June 2002 http://www.comets.amsmeteors.org/meteors/showers/leonidancient.html.
Lauaterus, Lewes. *Of Ghosts and Spirits Walking by Night*. London, 1572.
Levine, George. "Darwin and Pain: Why Science Made Shakespeare Nauseating," *Raritan: A Quarterly Review* 15 (1995): 97–114.
Levy, David H. *Starry Night: Astronomers and Poets Read the Sky*. Amherst: Prometheus Books, 2001.
Levy, David H. *Deep Sky Objects: The Best and Brightest from Four Decades of Comet Hunting*. Amherst, NY: Prometheus Books, 2005.
Levy, David H. *Shoemaker by Levy: The Man Who Made an Impact*. Princeton: Princeton University Press, 2000.
MacCaffrey, Isabel K. "Allegory and Pastoral in the Shepheardes Calendar," 1969. *Essential Articles for the Study of Edmund Spenser*. Ed. A.C. Hamilton. Hamden, CT: Archon Books, 1972, 549–568.
MacKenzie, Norman H. Ed. *The Poetical Works of Gerard Manley Hopkins*. Oxford: Clarendon Press, 1990.
MacNeice, Louis. *Astrology*. Garden City, New York: Doubleday, 1964.
Marcus, J. and Olsen, M. "Biological Implications of Organic Compounds in Comets," in *Comets in the Post-Hally-Era*. Ed. R. Newburn. Dordrecht: Kluwer Academic Publishers, 1991.
Marius, Simon. *Mundus Iovialis anno MDCIX Detectus Ope Perspicilli Belgici (Die Welt des Jupiter, 1609 mit dem flämischen Teleskop entdeckt).* Übersetzung; Hrsg. und bearb. von Joachim Schlör. Naturwiss. (von Alois Wilder), 1614.
Masson, David. *The Life of John Milton; Narrated in Connexion with the Political, Eccliastical and Literary History of His Time*. Cambridge: Macmillan, 1859.
McAlinon, T. *Shakespeare's Tragic Cosmos.* Cambridge: Cambridge University Press, 1991.
Meadows, A.J. *The High Firmament: A Survey in Astronomy in English Literature*. Leicester: Leicester University Press, 1969.
Meeus, Jean. *Mathematical Astronomy Morsels*. Richmond: Willmann-Bell, 1997.
Mercury Chaser's Calculator. Ed. John Walker. 2003. http://www.fourmilab.ch/images/3planets/elongation.html. 21 July 2003.
Miller, James L. *Measures of Wisdom: The Cosmic Dance in Classical and Christian Antiquity*. Toronto: University of Toronto Press, 1986, 465.
Mixxe, Adze. *Shakespeare and Astrology*. http://www.adze.com/zine/shakes.html. 23 May 2002.
More, Henry. *Philosophicall Poems*. Cambridge, 1647.
Moss, Jean Ketz. *Novelties in the Heavens: Rhetoric and Science in the Copernican Controversy*. Chicago: Chicago University Press, 1993.
Nashe, Thomas. *The Unfortunate Traveller and Other Works*. London: Penguin, 1972.
Nausea, Friedrich. *A Treatise of Blazing Starres in General*. 1577: rpt. London: Bernard Alsop, 1618.
Nicholl, Charles. *A Cup of News: The Life of Thomas Nashe*. London: Routledge and Kegan Paul, 1984.
Nicolson, Marjorie Hope, "The Discovery of Space." *Medieval and Renaissance Studies*. Ed. O.B. Hardison, Jr. Chapel Hill: University of North Carolina Press, 1966.
Nicolson, Marjorie Hope. *The Breaking of the Circle: Studies in the Effect of the "New Science"_ upon 17th Century Poetry*. Rev. ed. Evanston: University of Chicago Press, 1960.
Nicolson, Marjorie. "Milton and the Telescope," *ELH* 2 (1935): 1–10.

North, John David. *The Fontana History of Astronomy and Cosmology*. n.p., n.d.
Nuttall, A.D. *Shakespeare the Thinker*. New Haven: Yale University Press, 2007.
Olson, Donald W., Marilyn, S. Olson, and Russell L. Doescher. "The Stars of Hamlet," *Sky & Telescope* (November 1998): 68–73.
Parr, Johnstone, and Alfred Harbage, eds. *William Shakespeare: The Complete Works*. The Pelican Shakespeare ed. New York: Viking Press, 1969.
Patterson, W.B. "Review of G. Curzon, Wotton and His Worlds: Spying, Science and Venetian Intrigues," *The Catholic Historical Review* 92, 4 (2006): 677–679.
Piecoski, Frank. *Shakespeare's Astrology*. http://starcats.com/anima/shakespeare.html. 23 May 2002.
Pingre, Alexandre Guy. *Annales Celestes du Dix-Septieme Siecle*. Paris: Gauthier-Villars, 1783, 1901.
Pinsky, Robert, personal communication, 20 March 2006.
Pinsky, Robert. *The Life of David*. New York: Schocken, 2005.
Rabkin, Norman. *Shakespeare and the Problem of Meaning*. Chicago: University of Chicago Press, 1981.
Recorde, Roberte. *The Castle of Knowledge*. London, 1556.
Ribner, Irving. Notes on "The Life and Death of King John," *The Pelican Shakespeare*. New York: Viking Press, 1969, 1977, 623.
Reusche, Harry. "Edmund's Conception and Nativity in King Lear," *Shakespeare Quarterly* 20, 2 (Spring 1969): 161–164.
Robinson, L.J. "A Remarkable Eclipse of the Moon," *Sky & Telescope* 27 (March 1964) 142–146.
Rogers, Janine. "Lover, Poet, or Astronomer: Collecting Stars and Poems with David H. Levy," *Dalhousie Review* 89, 2 (Summer 2009): 155–168.
Roman, Miriam. "L'art et la science de William Shakespeare: Des chiffres et des lettres," *Revue des Lettres Modernes: Histoire des Idees des Litteratures* (1999): 1431–1436.
Roth, Cecil. *The Haggadah: A New Edition*. London: Soncino, 1934.
Rowlands, Samuel. *Humors Ordinarie: Where a Man May Be Verie Merrie, and Exceeding Well used for His Sixe-Pence*. London, 1605.
Russell, John L. *The Copernican System in Great Britain: The Reception of Copernicus' Heliocentric Theory*. Ed. Jerzy Dobrzycki. Dordrecht: D. Reidel, 1972.
Schoenbaum, Samuel. *William Shakespeare: A Compact Documentary Life*. Oxford: Oxford University Press, 1987.
Seneca, L.A. "Qeaestiones Naturales VII," *De Cometis* circa AD 60 XV11, 1.
Shakelton, Francis. *A Blazyng Starre or Burning Beacon, Seene the 10. of October Laste (and Yet Continewyng) Set on Fire by Gods Providence, to Call All Sinners to Earnest and Speedie Repentance*. London: Kyngston for Henry Kirkham, 1580.
Shakespeare, W. *The Complete Works*. London: Collins, 1951, 1964. References to Shakespeare are from this edition.
Shapin, Steven. *A Social History of Truth: Civility and Science in Seventeenth Century England*. Chicago: University of Chicago Press, 1994.
Shapley, Harlow. *Beyond the Observatory*. New York: Scribner's, 1967, 141–150.
Shoemaker, E.M., Hackman, R.J., and Eggleton, R.E. "Interplanetary Correlation of Geologic Time." In *Advances in the Astronautical Sciences*, Vol. 8. New York: Plenum Press, 70–89.
Smith, Logan Piersall. *The Life and Letters of Sir Henry Wotton*. Oxford: Clarendon, 1907.
Smith, W.D. "The Elizabethan Rejection of Judicial Astrology and Shakespeare's Practice," *Shakespeare Quarterly* 9 (1958): 159–176.
Sondheim, Moritz. "Shakespeare and the Astrology of His Time," *Journal of the Warburg and Cortauld Institutes* 2: (1939): 243–259.
Spencer, Jeffry. *Heroic Nature: Ideal Landscape in English Poetry from Marvell to Thomson*. Chicago: Northwestern University Press, 1973.
Spevack, Marvin. *A Complete and Systematic Concordance to the Works of Shakespeare*. Hildesheim: Georg Olms, 1968.

Steane, J.B. *Thomas Nashe: The Unfortunate Traveller and Other Works*. London: Penguin, 1972.
Stoyan, Ronald. *Atlas of the Messier Objects: Highlights of the Deep Sky.* Cambridge, U.K.: Cambridge University Press, 2008.
Stubbs, W. Ed. *Gervasii Cantuariensis Opera Historica: Chronica Gervasii, Rerum Britannicarum Medii Aevi Scriptores*. London, 1879, 73a.
Van Helden, Albert. Ed. *The Galileo Project*. 5 August 1996. Rice University. http://www.es.rice.edu/ES/humsoc/Galileo/Images/Astro/Conceptions/tycho_univ.gif. 23 March 2004.
Thoren, Victor E. *The Lord of Uraniborg: A biography of Tycho Brahe*. Cambridge: Cambridge University Press, 1990.
Tillyard, E.M.W. *The Elizabethan World Picture*. New York: Macmillan, 1944.
United Nations General Assembly, (announcement of International Year of Astronomy) 10863. http://www.un.org/News/Press/docs/2007/ga10683.doc.htm.
Usher, Peter. "Galileo's Telescopy and Jupiter's Tablet," *Bulletin of the American Astronomical Society* 35, 5 (2003): 1258.
Usher, Peter. "Shakespeare's Support for the New Astronomy," *The Oxfordian* 5 (2002): 132–146.
Wade, K., personal communication, 26 March 2006.
Weber, Alan Scott. "Shakespeare's Cosmology." Diss. State U of New York, 1996.
Weis, René. *Shakespeare Unbound: Decoding a Hidden Life*. New York: Henry Holt, 2007.
Whitfield, Peter. *Astrology: A History*. New York: Harry N. Abrams, Inc., 2001.
Woolley, Benjamin. *The Queen's Conjurer: The Science and Magic of Dr. Dee*. London: HarperCollins, 2001.
Yeomans, Donald K. *Comets: A Chronological History of Observation, Science, Myth, and Folklore*. New York: John Wiley, 1991.

Index