



WEBER STATE UNIVERSITY

Lindquist College
of Arts & Humanities

Master of Arts in English

THE CONTEXT OF COPERNICAN ASTRONOMY
WITHIN SHAKESPEARE'S PLAYS:
THE UNDERSTANDING OF THE EARLY MODERN AUDIENCE

by

Michael Todd Handy

A thesis submitted in partial fulfillment
of the requirements for the degree
of

MASTER OF ARTS IN ENGLISH

WEBER STATE UNIVERSITY
Ogden, Utah

1 July 2009

Approved

Donna Cheney

Diane Krantz

Sally Bishop Shigley

Table of Contents

List of Illustrations	iii
Abstract	iii
Introduction: The Copernican Astronomy in Shakespeare	iv
Chapter I: <u>Coriolanus</u> , Kepler, and Mars	1
Chapter II: The Cosmos of Ulysses' "Degree" Speech	13
Chapter III: The Kingship of the Sun	25
Conclusion: Early Awareness of the New Astronomy	36
Bibliography	49
	55

List of Illustrations

Ptolemaic, Geocentric Cosmos	1
Copernican, Heliocentric Cosmos	1
Kepler's Elliptical Orbit for Mars	13
Sphæra Civitatis, the Civil Sphere	25
Ptolemaic Cosmos	25
The Great Chain of Being	36
Thomas Digges' Model of the Copernican Cosmos	49

Abstract

Criticism of Shakespeare's cosmology has largely focused on the narrative importance of astrology within the plays. Those few scholars who investigate the evidence of the Copernican astronomy in Shakespeare's plays often attempt to portray the playwright as a Copernican disciple, but analysis of Shakespeare's work as a dramatist gives a more plausible explanation for the undercurrents of Copernican astronomy that appear in his plays. Shakespeare's work reflects the understanding and tastes of his audience. The evidence of the new astronomy in Shakespeare's plays implies that the theory was beginning to take root in the British cultural consciousness; thus the new astronomy shows that continental thinking directly influenced Shakespeare. Coriolanus moves through the play of his name in a physical and emotional pattern that mimics the eccentric orbit of Mars, which Johannes Kepler finally resolved by proposing the elliptical orbit. Ulysses' famous "Degree" Speech in the third scene of Troilus and Cressida allows two different Copernican interpretations. The language in the speech focuses on the sun, which implies a heliocentric cosmos. However, critics generally read the speech to espouse Ptolemaic principles, but the play's ironic structure inverts that very order to further displace the Ptolemaic system and replace it with the Copernican. The centrality of the sun forms the basis of Copernican astronomy. Shakespeare relates the sun to kingship in the histories with the symbol of the Sun-King. The Great Chain of Being requires that the king remain atop the human hierarchy, signaling the sun's lordship atop the cosmic hierarchy as Copernicus proposed. The astronomical passages in Shakespeare's plays prove that Shakespeare's audience understood the tenets of Copernican theory, and therefore that the new astronomy became ingrained in early modern thinking over a hundred years before the scientific establishment endorsed the theory.

Introduction: The Copernican Astronomy in Shakespeare

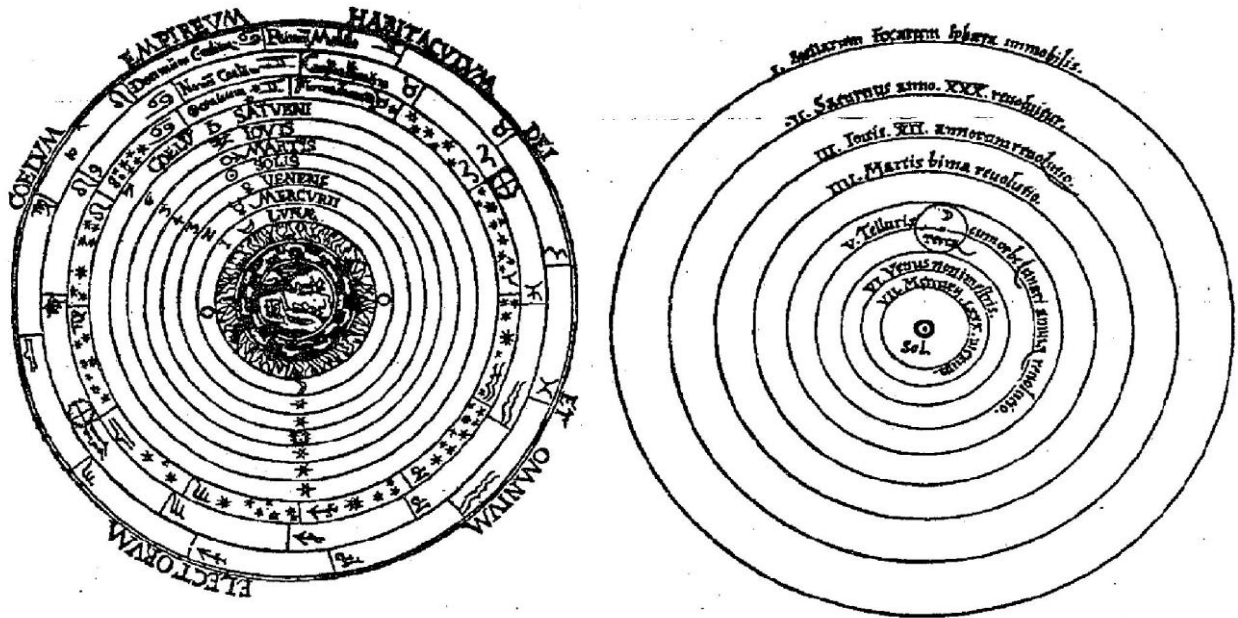


Figure 1, left: The Ptolemaic, geocentric cosmos. Figure 2, right: The Copernican, heliocentric cosmos. (Usher, "Hamlet's" 26-27)

Shakespeare's plays effuse the ideas of his time; readers who investigate the plays for sixteenth-century values dig up gold mines of context. Akron's D. L. Johanyak argues that Shakespeare was an active citizen of a global community, interested in people and ideas from around the world. Unsurprisingly, Shakespeare also took note of the great advances made in science during his time. The shift in cosmology from the geocentric cosmos¹ of Claudius Ptolemy (ca. 200 CE) to the heliocentric cosmos² accepted in Sir Isaac Newton's 1687 Philosophiæ Naturalis Principia Mathematica³ took its greatest step with the 1543 publication of Copernicus' De Revolutionibus Orbium Coelestium.⁴ Copernicus' text sparked debates of epistemology and theology along with astronomy, and the issue would not be fully settled for one hundred forty years. Any person who engaged the issues of the time, as Johanyak suggests Shakespeare did, would be aware of the Copernican theory. Shakespeare's plays imply that he understood the basics of Copernicus' astronomy. Indeed, scientists such as Henry Janowitz, M.D.,⁵ and Peter Usher, an astronomy professor at Penn State University, argue that Shakespeare actively adopted Copernican principles in his plays. Along with these two, Alan Scott Weber of State University of New York, Binghamton, suggests that Shakespeare learned of the Copernican theory from the writings of English almanac publisher Thomas Digges,⁶ particularly his text A Perfit Description of the Caelestiall Orbs.⁷ Whether this source provided all of Shakespeare's knowledge of Copernican astronomy is immaterial; the playwright certainly knew the basics of Copernican theory.

Insufficient evidence exists to suggest that Shakespeare believed in “the new

1 See Figure 1.

2 See Figure 2.

3 The Mathematical Principles of Natural Philosophy

4 Usually translated On the Revolution of Heavenly Spheres.

5 Late of Mount Sinai Medical Center. Janowitz died in August of 2008.

6 See Figure 7.

7 An appendix to his father's Prognostication Everlasting. The three critics generally base the connection on Shakespeare's acquaintance with Digges' son Leonard, who was involved in the printing of the First Folio.

astronomy”;⁸ indeed, as Karl E. Snyder of TCU argues, “Although special pleaders have used Shakespeare to prove all sorts of theories about the man, his life, or his beliefs, more dispassionate examination of his dramas is likely to lead to the conclusion that he never indulged strongly in any set of theories or beliefs on any given subject” (43). However, significant research argues that Shakespeare's work reflects contemporary attitudes, events, and beliefs (Shapiro xiii). Therefore, the discovery of Copernican elements in Shakespeare's plays argues that by the turn of the seventeenth century the Copernican theory had taken root, however unsteadily, in Elizabethan thought. Analysis of the Copernican elements in Shakespeare's plays aids understanding of early modern interpretation of astronomy, and also gives evidence of continental influence on both Shakespeare's work and his audience's thought.

In order to distinguish between Ptolemaic and Copernican astronomy in Shakespeare's plays, a brief survey of the two theories is necessary to provide a base. Ptolemy expounded the geocentric cosmos familiar to the people of medieval Europe. In his primary text Almagest, Ptolemy interpreted Aristotle's conception of the cosmos and gave a regular mathematical system to account for its movements. He argued “that the heavens move spherically” (7), that the Earth is spherical (8), “that the Earth is in the middle of the heavens” (9), that the Earth is stationary (10), and that “there are two different prime movements in the heavens,” the orbital movement around the Earth and an epicyclic⁹ movement around that orbit itself (12). The epicycle Ptolemy described is a movement in a clockwise circle around the path of a planet's orbit about the Earth, even as the planet moves along the orbital path. In essence, Ptolemy envisioned a universe centered on the Earth, with the seven planets (the moon, Mercury, Venus, the Sun, Mars, Jupiter, and Saturn) moving in the epicyclic pattern in their crystal spheres around Earth.

Departing from Ptolemy in the early sixteenth century, Copernicus returned to the idea

8 The term is thus cited by Janowitz (79).

9 An epicycle is a path around a circle: a spiral orbit around the average circular orbit.

held by the Pythagoreans¹⁰ that the sun is the center of the cosmos, not the Earth. In the 1543 text De Revolutionibus Copernicus argued that Earth has circular motion, both of revolution on its axis and of wandering around the sun as a planet (12-13).¹¹ In a more radical idea, Copernicus proved the heavens to far surpass the mass of the Earth, and reasoned that it was more likely that Earth moves among the heavens than that all the heavens revolve around the stationary earth (14-15). He revealed the inadequacy of arguments by his predecessors that Earth was the center of the universe (16-19) and wrote that Plato's followers held that the planets receive their light from the sun (19). Copernicus used the orbital period to demonstrate the order of the planets:

Saturn, the first of the wandering stars follows [the sphere of fixed stars]; it completes its circuit in 30 years. After it comes Jupiter moving in a 12-year period of revolution. Then Mars, which completes a revolution every 2 years. The place fourth in order is occupied by the annual revolution in which we said the Earth together with the orbital cycle of the moon as an epicycle is comprehended. In the fifth place, Venus, which completes its revolution in 7½ months. The sixth and final place is occupied by Mercury, which completes its revolution in a period of 88 days. In the center of all rests the sun. For who would place this lamp of a very beautiful temple in another or better place than this wherefrom it can illuminate everything at the same time? (24-25).

With his proof of a moving Earth in mathematical order, Copernicus identified what he termed a “threefold motion of the Earth”: diurnal revolution about the Earth's axis, annual revolution about the center, and the “declination,” the movement that produces the change between the solstices and equinoxes—a revision of the Ptolemaic epicycle (28).¹² To further

10 An early sect of Greek philosophers, ca. 500 B.C.E.

11 Copernicus appealed to the Pythagoreans to demonstrate that he was not the first to make that claim.

12 Copernicus named four circles of importance to the movement of the Earth: the equator, the “ecliptic,” which is

cement his case for the moving heavens, Copernicus demonstrated the apparent movement of the “fixed” stars, which some had tried to explain by adding a ninth sphere or a tenth to the heavenly spheres system (120-21). In Book Three of De Revolutionibus he explained phenomena such as the precession of the solstices and equinoxes, along with irregularities in the position of the sun, due to the movement of Earth. Copernicus generally developed his evidence through applying geometry to Ptolemy's postulates and showing that a moving Earth provides a simpler, more logical explanation.

The primary difference between Copernicus' cosmos and Ptolemy's is exchanging the sun for the Earth at the center position. Ptolemy's work generated a mathematical model to explain Aristotle's conception of the cosmos: Earth was surrounded by seven planets; these planets revolve around the Earth in regular patterns, with the retrograde motion explained by a cumbersome system of epicycles. Copernicus, hoping to simplify this system, proposed a cosmos with the sun at the center, orbited by Mercury, Venus, Earth, Mars, Jupiter, and Saturn; the moon he allowed to continue to orbit the Earth, as his observations convinced him was the case. His calculations retained the epicycle, though his shifting the sun to the center of the cosmos halved the number of epicycles necessary to fit the model. Epicycles would not disappear from cosmic theories until Johannes Kepler suggested in his 1609 Astronomia Nova that the planets' orbits fit not a circle, but an ellipse, and that the sun sits not at the center, but at one of the foci of the ellipse. Thus at the time Shakespeare was writing most of his plays, the prevailing cosmologies both suggested epicyclic movement about a center point, either the sun or the Earth.

The elliptical orbit was one of several further developments made near the turn of the seventeenth century by Kepler and Galileo Galilei. Galileo and Kepler made important contributions to the developing Copernican astronomy, but their writings could have had little

the circle that defines the epicycle, the tropics (circles parallel to the equator and tangent to the ecliptic), and the horizon (55).

bearing on most of Shakespeare's work: Kepler finished his magnum opus, the Astronomia Nova, as early as 1605, but could not publish it until 1609, the same year as the quarto printings of Troilus and Cressida and the sonnets. Galileo did not publish his observations of the moons of Jupiter until 1610. While traces of Kepler's work surface in Coriolanus,¹³ most of the astronomy in Shakespeare's plays must draw on early converts to the Copernican theory, such as Leonard and Thomas Digges or Giordano Bruno. And Shakespeare the dramatist would only mine such material if his audience also understood, and likely accepted some of the basics of Copernican astronomy. The scientific developments produced by these men changed the direction of the world and its ideas; Shakespeare recognized their importance and incorporated the astronomical concepts into his plays.

Shakespeare's incorporation of the stars into his work has not escaped the notice of modern scholars. They recognize the considerable quantity of references to the heavenly bodies, and interpret Shakespeare's use of the stars and planets in diverse ways. Most critics who treat Shakespeare's use of the stars rightly do so in context of astrology. In Shakespeare's time, astrology, the study of the stars' influence on man, was the primary science engaged in the study of the stars; while he never uses the word "astrology," each of his four uses¹⁴ of the word "astronomy" and its variants would transliterate into "astrology" in twenty-first century usage. However, some contemporary critics use astronomy, the study of the stars per se, to offer interesting interpretations of the plays. Astrological readings of Shakespeare's plays have been relatively common over the last century; however, the most compelling astronomical readings began to surface in the 1990s. A useful comparison of the criticism of Shakespeare's cosmology will divide the body of work into astrological and astronomical readings.

Although all of Shakespeare's plays refer to the heavenly bodies, many receive little

13 The following chapter develops this argument.

14 Sonnet 14, line 2; Tro. 5.1.92; Lr. 1.2.150; Cym. 3.2.27 (Smith 173).

attention from critics working through science-oriented readings of the plays. Indeed, only a dozen of Shakespeare's plays appear in more than two astrological readings—and most of his plays barely appear in one. For example, scholars of Coriolanus generally compare Martius to the god Mars, but their comparison is mythological rather than astrological. Caroline Spurgeon, an early twentieth-century professor at Bedford College, notes four occurrences of sun imagery in Henry VIII, but offers no commentary on them; she is the only critic to analyze the cosmology of that play even in such shallow depth. According to Weber, French astronomer Jean Richer provides evidence of Shakespeare's "intimate knowledge of the astrological sciences" (Weber, "Shakespeare's" 209) in The Merchant of Venice, but she is the only critic to address the cosmology of The Merchant of Venice. Two other critics, Johnstone Parr of the University of Alabama in 1953 and Warren D. Smith of the University of Rhode Island in 1958, wrote astrological readings that attempt to cover the gamut of Shakespeare's canon. The arguments the two critics make are nearly antithetical: Parr argues that Shakespeare uses astrology deliberately to enhance the poetic effect of his plays, while Smith argues that Shakespeare uses astrology ironically to reject the ideas of astrological influence. Smith is the only critic to analyze the use of astrology in The Comedy of Errors, and Parr alone analyzes the astrology in eight other plays.¹⁵ Both Parr and Smith develop astrological readings of nine of the plays that no other critic addresses,¹⁶ and in their individual arguments they analyze every other play not already mentioned. While very few critics address the astrological influences in the majority of Shakespeare's plays, it is noteworthy that some astrological criticism exists of nearly all of the plays; most scholars note the ubiquitous influence of astrology on Shakespeare's drama.

A number of critics investigate the function of astrology in the histories. Paul Jorgensen

15 Cymbeline, 2 Henry VI, 3 Henry VI, The Merry Wives of Windsor, Measure for Measure, Much Ado about Nothing, Pericles, and Timon of Athens.

16 2 Henry IV, King John, Love's Labour's Lost, Twelfth Night, All's Well That Ends Well, The Taming of the Shrew, Titus Andronicus, The Two Gentlemen of Verona, and The Winter's Tale.

of UCLA argues that Shakespeare's use of astrology in the histories was a device of the setting, placing characters who still believed in astrology on stage, while the more refined Elizabethan audience did not necessarily believe in astrology. He advances arguments from the Lancastrian tetralogy, 1 Henry VI, and Richard III. Aside from Parr, Smith, and Jorgensen, the most significant astrological criticism of the histories is a reading by Folger's Gail Kern Paster of Falstaff's comments on the humors in 1 Henry IV. Paster argues that Falstaff's association of himself with bears and cats reveals astrological beliefs underpinning the play—it connects himself with constellations, blaming his foolery on their influence. The astrological criticism of the major histories reveals the detailed characterization of both the dramatis personae and the audience of Shakespeare's work.

Other critics offer interesting astrological readings of some plays not commonly treated for their use of the stars. Parr and Smith both include these plays in their separate arguments, but the critics listed below present more compelling readings. Folger's Barbara Mowat details Prospero's magic book in The Tempest and compares it to the grimoires that include astrological data to aid the magician in conjuring spirits. Alan Taylor Bradford of Connecticut College reads Jaques' "Seven Ages" speech from As You Like It to reveal prevailing astrological beliefs about the influence of the planets; he further analyzes it to show that Jaques removes the age dominated by the sun, which allows the melancholy influence of Saturn to increase. Most critics of the astrology in Macbeth use the play to solidify their arguments about King Lear, but Paul Kocher of Stanford applies an astrological reading to Macbeth itself: he notes medical use of astrology in the Doctor's diagnosis of Lady Macbeth. John T. Ramsey of Illinois-Chicago contends that the warning in Julius Caesar to "beware the Ides of March" came from political, rather than astrological considerations. Katherine Perrault of Texas Tech University argues that the action of A Midsummer Night's Dream centers on the alchemical conjunction of the sun and

moon that supposedly occurs during the new moon. Each of these readings considers the significance of astrology to a single play; their work further legitimizes the practice of astrological criticism.

However, two of Shakespeare's plays receive more extended astrological analysis. Romeo and Juliet, for example, attracts several critics to its treatment of astrology. Writing in 1939 J. W. Draper of West Virginia University uses a "humors play"¹⁷ analysis to identify astrological influences on each of the major characters. In a recent collection A. M. Panaghis argues that the lovers' disaster comes because the two cross astrologically defined gender roles: Romeo is influenced by the moon and Juliet by the sun. Karen Bennet, in the 2003 Cambridge Quarterly, laments the loss of the astrological elements in Prokofiev's ballet Romeo and Juliet, which she argues the composer altered under pressure from the Soviet Government. Kim Axline of the University of Colorado dismisses Thomas McAlindon's (of the University of Hull) argument that the lovers' immaturity determines the play's speed; she argues instead that the stars set the pace. The many critics of the astrology in Romeo and Juliet understand a crucial need to apply astrological principles to interpret this and other plays. Similarly, critics of King Lear interpret this later tragedy with astrological principles. Parr, and later Harry Rusche of Emory University, detail Edmund's horoscope to show Shakespeare's use of astrology to characterize the villain. Jorgen Dines Johansen of the University of Roskilde reads Lear as espousing a cosmology that denies the heavens care about man. The astrological critics of Shakespeare's plays, although their arguments diverge widely, present one unified position: the sciences of the stars enrich readings of Shakespeare's plays.

The more recent astronomical readings of Shakespeare's plays have added to the insights of the astrological critics. Janowitz is one of the few critics to make a wide-ranging argument in

17 So named after Jonson's Every Man in his Humour (Shapiro 11).

light of astronomy,¹⁸ although his conjectures are somewhat troublesome—he takes all his evidence from narrow passages, rather than from larger patterns. He argues for Shakespeare's belief in “the new astronomy” (79), using as evidence verbal parallels between Thomas Digges' Perfit Description and passages in Hamlet and The Two Noble Kinsmen, as well as the Dauphin's assertion in 1 Henry VI that the motion of Mars was still a mystery. Janowitz also investigates Hamlet's comments on infinite space, a corollary of the Copernican astronomy by Thomas Digges, and notes with James Shapiro of Columbia the irony implicit in Hamlet's poem to Ophelia that casts doubt on the nature of the stars and the motion of the sun. These arguments introduce the potential for astronomical analysis of Shakespeare's work.

Alan Scott Weber wrote a notable dissertation in 1995 titled Shakespeare's Cosmology, in which he identifies multiple cosmologies present in Shakespeare's plays. He specifically wrote of a “pneumatic” cosmos, a “stoic-hermeneutic” cosmos, a “numerical” cosmos, and a “musical” cosmos, and focused his analysis on Troilus and Cressida, Antony and Cleopatra, and King Lear. Several other critics discuss the astronomical implications of Ulysses' Degree Speech in Troilus and Cressida.¹⁹ Hardin Craig of the University of Missouri, an early twentieth-century critic of Troilus, reads it along with Lear and Hamlet as stories of the violation of the Great Chain of Being, one of the ideas used to uphold the Ptolemaic cosmos. Weber's and Craig's arguments, though written decades apart, reveal significant insights through applying astronomical principles in reading the plays.

Some critics use astronomy to identify specific references in the plays, either searching for influences or attempting to date them. Parr uses this strategy in 1953, analyzing Gloucester's reference to the “late eclipses” in King Lear to argue that the play was composed after the solar eclipse of October 1605. Donald W. Olson, Russel L. Doeshcer, and Marilyn S. Olsen of

18 Indeed, most other astronomical arguments focus on Hamlet or King Lear.

19 These contributions will appear in a later chapter of this essay.

Southwest Texas University collaborate to identify the 1572 supernova in Cassiopeia as the “new star” mentioned in the first scene of Hamlet. Olson and his collaborators, as well as Peter Usher, note the influence of the astronomer Tycho Brahe on Hamlet. The setting at Elsinore is adjacent to Tycho's laboratory at Ven, and two of Tycho's kinsmen supplied names for the characters “Rosenkrans” and “Guldenstern” (Olson et al 71; Usher, “Hamlet's” 51). Usher argues in three different articles that Shakespeare knew of Copernican astronomy, and that he consciously wove Copernican theory into his plays in such a way that the appearance would seem innocuous to all but a small circle who knew the theory and would recognize the playwright's motives. He further contends that Hamlet is an allegory for the eventual triumph of Copernicanism over the old Ptolemaic theory, although this argument is anachronistic and troublesome—Usher is an astronomer, who uses Shakespeare to defend the history of his discipline rather than using his scientific training to read Shakespeare. Theodore Spencer of Harvard notes the disjoint that the Copernican astronomy creates between appearance and reality, which Shakespeare exploits in Hamlet. Each of these astronomical critics of Shakespeare encounters meaningful understanding through star-centered readings.

The criticism of Shakespeare's cosmology summarized above has largely focused on the narrative importance of astrology within the plays. Olson, Perrault, and Weber provide compelling readings of the astronomy in the plays, but only Janowitz and Usher contend that Shakespeare's plays show evidence of the Copernican astronomy—and their arguments lack the rigor of the astrological critics. This essay argues that Shakespeare's plays show undercurrents of Copernican astronomy, giving evidence that the theory was beginning to take root in the British cultural consciousness by the early seventeenth century; thus the astronomy in Shakespeare's plays shows that the thinking on the continent directly influenced him. Coriolanus, previously neglected as to its astronomical value, contributes evidence of the new astronomy, specifically in

reflecting Kepler's "war on Mars." Critics who read Ulysses' famous "degree" speech in the third scene of Troilus and Cressida for its cosmology unilaterally assign it to the Ptolemaic theory, ignoring the centrality of the sun in his view of the universe. Shakespeare also frequently associates kings with the sun in the histories, again signaling the sun's lordship of the solar system as Copernicus proposed. The astronomical passages in Shakespeare's plays prove that Copernican theory had become ingrained in early modern thinking over a hundred years before the early modern scientific establishment endorsed the theory. The evidence of continental thinking in Shakespeare's work furthers scholarly understanding of the context of the plays.

Chapter I: Coriolanus, Kepler, and Mars

Figure 3: A diagram of Kepler's elliptical orbit for Mars (Ferguson 298).

Copernicus and his successors attempted to correct problems in the old astronomy such as the inability of the old system to accurately predict the positions of the planets. The case of Mars makes this inability particularly apparent. Both the Ptolemaic and Copernican systems fail in particular to predict the position of Mars accurately (Ferguson 297-98). This discrepancy prompted Tycho Brahe (1546-1601) to include highly detailed observations of Mars in his marvelous astronomical data, and prompted his assistant Johannes Kepler to write a book elaborating Tycho's findings. By 1605, Kepler had discovered a mathematical model that fit Tycho's data, and which eventually proved able to predict the future position of Mars and other planets: he conceived planetary orbits in the shape of an ellipse, with the sun at one focus.²⁰ This famous result of his “war on Mars”²¹ would later inform Newton's vision of the cosmos.

Kepler experimented with Mars' orbit during the height of Shakespeare's career, from 1600-1605, and his ideas began to filter to other European thinkers even before he published Astronomia Nova in 1609. Shakespeare likely heard about Kepler's “war on Mars.” The mathematician's basic ideas had already been published in an early book in 1596,²² and much of educated Europe would have paid attention to the work of Tycho's assistants. Late in the decade of Kepler's work, Shakespeare composed Coriolanus. Coriolanus, a character metaphorically linked to Mars, moves through the play in a quasi-elliptical pattern; his physical location and his behavior change in an orbit around Rome and the Volscian cities, and his actions differ remarkably as he passes about either focus. Caius Martius Coriolanus demonstrates the influence of Mars in mimicking the planet's eccentric orbit.

While Shakespeare mentions many astronomical bodies in Coriolanus, Mars dominates the play's imagery. Shakespeare deliberately compares Coriolanus to Mars through imagery both

20 See Figure 3.

21 “My war on Mars” is Kepler's term for his attempt to fit Tycho Brahe's data of Mars' position to a simple orbit.

22 Mysterium Cosmographicum, which includes Kepler's hypothesis that a force from the sun moves the planets (Ferguson 194-95).

warlike and red. Shakespeare's red imagery for the central figure of the play begins with the siege of Corioles: after Martius enters the city alone, he reappears atop the city walls in red, as the stage direction in 1.4.61 reads, "Enter MARTIUS bleeding, assaulted by the enemy." Further red imagery continues after the Corioles siege, culminating when Cominius describes Coriolanus' appearance in act five, as he sits beseiging Rome: "I tell you, he does sit in gold, his eye / Red as 'twould burn Rome" (Cor. 5.1.63-64; all line references are to the 1997 Riverside Shakespeare edited by Evans and Tobin).²³ Assigning the color red to Martius, Shakespeare repeatedly connects his hero to the red planet. Along with the planet, Shakespeare's metaphors link Coriolanus with the Roman god Mars.²⁴ Even Coriolanus admits his inheritance from Mars when he says to his mother: "Why did you wish me milder? Would you have me / False to my nature?" (Cor. 3.2.14-15); his nature is warlike after the god whom he represents, and his mildness in politics proves to be his undoing. Shakespeare enlivens the Coriolanus he lifted from Plutarch,²⁵ deliberately connecting him to the god Mars, warlike and not mild.

The name "Mars" maintains a strong verbal presence in the play. Caius Martius receives the honorific name Martius Caius Coriolanus in 1.9.65. Thereafter in the speech-headings in modern editions he is identified as "Cor.," yet he is still regularly referred to as "Martius."²⁶ Even after Rome honors him as conqueror of Corioles, Shakespeare reminds the audience of the protagonist's connection to Mars. The play's characters name the central character "Coriolanus"

23 One other significant reference: When Coriolanus is banished, Volumnia bitterly rages, "Now the red pestilence strike all trades in Rome" (Cor. 4.1.13). The red pestilence refers to some unidentified disease. Metaphorically, however, this line becomes a foreshadow of the invasion in the fifth act, and the pestilence striking Rome's tradesmen is the blood-red Coriolanus himself.

24 In several instances, he prays to Mars (Cor. 1.4.10-12, 5.3.70 ff., 5.6.99). Aufidius and his servants refer to Coriolanus as "thou Mars" (Cor. 4.5.118) and "the son and heir to Mars" (Cor. 4.5.192). Several critics note the link between Coriolanus and the god (Simonds 35; Mackenzie 17; Willems 190; Buechmann 70 ff.; Ripley 120, 132, 139).

25 Plutarch regularly attributes a warlike nature to Coriolanus (par. 2, etc.), but he never mentions Mars. Of equal significance, Coriolanus' mother appears in Plutarch only in the introduction as "his widowed mother" (par. 1), at their parting after his banishment, and at the climax when she accompanies Valeria's embassy.

26 The 1623 Folio speech-headings still call him "Martius" or "Mart." or "Mar." through the end of the scene. Throughout the rest of the play it refers to him by a variant of "Coriolanus" until the final stage direction.

thirty-two times, yet after he gains his surname, Coriolanus is called “Martius” forty-four times.²⁷ As the play closes, even the stage directions revert to his original name: the stage direction that concludes the play reads, “Exeunt, bearing the body of Martius. A dead march sounded.” Referring to the central figure of Coriolanus by his family name reminds the audience of his connection to Mars, as Brutus calls the Martius family “The noble house o' th' Martians” (Cor. 2.3.238). Similarly, Shakespeare reminds readers of Mars' presence in the play through his diction, naming the god four times and repeating words similar to “Mars” in sound, such as “marks,” “marr'd,” “march,” and most notably the verb “mark,” which appears almost exclusive of its Shakespearean synonyms such as “note.”²⁸ Thus Shakespeare imbues the play with language foregrounding the prominent role of Mars.

As Coriolanus represents Mars, his behavior should reflect the orbit of Mars. In an astrological reading, this influence would suggest that Coriolanus' behavior alters according to Mars' relative position to other heavenly bodies; Shakespeare could even have altered the timing of the action, as he had done so often in other plays,²⁹ to include events at Mars' aphelion and perihelion. However, Coriolanus does not document the orbit of the planet Mars, but of Martius, the planet's avatar. While extensive critical effort has documented the connection between Coriolanus and the god Mars, insufficient attention has been given to his connection to the planet itself. The frequent use of red imagery documented above connotes the red planet more readily than it does the god who shares its name. Equally, Cominius openly compares Martius' attack on Corioles to the astrological influence of the planet Mars:

27 Once by Lartius before the scene in which he receives the name ends; nine times in the conversation between Brutus, Sicinius, Menenius, and Volumnia before Coriolanus' triumphal return to Rome; nine times by Aufidius, who never calls him Coriolanus, refusing to give him his “stol'n name” (5.6.90-92); and twenty-five times by others, including Coriolanus himself. While Buechmann also notes that “the use of 'Martius' decisively outweighs the use of 'Coriolanus'” (90), the counts are mine.

28 While expounding on the belly fable, Menenius does tell the leading citizen to “Note me this” (1.1.127), but “mark” appears with much greater frequency.

29 One documented example is Romeo and Juliet, in which Shakespeare condenses nine months of action in Brooke's Romeus and Iuliet to five days (Axline 124-25).

His sword, death's stamp,
 Where it did mark, it took; from face to foot
 He was a thing of blood, whose every motion
 Was tim'd with dying cries. Alone he ent'red
 The mortal gate of the city, which he painted
 With shunless destiny; aidless came off,
 And with a sudden reinforcement struck
 Corioles like a planet. (Cor. 2.2.107-14)

Because Shakespeare establishes that Martius strikes “like a planet,” a reading of the play can accurately respond to him in light of Mars' erratic orbit. In the new, heliocentric model of the cosmos, particularly in the early seventeenth-century developments by Kepler, each planet's orbit has points called perihelion, where it is closest to the sun, and aphelion, where it is farthest from the sun. These points lie on the orbit itself, the ellipse, and on a line called the apside that runs from the perihelion, through the two foci, to the aphelion. As the action of the play moves from one setting to another, Coriolanus' behavior demonstrates a perihelion and an aphelion—a place of conformity and order and a place of dissonance and irrationality. At first glance, the focus³⁰ of Coriolanus' orbit appears to be the city of Rome, yet his triumph at Corioles and his raving before the plebeians seem to belie this reading. Upon closer examination, however, the primary focus of the orbit is read to be his mother Volumnia, whom Peggy Muñoz Simonds argues “symbolizes the city of Rome itself” (38). Coriolanus' most erratic actions, those which lead most directly to his destruction, occur when he acts outside the influence of his mother.

Volumnia's influence builds her son's character. The play's opening scene establishes

30 An ellipse, of course, has two foci; however, in the case of planetary orbits, one focus, namely the sun, has a far more important role than the other in directing the planet's course. I will later call it the “gravitational focus” of the planet's orbit. It is to this focus that I compare Volumnia.

Martius' character: he is a military man, eager to take the offensive. He prepares for war against the Volsces, particularly his old foe Aufidius (1.1.223-40). He vents his anger at the plebeians because they would rather fight the state over the famine than fight their external enemies.

Martius even threatens,

Would the nobility lay aside their ruth
 And let me use my sword, I'd make a quarry
 With thousands of these quarter'd slaves, as high
 As I could pick my lance (1.1.197-200).

The pun on “quarry” and “quarter'd” depicts the gruesome, martial imagery that follows Martius through the play; he longs to turn the plebeian mob into a pile of traitors' corpses. As he goes to war in act one, he is enacting this martial character in its fullest. The most memorable image of Martius through the first act is his blood-soaked red appearance (1.4.61 s. d.), the image of his conquest and the audience's visual connection between Martius and the red planet. Fittingly, this Roman patriotism and love of martial glory meets his mother's approval. When she receives him in triumph upon his return to Rome, the first name she gives him is “my good soldier”³¹ (2.1.171). At this moment, with Coriolanus kneeling before Volumnia, the audience sees clearly that she, the mother, controls her son's actions. Volumnia exerts exactly such a force over her son that Kepler posited the sun to exert over the planets. Coriolanus' triumphal return to Rome marks his first perihelion.

Coriolanus, returned to Rome, seeks to become consul under his mother's guidance (2.1.260-61). In act two, Coriolanus remains at perihelion—he has reached the summit of his political power in Rome. He succeeds in acquiring the senate's approval (2.2.132-33) and the popular vote (2.3.136), yet his refusal to show his wounds—wounds of which Volumnia freely

31 Ironically, Volumnia naming her son “my good soldier” implies that he follows her orders.

boasts—earns the people's contempt and rejection (2.3.254-55, 3.1.24-57). When Volumnia and Menenius advise him to seek meekly the people's pardon and approval to ascend to the consulship (3.2.72-89), he acquiesces at first, and could have continued his rise to power. However, his unbridled passion causes him to reject his mother's counsel: he berates the plebeians and their tribunes (3.3.68-74), who enforce his exile from Rome (3.3.99-101). Even as he spits his fatal disdain at the mob, Menenius warns him, “Is this the promise that you made your mother?” (3.3.86). The old counselor links Coriolanus' failure with the plebeians directly to his abandonment of Volumnia's instructions. Volumnia's force cannot alter her son's martial nature—no more than the sun's force can alter a planet's momentum and pull the planet into itself. So, like a planet departing perihelion, Coriolanus' orbit flies away from Rome and his mother as he decides to stray from her counsel.

Once banished, Coriolanus acts against his previous patriotism and his repeatedly stated hatred of Aufidius. He goes directly to Antium, the farthest physical setting from Rome he ever gets, and conspires with his sworn enemy to betray his home city (4.5.136-43). Little seems to remain of the Rome-loving Martius, who has claimed that he would fight Aufidius eternally, that

Were half to half the world by th' ears, and he
 Upon my party, I'd revolt, to make
 Only my wars with him. He is a lion
 That I am proud to hunt. (1.1.233-36)

Volumnia's kneeling, obedient son is gone. The meeting with Aufidius, in which the Volscian general reminds us of Coriolanus' link to Mars, represents the aphelion of Coriolanus' orbit. His decision to invade Rome with an army under the command of the hated Aufidius is his most perplexing act, both to the audience and to his friends. It runs against his patriotism. Plutarch's Coriolanus gives better reason for the betrayal—in Plutarch, the revenger makes concessions for

the patricians (Parker 26), so his war is with the plebeians who have rejected him. Shakespeare omits this concession, so little in the prior behavior of Shakespeare's Coriolanus anticipates this action—much in the same way the Ptolemaic theory failed to predict the position of Mars. On his way to aphelion, Coriolanus mimics the erratic, unpredictable behavior of the planet Mars.

As Coriolanus brings his army closer to Rome, and closer to his mother, his fortunes improve: the plebeians hastily recall his banishment (5.1.33-41), and the senate sends three distinct peace embassies to placate him. Indeed, had Coriolanus accepted either Cominius' or Menenius' pleas for the safety of Rome, he likely would have received the consulship for which he was enacting his revenge. However Coriolanus' errant behavior remains unaltered until Volumnia confronts him. Volumnia's embassy completes Coriolanus' return to perihelion. As the gravitational focus of Coriolanus' eccentric orbit, Volumnia has the power to redirect him. She explicitly links Coriolanus' attack on Rome to his rejection of her principles:

thou shalt no sooner
 March to assault thy country than to tread
 (Trust to't, thou shalt not) on thy mother's womb
 That brought thee to this world. (5.3.122-25)

She succeeds in convincing him to spare Rome, though he knows his submission to her authority again will hasten his downfall: “Most dangerously you have with him prevail'd, / If not most mortal to him” (5.3.188-89). As the physical setting has returned to Rome, so the protagonist's psychological orbit must return to its perihelion, obedience to his mother. At perihelion, Volumnia reasserts her control over Coriolanus and sends him away again, apparently to Corioles.

At Corioles, Coriolanus lies once again out of his mother's influence and in Aufidius' hands. This is his final aphelion—this time his erratic behavior allows Aufidius' conspirators to

murder him. The Volscian has planned his victory throughout the fourth and fifth acts. In the final scene, Aufidius refers to Coriolanus as “a man by his own alms empoison'd, / And with his charity slain” (5.6.10-11). Yet Coriolanus, oblivious to his danger, brags to the people of Corioles what shallow conquests he has made on their behalf. Aufidius' accusation of Coriolanus' treason and subsequent murder merely complete the cycle of Coriolanus' orbit of Roman power. Martius mimics his former behavior from Rome, yet he is now at his aphelion, completely outside Volumnia's influence, and his conquests here earn the deserved contempt of the Volscians, who cut him down. Throughout the play Coriolanus, a faithful representation of Mars, follows an orbit that waxes and wanes as he moves closer to or farther from the influence of his mother.

As Mars plays such a prominent role in Coriolanus, readers should understand the unique contributions the motion of Mars made to the advance of Copernican theory. The defining work on the orbit of Mars was written by Johannes Kepler. In the winter of 1600, Kepler went to the Bohemian castle of Tycho Brahe to become one of his research assistants. Tycho had invited Kepler to come to apply Kepler's geometrical theories to Tycho's own superior astronomical data. Several months after Kepler arrived at Tycho's castle of Benatky, “Tycho put him to work [. . .] on the Mars observations under the supervision of Longomontanus” (Ferguson 256). Shortly thereafter Kepler was allowed to work on Mars on his own, and eventually found that “The Mars observations alone were³² sufficient for work on his hypothesis that a force from the sun moves the planets” (Ferguson 259). Mars would supply the key to Kepler's advancement of the Copernican theory.

The Mars observations, to which Kepler had full access after Tycho's death in 1601, commenced Kepler's “war on Mars.” The data enabled him to verify several hypotheses about planetary motion that contributed to his defense of the Copernican theory: first, the planets do

32 Emphasis in Ferguson.

not maintain a fixed distance from either the Earth or the sun, but have in their orbits an aphelion and a perihelion; second, the planets' orbits do not fit a circle centered either on the Earth or the sun. Kepler deduced from these data that Mars' orbit must be an eccentric circle, that is, a circle whose center is an abstract point rather than a fixed heavenly body (Ferguson 297). He struggled with the data for three years, eventually making the two groundbreaking discoveries for which he would become famous: that a planet's orbit “sweeps out” equal areas in equal times, and that the orbit of planets is best described by an ellipse with the sun as one focus. The second discovery, now called Kepler's First Law, was Kepler's most important innovation. Using that hypothesis and his astounding geometrical abilities, Kepler successfully proved that Earth also moves in an elliptical orbit, similar to Mars' in shape and obeying both of his formulae for planetary motion.

What is most critical about Kepler's “war on Mars” in relation to Coriolanus is their accessibility to Shakespeare and his audience. Fortunately, like most scientists working on a problem of this magnitude, Kepler communicated with his colleagues and friends about his work. In July 1603, “Kepler wrote to his friend David Fabricus that surely if the orbit were a perfect ellipse the problem he had been struggling with would have been solved long ago by Archimedes or Apollonius” (Ferguson 317). He completed Astronomia Nova in 1605 and submitted it to Franz Tegnagel, another of Tycho's assistants, for review before publication. Tegnagel detested Kepler's results, as they verified Copernicus' theory rather than Tycho's;³³ Tegnagel wrote a preface to the work warning readers not to accept Kepler's conclusions without examination (Ferguson 321), and certainly corresponded with his supporters about the manuscript. Kepler's new explanation of the ancient observation of Mars' aberrant motion disseminated throughout Europe prior to its publication in the summer of 1609. It was a current

33 Tycho developed a cosmology that worked as a compromise between Ptolemy and Copernicus. Whereas in Ptolemy's theory all of the planets orbit the earth, and in Copernicus' theory all of the planets orbit the sun, in Tycho's theory the sun and moon orbit the earth, and all other planets orbit the sun.

idea, and as Shapiro argues,³⁴ Shakespeare regularly incorporated current ideas into his plays.

While Shakespeare may have appropriated Mars into Coriolanus due to the rumblings in the scientific world about Tycho's and Kepler's work on the Martian orbit, this play was not the first time he had referred to the planet's aberrant orbit. In the second scene of 1 Henry VI, the Dauphin says to his lords, "Mars his true moving, even in the heavens, / So in the earth, to this day is not known" (1H6 1.2.1-2).³⁵ Shakespeare had been aware of Mars' eccentricity since the early stages of his career. This is important to note, since Shakespeare's apparent source for Copernican astronomy, Digges' Perfit Description,³⁶ does not openly attempt to answer the question of Mars' orbit. What Digges does contribute to Shakespeare's understanding in this case is his affirmation of the existence of apsides, imaginary lines that pass through the aphelion and perihelion. With Digges' evidence in the back of the poet's mind for at least a decade,³⁷ the news of Kepler's investigation of Mars' orbit may have triggered his curiosity.³⁸ Kepler had made it no secret that a part of his experiments with Tycho's data involved the hypothesis of the elliptical orbit. While Shakespeare left no evidence of mathematical abilities on par with Kepler's, Shakespeare's audience may have absorbed enough concepts from the whisperings of Kepler's "war on Mars" to enable him to write in Coriolanus a demonstration of Mars' elliptical, or at least eccentric, orbit around the sun.

34 Shapiro notes numerous ideas that were "in the air" at the times he postulates Shakespeare was writing specific plays. For example, he contends that Montaigne's personal essay form influenced the development of the soliloquy form in Hamlet (Shapiro 297-98).

35 The Dauphin associates the planet Mars in this scene with the powers of the war god, as do the many characters who compare Coriolanus to Mars.

36 As noted previously, the argument that Digges is Shakespeare's primary source for astronomy is Usher's, though Janowitz and Shapiro also make note of the importance of A Perfit Description.

37 Usher and Janowitz argue that Shakespeare uses Digges as a source for Hamlet, written as early as 1599; Janowitz further argues that the poet returns to Digges as a source for The Two Noble Kinsmen, written several years after Coriolanus.

38 Shapiro's primary argument is that events such as these that shaped the ideas of the time as well as the future readily found expression in Shakespeare's drama. One such example is the birth of the East India Trading company on 24 September 1599. Shapiro reads this event to be one of the harbingers of the death of chivalry and the rise of globalization; he traces the decline of chivalry during Shakespeare's lifetime, culminating with the formation of the East India company, and notes the expression of that decline in Hamlet (Shapiro 276).

Coriolanus' position as a symbol of Mars keeps both the god and the planet in mind. He moves in a cycle like a planet, exerts a seemingly astrological influence like a planet, and his behavior as he moves defies conventional prediction as does the position of Mars. Coriolanus' erratic orbit of his mother in the play represents the similarly erratic orbit of Mars that motivated both Tycho and Kepler to make their brilliant discoveries that would forever change astronomy and would help to prove the Copernican theory. These changes perhaps explain why Sicinius arrests Coriolanus for being "a traitorous innovator" (Cor. 3.1.174): since Sicinius' position is itself an innovation during the time period of the play, it seems illogical that he should have power to arrest Coriolanus for innovation. However, Coriolanus the symbol of Mars reminds audiences of the new developments in astronomy that are both innovative and traitorous to the establishment. The ideas surrounding the new astronomy, and the problems scientists were working to solve, were familiar to Shakespeare's audience. Shakespeare employed the problem of Mars' orbit as a major metaphor in his characterization of Coriolanus.

Chapter II: The Cosmos of Ulysses' "Degree" Speech

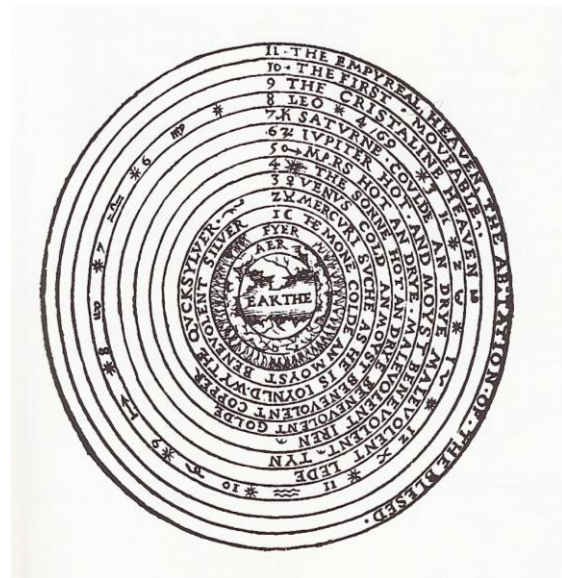
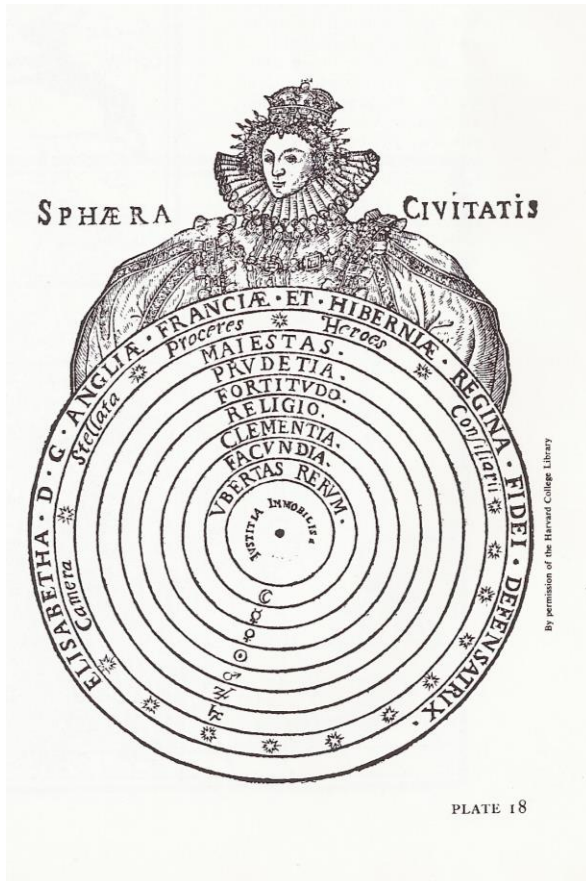


Figure 4, left: Sphæra Civitatis, the Civil Sphere. This model relates the political virtues to the orbits of the planets in the Ptolemaic cosmos, with Queen Elizabeth overseeing the whole as a prime mover. Figure 5, right: A model of the Ptolemaic cosmos (Evans Plate 18).

As knowledge of the Copernican astronomy filtered through society, Shakespeare appropriated the budding awareness of the theory in many of his plays. The elliptical orbit in Coriolanus presents a cutting-edge development in Copernican astronomy. However, more telling signs of the new astronomy appear in passages that center on the sun. Heliocentrism is the primary tenet of Copernicus' theory—he claims that the planets orbit the sun, rather than the Earth. A stronger case for Copernicanism in Shakespeare's plays will therefore address sun-centered readings of the cosmos within the plays. Troilus and Cressida provides such a reading. Although the play as a whole does not address a particular cosmology in the same way Coriolanus addresses Kepler's theory, one of the play's crucial passages is saturated with astronomical imagery. Ulysses' great Degree Speech in the third scene of Troilus and Cressida supports Copernican readings of Shakespeare's cosmos.

The heavens themselves, the planets, and this centre
 Observe degree, priority, and place,
 Insisture, course, proportion, season, form,
 Office, and custom, in all line of order;
 And therefore is the glorious planet Sol
 In noble eminence enthron'd and spher'd
 Amidst the other; whose med'cinable eye
 Corrects the [ill aspects] of [planets evil],
 And posts like the commandment of a king,
 Sans check, to good and bad. But when the planets
 In evil mixture to disorder wander,
 What plagues and portents, what mutiny!
 What raging of the sea, shaking of Earth!

Commotion in the winds! Frights, changes, horrors

Divert and crack, rend and deracinate

The unity and married calm of states

Quite from their fixure! (1.3.85-101)

Many critics agree that the Degree Speech is Shakespeare's great statement of Ptolemaic cosmology. In the speech, every planet must keep its order, or “degree, priority, and place,” and Ulysses names the Earth as the “centre.” Johnstone Parr notes that Shakespeare writes through Ulysses' mouth that moving the planets from their intended positions invites plagues and political upheaval (58, 59, 66).³⁹ Alan Taylor Bradford demonstrates from Ulysses' speech that Shakespeare knew fully well the astrological importance of the sun in the Ptolemaic order of the cosmos; the sun is placed between the other planets orbiting Earth to prevent them from flying into discord and extending their influence outside their own sphere (175). Hardin Craig compares the speech to the ancient idea of the Great Chain of Being,⁴⁰ a pillar of Ptolemy's theory (4). John Dover Wilson, the famous twentieth-century professor of the University of Edinburgh, uses the Degree Speech to point out Shakespeare's frequent comparison of the sun to the monarchy, and gives this explanation:

Platonic in its association of the ordered hierarchy of the estates with the harmony of music, it is Ptolemaic in its identification of these two harmonies with the harmony of the spheres, while memories of anarchy in fifteenth century England supply the emotional colouring to the picture of the deplorable results that follow for mankind and his world from the breakdown of this harmony. There is no need to insist upon the importance of the monarchy in such a scheme of things. The King or Governor is the sun in the political heavens, that is to say not only the

39 See Figure 4, in which political order is modeled on the diagram of the Ptolemaic cosmos.

40 See Figure 6.

largest but, in those astrological days, the most potent for good or ill of all stellar bodies. (96-97).

Although Wilson's reading lacks some consistency of definition, he reads the speech like other critics to support the ancient cosmology. He points out Shakespeare's consistency in symbolizing the monarchy with the sun,⁴¹ yet Wilson and the other critics of Troilus and Cressida ignore the Copernican possibilities of the language of this speech.

Shakespeare's sources contribute to the language of the Degree Speech, yet some crucial language is uniquely his. The critical consensus suggests that Shakespeare's primary sources for the Degree Speech are passages from Sir Thomas Elyot's 1531 Book of the Governor, the 1547 homily "On Obedience," the 1571 homily "Against Disobedience," and Richard Hooker's 1593 Laws of Ecclesiastical Polity. Elyot and the two homilies appear to inform the segment of the Degree Speech beginning with "Take but degree away," beginning in line 104. These sources all describe the horrific consequences of interrupting the political hierarchy, which is Ulysses' intent in giving the speech. Three of these passages have astronomical importance: Elyot mentions "universal dissolution"; the 1547 Homily speaks of the sun, moon, and other heavenly bodies obeying divine law, in a sense "Observ[ing] degree, priority, and place"; Hooker makes a similar argument, and adds to it this passage:

Now if nature should intermit her course, and leave altogether, though it were but for a while, the observation of her own laws; if those principal and mother elements whereof all things in this lower world are made should lose the qualities which now they have; if the frame of that heavenly arch erected over our heads should loosen and dissolve itself; if celestial spheres should forget their wonted motions and by irregular volubility turn themselves any way as it might happen; if

41 Many Renaissance kings used the sun as a personal symbol.

the prince of the lights of heaven, which now as a giant doth run his unwearied course, should as it were, through a languishing faintness, begin to stand and to rest himself; if the moon should wander from her beaten way, the times and seasons of the year blend themselves by disordered and confused mixture, the winds breathe out their last gasp, the clouds yield no rain, the Earth be defeated of heavenly influence, the fruits of the Earth pine away as children at the withered breasts of their mother, no longer able to yield them relief—what would become of man himself whom these things now do all serve? See we not plainly that obedience of creatures unto the law of nature is the stay of the whole world? (66)

These four sources contribute important language to Shakespeare's portrayal of Ulysses; the playwright characterizes the old commander as a parrot, gibbering saws of Renaissance orthodoxy. Much of the language of the Degree Speech, both ideas and specific phrases, Shakespeare lifts directly from Tudor political tracts.

Analysis of Shakespeare's sources for the Degree Speech should reveal what language within the speech originates with this text, particularly the language that relates to the cosmology of the speech. Elyot's⁴² simple phrase of “universal dissolution” may be dismissed as hyperbole, with “universal” connoting “widespread,” not necessarily “pertaining to the universe.”⁴³ The argument in the homily and in Hooker that nature observes law, and consequently that the heavenly bodies move in their appointed orbits, informs the first lines of the speech. Also, Hooker refers to the sun as “the prince of the lights of heaven,” prefiguring Shakespeare's comparison of the sun and kingship. These sources, however, do not supply one crucial phrase of the speech: “whose med'cinable eye / Corrects the ill aspects of planets evil” (Tro. 1.3.91-92).

42 Elyot builds his entire work around the political question that would shape the sixteenth century: the royal succession after Henry VIII. Shakespeare uses his work in developing Troilus and Cressida, a satire that was most likely first performed near the end of Elizabeth's life, when the succession question had become a crisis.

43 Indeed, the O. E. D. indicates that in the sixteenth century “universal” had no other connotation.

These two lines must arise from Shakespeare himself. Also, while the some of the sources mention the heavenly bodies, none of them deals overtly with astronomical principles, and as such, any cosmology attributed to the speech must derive from Shakespeare.

Two alternate readings of the Degree Speech can reflect a Copernican interpretation of the cosmology of this play. Both readings validly demonstrate Shakespeare's awareness of Copernican theory. One argument is that the speech should be read to reflect Copernican, not Ptolemaic, cosmology. This reading centers on the eminence of the sun in Ulysses' cosmos and its role in correcting "the ill aspects of planets evil," which informs a later discussion of the sun-symbolism for the monarchy in the histories. A second, contextual reading admits the critical consensus that the speech argues a Ptolemaic order, but that Copernicanism itself represents a breakdown in the degree which Ulysses prizes, and aids in the spreading degradation throughout the play.

The Degree Speech, whose cosmology Wilson calls "Ptolemaic," readily admits a Copernican interpretation instead. Although Ulysses refers to Earth as "this centre" and describes a cosmos that observes order and place, this language is insufficient to interpret the passage exclusively as embodying Ptolemaic cosmology. In fact, if "this centre" is anachronistic, every other word in the Degree Speech can be read to suggest Copernican philosophy. Lines 85-88, with an allowance for replacing "this centre" with "Earth," read that all heavenly bodies follow natural law and observe order. The Copernican cosmos, like the Ptolemaic, requires that the planets follow natural law and observe order: they remain in the proposed new order, the Sun, Mercury, Venus, Earth with its moon, Mars, Jupiter, and Saturn; they follow a strict, though simpler, epicyclic pattern. Although this small emendation in the text allows for either the Ptolemaic or the Copernican theory, further language in the Degree Speech solidifies a Copernican interpretation.

The best evidence for a Copernican interpretation of the Degree Speech appears in its description of the sun. Lines 89-94 describe the role of the sun: it sits “Amidst the other,” serving to “Correct the ill aspect of planets evil.” This line, line 92, contains the greatest textual variance⁴⁴ of any in the speech. Line 92 reads in the 1609 Quarto “Corrects the influence of euill planets,” while in the 1623 Folio it reads as printed, “Corrects the ill aspects of planets evil.” The O. E. D. defines the major variant words, “influence” and “aspects,” thus: “influence” denotes the act of flowing in, or in astrology, the flowing in of a fluid from a planet to affect people; “aspects” signifies a way of looking, as to position or direction, or in astrology, the relative position of a planet to the Earth. As this line has the greatest variation of any lines in the speech, it has the greatest potential to alter the reading of the whole speech and, by extension, the play. The Riverside editors use the quarto text as the copy-text for the play (526), suggesting that they believe it to be closer to Shakespeare's intent; however, they change line 92 to the folio reading.⁴⁵ Their textual note may explain this choice: “the present text [. . .] adopts F1 readings only where they seem significantly superior to the equivalent Q readings” (526)—the folio reading of the line scans far better than the quarto reading. However, the difference in the wording is significant. In the quarto the sun corrects the astrological influence of the “evil” planets, possibly referring to Saturn, but also apparently referring to any planet out of place. In the folio the sun corrects their “ill aspects,” or improper positions. While both Ptolemy and Copernicus allow for the astrological interpretation of the quarto line, only in Copernicus' universe is the sun capable of correcting planets' positions, as in the folio line.⁴⁶ In Copernicus' system, the sun sits at the center of the universe, directing the motion of all other bodies by its position.

44 According to the textual notes in the 1997 Riverside, pages 525 ff.

45 Riverside is not the only edition to do so. This emendation appears to be standard, with the Norton, Oxford, and David Bevington editions of Troilus and Cressida printing the Degree Speech exactly as it appears in Riverside.

46 The speech has only one other significant textual variant, changing the preposition “of” in the quarto to “to” in the folio. While this change is interesting, it has no real relevance to my argument. All other textual variants in the Degree Speech recorded by the Riverside editors are variant spellings.

Shakespeare describes the sun with words fit for a monarch: he calls it “the glorious planet Sol / In noble eminence enthron'd” (Tro. 1.3.89-90) and compares correcting the ill aspects of the planets to “the commandment of a king, / Sans check” (Tro. 1.3.93-94). The language is monarchist: the king of the planets is glorious, noble, eminent, enthroned, and absolute, as his commandments have no check. This sun is Copernicus' sun: it is enthroned in the midst of the cosmos, directing the motion of the planets with no greater power to override it. In Ulysses' depiction, the sun's lordship is the reason for its position: “And therefore,” or for that purpose, “is the glorious planet Sol / In noble eminence enthron'd and spher'd / Amidst the other.” The next eight lines describe the consequences of planets' leaving their orbits, which Ulysses compares to subjects rebelling against their king.⁴⁷ The monarchical position of the sun validates a Copernican reading.

The Copernican reading, however, is not the only valid reading of Ulysses' speech. A careful scholar cannot ignore the weight of the critical accord that Ulysses' cosmos is indeed Ptolemaic. Yet an alternate reading also demonstrates Shakespeare's awareness of the Copernican theory while allowing for a Ptolemaic interpretation of the passage. Reading the Degree Speech in the light of a Ptolemaic cosmos would validate the Earth's position as “this centre” and the entire speech's glorifying of precise order. Regarding the sun's position “Amidst the other,” Ptolemy placed the sun in the center of the seven planets orbiting Earth: the moon, Mercury, Venus, the Sun, Mars, Jupiter, and Saturn. The sun's primary astrological function, the reason why it is placed amidst the other planets, is to counterbalance the evil influence of planets and stars on mankind, especially that of Saturn, which was assumed to effuse the greatest evil influence of any planet (Bradford 175). Hence the Ptolemaic reading easily accepts either the

47 While Ulysses' catalog of catastrophes is impressive, perhaps the most important to him is “what mutinies!” Mutiny, at its root, implies rebellion against the king, who put in place the authorities against whom the mutineer rebels.

quarto “Corrects the influence of evil planets” or the folio “Corrects the ill aspect of planets evil,” for in astrological terms these two phrases are equivalent: the sun intervenes to prevent the consequences of evil planets out of position. A Ptolemaic reading can thus explain the most crucial passage in the above Copernican reading. The rest of the speech follows standard astrological interpretation: when the planets are in improper position, the catastrophes of which Ulysses warns follow. This interpretation of the sun's position allows for a Ptolemaic reading of the speech.

Yet the Ptolemaic reading does not eradicate the argument that Shakespeare not only was aware of, but depended on the Copernican theory. In fact, as many critics argue,⁴⁸ the unfolding of the plot destroys Ulysses' rhetoric: his predicted calamities metaphorically appear in the brutal ending of the play. As a whole, Troilus and Cressida is best read as satire. The action of the play, even that of Ulysses himself, unfolds in a widening spiral of mutiny, degradation, and calamity, until it is clear that all of Ulysses' prophecies of literally Earth-shaking consequences have been fulfilled. Since the effects are present, the causes are presumably in force as well. In the speech, two conditions precede the catastrophes: “take but degree away” (Tro. 1.3.104) and “when the planets / In evil mixture to disorder wander” (Tro. 1.3.94-95). The plot of the play shows the characters repeatedly ignoring royal degree.⁴⁹ The disruption of degree within the play parallels a disruption outside the play of the traditional heavenly order—while Copernican influences undermined Ptolemy's understanding of the universe, Ulysses warns of the mutiny and degradation that follow such a heavenly upheaval.

Theodore Spencer argued seventy years ago that the Copernican theory upset Ulysses' heavenly order within Shakespeare's play (259). Here is the ironic joke the playwright lays for

48 Kaula 279; Greene 271-72; McAlindon, “Language” 30; Eldridge 44; Meyer 48.

49 As when Troilus usurps Hector's seniority in the Trojan council scene, Achilles continues his refusal to fight for Agamemnon, Ajax usurps Achilles' place in the duel with Hector, then refuses to fight him, or Paris ignores the fighting ravaging his city and spends his days with Helen (Eldridge 35).

his sophisticated spectators: as Ulysses praises the calm order of the Ptolemaic cosmos, the audience laughs, knowing Copernicus has already uprooted that precious degree. Shakespeare reflects precisely this upheaval in the disrupted order within Troilus and Cressida. The Ptolemaic cosmos, which had interpreted the universe throughout the Western world for nearly two millennia, was now under attack from an upstart theory published by a Polish intellectual and denounced by the Roman church. Ulysses, a hallmark of Tudor conservatism⁵⁰ (Greene 271), reacts on stage to this invasion by setting out order or degree as the quintessential virtue, warning that calamities will follow the upset of cosmic, social, or political order. However, outside the playhouse, figures such as Thomas Digges (Usher, “Shakespeare’s” 133), Giordano Bruno (Janowitz 79), Johannes Kepler, and Galileo Galilei were producing evidence that the cosmic order is not as Ulysses attempts to portray it. These men disrupt the cosmic order outside; the characters disrupt the sociopolitical order within the play; and Ulysses’ calamitous prophecies are all fulfilled.

Either interpretation of the cosmology of Ulysses’ Degree Speech provides evidence that Shakespeare and his audience had become aware of the Copernican model of the universe. If the speech suggests that the planets revolve around the sun, as courtiers revolve around the king, the language unquestionably points to a Copernican interpretation. However, if the speech suggests that the Earth is the center of the cosmos, and that maintaining cosmic order keeps the world of men in order, the action of the play removes all confidence in a world of order, and suggests that the cosmic order has been disrupted. One such disruption is the replacement of the traditional Ptolemaic theory with the new Copernican theory.

The invasion of “the new astronomy”⁵¹ as it appears in Troilus and Cressida paralleled the other innovations of the Renaissance. As he would later achieve in writing the eccentric orbit

50 Of course, the Tudors had also been denounced by the Roman church.

51 Sicinius’ “treacherous innovation” in Coriolanus.

pattern in Coriolanus, Shakespeare wove into the Degree Speech in Troilus and Cressida elements of the Copernican astronomy to make a specific point. Yet whereas Shakespeare uses the new astronomy in Coriolanus for characterization, his use in Troilus and Cressida is thematic. In this earlier play, Copernican astronomy becomes a segment of a larger satirical attack on Shakespeare's society. Satire of the degradation of London society became common in the early Jacobean stage. Although critics rarely assign so late a date to Troilus and Cressida, the roots of the same depravity that Jonson, Middleton, Dekker, and their contemporaries would attack existed already in the late Elizabethan years, and Shakespeare may well be drawing an ironic parallel with Ulysses' speech. The Degree Speech reflects the audience's growing awareness of the new astronomy as well as its growing dissatisfaction with contemporary society. Shakespeare skilfully uses the Copernican astronomy within his satire. Whether Shakespeare believed the new theory is immaterial; it is clear that he and his audience are aware of it.

Chapter III: The Kingship of the Sun



Figure 6: The Great Chain of Being as envisioned by Medieval Europe. The hierarchy from the top down is as follows: God, the angels, the saints, humans, birds, fish, beasts, plants, minerals. The images in the margins of the graphic depict the fallen angels (Hatheway).

The heliocentric effect of Ulysses' Degree Speech focuses readers' attention on a larger pattern in Shakespeare's plays. The sun did not assume its lordship over Shakespeare's cosmos merely upon the first performance of Troilus and Cressida. Indeed, Dover Wilson notes that “sun-symbolism for the majesty of kingship is one of Shakespeare's leading ideas” (96).

Particularly in his history plays, Shakespeare consistently symbolizes the king and kingship with the sun. In Tudor England, the monarch was the most important figure, head of both church and state. The Great Chain of Being, the Medieval hierarchy of all creation, grants a special position to the king, placing him above other men. Within the Great Chain, each order has its own hierarchy; even the heavens have their order. The monarchy of the sun among the heavenly bodies in Shakespeare's histories places it at the top of the analogous “chain of being” of the cosmos. The sun's lordship of the cosmos implies a Copernican astronomy, and Shakespeare's regular appropriation of the Sun-King image implies that the playwright and his audience understood the basic idea of Copernican theory—a universe centered on the sun.

The Great Chain of Being assigns a permanent place in an immutable hierarchy to everything in the universe. The highest link in this chain is God, followed by angels, humans, the animals, plants, and minerals. Each of these, as well, has its own order. For mankind, the order held the divinely appointed king at the top, followed by the nobles and the peasants. For the planets in the Ptolemaic cosmos, the reigning cosmos in the Middle Ages that advanced the Great Chain of Being, the order was the hierarchy of proximity to the center, or Earth: the moon, Mercury, Venus, the Sun, Mars, Jupiter, and Saturn. However, Shakespeare upsets that order in the histories, placing the sun at the head of the Great Chain by connecting the sun with the throne. In Shakespeare's day, the Tudor doctrine of the Divine Right of Kings imbued the king with authority that was sacrilegious to challenge. R. B. Parker, editor of the Oxford Coriolanus, notes that Shakespeare's early histories operate within “the secure medieval doctrine that,

because of the Fall of Man, the state must limit Original Sin by imposing a fixed, hierarchical order under the King's unquestioned authority, rebellion against which is heinous sin (8).⁵² The king stood apart from the rest of mankind, as his place on the Great Chain of Being required.⁵³

Shakespeare, however, carefully observed that kings were flawed men, and wrote his royal characters to be real men. Although Shakespeare had limited exposure to Queen Elizabeth while writing his histories, he was acquainted with some of the court, especially the Earl of Southampton, and knew that at a fundamental level human beings all share the same passions and needs—even kings. Because of this humanizing connection, Shakespeare wrote into his kings the character and concerns of the men he envisioned them to be. Two of his kings, Richard II and Henry V, extemporize on what separates kings from ordinary men. However, neither of these kings denies his own royalty, nor equates himself with common men. John Halverson, after quoting Richard II 3.2.174-77, comments:

Casual reading may suggest that Richard equates himself with any ordinary human being, but the implication is that a king would somehow be above all these things, which apply to subjects (characteristically Richard cannot resist a punning opportunity). And the one thing that Richard can never accept is that he is not a king or could ever not be king. He may be “deposed,” but only in a material sense: mortal men can take away his crown, his throne, his power—this he understands all too well—but “Not all the water in the rough rude sea / Can wash the balm off from an anointed king” (3.2.54-55). True kingship comes from God and is infallible and inviolable. (351)

52 These comments on the Henry VI plays and Richard III appear in Parker's introduction to Coriolanus.

53 Even speaking to a king is governed by strict regulations. In F. P. Lock's recent study of pronoun address to the king, he diagrams rules governing address to the king so minute as to express when it is appropriate to refer to the king by the familiar “thou,” rather than the formal “you.” Calling a person “thou” makes him an equal or an inferior, and, as Lock notes, no one is equal to the king.

Richard never accepts any other man as his equal; he remains atop the Great Chain of Being, in his own mind at least. Similarly, Henry V's soliloquy the night before Agincourt may lead readers to similarly suspect him of thinking himself equal to his soldiers, especially when he questions, "And what have kings, that privates have not too, / Save ceremony, save general ceremony?" (H5 4.1.238-39). Yet Henry answers his own question; he asserts, "I am a king that find thee; and I know / 'Tis not [. . .] thrice-gorgeous ceremony" that makes a king (H5 4.1.259-66). As Henry knows, leadership and care for the kingdom make a king. Indeed, Keiji Aoki argues that Shakespeare's Henry V possesses the qualities of an ideal king throughout his life, from his days with his tavern crew in 1 Henry IV through his brilliant career as king (6). While kings are human, kingship in Shakespeare's plays is a fixed ideal—the king's office makes him supreme on the Great Chain of Being and superior to common humanity.

Shakespeare's histories not only reflect the Great Chain of Being revered in medieval thought, but they advance newer ideas about kingship. Though the plays never question the potency monarchy, they place strict demands upon the person of the monarch. A truly ideal king must merit the supremacy afforded him. Barbara Baines argues that the plays of Henry IV require the king to measure up to the standards that place him above his subjects: "When he [Bolingbroke] returns to claim his rights, he is claiming more than his title and property. He is claiming the right which, according to one theory of kingship, every Englishman has—the right to be governed by a responsible king. [. . .] The first lesson which Bolingbroke offers Hal is that kingship is merited, not merely inherited" (Baines 27, 33). The king whom Henry IV demands, the king whom many readers experience in Henry V, the king who merits his authority is an ideal. Such a king is advanced above his subjects by nature; such a king assumes his place in the Great Chain of Being. However, to reconcile the ideal king with the real, flawed men who held the throne, Shakespeare needed a mode of representation that could portray the ideal while

accepting the actual king. He found his representation in the symbol of the Sun-King.

Shakespeare commonly represented kingship⁵⁴ with the symbol of the sun. References to this symbolism are scattered throughout the histories, with many kings and claimants taking the sun-symbol for themselves. In 2 Henry VI, for example, the Duke of York compares the crown he seeks to the sun and its beams:

I will stir up in England some black storm
 Shall blow ten thousand souls to heaven or hell;
 And this foul tempest shall not cease to rage
 Until the golden circlet on my head,
 Like to the glorious sun's transparent beams,
 Do calm the fury of this mad-bred flaw. (2H6 3.1.349-54)

Not only is the crown a “golden circlet,” similar in appearance to the sun, but the simile that follows openly compares the crown—and, through the synecdoche, kingship—to the sun. York threatens also to wage war on Henry VI, though he delivers the threat in terms of a “black storm,” a “foul tempest” that would block the light of the sun. While the passage operates as a leitmotif, comparing the darkness of war to the peaceful light of a potential Yorkist reign, the simile in this passage invites comparing York's rebellion with a storm blocking out Henry's sun.⁵⁵

Shortly after York's defeat in 3 Henry VI, York's sons view the sun as an omen favoring

54 Since the king's position was so far above that of the common man, Shakespeare needed to represent kingship on stage with great caution. This was a difficult task, since, as David Kastan argues, the very act of placing a king on stage played by a common actor could be subversive (460). Heninger notes the dilemma faced by the playwright: “To imitate nature as his contemporaries saw it, Shakespeare was committed to a dramatic technique which recognized an absolute order, but at the same time admitted that real men seldom fulfill the ideal conditions” (319). Shakespeare successfully used symbols to portray kingship respectfully and accurately. Timothy Rosendale demonstrates the success Shakespeare enjoyed in the Lancastrian tetralogy in symbolizing kingship (124). While Richard II insists on his being an “anointed king,” the Chorus to Henry V invites the audience to recognize the transparency of the limited stage (Rosendale 134).

55 Despite York's claim, Heninger notes the challenger's primary weakness: he is not the legitimate king. “The usurper can never enjoy the full privileges of kingship, since he is not appointed by God. He does not derive his authority from natural order” (324-25). In the context of Shakespeare's histories, usurpers such as Bullingbrook or the Duke of York can never fully assume the majesty atop the Great Chain that their heirs, Henry V or Edward IV, attain through their legitimate succession.

their impending victory and Edward's kingship (3H6 2.1.21-31). The idea of this passage is inordinately sensational, with the brothers beholding three suns at once, then watching them meld into one. Richard implies that the three suns symbolize three kings, who join in “some league inviolable.” The two brothers, who would become Edward IV and Richard III, are certainly two of the suns; the third has often been assigned to their brother George, later Duke of Clarence. Richard would again compare his brother to the sun after Edward obtains the crown: “Now is the winter of our discontent / Made glorious summer by this son of York” (R3 1.1.1-2), with the obvious pun on “son.” Edward, the victorious king, holds the sun's power to warm “the winter of our discontent” and war into a “glorious summer” of peace. The Yorkist kings in the early tetralogy regularly appropriate the symbol of the Sun-King. Other royal figures, such as Hotspur (2H4 2.3.18-21) and Henry VIII (H8 3.2.415) earn the sun metaphor as well. However, Shakespeare best develops the Sun-King symbol in the Lancastrian tetralogy.

The histories generally propound the ideal of the Sun-King, but the Lancastrian tetralogy develops the symbol most fully. The single figure in the Lancastrian tetralogy to receive the most references as the Sun-King is Henry V, the central character of three of the four plays. Henry's first comparison to the sun comes in his own soliloquy early in 1 Henry IV:

Yet herein will I imitate the sun,
 Who doth permit the base contagion clouds
 To smother up his beauty from the world,
 That when he please again to be himself,
 Being wanted, he may be more wond'ered at
 By breaking through the foul and ugly mists
 Of vapors that did seem to strangle him. (1H4 1.2.197-203)

Prince Hal will become the sun, the king of England, yet throughout the Henry IV plays he

associates with lewd company. Aoki argues that the Prince allows himself, the sun, to be obscured by “the base contagion clouds” in the form of Falstaff and his East Cheap cronies (7).⁵⁶ This soliloquy engraves the Sun-King symbol upon Prince Hal, and the audience observes the ideal king emerge from the wayward prince. Throughout the plays depicting Henry's career, Shakespeare's greatest Sun-King imagery⁵⁷ appears in the king's own mouth as he plans his invasion of France. Henry's sunlike description of himself threatens the Dauphin's inferiority: “But I will rise there with so full a glory / That I will dazzle all the eyes of France, / Yea, strike the Dolphin blind to look on us” (H5 1.2.278-80). The metaphor is unmistakable: Henry rises, dazzles, and strikes blind.

Shakespeare does not limit the sun metaphor Henry V to the king's words alone. Henry's great apologist, the Chorus, regularly reminds the audience of the magnificence of his Sun-King. On the eve of Agincourt the Chorus shows the king acting the part of the sun, warming his troops: “A largess universal, like the sun, / His liberal eye doth give to every one, / Thawing cold and fear [. . .]” (H5 4.0.42-44). This Henry, the greatest of Shakespeare's English kings, so completely merges with the sun that he bestows light, when he “dazzle[s] all the eyes of France/ And strike[s] the Dolphin blind,” and warmth, when he “Thaw[s] cold and fear” from his soldiers. The Sun-King metaphor follows Henry V throughout his life. Lisa Dickson notes that even in death Henry's followers compare him to the sun (138). Gloucester's eulogy of the king from the opening lines of 1 Henry VI, likely Shakespeare's first play,⁵⁸ extend the comparison years before Shakespeare established the character of the living Henry:

56 Aoki argues that this sun-cloud metaphor, with Prince Hal hiding his greatness behind the tavern crew, creates unity in the two parts of Henry IV (6).

57 Many other images appear through the Henry IV plays. Hal's father King Henry IV advises him on kingship: “Such as is bent on sunlike majesty / When it shines seldom in admiring eyes” (1H4 3.2.78-79). Before the battle at Shrewsbury, Vernon compares Prince Hal and his army to the sun: “Glittering in golden coats like images, / As full of spirit as the month of May, / And gorgeous as the sun at midsummer” (1H4 4.1.100-02).

58 While scholars are divided on the order of composition of Shakespeare's earliest plays, there is general agreement that he completed 1 Henry VI before composing Richard III in 1593 or 1594 (Evans 78). Most scholars now accept 1599 as the year of composition for Henry V (Evans 83; Shapiro 86).

His brandish'd sword did blind men with his beams;

His arms spread wider than a dragon's wings;

His sparkling eyes, replete with wrathful fire,

More dazzled and drove back his enemies

Than midday sun fierce bent against their faces. (1H6 1.1.10-14)

The glory of the Sun-King dazzles his followers even in death. Shakespeare consistently represents Henry V, from his youth to his eulogy, with the sun. As the playwright advances the Sun-King metaphor on stage through multiple plays spanning the better part of a decade, his audience continually connects the glory of the sun with the glory of the throne, the pinnacle of the terrestrial Great Chain.

However, despite the host of Sun-King references applied to Henry V, Richard II displays the most frequent sun-images. These range from Bullingbrook's⁵⁹ early hope of the sun shining on his banishment (R2 1.3.144-48) to the outright comparisons Richard makes between himself and the sun. As in the case of Henry V, sunrise and sunset signal the beginning and end of the reign of the king. Salisbury foresees such a sunset in the doom of Richard's reign (R2 2.4.18-22); like the rest of the court, he knows that Bullingbrook will win the military and political conflict between the two. That sunset contrasts with the sunrise Richard prophesies when he learns York has joined Bullingbrook: "Discharge my followers, let them hence away / From Richard's night to Bullingbrook's fair day" (R2 3.2.217-18).⁶⁰ As Richard loses his grip on the kingdom, his sun imagery turns into sunset and night.⁶¹

59 My edition, the 1997 Riverside, spells the future Henry IV's name "Bullingbrook" (847). I therefore retain that spelling except when quoting or paraphrasing my sources. In those cases I adopt the spelling of the critic.

60 Kathryn Montgomery Harris argues that at this point Richard exchanges symbols with Bullingbrook; she reads the play to provide opposing symbols for the two, namely the sun or fire for Richard and water for Bullingbrook. According to Harris' analysis, Richard and Bullingbrook carry these symbols into the surrender scene, but they trade symbols at the moment of abdication. The Abdication Scene confirms Bullingbrook as the sun (Harris 162).

61 Sixty years ago, Samuel Kliger argued that the sun imagery in Richard II elevates the language of the drama: "Prosaically, the king is deposed, killed, or banished; poetically, however, his effulgence is dimmed by nightfall,

Although Richard gradually loses the kingdom, he retains the Sun-King symbol in the minds of the audience. Bullingbrook receives some attention as a Sun-King,⁶² but those passages primarily establish the usurper as a foil to Richard. The most and best-known sun images are those Richard uses to identify himself as a divinely ordained king (Harris 159). One of these is his famous assertion that the king's presence banishes treason:

But when from under this terrestrial ball
 [The searching eye of heaven]⁶³ fires the proud tops of the eastern pines
 And darts his light through every guilty hole,
 Then murders, treasons, and detested sins,
 The cloak of night being pluck'd from off their backs,
 Stand bare and naked, trembling at themselves?
 So when this thief, this traitor Bullingbrook,
 Who all this while hath revell'd in the night,
 Whilst we were wand'ring with the antipodes,
 Shall see us rising in our throne, the east,
 His treasons will sit blushing on his face,
 Not able to endure the sight of day,
 But self-affrighted tremble at his sin. (R2 3.2.41-53)

Richard compares his own return to the sunrise, which scatters not only night's darkness but

he is banished to northern sunless exile, a rival body (Bolingbroke) eclipses his brightness: all these are appropriate formally to the initial sun-image [. . .]" (Kliger 196-97). The underlined terms are italicized in Kliger's original.

62 As the crown passes to Bullingbrook in the Abdication Scene, Richard openly associates his rival with the sun: "God save King Henry, unking'd Richard says, / And send him many years of sunshine days!" (R2 4.1.220-21); he further relates his new station as former king, unimportant before Bullingbrook, to the sun and the snow: "O that I were a mockery king of snow, / Standing before the sun of Bullingbrook, / To melt myself away in water-drops!" (R2 4.1.260-62). In the climax of this scene, Richard looks into a mirror and declares, "Was this the face / That, like the sun, did make beholders wink?" (R2 4.1.283-84).

63 In the play the word here is "He"; the term I have inserted is the antecedent of "He" found in line 37.

nocturnal creatures. Thus Richard expects Bullingbrook to “self-affrighted tremble at his sin” when he sees the majesty of Richard “rising in our throne, the east.” Richard calls himself “the searching eye of heaven,” directly equating himself with the sun. Although he claims to have “wand[ered] with the antipodes”—in effect, the sun has traveled to visit the other side of the world—his wanderings do not weaken the Copernican reading of the sun in this passage. Adherents of both the Ptolemaic and the Copernican cosmologies understood that night in England meant day on the other side of the world, “the antipodes.” Further, while Richard refers to himself as “wand'ring,” he retains the focus of his speech on himself. He also refers in the last two lines to the permanency of kingship—the Great Chain of Being sets Richard apart from the rest of mankind, and he refuses to believe that Bullingbrook can defeat him. Halverson notes that “Identifying himself with the sun, he [Richard] expects that his mere presence will scare off Bolingbroke, and in any event God will send angels to fight on his side” (354-55). Richard's divine mandate and ordination as king, he believes, protects him from the consequences of Bullingbrook's rebellion. Richard thus symbolizes his own kingship with the sun.⁶⁴

Further imagery throughout Richard II enriches Richard's self-applied sun symbol. When Richard and Bullingbrook meet in the Surrender Scene, Bullingbrook welcomes the king, who is still the recognized king, with language that further invokes the sun imagery:

See, see, King Richard doth himself appear,
 As doth the blushing discontented sun
 From out the fiery portal of the east,
 When he perceives the envious clouds are bent

⁶⁴ Richard associating himself with the sun in either cosmology is laughably ironic, as the audience knows that Richard will fall from his throne. A separate reading could analyze Richard and Bullingbrook as cosmic foils, a Ptolemaic Sun-King and a Copernican Sun-King. Such a reading could also consider the possibility that Richard's fall and Henry's ascension symbolize the supplanting of the old cosmology, but such analysis is beyond the scope of the present essay.

To dim his glory and to stain the track

Of his bright passage to the occident. (R2 3.3.62-67)

While Bullingbrook still ascribes to Richard the status of the sun, he notes that “the envious clouds are bent / To dim his glory.” The clouds are Bullingbrook himself and his allies, envious of Richard's power and ready to “stain the track” of Richard's reign with blood. Richard knows he is already defeated and surrenders immediately. Commenting on his fall, Richard says, “Down, down I come, like glist'ring Phaëton, / Wanting the manage of unruly jades” (R2 3.3.178-79). Equating Phaeton with the sun problematizes the reading, since Phaeton was to drive the sun around the earth, but Richard is merely using the sun itself (Apollo, not Phaeton) as a metaphor for kingship, and it is Richard's own fall that he likens to Phaeton's. In the myth the boy falls from the sun after Earth begs Zeus to deliver her from the scorching heat of Phaeton's wild ride (Bulfinch); Zeus destroys Phaeton as earth requests. The chariot itself also falters, but does not fall to the Earth, and Apollo restores the sun to its proper order. In the play Richard falls from kingship when the magnates and commons join with Bullingbrook to depose him. By analogy, the deposition shakes the crown's power, but the resolution hopes that Henry IV will restore the monarchy to its ideals,⁶⁵ deserving the Sun-King recognition that Richard seems to adore. Even in declaiming the fall of a weak king, the Sun-King symbol represents an ideal.⁶⁶ While Richard identifies both himself and Bullingbrook in turn with the sun, it is the ideal of kingship which the sun truly represents in Richard II.

Throughout Richard II, the other Lancastrian histories, and the earlier histories, the sun

65 The two Henry IV plays belie the idea that Henry's reign will bring peace. Indeed, Henry's reign becomes even more troublesome than Richard's with the rebellions of the Percies and Archbishop Scroop.

66 Heninger analyzes the sun imagery in Richard II to perform three functions: “The Sun-King [. . .] is spotlighted as a multifaceted image which in this context functions in three fundamental ways: (1) it is the symbol of royal prerogative as it passes from Richard to Bolingbroke; (2) it is the mirror that reveals in turn the deficiencies of both Richard and Bolingbroke; and (3) it is an instrument of transition in Richard's personal tragedy, in his evolution from unscrupulous villain to sympathetic victim” (Heninger 322).

regularly returns as a symbol for ideal kingship, whether it be found in particular kings or in the image the monarchy seeks to project. Heninger explains that “In another function, the Sun-King embodies an ideal of kingly conduct which had been well developed and oft stated in Elizabethan times. It is the imagistic presentation of the perfect statesman-king” (324). To merit the sun image, a true Sun-King must embody “ideal kingly conduct.” The histories can be read as a dissertation on ideal kingship: Henry VI woefully fails; York, Edward IV, and Richard III appropriate the image, but do not merit it; Richard II fails, and the sun image he so frequently invokes becomes an ironic foil to his actual conduct (Heninger 324); Henry IV is tainted by his plotting and forced to fight continually for his throne; only Henry V enjoys acclaim as the Sun-King throughout the play that bears his name, though the reader questions his behavior in his youth; the epithet is finally unchallenged only in Henry VIII, the Arch-Tudor.

Thus the Sun-King image in Shakespeare's histories links the monarchy with its indelible symbol. Cosmologically, relating the sun to the king asserts the sun's primacy in the Great Chain of Being. As the king is the highest in the hierarchy of men, the sun as symbol of the king must be the highest in the cosmic hierarchy. The sun becomes the king of the planets, with the rest revolving around it like courtiers. This is Copernicus' view of the cosmos: the planets orbit the Sun, rather than the Earth. More than the peripheral relation between Coriolanus and the aberrant planet Mars, more even than the dual interpretation of Ulysses' Degree Speech, the Sun-King symbol reveals the Copernican astronomy in Shakespeare's plays by repeatedly asserting the sun's primacy in the cosmos.

Shakespeare's frequent relation of the sun to kingship was not his own invention, however. The Sun-King image was a common trope of his day. His appropriation of the image does not imply that he introduces Copernican elements into early modern thought, as Usher suggests, but that these Copernican elements were already present. Shakespeare reflects the ideas

and attitudes of his audience in his characters. Because Shakespeare's characters accepted the Sun-King, Shakespeare's audience must have similarly accepted it. Heninger argues that "Richard's deposition has cosmic implications" (319). Because the Great Chain of Being assigns an infallible position to the monarchy, removing a king from power disrupts the certainty of the Great Chain. If the sun, the body of the king, can be removed from its place, the whole conception of the cosmos is in jeopardy. Thus the Sun-King image in Shakespeare's history plays "deposes" the Ptolemaic theory of the cosmos, placing the sun itself at the head of the cosmos, and revealing the threads of Copernican thought that underlie the English Renaissance cosmology.

These threads of Copernicanism act as one of many connections between the history plays and their audience. Shakespeare's histories are his most English plays, and their extraordinary popularity⁶⁷ indicates that the audience resonated well with these plays. Shakespeare could not have included so many references to the connection between the throne and the sun unless his audience accepted the symbol. The Sun-King symbol develops a key idea of the Copernican astronomy through a long series of plays. Shakespeare's audience, familiar with the concept already, accepted the Sun-King as an appropriate mode of representation. The remarkable frequency with which the playwright reminded the audience of the Sun-King suggests that the Elizabethan English could accept the notions of the Copernican astronomy, which set the sun at the head of the universe.

67 Six of the seventeen plays published before 1616 were histories, and Richard III and 1 Henry IV saw many Quarto printings before the 1623 Folio (Evans 78-85). No of the comedy or tragedy has such a print history.

Conclusion: Early Awareness of the New Astronomy

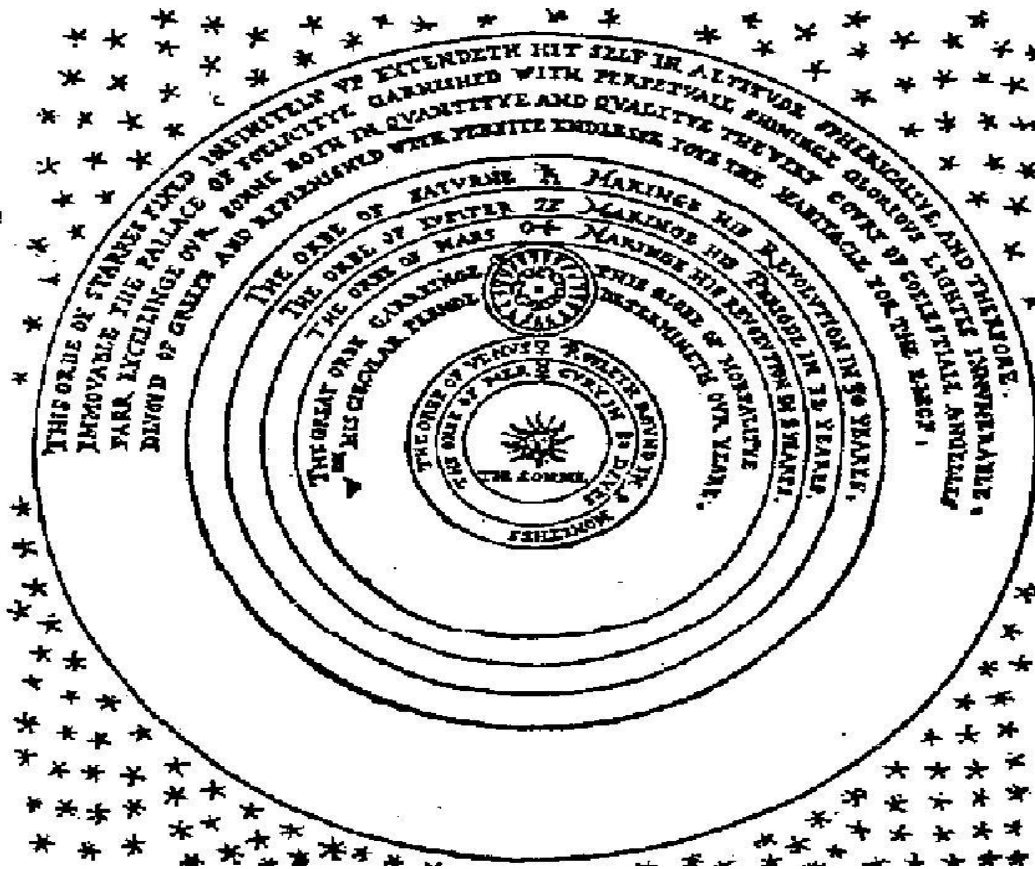


Figure7: The Copernican cosmos of Thomas Digges, from A Perfit Description (Usher, "Hamlet's" 28).

Shakespeare knew what his audience wanted to see at the theater. As demonstrated, Shakespeare knowingly wrote elements of the Copernican astronomy into his plays. He wrote them into the plays because his audience knew to recognize “the new astronomy” when it appeared on stage. The audience recognized Shakespeare's subtle use of Copernican astronomy because they took their ideas more readily from the continent than even they would have admitted. Heliocentric astronomy would not receive its stamp of approval from the English establishment until late in the seventeenth century, under the Royal Society and Newton.⁶⁸ Although Elizabethan England tried to distinguish itself from European influences, the appearance of a Continental theory in the work of the greatest expositor of Elizabethan England belies the attempt. Continental thought directly influenced the thinking of the Elizabethan theater audience, and through the audience those theories influenced Shakespeare. Regardless of when England accepted Copernican theory, Shakespeare and his audience were talking about it, and they were thinking about it.

The new theories of the cosmos influenced Shakespeare from the earliest stages of his career. He opened 1 Henry VI with his first Sun-King symbol (1H6 1.1.10-14), and he continued to embed the Copernican astronomy within his plays. While Shakespeare used the Sun-King symbol widely, it is hardly unique to him. This symbol permeated European ideas about kingship. Shakespeare's act of appropriating the sun-king as a metaphor in his plays about the English kings clearly takes a continental symbol into an English context. The Sun-King symbol is critically important in Shakespeare's Copernican imagery. Copernicus made the sun king of the planets by envisioning a cosmos centered on the sun, so Shakespeare's Sun-King symbol would resonate with an audience who had learned of the new astronomy. The Great Chain of Being had

68 The Royal Society, founded in 1662, grew into the scientific magnate of the eighteenth century under the presidency of Newton (Prall and Willson 421-22); it was under the auspices of this society that Newton published Principia Mathematica in 1687.

already engraved on English thought the concept of hierarchy. Shakespeare's equating the sun with the lord of the terrestrial hierarchy implies that his audience could accept the sun as lord of the cosmic hierarchy.

As Shakespeare's work evolved from the English history form into the darker plays of his later periods, he did not lose the Copernican connection between the sun and the monarchy. He strengthened the connection in Troilus and Cressida. The playwright composed this satire at the height of his career.⁶⁹ In this play Shakespeare inverts the symbolic connection between the sun and the monarchy: instead of writing the sun as a symbol for the king, he wrote the king as a symbol for the sun. Ulysses' Degree Speech, which so many critics have read to espouse a Ptolemaic cosmology, uses language that can be readily interpreted with a Copernican understanding of the cosmos. Although Ulysses is an old man whom no one in the play respects nor believes, his Degree Speech exhibits features of the new, Copernican cosmology. Even reading Ulysses' speech as an anachronistic throwback to the Ptolemaic cosmology, the play fulfills his prophecies of disaster and unravels that cosmology. The themes that unfold in Shakespeare's satire within Troilus and Cressida—themes that target Shakespeare's audience at the end of Elizabeth's life and the beginning of James' reign—reveal dissipation, mutiny, and rapaciousness arising from the early modern English sense of the new, modern world. The new English thought themselves better than any people the world had ever known—even to the point, Shakespeare suggested, that they rejected the very cosmic order that their forebears believed. Ulysses' sun-centered Degree Speech serves not only to reveal that Shakespeare's audience knew of the Copernican astronomy, but that many of them accepted it as a part of the new, modern world. The satire in Troilus and Cressida illuminates the understanding of Copernican astronomy that the Elizabethan audience had gained by the turn of the seventeenth century.

⁶⁹ The date for Troilus and Cressida is most likely between the composition of Hamlet very near the turn of the century and his company's receiving the royal patronage in 1603.

Even after Elizabeth's death, when Shakespeare entered his great tragic period, he continued to refer to the new astronomy. Critics have detailed the possibilities of the Copernican astronomy in several tragedies, particularly Hamlet and Lear. Near the end of Shakespeare's tragic period, he composed Coriolanus. In this late tragedy,⁷⁰ he investigated a newer concept within the Copernican astronomy. In Coriolanus he turned to the emerging understanding of the elliptical orbit of the planets around the sun. Kepler's theory, which uses the orbit of Mars to prove the elliptical orbits of all the planets, solidifies his previous theory that a force from the sun moves the planets. Shakespeare embraced this concept with his protagonist Coriolanus, demonstrating the eccentric orbit of the planet Mars moved by a powerful force. Coriolanus' mother Volumnia exerts exactly such a powerful force on her son. She moves Martius through his decisions as the sun moves Mars through the heavens. Shakespeare uses the eccentric orbit of the planet Mars as an element of his pattern of characterization of his hero. As Coriolanus moves, physically and emotionally, through an eccentric, unpredictable pattern governed by his mother's influence, his fortunes wax and wane, as would the appearance of the planet Mars from Earth. Shakespeare had been fascinated with the unexplained motion of Mars from the earliest point in his career, and the advance details of Kepler's new theory provided a new way to explore the phenomenon. More importantly, Kepler's work gave the Mars problem currency with Shakespeare's audience so that they would appreciate the bard's characterization of Coriolanus in connecting him to the eccentric behavior of the planet.

Shakespeare referred often to the new astronomy, so some of his audience must have understood the new theory, or at least known enough of the basic ideas to understand the references. It would be unwise to assert, as Usher and Janowitz do, that Shakespeare believed in or supported the Copernican astronomy. We return to Snyder's argument: "he never indulged

⁷⁰ Arguably the last tragedy that he finished—some scholars believe Timon of Athens was never finished nor performed, and Parker argues that Shakespeare began Coriolanus after he abandoned Timon (2).

strongly in any set of theories or beliefs on any given subject” (43). Shakespeare used his drama to “hold as 'twere the mirror up to nature” (Ham. 3.2.22). Indeed, Shapiro argues that much of Shakespeare's art consisted of assimilating ideas that held currency with the audience and inserting references in the plays to those ideas. The fact that Shakespearean drama shows evidence of Copernican astronomy demonstrates an early understanding of the theory in England. That early understanding shows the influence of continental European thinking on Shakespeare's audience.

It is significant that Copernican astronomy reveals Continental thinking in Shakespeare's plays. Elizabethan England prided itself in being distinguished from the rest of Europe,⁷¹ the decadent Babylon that reveled in immorality and reeked of disease. The prudish English poked fun at their continental neighbors. Shakespeare himself regularly made nationalistic jokes aimed at the European nations, particularly Spain and France. Yet his plays exhibit continental influence through their understanding of Copernican astronomy. Evidence that Shakespeare, the pillar of Elizabethan England, drew upon the ideas of continental scientists opens the avenues of inquiry into what other contemporary ideas from Europe influence Shakespeare's plays. Such inquiry will expand understanding of the influence of continental Europe on early modern England.

The evidence of Copernican astronomy in Shakespeare's plays explored in this essay includes a diverse selection of his work. Copernican astronomy appears in a tragedy, a comedy,⁷² and several histories. Copernican astronomy surfaces in a restricted passage, a metaphor through a whole play, and a symbol through a series of plays. Shakespeare uses Copernican astronomy in characterization, thematic development, and symbolism. The evidence arises from plays written

71 The queen herself “loved England, [. . .] identified herself with her country, [and] gloried in being 'mere English” (Prall and Willson 271).

72 Troilus and Cressida is one of the so-called “problem plays” (Bloom 327). It appears in the 1623 Folio between the histories and the tragedies but not on the table of contents. The play itself defies easy classification—it lacks a marriage plot, the death of a protagonist, or other features that would lend it an easy category. Many editors classify it with the comedies, since it does not display characteristics of either the tragedies or the histories.

early in Shakespeare's career, a play near his peak in Elizabeth's last years, and a play from Shakespeare's latest years with the theater. The prevalent patterns in Coriolanus, Troilus and Cressida, and the Lancastrian histories reveal an enduring understanding within Shakespeare's work not limited to a particular play, genre, or time period. Shakespeare's demonstrated awareness of the Copernican astronomy implies that Shakespeare's audience knew the Copernican astronomy. Although contemporary historians infer that the scientific establishment did not yet fully accept Copernican theory, the ideas were already filtering through the English society. Shakespeare absorbed these ideas, creating subtle references to the news abroad and giving his plays immediacy for his audience.

Bibliography

- “Against Disobedience and Willful Rebellion.” Anglican Library. Ed. Ian Lancashire. 1999. U of Toronto. 3 July 2008. <http://www.anglicanlibrary.org/homilies/bk2hom21.htm>.
- Aoki, Keiji. Shakespeare's Henry IV and Henry V: Hal's Heroic Character and the Sun-Cloud Theme. Kyoto: Showa, 1973.
- Axline, Kim. “When Stars Fall to Earth: The Onslaught of Time in Romeo and Juliet.” On-stage Studies 21 (1998): 123-33.
- Baines, Barbara J. “Kingship of the Silent King: A Study of Shakespeare's Bolingbroke.” English Studies 61 (1980): 24-36.
- Bennett, Karen. “Star-Cross'd Lovers: Shakespeare and Prokofiev's ‘pas de deux’ in Romeo and Juliet.” Cambridge Quarterly 32 (2003): 311-47.
- Berry, Ralph. “Sexual Imagery in Coriolanus.” SEL 13 (1973): 301-16.
- Bradford, Alan Taylor. “Jaques' Distortion of the Seven-Ages Paradigm.” Shakespeare Quarterly 27 (1976): 171-76.
- “Bruno thru Kepler.” Humanities 399. 2003. U of Oregon. 18 May 2009. <http://zebu.uoregon.edu/2003/hum399/kmars.gif>.
- Buechmann, Claus-P. “Shakespeare's Coriolanus: The Icon of Mars.” Diss. U of New Mexico, 1972.
- Bulfinch, Thomas. “Chapter V. Phaeton.” The Age of Fable: Or Stories of Gods and Heroes. 26 May 2009. <http://www.sacred-texts.com/cla/bulf/bulf04.htm>.
- Burvill, Tom. “Ulysses on 'Degree': Shakespeare's Doctrine of Political Order?” Parergon 2 (1984): 191-203.
- Clark, Cumberland. Astronomy in the Poets. Bournemouth: Sydenham, 1922.

- Copernicus, Nicolaus. On the Revolution of Heavenly Spheres. 1543. Great Minds Series. Amherst, N. Y.: Prometheus, 1995.
- Coursen, Herbert R., Jr. "Henry V and the Nature of Kingship." Discourse 13 (1970): 279-305.
- Craig, Hardin. "A Cutpurse of the Empire: On Shakespeare Cosmology." Tribute to G. C. Taylor. Ed. Arnold Williams. Chapel Hill: U of North Carolina P, 1952. 3-16.
- Cramer, Frederick H. Astrology in Roman Law and Politics. Philadelphia: s. n., 1954.
- Daniels, F. Quindland. "Order and Confusion in Troilus and Cressida." Shakespeare Quarterly 12 (1961): 285-91.
- Dickson, Lisa. "No Rainbow Without the Sun: Visibility and Embodiment in 1 Henry VI." Modern Language Studies 30 (2000): 137-56.
- Digges, Thomas. "A Perfit Description of the Cælestiall Orbes according to the moſt aunciente doctrine of the Pythagoreans, lately reuiued by Copernicvs and by Geometricall Demonstrations approued." A Prognostication Everlastinge Corrected and Augmented by Thomas Digges. Leonard Digges. London, 1576. The English Experience number 727. Amsterdam: Theatrum Orbis Terrarum, 1975.
- . "A Perfit Description of the Coelestiall Orbes according to the most aunciente doctrine of the Pythagoreans, lately revived by Copernicus and by Geometricall Demonstrations approved." 1576. As the World Turned: A Reader on the Progress of the Heliocentric Argument from Copernicus to Galileo. 1 September 1999. Dartmouth College. 11 August 2008. <http://math.dartmouth.edu/~matc/Readers/renaissance.astro/5.1.Orbs.html>.
- Draper, J. W. "Shakespeare's 'Star-Crossed Lovers.'" Review of English Studies 15.57 (1939): 16-34.
- Eldridge, Elaine. "Moral Order in Shakespeare's Troilus and Cressida: The Case of the Trojans." Buchreihe der Anglia 104 (1986): 33-44.

Elyot, Thomas. The Book Named the Governor, 1531. Questia. Ed. S. E. Lehmborg. 2 July 2008.

<http://www.questia.com/PM.qst?a=o&d=37077367>>.

Evans, G. Blakemore, and J. J. M. Tobin, eds. The Riverside Shakespeare. Boston: Houghton, 1997.

Ferguson, Kitty. Tycho and Kepler: The Unlikely Partnership That Forever Changed Our Understanding of the Heavens. New York: Walker, 2002.

Frye, Northrop. Fools of Time: Studies in Shakespearean Tragedy. Toronto: U of Toronto P, 1967.

Goins, Scott E. "Pain and Authority in the Aeneid and Henry V." Classical and Modern Literature 15 (1995): 367-74.

Greene, Gayle. "Language and Value in Shakespeare's Troilus and Cressida." SEL 21 (1981): 271-85.

Gurr, Andrew. The Shakespearean Stage. 3rd Edition. Cambridge: Cambridge UP, 1992.

Halverson, John. "The Lamentable Comedy of Richard II." English Literary Renaissance 24 (1994): 343-69.

Harris, Kathryn Montgomery. "Sun and Water Imagery in Richard II: Its Dramatic Function." Shakespeare Quarterly 21 (1970): 157-65.

Hatheway, Eric. "The Great Chain of Being." e>log. 23 August 2008. 14 May 2009.

<http://blog.erichatheway.com/2008/08/23/the-great-chain-of-being.aspx>.

Heninger, S. K., Jr. "The Sun-King Analogy in Richard II." Shakespeare Quarterly 11 (1960): 319-27.

Holt, Leigh. From Man to Dragon: A Study of Shakespeare's Coriolanus. Ed. James Hogg. Jacobean Drama Studies. 61. Salzburg: Universität Salzburg, 1976.

“Homily on Obedience.” Anglican Library. Ed. Ian Lancashire. 1999. U of Toronto. 2 July 2008.

<http://www.anglicanlibrary.org/homilies/bk1hom10.htm>.

Hooker, Richard. The Laws of Ecclesiastical Polity. Google Books. Ed. Henry Morley. 2 July

2008. <http://books.google.com/books?id=OBlbuD57RecC&printsec=titlepage#PPA1,M1>.

Hope, Jonathan. Shakespeare's Grammar. London: Arden, 2003.

Huffman, Clifford Chalmers. Coriolanus in Context. Lewisburg: Bucknell UP, 1971.

Jacobs, Henry E. “Prophecy and Ideology in Richard II.” South Atlantic Review 51 (1986): 3-17.

Janowitz, Henry. “Some Evidence on Shakespeare’s Knowledge of the Copernican Revolution and the ‘New Philosophy.’” Shakespeare Newsletter 51.3 (2001): 79-80.

Johansen, Jorgen Dines. “The Structure of Conflicting Cosmologies in King Lear.” Poetics 5 (1972): 84-127.

Johanyak, D. L. Shakespeare's World. Upper Saddle River, New Jersey: Pearson, 2004.

Jorgensen, Paul A. “A Formative Shakespearean Legacy: Elizabethan Views of God, Fortune, and War.” PMLA 90 (1975): 222-33.

Kastan, David Scott. “Proud Majesty Made a Subject: Shakespeare and the Spectacle of Rule.” Shakespeare Quarterly 37 (1986): 459-75.

Kaula, David. “Will and Reason in Troilus and Cressida.” Shakespeare Quarterly 12 (1961): 271-83.

Kepler, Johannes. Astronomia Nova. 1609. Google Books. 30 May 2009.

http://books.google.com/books?id=2143HQAACAAJ&dq=astronomia+nova+intitle:Astronomia+intitle:Nova+inauthor:Kepler&lr=&as_drrb_is=q&as_minm_is=0&as_miny_is=&as_maxm_is=0&as_maxy_is=&as_brr=0&as_pt=BOOKS.

---. Mysterium Cosmographicum. 1596. Google Books. 30 May 2009.

<http://books.google.com/books?id=dMb->

[PQAACAAJ&dq=mysterium+cosmographicum&lr=&as_brr=0.](#)

Kliger, Samuel. "The Sun Imagery in Richard II." Studies in Philology 45 (1948): 196-202.

Kocher, Paul H. Science and Religion in Elizabethan England. New York: Octagon, 1969.

Lock, F. P. "Thouing the King in Shakespeare's Plays." Essays in Criticism 58 (2008): 120-42.

Lovejoy, Arthur O. The Great Chain of Being: A Study in the History of an Idea. 1936.

Cambridge: Harvard UP, 1964.

Mackenzie, Clayton G. "Girding the Gods: Mythologies of Mars in Coriolanus." Litteraria

Pragensia 4.8 (1994): 17-38.

Markey, T. L. "The Cosmology of Lear and his Daughters." Beiträge zur Namenforschung 17

(1982): 56-62.

Mayhew, Robert J. "Was William Shakespeare an Eighteenth-Century Geographer? Constructing

Histories of Geographical Knowledge." Transactions of the Institute of British

Geographers ns 23 (1998): 21-37.

McAlindon, T. "Language, Style, and Meaning in Troilus and Cressida." PMLA 84 (1969): 29-

43.

---. Shakespeare's Tragic Cosmos. Cambridge: Cambridge UP, 1991.

Meyer, George W. "Order out of Chaos in Shakespeare's Troilus and Cressida." Tulane Studies in

English 4 (1954): 45-56.

Molnar, M. "Astrological Omens Commemorated on Roman Coins: The Ides of March." Celator

8.11 (1994): 6-9.

Mowat, Barbara A. "Prospero's Book." Shakespeare Quarterly 52 (2001): 1-33.

Newton, Isaac. Philosophiæ Naturalis Principia Mathematica. 1687. Google Books. 30 May

2009. [http://books.google.com/books?id=WqaGuP1HqE0C&printsec=frontcover&dq=](http://books.google.com/books?id=WqaGuP1HqE0C&printsec=frontcover&dq=principia+mathematica)

[pricipia+mathematica.](#)

- Olson, Donald W., Marilyn S. Olson, and Russell L. Doescher. "The Stars of Hamlet: Shakespeare's Astronomical Inspiration?" Sky and Telescope 1 Nov. 1998: 68-73.
- Overholser, Winfred. "Shakespeare's Psychiatry—And After." Shakespeare Quarterly 10 (1959): 335-52.
- Panaghis, A. M. "The Star-Crossed Lovers: A Reading of William Shakespeare's Romeo and Juliet." Essays on Audience Perception in Elizabethan and Jacobean Literature. Ed. Wolfgang Görtschacher and James Hogg. Salzburg, Austria: Institut für Anglistik und Amerikanistik, Universität Salzburg, 1997.
- Parker, R. B., ed. The Tragedy of Coriolanus. By William Shakespeare. The Oxford Shakespeare. Oxford: Clarendon, 1994.
- Parr, Johnstone. Tamburlaine's Malady: And Other Essays on Astrology in Elizabethan Drama. University, Alabama: U of Alabama P, 1953.
- Paster, Gail Kern. "Melancholy Cats, Lugged Bears, and Early Modern Cosmology: Reading Shakespeare's Psychological Materialism across the Species Barrier." Reading the Early Modern Passions. Ed. Gail Kern Paster, Katherine Rowe, and Mary Floyd-Wilson. Philadelphia: U of Pennsylvania P, 2004. 113-29.
- Perrault, Katherine Bartol. "Astronomy, Alchemy, and Archetypes: An Integrated View of Shakespeare's A Midsummer Night's Dream." Diss. Texas Tech U, 2001.
- Phillips, James E., ed. Twentieth-Century Interpretations of Coriolanus: A Collection of Critical Essays. Englewood Cliffs, NJ: Prentice, 1970.
- Plutarch. "The Life of Coriolanus." Parallel Lives. Volume IV. Boston: Loeb Classical Library, 1916. Early Roman Texts. Ed. Bill Thayer. 16 May 2008. U of Chicago. 6 May 2009. http://penelope.uchicago.edu/Thayer/E/Roman/Texts/Plutarch/Lives/Coriolanus*.html.

- Potts, Abbie Findlay. "Cynthia's Revels, Poetaster, and Troilus and Cressida." Shakespeare Quarterly 5 (1954): 296-302.
- Prall, Stuart E., and David Harris Willson, ed. A History of England. Fourth edition. Volume I: Prehistory-1714. Fort Worth: Holt, 1991.
- Ptolemy, Claudius. The Almagest. Trans. R. Catesby Taliaferro. Great Books of the Western World. 16. Chicago: Encyclopedia Britannica, 1952.
- Ramsey, John T. "'Beware the Ides of March!': An Astrological Prediction?" The Classical Quarterly ns 50 (2000): 440-54.
- Ribner, Irving. The English History Play in the Age of Shakespeare. 2nd ed. New York: Barnes and Noble, 1965.
- Rice, Julian C. "Julius Caesar and the Judgment of the Senses." SEL 13 (1973): 238-55.
- Ripley, John. Coriolanus on Stage in England and America, 1609-1994. Madison: Fairleigh Dickinson UP, 1998.
- Ronan, Clifford J. "Daniel, Rainolde, Demosthenes, and the Degree Speech of Shakespeare's Ulysses." Renaissance and Reformation 9 (1985): 111-18.
- Rosendale, Timothy. "Sacral and Sacramental Kingship in the Lancastrian Tetralogy." Shakespeare and the Culture of Christianity in Early Modern England. Ed. Dennis Taylor and David N. Beuregard. New York: Fordham, 2003. 121-41.
- Rusche, Harry. "Edmund's Conception and Nativity in King Lear." Shakespeare Quarterly 20 (1969): 161-64.
- Schelling, Felix E. "Features of the Supernatural as Represented in Plays of the Reigns of Elizabeth and James." Modern Philology 1 (1903): 31-47.
- Shapiro, James. A Year in the Life of William Shakespeare: 1599. New York: Harper, 2005.

- Simonds, Peggy Muñoz. "Coriolanus and the Myth of Juno and Mars." Mosaic 18.2 (1985): 33-50.
- Smith, Warren D. "The Elizabethan Rejection of Judicial Astrology and Shakespeare's Practice." Shakespeare Quarterly 9 (1958): 159-76.
- Snyder, Karl E. "Kings and Kingship in Four of Shakespeare's History Plays." Shakespeare 1964. Ed. Jim W. Corder. Fort Worth: Texas Christian UP, 1965. 43-58.
- Sohmer, Steve. "Certain Speculations on Hamlet, the Calendar, and Martin Luther." Early Modern Literary Studies 2.1 (1996): 51 pars. 29 November 2007. <http://www.chass.toronto.edu/emls/02-1/sohmshak.html>.
- . "The Lunar Calendar of Shakespeare's King Lear." Early Modern Literary Studies 5.2 (1999): 24 pars. 29 November 2007. <http://extra.shu.ac.uk/emls/05-2/sohmlear.htm>.
- . "A Note on Macbeth and a Query." Notes and Queries 49 (2002): 231-34.
- Sousa, Geraldo U. de. "Semiotics of Kingship in Richard II." Shakespeare and Deconstruction. Ed. G. Douglas Atkins and David M. Bergeron. New York: Peter Lang, 1988. 173-92.
- Spencer, Theodore. "Hamlet and the Nature of Reality." ELH 5 (1938): 253-77.
- Spurgeon, Caroline F. E. Shakespeare's Imagery and What It Tells Us. 1935. Cambridge: Cambridge UP, 1958.
- Taylor, John. "Richard II's Views on Kingship." Proceedings of the Leeds Philosophical and Literary Society, Literary and Historical Section 14 (1971): 189-205.
- Traister, Barbara H. "The King's One Body: Unceremonial Kingship in King John." King John: New Perspectives. Ed. Deborah T. Curren-Aquino. Newark: U of Delaware P, 1989. 91-99.
- Usher, Peter. "Advances in the Hamlet Cosmic Allegory." Oxfordian 4 (2001): 25-49.
- . "Hamlet's Transformation." Elizabethan Review 7 (1999): 48-64.

---. "Shakespeare's Support for the New Astronomy." Oxfordian 5 (2002): 132-46.

Walker, Alice, ed. Troilus and Cressida. William Shakespeare. Cambridge: Cambridge UP, 1963.

Weber, Alan Scott. "New Physics for the Nonce: A Stoic and Hermetic Reading of Shakespeare's Antony and Cleopatra." Renaissance Papers. Columbia: Camden House, 1995. 93-107.

---. "Shakespeare's Cosmology." Diss. State U. of New York, Binghamton, 1995.

Willems, Michèle. "Women and horses and power and war': Worship of Mars from 1 Henry IV to Coriolanus." French Essays on Shakespeare and his Contemporaries: "What would France with us?' ed. Jean-Marie Maguin and Michèle Willems. Newark: U of Delaware P, 1995. 189-202.

Williams, Gary J. Our Moonlight Revels: A Midsummer Night's Dream in the Theater. Iowa City: U of Iowa P, 1997.

Wilson, John Dover. "The Political Background of Shakespeare's Richard II and Henry IV." A Shakespeare Reader: Sources and Criticism. Ed. Richard Danson Brown and David Johnson. New York: St. Martin's, 2000. 93-104.

Wright, Eugene P. "Hamlet: From Physics to Metaphysics." Hamlet Studies 14 (1992): 19-31.