ing these: itinary (page 64); as as (page 68); emplying (page 74); 'here' instead of 'her' (page 75); inidicative (page 189). Unfortunately, the book has no Index, and no illustrations.

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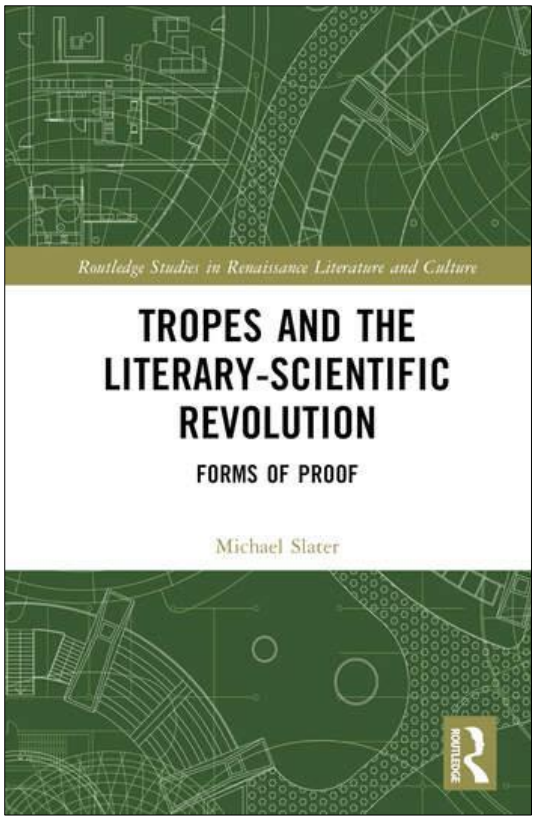
Tropes and the Literary-Scientific Revolution: Forms of Proof, by Michael Slater, (New York, Routledge, 2024). Page ii + 221. ISBN: 978-1-032-42271-8 (hardback), 158 × 235 mm, US$136.00.

The primary emphasis of Michael Slater's book *Tropes and the Literary-Scientific Revolution: Forms of Proof* (henceforth *Tropes*) posits a mutual impact of the so-called New Science and its methodology with language and literature primarily in the late sixteenth and seventeenth century. Early modern science introduced new concepts, the first major one being a new and revolutionary mechanism for the motions of heavenly bodies. This theory was advanced in the mid-sixteenth century by a Polish prelate Nicholas Copernicus (1473–1543). It upset the widespread belief that the Earth was at the center of Creation, a change in perception whose effect was universal. Inevitably, by the start of the seventeenth century the new science had influenced vocabulary and impacted the language of the time. Professor Slater tackles changes in the array of literary tropes instigated by the New Science, purposefully restricting interest to the apparent correlation of the decline of allegory with the advance of empirical realism, and he argues that these in turn affected the writings of the new scientists, so that revolutions in science and literature went hand-in-hand.

Slater's book is a welcome addition to the now steadily increasing genre of works that straddle the boundary between science and the humanities. Notwithstanding the influence of C. Page Snow's *The Two Cultures and the Scientific Revolution* of 1959, academics steeped in the liberal arts rarely thought it worthwhile to bridge the gap (Orsi, 2016: 299–300). In the case of the English language's foremost poet, Shakespeare's contributions to the New Science have until very recently been almost universally ignored, or at best, publications have indicated that the bard had but a superficial knowledge of astronomy. A few writers in the humanities have urged consilience between cultures, and recent literary studies have begun to include references to science and its development. Most recently, a handful of authors have posited that Shakespeare was extremely well-versed in the New Science.

The author's task is an ambitious attempt to analyze and discuss the growth and nature of English-language tropes that characterize the literature of the post-Copernican era. During that time, language underwent a revolution of its own, but Slater's omission of information from the beginnings of the New Science is unfortunate, as it deprives readers of context helpful in appreciating the chosen



topics. We may think of the theory of heliocentrism being born in 1543 under the guidance of Rheticus with the issuance of *De Revolutionibus*, but with the biographer more interested in the subject's later years. Even if the earliest years lacked much in the way of tropes, that information, in itself, would be worthy of note.

In earlier times, as Charlotte Sleigh (2011: 3) puts it, literature and science had a lot to say to one another, but in astronomy until the seventeenth century, universities were single-mindedly devoted to bounded geocentric models of the Universe. Aristotle (384–322

BCE) and Claudius Ptolemy (85–165 CE) were the most prominent exponents of geocentrism, and it hardly occurred to them and their followers that their location coincided with the place they deemed both the center of Creation and the place most susceptible to error and corruption. Contrary models, like the unbounded geokinetic models of the Pythagoreans Philolaus (470–*ca*.385 BCE) and Archytas (435/410–360/350 BCE), as well as the heliocentric model of Aristarchus (310–230 BCE), were ignored too, yet these natural philosophers presaged the New Science, and Aristarchus's model in particular was an early precursor to that of Copernicus.

After study in Italy, Copernicus returned to Poland where he developed his theory of a heliocentric planetary system. The first printed copy of his completed work was entitled *De Revolutionibus Orbium Coelestium* (*On the Revolutions of the Celestial Orbs*) and it appeared in 1543 on the day of his death. Through the efforts of his one and only student Georg Joachim Rheticus (1514–1574), Copernicanism received its first academic exposure at Wittenberg University in Germany, where Rheticus surreptitiously included it in his lectures, but generally institutions of higher learning remained steadfastly committed to Aristotelian science well into the seventeenth century. In the process, a divergence occurred between the various categories of knowledge and thus Science became increasingly divorced from the Humanities.

In England, an early sign of support for Copernicanism is found in the vernacular *The Castle of Knowledge* of 1556 by Robert Recorde (1510–1558) who foresaw that heliocentrism would need more attention in the future. John Dee (1527–1608/9) owned two copies of *De Revolutionibus* and was another supporter of heliocentrism who served also as a sometime tutor to Thomas Digges (*ca*. 1546–1595), the first to publicize the Copernican model in England. Digges was England's most esteemed mathematician and author of an essay "A Perfit Description" of 1576 which concluded on empirical grounds that planets went around the Sun, but up until very recently his seminal work has been resolutely ignored. By 1583, Dee's library surpassed any in England, and insofar as a university is often as esteemed as its library, Dee's home became in effect England's university. The backwardness of England's universities in the sixteenth century may be judged by fact that mathematicians felt obliged to apologize for their skills, including Dee who in 1570 wrote a long and articulate "Mathematical Preface" to a translation of Euclid's *Elements*.

Digges' major advance occurred under the noses of the universities who would have opposed data-gathering on principle lest it contradict the truths of Aristotelian science. The next level of proof of heliocentrism occurred 33 years later in 1609 when Johannes Kepler made brilliant use of the sixteenth-century data of Tycho Brahe (1546–1601) to show that the centre of planetary motion was the Sun itself.

Chapter 1 of *Tropes* addresses a problem that concerns litterateurs—that when abstract concepts are personified, the abstractions move around as if they were persons. So, when with the advance of science, inanimate objects began to be treated mechanically, there was a corresponding alteration in tropological expression which affected the literary–scientific revolution.

A partially reprinted Chapter 2 deals with the works of Edmund Spenser (1552/3–1599), leaving Shakespeare's *Hamlet* as a prominent topic in the rest of *Tropes.* This latter emphasis is understandable since long before *Hamlet*'s scientific content had been revealed, artists of all kinds felt that the play was symptomatic of cosmology and change. For example, Barbara Mowat and Paul Werstine's *Hamlet* of 1992 use the Copernican Revolution to exemplify the ferment of change occurring during Shakespeare's lifetime, and Kenneth Branagh's film *Hamlet* of 1996 exhibits scientific instruments no doubt for the same reason. Nevertheless, many authors have commented on Shakespeare's apparent disinterest in the so-called 'scientific revolution', among them John Dover Wilson who in 1942 was of the opinion that it was not Shakespeare's way to ignore major developments (Sacerdoti, 2011: 224), but World War II notwithstanding, Dover's reflection should have incentivized scholars to seek a solution to such a major literary anomaly. The authors that Slater cites, and many others besides, talk around the topic, but prior to 1990 there was no enthusiasm for the position that the illiterate son of a glover from Warwickshire had more than the slightest interest in the celestial sciences.

The first sign of lateral thinking occurred in 1990 when Gilberto Sacerdoti interpreted the Shakespearean play of the seventeenth

century, *Antony and Cleopatra* in a cosmic context. His book *Nuovo Cielo, Nuovo Terra* (from *New Heaven, New Earth*, *Ant*. 1.1.14–17) refers to the model of Giordano Bruno (1548–1600) comprising a Copernican planetary system imbedded in an infinite Universe of stars which he supposes are like our Sun replete with planets. Bruno proposed this new vision of Sky and Earth chiefly in *The Ash Wednesday Supper* and *On the Infinite Universe and Worlds*, which are two of the so-called 'Italian Dialogues' written while he visited London England in 1583–1585. These remarkable works were the product of pure thought grounded in philosophy and religion and based solely on what Bruno could see with the naked eye, yet they announce what is today the essence of the modern Worldview. Moreover, the *Dialogues* expand on a topic that science has not yet resolved, that the plethora of extra-Solar System planets that Bruno proposed and indications of which astronomers have only recently discovered, harbor intelligent life. But *Tropes* has no reference to Sacerdoti or to Bruno's *Dialogues*.

Slater characterizes the distinct disciplines among the sciences that began to develop in the seventeenth century as "rigid" (page 1), yet elsewhere (page 93n8) he uses the same term to diminish what in 1996 was arguably the first attempt to breach the barrier between astronomy and *Hamlet*. The charge of rigidity implies a limit to thought, thereby exemplifying the advice of Ludwig Wittgenstein (1889–1951) who wrote that in order to draw a limit to thinking, we must think both sides of the limit. With such a bias in hand, Slater criticizes an explanation for the coinage of Ophelia's name as reflecting the two brightest objects in the sky. He regards this derivation as highly questionable, but she is after all "celestial" (*Ham*. 2.2.109) and the suggestion is surely less questionable than the popular alternative of "help" (*opheleia*) which is close to the verb 'to help' (*ophelein*). But whom is Ophelia to help? At home she is likely a companion, of sorts, to her single father, but otherwise the best guess is that she could serve as Hamlet's helpmate and wife, as the celestial source suggests. The guess is supported by the cosmic allegorical definition that Slater questions, and which works just as well if, as it turns out, she is the one who needs the help, since Hamlet does his best to provide it.

Dr. Slater believes that Prince Hamlet has an "… intense preoccupation with astronomy …" (page 102), which apparently is allowable as long as the preoccupation is not rigid, and he cannot resist strengthening the putative rigidity with some insights of his own, such as suggesting that the identity of the specter that haunts Elsinore is the Ghost of Tycho Brahe (page 110–111).

Chapter 3, "Rethinking Revolution," deserves more sixteenth-century development than a few passing footnotes (page 91nn1–4). Two major players in the seventeenth century, Galileo and Kepler, receive the title of Chapter 5 all to themselves, and are permitted to link 'Allegory and Astronomy'. By one measure, their names appear in the Index 28 times, but the sixteenth-century instigator of the New Science, Copernicus, is not listed. By my count, 'Copernicus' crops up only half-way through the text, after much has been devoted to deriding the old science that Copernicus himself helped overthrow.

Another shortcoming of *Tropes* is its incompleteness in dealing with the plethora of types of allegory, either by their application or lack thereof in the posited scientific–literary revolution. Of the tropes mentioned, the author seems reluctant to whittle the definition of allegory to a range narrow enough to be helpful to scientists struggling to present literature to the satisfaction of colleagues from the other culture. We encounter ambivalence toward allegory early on in the preface-like Introduction (page 8–9), where despite lacking a reference, the author's treatment could well pertain to a quibble about the labeling of *Hamlet* as a 'cosmic allegory'. The author takes issue with this term as if looking a gift-horse in the mouth—as if after four centuries of searching, a seeker finds a goose that has laid a golden egg only to find that the egg's color is not quite to his liking.

Although Slater is fully aware of the difficulty of defining allegory, and notes that many texts have dealt with the problem, yet he objects to the term 'cosmic allegory' because "Hamlet does not encounter a figure named Grief or Anger, as he might in a typical allegory." (page 94). But let us assume that an author agrees with Slater's pithy opinion that allegory exists "… only where an author speaks one thing but means another." (page 48), or when he looks to the *Oxford English Dictionary* (*OED*) for help only to find allegory defined as: "The use of symbols in a story, picture, etc., to convey a hidden or ulterior meaning, typically a moral or political one." (*OED* 1). As far as *Hamlet* is concerned, it

turns out that the ulterior meaning is both moral and political, and in this present century we know that it is also scientific. Johann Wolfgang von Goethe (1749–1832) observed that

> Shakespeare abounds in wonderful tropes which are formed from personified conceptions and would not harmonise with our modern ideas at all, but which, with him, are quite in their proper place, seeing that all art in those days was dominated by allegory. (Ronnfeldt, n.d.: 79; cf. Curtius, 1953: 303).

A drawback of the book is that it rambles and would do justice to its subtitle *Forms of Proof* by a systematic organization and presentation of the forms addressed. In the case of Shakespeare, we must remember that he is a masterful poet who is not one to conform to classical literary norms particularly those promoted by Aristotle. Shakespeare mixes comedy and tragedy, and disdains the Three Unities, and only if it suits him does he have a single Action occur over one day in one Place. We should not be surprised if Shakespeare defies tradition to suit his tale rather than force his story into a pre-existing mold. As Slater remarks, "... practice precedes theory …" (page 30) as it does most often in the post-Thomist world of the New Science, and the author might have contributed to Shakespeare studies by broadening his *theory* of allegory to accommodate the bard's creative *practice*. Vladimir Brljak, writing in 2022, sees allegory as a discipline

> … inviting a broad historical and theoretical outlook, yet also informed by specific discipline-, period-, author-, or work-focused contexts …

and relates that

> … a growing number of scholars have come to realize that the subject has outgrown traditional disciplinary models and requires a dedicated research platform in its own right. (Brljak, 2022: 2).

In Shakespeare's cosmic allegories, it is fair to say that "… allegory is directed towards the discovery of values …" (Clifford, 1974: 49), and that

> The quest for value [is] lifelike … [It tells] about the difficulties the characters have to overcome … about the qualities and virtue that are important to them … about the consequences of their choices. (Casteren van Cattenburch, 2017: 29).

These values apply to *Hamlet* no less than to Shakespeare's other cosmic allegories. Textual versus subtextual contests are mirrored by the scripts as transcendent abstractions like Good versus Evil, or with the idea of a cosmic allegory publicly proclaimed and more in line with science, like Knowledge versus Ignorance (e.g., *The Times*, London, 14 January 1997; *The Globe and Mail*, Toronto, 18 January 1997; *The Dallas Morning News*, 20 January 1997; *De Volkskrant*, Utrecht, 25 January 1997; *The Boston Globe*, 3 February 1997). Classical scholars equated Evil with Ignorance and as far as the need for a moral theme is concerned, in 1781 Immanuel Kant (1724–1804) wrote famously that two things fill the mind with ever new and increasing wonder and awe—the starry heavens above and the moral law within. Likewise in 1543 Copernicus (1995: 8) believed that through the study of the heavens, "… we are transported to the contemplation of the highest Good." These qualities are forthcoming as Shakespeare's plays develop and are represented on stage as opposing properties of leading players whose figurations are appropriate to their subtextual roles, and it is virtually a given that any allegory involving the nature of the Heavens is bound to evince a moralistic theme.

Contrary to the conviction that allegory in *Hamlet* is chiefly a literary device (page 97), by now in 2024 we know it is equally epistemic for it and its closely related cousins in the cosmic genre do more than serve merely as "… signs or convenient tropes …" for change in the heavenly order (page 97). They actually inform us what the new order is, which means that astronomical history and culture would like to know the nature of the explanatory tropes. For example, *Hamlet* tells us *inter alia* that stars do not cease to exist coincidentally exactly at the limit of human vision; that stars are not as large as they appear to be; that the welkin is mutable and huge and does not spin around the earth with unimaginable speed; that the Universe has no physical bound; that data support the fullness of the phases of Venus; that planets do not reverse course; and that in the sixteenth century Copernicus and the Digges father and son were the theoretical-*cum*-empirical instigators of the New Astronomy. The tropes involved could well have improved the erudite discussion of Chapter 1.

Slater correctly sees Hamlet as a transitional figure between the old and the new science (pages 93–98), but fails to identify his successor, Fortinbras, who promises a stable future both for Denmark and the New Astronomy. This oversight contrasts with protracted emphases on the terrestrial and celestial disorder manifest *inter alia* in the two meanings of the word 'revolution' which entered the English language virtually simultaneously at the turn of the fourteenth century (*OED*). In *Hamlet*, heliocentrism triumphs over the falsity of Sunless epicycles, and the perennially puzzling delay before Hamlet slays the usurper King of Denmark reflects the two millennia it took for Knowledge to defeat Ignorance.

The classical cosmos survived for two millennia thanks to the primacy of geo-anthropocentric philosophers whose chief shortcoming was that they failed to compensate for their existence at the center of their own perceptions. Just so, Claudius is governed by a self-centered desire both for the King's crown and his wife. Hamlet on the other hand is altruistic to a fault, a universal thinker perhaps, for he does not value his life more than a "pin's fee" (*Ham.* 1.4.65). He believes that all lives have a divine purpose and he is content to let a "special providence" (*Ham*. 5.2.192) oversee his swordfight even as he does his best to win.

With benefit of hindsight, Slater concludes that Hamlet is "… perhaps one of the first dramatic characters to systematically advocate for a new cosmic order …" (page 108), yet in the Introduction he considers "… the term 'allegory' to be a rather simple notion." (page 8). He hesitates "… to use the term 'allegory' to describe the literary structure of *Hamlet* …" and at no point in the book does he claim "… that characters stand in for or symbolize some particular figure or idea throughout the play." (page 94). Yet a few pages later, the author allows Lorenzo's impression of the heavens in Act 5 to emerge from what he characterizes in the Introduction as an "allegorical" view of the world (page 98–99). Instead, *Hamlet*'s abundance of scientific tropes are a "… constellation of allusions and metaphors that furnish the play's allegorical frame." (page 109–110). Thus, we learn that *Hamlet* has an "allegorical frame" and not merely an allegory but a "naïve allegory" (page 110). Still, given the self-admitted inadequacy of the definition of allegory (page 18), and our state of knowledge in 2024, one wonders whether that characterization is itself naïve.

George Puttenham (1529–1590) regarded allegory "… as a master trope for a poetic discourse with deception at its center." (page 5). In *Hamlet* in particular, Shakespeare used allegory to deceive potential censors and diverse fanatics, and succeeded in hiding its cosmic content for over four centuries by "… fixing over …" speech from its natural signification and applying it to other meanings (page 77). In its heyday in the sixteenth and seventeenth centuries, such 'dissembling' was often necessary. With England beset by domestic discord and international threats, Shakespeare used allegory because he had better things to do than to squander his genius on disputes with lesser intellects.

Concerning astronomical history and culture, a few other corrections and additions are helpful:

• The "… birth of modern science …" is a feature of 'early modernity' that did not escape Shakespeare's "… penetrating grasp." (page 91).
• The characterization of Hamlet as a "… prototype of the new astronomer …", and the play's connection between madness and astronomy, are not new (page 93).
• Tycho Brahe, via Rosencrantz and Guildenstern, figures prominently throughout *Hamlet* (page 93), and his Danish personae are essential to the structure of the cosmic allegory.
• Hamlet is, "Possessed of unrivaled powers of eloquence" (page 101), yet beginning two pages later Slater falls for Shakespeare's ruse in Sc. 2.1, that we should not doubt that Hamlet wrote the doggerel verse in the letter addressed to Ophelia (page 103–108).
• Names in *Hamlet* are chosen appropriately, but one need not fear going too far in seeking their connections to the cosmic allegory (page 111n41) because as T.S. Eliot wrote, "… only those who will risk going too far can possibly find out how far one can go." (Eliot, 1931: ix).
• It should come as no surprise to anyone familiar with astronomy in *Hamlet* that the usurper King's name Claudius derives from the name of the mathematician Claudius Ptolemy and that King Claudius' invocation of 'opposition', 'Wittenberg', and 'retrograde' (*Ham*. 1.2.100, 113–114) should be clear to those familiar with Shakespeare's playfulness with words (page 111n41). Thus, we celebrate Slater's brilliant suggestion for the source of the name 'Polonius' (page 124–

126).
• The association of the names 'Rosencrantz' and 'Guildenstern' in *Hamlet* with Tycho Brahe's portrait was proposed in years ranging from 1904 to 1981 (page 113) (Olson, 2014: 296–297; Olson et al., 1998: 71).
• By 1921, James Joyce had associated the Ghost in *Hamlet* with the New Star of 1572 (page 118–119) and incorporated the association into *Ulysses* (Gabler, 1986: 17.1118–1124; Littmann and Schweighauser, 1965: 239).
• Tycho Brahe observed the New Star of 1572 (page 118) five days after its discovery on 6 November 1572. The line *Ham*. 1.1.21 suggests that the Ghost first appeared at that time too. Tycho Brahe died in 1601, so if the Ghost is a disembodied Tycho (page 110–111), there is much to explain.
• The term 'new astronomy' is used throughout in reference to the Copernican Revolution, but the term does not apply to Tycho's cosmic model (page 128–129). Rather, the term used there pertains to Tycho's hybrid geo-heliocentrism which was still basically geocentric and which explains why Claudius welcomed Rosencrantz and Guildenstern to Elsinore.

For those scientists who are willing to put in the time, Slater's book is an excellent source of information and guide for the use of tropes in a scientific context, and its bibliography is as current as one could expect in a fast-changing field.

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Islamic Theology and Extraterrestrial Life: New Frontiers in Science and Religion, edited by Shoaib Ahmed Malik and Jörg Matthias Determann (London, I.B. Taurus, 2024), Pp. xii +240. ISBN 978-0-7556-5088-0 (hardback), 157 × 231, US $130.

Throughout history astronomy has impacted society perhaps more than any other science. Over millennia the study of the heavens has generated cosmological worldviews ranging from the geocentric to the heliocentric to the galactocentric, worldviews that have entered into popular culture through works ranging from Dante's *Divine Comedy* to Harlow Shapley's *Of Stars and Men* (Palmeri, 2009; Shapley, 1958), and many more modern writings both popular and scientific. Our worldview today continues to be shaped by the knowledge that we reside in one of several trillion galaxies in a Universe that is product of 13.8 billion years of cosmic evolution. Little wonder that quite aside from popular works like those of Carl Sagan and Neil de Grasse Tyson, serious scholarly books are increasingly being written on subjects like the meaning of life in a cosmological perspective, cosmological theories of value, and the meaning of cosmic evolution and our place in it (Chaisson, 2005; Lupisella, 2020; Vidal, 2014).

Theology is no exception when it comes to the role of astronomy in shaping worldviews. This is particularly true when it comes to theological and religious connections to the extraterrestrial life debate, with books on