

Why Isaac Newton Rejected Astrology: A Preliminary Reconstruction or "Newton's Comets and the Transformation of Astrology": 20 Years Later

H. Darrel Rutkin*

What was Isaac Newton's relationship to astrology? Unlike with his study and practice of alchemy, there is very little evidence on which to base a well-established answer. In this preliminary investigation, I argue that Newton rejected astrology for both personal and ideological reasons. This anti-astrological valence is primarily revealed in manuscript writings related to his mid-1680s theological tract, "The Philosophical Origins of Gentile Theology." In addition to arguing for this anti-astrological orientation, I also wish to establish, pace Simon Schaffer's influential argument, that Newton never considered comets to be ensouled. Finally, I present evidence to argue that Newton's rejection of astrology should be seen within the broader framework of astrology's changing relationship to God's providential creation and governance of the world; whereas previously astrology had been used to support God's Providence, Newton's rejection of astrology and revision of cometology radically reoriented this centuries long tradition.

¿Cuál era la relación de Newton con la astrología? A diferencia de su estudio y práctica de la alquimia, existe poca evidencia en la cual basar una respuesta bien fundamentada. En esta investigación preliminar, sostengo que Newton rechazó la astrología tanto por razones personales como ideológicas. Esta valencia anti-astroológica se manifiesta principalmente en manuscritos relacionados con su tratado teológico "The Philosophical Origins of Gentile Theology" (1680s). Además de argumentar por esta orientación anti-astroológica, quisiera establecer, pace al argumento de influencia de Simon Schaffer, que Newton nunca consideró que los cometas estuvieran dotados de alma. Finalmente, presento evidencia para argumentar que el rechazo de Newton a la astrología debería ser visto dentro del más amplio marco de la cambiante relación de la astrología con la creación providencial de Dios y su dominio del mundo. Mientras que anteriormente la astrología había sido usada para apoyar la divina providencia, el rechazo de Newton a la astrología y su revisión de la cometología reorientaron radicalmente esta tradición centenaria.

WHAT WAS ISAAC NEWTON'S RELATIONSHIP TO ASTROLOGY? This is not a rhetorical question—and the answer is neither obvious nor well understood. What was Isaac Newton's relationship to alchemy? The answer to this question is much more fully developed, although many interesting facets still remain to be explored and clarified. One very well established response to the alchemy question, however, is that he spent many years of his life engaged in alchemical pursuits, and left a manuscript paper trail numbering to many millions of words.¹

* The University of Oklahoma.

¹ See, for example, Teeter Dobbs, B.J. (1975). *The Foundations of Newton's Alchemy: Or, The Hunting of the Greene Lyon*, Cambridge, Cambridge University Press. — (1991). *The Janus Faces of Genius: The Role of Alchemy in Newton's Thought*, Cambridge, Cambridge University Press.

By contrast, Newton's almost complete silence concerning astrology, in both manuscript and print, is correspondingly deafening. In 1977, after examining approximately 50 million words in Newton's manuscripts, mainly mathematical, the indefatigable Derek Whiteside reported that he had found no trace of any horoscopes.² Nor are there any sustained attacks on astrology, published or unpublished, and very few discussions in any context. I know of a handful;³ hopefully more will emerge. I will discuss the two most detailed in what follows, building a necessarily conjectural interpretation around them.⁴ I will argue that Newton did in fact reject astrology, and that he was encouraged in this by both ideological commitments and his own personal experience.

Before turning to my reconstruction, however, I should first say that it is not obvious that Newton should have rejected astrology, although it may seem unproblematic to most of us. As late as the middle of the seventeenth century, astrology was still a normal part of legitimate natural knowledge. It was still taught in the finest Italian universities, including Padua and Bologna, as it had been at least since the early 14th century.⁵ It was also still practiced in learned circles in England, as Michael Hunter has shown in a revealing article on John Flamsteed's profoundly ambivalent relationship to astrology.⁶ Indeed, Tycho Brahe, Johannes Kepler and Galileo Galilei were all practicing astrologers into the early decades of the seventeenth century, still a normal practice for a *mathematicus*; and Francis Bacon proposed a serious reform of astrology in his *De augmentis scientiarum* of 1623, one of his last scientific

² Cowling, T. G. reports this in his Selig Brodetsky Memorial lecture (1977), *Isaac Newton and Astrology*, Leeds, Leeds University Press.

³ In addition to the texts discussed here, the others will be published in Robert Iliffe's forthcoming *Prisca Newtoniana*; my thanks to Professor Iliffe for a prepublication perusal.

⁴ Westfall, R. S. published the first in his article, (1982) *Isaac Newton's Theologiae Gentilis Origines Philosophicae*, in W. W. Wagar, ed., *The Secular Mind: Transformations of Faith in Modern Europe*, New York, Holmes and Meier, pp. 15-34. Schaffer, S. published both in his (1987) *Newton's Comets and the Transformation of Astrology*, in P. Curry, ed., *Astrology, Science and Society: Historical Essays*, Woodbridge, Boydell Press, pp. 219-243.

⁵ For a brief introduction, see my (2006) *Astrology*, in Lorraine Daston and Katharine Park (eds), *The Cambridge History of Science*, Vol. 3, *Early Modern Science*, Cambridge, Cambridge University Press, pp. 541-61. For more detail, see my dissertation (2002), *Astrology, Natural Philosophy and the History of Science, c. 1250-1700: Studies Toward an Interpretation of Giovanni Pico della Mirandola's Disputationes adversus astrologiam divinatricem*, PhD thesis, Indiana University, and my forthcoming book, *Reframing the Scientific Revolution: Astrology, Natural Philosophy and the History of Science, ca. 1250-1750*, to be published in J. Z. Buchwald, ed., series *Archimedes*, *New Studies in the History and Philosophy of Science and Technology*, Dordrecht: Kluwer Academic Publishers. For Bologna in particular, see Bonoli, F. and D. Piliarvu (2001). *I Lettori di Astronomia presso lo Studio di Bologna dal XII al XX Secolo*, Bologna, CLUEB. For the situation in Spain, see Lanuza Navarro, T. (2005). *Astrología, Ciencia y Sociedad en la España de los Austrias*, PhD thesis, University of Valencia.

⁶ Hunter, M. (1987). *Science and Astrology in Seventeenth-Century England: An Unpublished Polemic by John Flamsteed*, in P. Curry, ed., *Astrology, Science and Society*, pp. 260-300.

works.⁷ In this context, Newton's subtle but deliberate (and not very well advertised) rejection of astrology requires explanation.⁸

First, the two most detailed passages I know of where Newton discusses astrology or astrologers, both of which occur in unpublished manuscripts. In the *Philosophical Origins of Gentile Theology* composed in 1683-84, Newton explained that when "the stars were declared to move in their courses in the heavens by the force of their souls and seemed to all men to be heavenly deities" then "gentile Astrology and Theology were introduced by cunning priests to promote the study of stars and the growth of the priesthood, and at length spread through the world."⁹ He developed this idea in his *Paradoxical Questions* on Athanasius: "the old heathens first commemorated their dead men then admired them, afterwards adored them as Gods then praised them [...] so to make them Gods celestial."¹⁰ It is precisely this wrong turn toward idolatry that Newton hopes to reform with his revised cometology and natural philosophy, and his rejection of astrology.

Newton's second usage occurs in the context of divination in manuscript notes for the *Philosophical Origins*: "astrologers, augurs, aurspiciers etc are such as pretend to y^e art of divining [...] without being able to do what they pretend to [...] and to believe that man or woman can really divine [...] is of the same nature with believing that the Idols of the Gentiles were not vanities but had spirits really seated in them."¹¹ Divining (including astrology) is thus a false and deceptive idolatrous practice. The central questions, then, are: What does Newton mean by "astrology," and how does it relate to cometology?

These passages both appear at the end of an insightful and influential 1987 article, "Newton's Comets and the Transformation of Astrology," in which Simon Schaffer relates Newton's reformed cometography to astrology. His dense and allusive analysis still provides the *status quaestio-*

⁷ For all of these figures (with fuller bibliography), see my (2005a), Various Uses of Horoscopes: Astrological Practices in Early Modern Europe, in G. Oestmann, H. D. Rutkin and K. von Stuckrad, eds., *Horoscopes and Public Spheres: Essays on the History of Astrology*, Berlin, Walter de Gruyter, pp. 167-82; for Galileo in particular, see my (2005b), Galileo Astrologer: Astrology and Mathematical Practice in the Late-Sixteenth and Early-Seventeenth Centuries, *GALILAEANA: Journal of Galilean Studies*, 2, pp. 107-43.

⁸ The ideas expressed here are preliminary suggestions. I hope to develop this material further in future research. My main intention in this article is to correct the fundamental error in Schaffer's (1987) "Newton's Comets" concerning whether comets are ensouled. My thanks to Mordechai Feingold for his stimulating comments in response to my presenting this paper at the History of Science Society annual meeting in Vancouver, B.C., Nov. 2006. Firm conclusions are impossible with such sparse evidence. Nevertheless, Newton's anti-astrological valence seems clear to me, especially in the way it occurs with discussions of idolatry. There is much more work to be done on this richly interesting topic.

⁹ This is Schaffer's (1987) representation, p. 242, quoting Yahuda MS 17.3 f. 9.

¹⁰ Schaffer, S. (1987), p. 242.

¹¹ Schaffer, S. (1987), pp. 242-3, quoting Bodleian Library, New College MSS 361.3 f. 32.

nis, which I hope to refine and develop here. Schaffer emphasizes that Newton's work on cometography—including its catalyzing the completion of the world-system in the *Principia*—was accomplished at the very same time he was composing “his most fundamental study of ancient theology and natural philosophy, the *Philosophical origins of gentile theology*.”¹² The dates for this treatise to late-1683—early-1684 are well established, and come just before he composed *De motu* in late summer 1684. The dating is solid because much of the manuscript is in the hand of Newton's amanuensis, Humphrey Newton (no relation), who arrived in late 1683, thus providing a clear *terminus ante quem non*.¹³

In the *Philosophical Origins*, Newton analyzed and criticised the corruption of natural philosophy, which he was currently in the process of reforming. Idolatry was the main corrupting influence, informing Newton's analysis of how philosophers err *and* how church and state become corrupt, thus linking natural philosophical, religious and socio-political dimensions. False natural philosophy played a critical role in allowing idolatry to flourish. So far, so good. The tricky part comes when Schaffer states: “False cometography suffered from the same problem: it connected corrupt natural knowledge with worship of planetary souls as real divinities identified with temporal kings and heroes (241).”

How Newton understood the reforming role of cometography within the overall natural philosophical reform is the main issue. Schaffer asserts more than argues that false cometography connected corrupt natural knowledge with corrupt religious practices, namely, the worship of planetary souls as real divinities identified with temporal kings and heroes, the central expression of idolatry in Newton's view. Thus reforming cometography will undermine idolatry. I will argue that this analysis misconstrues Newton's use of comets in his intended reformation, and thus confuses its relationship to astrology.

In Schaffer's helpful discussion of idolatry, Newton posed two central issues. In the first, “idolatry was defined as the illegitimate attribution of God's power over his works to inferior surrogates, and so false cometography was idolatrous (241).”¹⁴ Schaffer's formulation here easily leads to confusion. In what way precisely is false cometography idolatrous? The obvious deduction *to us* is that cometography is idolatrous because souls are attributed to comets, which are thus deified and then worshipped. Sara Schechner Genuth uses the evidence of the Julian star to support Schaffer's interpretation:

[Newton's] criticism of rulers' deifying their ancestors in order to aggrandize themselves brings to mind a well-known case of comet lore used for

¹² Schaffer, S. (1987), p. 239.

¹³ Westfall, R. S. (1982), pp. 16-17.

¹⁴ The second issue is not relevant for my argument.

political gain: the case of Augustus and the comet of 44 B.C. Since Augustus was the chief symbol of the restored Stuart monarchy, this historical episode had immediate relevance for Newton and deserves a closer look.

Roman emperors encouraged the belief that the souls of their dead predecessors had become stars in the heavens. They gave the title "divus" (meaning "divine") to the deceased emperors and had them worshiped in temples. In this way, the political power of the current emperor was strengthened by the apotheosis of the former. Augustus appreciated this when a comet appeared soon after the death of Julius Caesar (44 B.C.). As Caesar's successor, Augustus exploited the common view that Caesar's soul had been received among the gods, and used the comet to legitimate the power of the Julian line.¹⁵

This may be Newton's intention, but I think not. Rather, true cometology will reform idolatry and corruption not by de-animating comets, but only in the sense that the souls attributed to the planets and their concomitant Eudoxan solid spheres, which had crowded comets out of the heavens and pushed them into the sublunar realm of meteors, would be destroyed:

The false astronomy was a direct consequence of idolatry and false interpretation. After Eudoxus, corrupt philosophers identified each orbital soul with a specific deity, so by abandoning true celestial mechanisms the gentiles allowed idolatry to flourish. Most revealingly, Newton wrote in the mid-1680s, 'because of the solidity of the spheres they located the comets beneath the sphere of the Moon and supposed them to be meteors.'¹⁶

Newton's reforms (following Tycho's) would then explode the solid spheres (and the souls that led thereto) and thus work toward reforming natural philosophy. In fact, in the adduced texts, comets are never described as ensouled; this only applies to the luminaries, planets and stars, the components of normal planetary astrology. The claim of idolatrous practices in the heavens thus applies directly to planetary astrology; not to comets, which Newton only discussed in relation to the solid spheres.

Before Newton, comets were not normally named after people because they were thought to be ephemeral. Rather, normal persistent celestial phenomena were named. Newton provides a telling recent example:

¹⁵ Schechner, S. J. (1997), *Comets, Popular Culture, and the Birth of Modern Cosmology*, Princeton, Princeton University Press, pp. 140-1.

¹⁶ Schaffer, S. (1987), p. 240.

The worship of Gods and Gentile Theology do in fact seem to have begun in this way. We have recently seen that Galileo named the stars about Jupiter the Medician stars in honor and memory of his benefactors, and that the names of the most illustrious men were given by others to the moon. We also note that the memory of certain men is preserved in the constellations. In the way that more recent Astronomers have done this, so the most ancient applied the names of their forebears to the stars and elements.¹⁷

We see that Newton mentions here only Jupiter's moons, our moon, the constellations, stars and elements; there is no mention of comets at all in this passage.

Comets by contrast were not named. Indeed, in the dedicatory preface to the *Sidereus Nuncius*, the text Newton implicitly refers to above, Galileo explicitly contrasts the permanence of his gift to Cosimo II with the ineffectual naming of the comet of 44 B.C. that appeared soon after Julius Caesar was murdered. His adopted son, Octavian, the future emperor Augustus, named it the *Iulium sydus* after him, but in vain, for it vanished soon after:¹⁸ "And thus, moving to the heavens, it [human ingenuity] assigned to the familiar and eternal orbs of the most brilliant stars the names of those who, because of their illustrious and almost divine exploits, were judged worthy to enjoy with the stars an eternal life (30)."¹⁹ Human ingenuity consigned the names of those deemed worthy—based on their extraordinary, almost divine deeds—to the stars. This reiterates the central theme of the entire first part of Galileo's dedicatory letter: how to commemorate the deeds (*res gestae*) of men who excel in *virtus* (*excellentium virtute virorum*), and whose names are worthy of immortality (*immortalitate digna nomina*). "For this reason, the fame of Jupiter, Mars, Mercury, Hercules, and other heroes after whom the stars are named will not be obscured before the splendor of the stars themselves is extinguished (30)."²⁰

¹⁷ Quoted in extenso in Westfall, R. S. (1982), p. 19, from Yahuda MS 16.2 f. 10. Neither he, Schaffer, S. (1987) nor Schechner, S. J. (1997) either identify the passage from Galileo or draw out its implications.

¹⁸ For an in-depth treatment of this dedicatory letter, see my (2001), *Celestial Offerings: Astronomical Motifs in the Dedicatory Letters of Galileo's Sidereus Nuncius and Kepler's Astronomia Nova*, in W. R. Newman and A. Grafton (eds), *Secrets of Nature: Astrology and Alchemy in Early Modern Europe*, Cambridge, MA, MIT Press, pp.133-72. References to the Latin text are to Galileo Galilei, *Le Messager Celeste*, Isabelle Pantin, ed. and tr., (1992), Paris. References to the English translation are to Galileo Galilei, *Sidereus Nuncius or the Sidereal Messenger. Translated with Introduction, Conclusion, and Notes by Albert van Helden*, (1989), Chicago, University of Chicago Press, slightly modified.

¹⁹ In *Coelum itaque migrans, clarissimorum Syderum notis, sempiternis illis orbibus eorum nomina consignavit, qui ob egregia, ac prope divina facinora digni habitus sunt, qui una cum Astris aevo sempiterno fruerentur* (2, 24-27).

²⁰ *Quam ob rem non prius Iovis, Martis, Mercurii, Herculis, caeterorumque heroum, quorum nominibus Stellae appellatur, fama obscurabitur, quam ipsorum Syderum splendor extingatur.* (2, 27-29)

Galileo then presents a very conspicuous example of this process of naming, conspicuous both in its protagonists—Julius and Augustus Caesar—and in its failure:

This especially noble and admirable invention of human sagacity, however, has been out of use for many generations, with the pristine heroes occupying those bright places and keeping them as though by right. In vain, Augustus's affection tried to place Julius Caesar in their number, for when he wished to name a star (one of those the Greeks call *Cometa* and we call hairy) that had appeared in his time the Julian star, it mocked the hope of so much desire by disappearing shortly (30).²¹

This is not to imply that Newton's reform of cometology did not have an astrological dimension; I believe it did. Within its broader system, Newton's revised cometography can reform natural philosophy by exploding the solid spheres, but even more significantly by naturalizing comets and thus bringing them within the domain of regular celestial phenomena, albeit with wildly eccentric orbits. Reforming comets in this way takes us a long way toward reforming the science of the stars by naturalizing and thus neutralizing this high-profile astrological component as part of the larger goal of rejecting astrology altogether with its corrupted idolatrous practices.

Here it is important to have a clear structural understanding of how comets were situated within astrology. Newton does not try to reform cometary astrology because comets were thought to be ensouled and thus idolatrous, but because they were used in an extremely popular form of divination; in this sense only did they participate in idolatry.²² Planetary astrology, on the other hand, was condemned on both counts. Indeed, Newton worked to undermine the use of comets in socially disruptive prognosticatory practices by transforming their ontological and thus their epistemological status. In this sense it is a part of astrology, the science or art that interprets celestial phenomena and makes prognostications on that basis. Comets, however, are a special case when compared with the luminaries, planets and fixed stars, the regular

²¹ Hoc autem humanae sagacitatis inventum cum primis nobile, ac mirandum multorum iam saeculorum intervallo exolevit, priscis heroibus lucidas illas sedes occupantibus, ac suo quasi iure tenentibus: in quorum coetum frustra pietas Augusti Iulium Caesarem coaptare conata est: nam cum Stellam suo tempore exortam, ex iis, quas Graeci Cometas, nostri Crinitas vocant, Iulium Sydus nuncupari voluisset, brevi illa evanescens, tantae cupiditatis spem delusit. (2, 30-3, 5; Van Helden's parentheses)

²² For cometary astrology in early modern England, see Schechner, S.J. (1997); Capp, B. (1979). *English Almanacs 1500-1800: Astrology and the Popular Press*, Ithaca, Cornell University Press; and Geneva, A. (1995). *Astrology and the Seventeenth Century Mind*: William Lilly and the Language of the Stars, Manchester, Manchester University Press. For the situation in Italy, see Casali, E. (2003). *Le Spie del Cielo: Oroscopi, Lunari e Almanacchi nell'Italia Moderna*, Turin, Einaudi.

celestial phenomena, and the normal elements in astrological prognostications. Before the publication of Newton's *Principia*, comets were not considered a regular celestial phenomenon. Rather, they were considered by most people, learned and otherwise, as a sign of God's direct and providential action in the world, usually portending some sort of disaster.²³

Newton thus intended to reform the science of the stars by rejecting both of astrology's irregular (cometary) and regular (planetary) dimensions by reconfiguring comets as a regular celestial phenomenon and rejecting planetary astrology on religious grounds as an idolatrous practice. This would then lead (1) to a return to true natural philosophy and thence to true theology, and (2) to the removal from the public sphere of an intensely destabilizing element of religious and political discourse.²⁴ Newton had experienced the destabilizing effects of astrology as a child, but more pointedly during the six years from 1677 to 1683 leading up to his writing the *Philosophical Origins*, a time of renewed instability with the Popish Plot and Exclusion Crisis. There was indeed an extraordinary profusion of comets during precisely this time, in 1677, 1680-81 and 1682, a time when Newton himself still thought that comets were irregular celestial phenomena with linear trajectories.²⁵ In the regular astrological realm, there was also a great conjunction of Saturn and Jupiter in 1683 in the fiery trigon in Leo, apparently the sign that rules Rome. Sara Schechner Genuth and William E. Burns both dramatically reconstruct the profound socio-political turbulence and anti-Catholic sentiment of precisely this moment.²⁶

Now that the analysis has been sharpened and we can see more clearly how Newton's reforms attacked astrology in its two distinctive respects, I would like to briefly set Newton's reform in a broader historical context.

²³ Schechner, S. J. (1997); I discuss God's Providence below.

²⁴ For astrology and the destabilized political and religious situation during the civil wars and interregnum, see Curry, P. (1989). *Prophecy and Power: Astrology in Early Modern England*, Princeton, Princeton University Press. Born 25 Dec 1642, Newton spent all his formative years within this intensely destabilized, richly astrological context, in which astrology was used passionately on both sides of the war and all throughout the socio-political and religious spectrum.

²⁵ Schechner, S. J. (1997)

²⁶ See Schechner, S. J. (1997) and Burns, W. E. (2002), *An Age of Wonders: Prodigies, Politics, and Providence in England, 1658-1727*, Manchester, Manchester University Press, and -- (2001), *A Whig Apocalypse: Astrology, Millenarianism, and Politics in England during the Restoration Crisis, 1678-83*, in J. E. Force and R. H. Popkin, eds., *Millenarianism and Messianism in Early Modern European Culture: The Millenarian Turn*, Dordrecht, Kluwer, pp. 29-41. William Lilly and Elias Ashmole were both astrological consultants for King Charles II. For more on this, and on Ashmole in context, see C. H. Josten's magisterial edition (1966), *Elias Ashmole (1617-1692): His Autobiographical and Historical Notes, His Correspondence, and Other Contemporary Sources Relating to his Life and Work*, 5 vols., Oxford, Clarendon Press.

This reframing can also help develop our understanding of the essential distinction I drew between planets and comets as regular and (formerly) irregular celestial phenomena. This framework once again situates Newton's reforms within a theological context, namely, God's providential creation and governance of the world.²⁷

One of the most interesting parts of this story, it seems to me, is the changing role of Providence in relation to astrology. Indeed, Providence seems to provide the overarching framework for my story. From the thirteenth until well into the seventeenth century, a number of influential natural philosophers and theologians used astrology as the best human science for gaining insight into both the nature of God, on the one hand, and His creation and its governance, on the other. Indeed, in this view, the intensive study of God's creation—including the heavens—is the best way to understand that creation, obviously, but also the creator himself, as Newton also acknowledges: "For there is no way to come to y^e knowledge of a Deity but by the frame of nature."²⁸

An influential early statement of this view appeared in the anonymously composed, mid- to late-13th century *Speculum astronomiae*, which, by the mid-14th century, was normally attributed to Albertus Magnus.²⁹ In it, God is held to have created the world system with the greatest wisdom, and to act in and on it using the planets and luminaries as His instruments. He states this position as a long dense rhetorical question:

For if the highest God ordered this world by His great wisdom in such a way that He who is a living God—but who is God of a heaven which is not alive—wished to act (*operari*) within the realm of created things, which are found among these four lower elements, by means of deaf and mute stars as <His> instruments (and we have a metaphysical *scientia*, which teaches us to consider the causer of causes among the causes of things, and another, natural *scientia*, which teaches us to experience the creator of creatures among created things), what then would

²⁷ For providence, see Thomas, K. (1971). *Religion and the Decline of Magic*, New York, Scribner, pp. 78-112; Walsham, A. (1999). *Providence in Early Modern England*, Oxford: Oxford University Press; Winship, M. P. (1996). *Seers of God: Puritan Providentialism in the Restoration and Early Enlightenment*, Baltimore, Johns Hopkins University Press; and Gascoigne, J. (1991). *The Wisdom of the Egyptians and the Secularisation of History in the Age of Newton*, in S. Gaukroger, ed., *The Uses of Antiquity: The Scientific Revolution and the Classical Tradition*, Dordrecht, Kluwer, pp. 171-212.

²⁸ For Newton's views on Providence, see Cohen, I. B. (1969). *Isaac Newton's Principia*, the Scriptures, and the Divine Providence, in S. Morgenbesser, P. Suppes and M. White (eds), *Philosophy, Science and Method: Essays in Honor of Ernest Nagel*, New York, St. Martins, pp. 523-48; Gascoigne, J. (1996); and Dobbs, B.J. (1975).

²⁹ Zambelli, P. (2001). *The Speculum astronomiae and its Enigma: Astrology, Theology, and Science in Albertus Magnus and His Contemporaries*, Dordrecht, Kluwer; references to the text are to this edition. For the attribution to Albertus, see Paravacini Bagliani, A. (2001), *Le Speculum Astronomiae, Une Enigme?: Enquete sur les Manuscrits*, Florence, Galluzzo.

be more desirable to a person of sense than to have a median science (*media scientia*) which would teach us how a change (*mutatio*) of the mundane world, with respect to this and that <particular thing>, came to be by a *mutatio* of the celestial bodies?³⁰

This study of the science of the stars, then, would lead to a greater knowledge of—and thus love for God: “wherefore, it [astrology] inspires human-kind to love God more ardently to the extent that He is declared by it [astrology] the leader and first principle (*princeps atque principium*) of everything.”³¹

Regiomontanus articulated a similar view in the extant inaugural oration for his 1464 course of lectures on al-Farghani’s *De scientia stellarum* at the University of Padua.³² But it was Philipp Melanchthon who greatly promoted this view in the 16th century in a Lutheran key as Sachiko Kusakawa has convincingly shown.³³ In the 17th century, this view was clearly expressed by Andrea Argoli, professor of astrology at Rome and Padua, in his extremely popular ephemerides.³⁴ Chapter XV begins with a passage describing the astrological insight one may acquire into God’s Providence, referring explicitly to the *Speculum astronomiae*, here clearly attributed to Albertus Magnus (as in Regiomontanus’s inaugural oration):

Aeterna Dei Optimi Maximi providentia Inferiorem hanc machinam tradidit secundis causis gubernandam et inferiora ad usum hominis venientia a Deo mediantibus Angelis et corporibus caelestibus dispensantur quorum fere omnia ostendit nobis (ut bene Albert. Mag. in Speculo) in libro universitatis qui est pellis Caeli.³⁵

³⁰ Si enim sic ordinavit Deus altissimus sua summa sapientia mundum istum, ut ipse qui est Deus vivus, Deus caeli non vivi, velit operari in rebus creatis, quae inveniuntur in his quattuor elementis inferioribus, per stellas surdas et mutas sicut per instrumenta (et nos habemus unam scientiam metaphysicam, quae docet nos in rerum causis causatorem causarum considerare, et aliam naturalem, quae docet nos in rebus creatis creatorem creaturarum experiri), quid desideratius concionatori quam habere mediam scientiam, quae doceat nos qualiter mundanorum ad hoc et ad illud mutatio caelestium fiat corporum mutatio (3, 1-13)?

³¹ [Q]uare tanto provocat hominem ad Deum ardentius deligendum, quanto per ipsam attingentius omnium princeps atque principium declaratur (3, 21-3). I discuss this passage in greater detail in chapter 2 of my dissertation.

³² For much useful information on this oration, see Swerdlow, N. M. (1993). *Science and Humanism in the Renaissance: Regiomontanus’s Oration on the Dignity and Utility of the Mathematical Sciences*, in P. Horwich, ed., *World Changes: Thomas Kuhn and the Nature of Science*, Cambridge, MA, MIT Press, pp. 131-168. The text is printed in facsimile in F. Schneider, ed., (1972), *Joannis Regiomontani Opera Collectanea; Faksimiledrucke von Neun Schriften Regiomontans* [...], Osnabruck, Zeller. I also discuss it in chapter 3 of my dissertation.

³³ Kusakawa, S. (1995), *The Transformation of Natural Philosophy: The Case of Philip Melanchthon*, Cambridge, Cambridge University Press, pp. 124-73.

³⁴ For Argoli, see the article by Gliozzi, M (1962) s.v., *Dizionario Biografico degli Italiani* (Rome, Treccani, 1960), 4, pp.132-4.

³⁵ *Exactissimae coelestium motuum ephemerides...*, Padua, P. Frambotti, 1648, p. 259.

Newton still very much adopted a providentialist view of God and nature, but, by neutralizing comets and rejecting astrology, he removed astrology from its formerly privileged position as a language for interpreting God's providential plan in the world, believing that natural philosophers, not astrologers, should be the proper priests of nature.³⁶ Indeed, Newton replaced astrology with his own reformed natural philosophy, and made those trained in that system into the new caste of "authorized prophets" to interpret the universe and God's ways in it. The last thing Newton and his Latitudinarian colleagues wanted were widespread interpretations of comets, great conjunctions and other destabilizing and uncontrollable astrological prognostications.³⁷

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³⁶ Schaffer, S. (1987) and his — (1987b) *Authorized Prophets: Comets and Astronomers after 1759*, *Studies in Eighteenth Century Culture*, 17, pp. 45-74.

³⁷ For Newtonian and Latitudinarian ideology, see Jacob, M. C. (1976). *The Newtonians and the English Revolution, 1689-1720*, Ithaca, Cornell University Press.

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