




HISTORIOGRAPHICAL REVIEW

Reassessing the Marginalization of Astrology in the Early Modern World

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Abstract

The marginalization of astrology – the protracted process by which a rich scholarly field and a highly skilled trade migrated into the margins of European culture – is coming to be recognized as one of the most fundamental transformations in the transition from the pre-modern to the modern world. Long assumed to be a casualty of the ‘scientific revolution’ and ‘Enlightenment’, since the 1970s historians have questioned the power of intellectual developments to carry the weight of this major shift, and have constructed alternative social, political, and cultural narratives. However, in the last fifteen years, the field has been making a (re-)turn to intellectual history, albeit in innovative ways. This critical historiographical review accumulates and digests this large body of new work, showing how these historiographical about-turns leave us with broader questions about the role of ideas in cultural transformations, as well as – on a smaller scale – the processes by which individuals change their minds. I close the review by contending that after decades of neglect, it is an opportune time to bring intellectual history back into our studies of the ‘disenchantment of the world’.

The marginalization of astrology – the protracted process by which a rich scholarly field and a highly skilled trade migrated into the margins of European culture – is coming to be recognized as one of the most fundamental transformations in the transition from the pre-modern to the modern world. Formerly prominent figures in late medieval and Renaissance universities, courts, clinics, and public squares, by the eighteenth century astrologers were by and large excluded from these spaces. Once a basic feature of undergraduate curricula, astrology was gradually excised from formal university teaching. Previously key advisers in royal and princely courts, astrologers had an increasingly marginal and unofficial role in politics. While astrology had traditionally been closely tied to medicine, in the seventeenth century learned physicians appealed to celestial influence much more rarely. And while astrologers’ trade in guidance on just about every aspect of life could

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once dominate several corners of the market, they soon had to vie with new experts in economic, social, medical, and meteorological forecasting. Astrology survived, of course, but by the eighteenth century its cultural and intellectual position was fundamentally altered.

Historians of astrology used to dedicate most of their efforts to demonstrating astrology's importance to pre-modern culture in an attempt to establish its legitimacy as a topic of scholarly investigation.¹ Now, with the history of magic and so-called 'boundary sciences' confirmed as respectable objects of study, specialists have increasingly turned to the developments that precipitated astrology's changing status in the early modern period. In 2017, the editors of a special issue of *Early Science and Medicine* announced that 'the time is ripe to put the question of marginalization on the historical agenda', a statement that recognized a growing subfield and has since stimulated an enterprising body of work.² Astrology's diminishing reputation across the early modern period now appears to be the result of a complicated set of overlapping social, political, religious, institutional, and intellectual factors. While the precise contours of these shifts continue to elude historians, a growing literature has now offered illuminating diachronic case-studies in a variety of European and, more recently, colonial, contexts.

The main focus of this critical historiographical review is work on the marginalization of astrology published in the last decade and a half, but to understand the significance of this scholarship we must first set it within broader historiographical trends over the past half century. This is attempted in section I. In the second half of the twentieth century, the assumption that the science of the scientific revolution inevitably caused astrology's decline was itself marginalized in the literature by historians who questioned the power of ideas to carry the weight of this transformation, and constructed alternative narratives with the tools of social, political, and, more recently, religious history. However, as I show in section II, in the last fifteen years once discarded paradigms about the causal role of intellectual developments have been making something of a comeback. This is a welcome move, not least because, as the editors of the aforementioned special issue point out, the historical shifts that 'the marginalization of astrology' describes for the most part took place in *learned* culture, particularly in universities. These historiographical about-turns leave us with broader questions about the role of ideas in cultural transformations, as well as – on a smaller scale – the processes by which individuals change their minds. I close the review by contending that after decades of neglect, it is an opportune time to bring intellectual history back into our studies of astrology's marginalization, as well as the so-called 'disenchantment of the world'.

¹ Keith Thomas's *Religion and the decline of magic* (London, 1971) dedicated most of its pages to demonstrating the vitality of early modern astrology (inter alia), not its decline. Helpful reviews include Liba Taub, 'The rehabilitation of wretched subjects', *Early Science and Medicine*, 2 (1997), pp. 74–87; Anthony Grafton, 'Starry messengers: recent work in the history of Western astrology', *Perspectives on Science*, 8 (2000), pp. 70–83.

² Rienk Vermij and Hiro Hirai, 'The marginalization of astrology: introduction', *Early Science and Medicine*, Special Issue (2017), p. 408.

The intractable problems that historians of astrology's marginalization face are encapsulated in the story of Carlos de Sigüenza y Góngora (1645–1700), Professor of Astrology and Mathematics at Real y Pontificia Universidad in Mexico City. Sigüenza had practised astrology since his youth, and in addition to teaching astrology owned the largest astrological bookshop in New Spain. But in 1695, he announced that the almanac prognostications he was obligated to compile as part of his job were a waste of time. Enconced in Mexico City, Sigüenza had access to cutting-edge astronomical discoveries in Europe, and he began to deploy them against astrology.³ While youthful curiosity had led him to study the predictive part of the science of the stars, the scholar admitted in exasperation that the more effort he put into his predictions, the more he managed to get them wrong. If this was the success rate of an experienced academic astrologer, it was not an encouraging sign. Sigüenza now dismissed astrology as a 'trifle' (*bagatela*), and complained that the credibility he lost amongst his European colleagues for compiling almanacs was greater than the *reales* he earned for the task. Such 'reckless' (*temerario*) comments led one Inquisition censor to question why someone who was paid to teach astrology would disparage his subject so openly! Yet Sigüenza explained that it was his insider information that enabled him to appreciate the art's shortcomings: 'I am an astrologer', he wrote, and so 'I know very well the foot on which astrology limps and the very weak foundations on which its edifice is built.'⁴

Sigüenza's story, to which we will return several times in what follows, echoes an experience of disappointment and disenchantment that by the turn of the eighteenth century was commonplace in Europe as well as its colonies. At first glance, Sigüenza's experience seems to point to an obvious explanation for astrology's marginalization, one that was a common refrain amongst historians and philosophers of science of the middle decades of the twentieth century: astrology is a superstition that simply failed to live up to the requirements of modern science.⁵ In the sixteenth and seventeenth centuries, it was said, a series of astronomical and mathematical developments and discoveries – heliocentrism and universal gravitation, but also the finding of sunspots, new stars, and superlunary comets – unsettled the idea that the changeable earth was perfectly positioned to receive one-way influence from

³ Irving A. Leonard, *Baroque times in old Mexico: seventeenth-century persons, places, and practices* (Ann Arbor, MI, 1959), ch. 13.

⁴ Sigüenza's almanacs are edited in José Miguel Quintana, ed., *La astrología en la Nueva España en el siglo XVII: de Enrico Martínez a Sigüenza y Góngora* (Mexico, 1969), pp. 193–5, 197, 242. The final quotation is from Carlos de Sigüenza y Góngora, *Libra astronómica y filosófica* (Mexico, 1690), p. 14.

⁵ James H. Robinson, *The great comet of 1680: a study in the history of rationalism* (Northfield, MN, 1916), p. 113; Marjorie Hope Nicolson, 'The telescope and imagination', *Modern Philology*, 32 (1935), p. 236; Don Cameron Allen, *The star-crossed Renaissance: the quarrel about astrology and its influence in England* (Durham, NC, 1966, orig. edn. 1941), p. 146. For philosophers, see Thomas Kuhn, *The Copernican Revolution: planetary astronomy in the development of Western thought* (Cambridge, MA, 1957), p. 94; Karl Popper, 'Science: conjectures and refutations', in *Conjectures and refutations: the growth of scientific knowledge* (London, 2002; orig. edn 1963), pp. 43–86.

the immutable celestial bodies that orbited it.⁶ Besides, it would seem Sigüenza found that, as a predictive art, astrology did not work. A barrage of mispredictions led to an unavoidable reputational tipping point, it was suggested, and thus Giovanni Pico della Mirandola's *Disputationes adversus astrologiam divinatricem* (1496) – which alongside a religious and natural philosophical critique of astrology offered a catalogue of failed predictions – destroyed astrology 'with one blow'.⁷ As with other historical developments deemed to be 'right', the repudiation of astrology by the elite was presumed to be inevitable. A case this straightforward required little historical explanation: if astrology was self-evidently false, its fall required no deeper study.

It soon became apparent, however, that pointing to early modern science raised more questions than answers. On the one hand was the assumed marriage between astrology and geocentrism. If Copernicus's *De revolutionibus* was astrology's death knell, why were astrologers some of the first to advocate for heliocentrism, and why did Kepler and Galileo still cast horoscopes?⁸ Further study revealed that what actually mattered for the casting of horoscopes was not the 'real' order of the planets, but their positions in relation to each other and to the signs of the Zodiac as seen from the perspective of earth. On the other hand, as revisionist historians revealed the productive roles played by magic and astrology in the foundations of modern science,⁹ pre-modern astrology itself began to appear more 'scientific' than 'magical', perhaps one of the most durable bodies of natural theory in the Western tradition.¹⁰ It furthermore became clear that Sigüenza's claim that astrology 'doesn't work' was actually about as old as astrology itself.¹¹ Astrology's predictive shortcomings had never been a secret; furthermore, erroneous prognostications were not only understandable, but in fact anticipated, because astrology was conceived as a stochastic art, a form of conjecture that involved

⁶ Clarisse Doris Hellman, *The comet of 1577: its place in the history of astronomy* (New York, NY, 1944); Alexander Koyre, 'La gravitation universelle de Kepler a Newton', *Archives internationales d'histoire des sciences*, 4 (1951), pp. 638–53; Lynn Thorndike, 'The true place of astrology in the history of science', *Isis*, 46 (1955), pp. 273, 274, 277; Mark Graubard, 'Astrology's demise and its bearing on the decline and death of beliefs', *Osiris*, 13 (1958), pp. 223, 253; C. D. Hellman, 'The role of measurement in the downfall of a system: some examples from sixteenth century comet and nova observations', *Vistas in Astronomy*, 9 (1967), pp. 43–52.

⁷ Ernst Cassirer, *The individual and the cosmos in Renaissance philosophy*, trans. Mario Domandi (New York, NY, 1963; orig. edn 1927), p. 115.

⁸ Harry Woolf, 'Science for the people: Copernicanism and Newtonianism in the almanacs of early America', in Jerzy Dobrzycki, ed., *The reception of Copernicus' heliocentric theory* (Dordrecht, 1972), pp. 293–309; S. Hetherington, 'Almanacs and the extent of knowledge of the new astronomy in seventeenth-century England', *Proceedings of the American Philosophical Society*, 119 (1975), 275–9.

⁹ Esp. Lynn Thorndike, *History of magic and experimental science* (8 vols., New York, NY, 1923–58); Frances Yates, *Giordano Bruno and the hermetic tradition* (London, 1964).

¹⁰ Otto Neugebauer, *The exact sciences in antiquity* (New York, NY, 1951); Eugenio Garin, *Zodiac of life* (London, 1983; orig. edn 1976); John North, *Horoscopes and history* (London, 1986); Paola Zambelli, *L'ambigua natura della magia* (Milan, 1991); Germana Ernst, *Religione, ragione e natura* (Milan, 1991); Anthony Grafton, *Cardano's cosmos* (Cambridge, MA, 1999).

¹¹ A. A. Long, 'Astrology: arguments pro and contra', in J. Barnes et al., eds., *Science and speculation: studies in Hellenistic theory and practice* (Cambridge, 1982), pp. 165–93.

'educated guesswork' rather than certainty.¹² In any case, as Philipp Nothaft has recently suggested, the propensity of astrologers to make mistakes might actually have buttressed astrology's religious legitimacy in the longer term, as it undermined the accusation of determinism.¹³

These insights dovetailed with the concurrent realization by historians that it was difficult to find new arguments against astrology in the very period in which its reputation was changing most radically. The institutionalization of experimental natural philosophy in the seventeenth century only complicated matters further because there seemed to be only a few attacks on astrology reliant on new epistemological principles.¹⁴ Instead, there were seemingly more attempts to *reform* astrology with the new science.¹⁵ It became a standard move amongst historians of astrology to admit to being unable to locate any 'new compelling argument or discovery to explain why astrology lost its hold over the educated classes'.¹⁶ The apparent dearth of direct, scientific attacks led Keith Thomas to describe the decline of astrology as a 'silent' revolution.¹⁷

That it is difficult to point to new arguments against formerly hegemonic beliefs at the moment when the legitimacy of such beliefs was most under stress is a long-standing and still much-cited commonplace in studies of the 'disenchantment of the world'.¹⁸ But it is no coincidence that these insights led to a historiographical turn away from ideas at the same time as the historical discipline more generally was embracing social history. From the 1960s, historians were more suspicious of laying too much emphasis on the dominant role of ideas in changing minds and cultural attitudes. When it came to shifting

¹² James Allen, 'Failure and expertise in the ancient conception of an art', in Tamara Horowitz and Allen I. Janis, eds., *Scientific failure* (Lanham, MD, 1994), p. 86.

¹³ C. Philipp E. Nothaft, 'Glorious science or "dead dog"? Jean de Jandun and the quarrel over astrology in fourteenth-century Paris', *Vivarium*, 57 (2019), p. 63.

¹⁴ William Clark, 'Der untergang der astrologie in der deutschen Barockzeit', in Hartmut Lehmann and Anne-Charlott Trepp, eds., *Im Zeichen der Krise: religiosität im Europa des 17. jahrhunderts* (Göttingen, 1999), pp. 461–2. An (unpublished) exception was discussed in Michael Hunter, 'Science and astrology in seventeenth-century England: an unpublished polemic by John Flamsteed', in Patrick Curry, ed., *Astrology, science, and society* (Woodbridge, 1987), pp. 261–300.

¹⁵ Paolo Rossi, 'Considerazioni sul declino dell'astrologia agli inizi dell'Eta' moderna', in *L'Opera e il pensiero di Giovanni Pico della Mirandola nella storia dell'umanesimo* (2 vols., Florence, 1965), II, pp. 330–2; Mary E. Bowden, 'The scientific revolution in astrology: the English reformers, 1558–1686' (Ph.D. thesis, Yale, 1975); Charles Webster, *From Paracelsus to Newton: magic and the making of modern science* (Cambridge, 1982), pp. 18–19, 31–6; Patrick Curry, *Prophecy and power: astrology in early modern England* (Princeton, NJ, 1989), ch. 3; idem, 'Saving astrology in Restoration England: "Whig" and "Tory" reforms', in Curry, ed., *Astrology, science, and society*, pp. 245–69; Bruce Stephenson, *The music of the heavens: Kepler's harmonic astronomy* (Princeton, NJ, 1994), ch. 3. See more recently Steven Vanden Broecke, *The limits of influence: Pico, Louvain, and the crisis of Renaissance astrology* (Leiden, 2003); Luís Campos Ribeiro and Henrique Leitão, 'Astrology with new eyes: the telescope in astrological prognostication', *Journal for the History of Astronomy*, 49 (2018), pp. 352–3.

¹⁶ Bernard Capp, *Astrology and the popular press: English almanacs, 1500–1800* (London, 1979), p. 277. See also Lynn Thorndike, 'History of science', *Isis*, 6 (1924), p. 378; Allen, *Star-crossed renaissance*, p. 148; Graubard, 'Astrology's demise', p. 210; Vermij and Hirai, 'Marginalization', p. 407.

¹⁷ Thomas, *Decline of magic*, pp. 418, 681.

¹⁸ Michelle Pfeffer, 'The contribution of the early modern humanities to "disenchantment"', *Magic, Ritual, and Witchcraft*, 16 (2021), pp. 398–9.

mentalities, what really mattered were material and social structures. Even historians of science had by the 1980s embraced the sociology of knowledge, increasingly turning to 'external' factors to account for the success and failure of scientific theories, rather than trusting their internal logic.¹⁹ Those who investigated Max Weber's 'disenchantment of the world' – according to which a rationalizing intellectual tradition, spurred by the Reformation, rid Europe of superstition – made similar moves, suggesting that intellectual attack rarely impacted belief in the supernatural directly.²⁰

When it came to the marginalization of astrology, further discoveries exacerbated this shift, for part of the critique of the intellectualist explanation rested on the finding that even into the early modern period, astrology's critics tended to be more concerned with the legitimacy of the *practice* of astrology, rather than the legitimacy of its *theories*.²¹ For instance, new work on the social contexts of astrology revealed that it was often seen as a sort of political crime. Already in ancient Rome, astrologers were expelled on numerous occasions due to imperial anxieties about their predictions.²² Predicting the illness and/or death of leaders was a sure-fire way to make oneself disliked by those in power.²³ But astrology could also be socially disruptive, and this too could wound its reputation. Here, we can return to Sigüenza, for the Mexican Inquisition was so concerned his prognostications might cause civic disturbances that its censors cancelled out words like 'uprising' from his almanac drafts because they were 'not convenient at the present times'.²⁴ Back in Europe, Giovanni Michele Bruto suggested that for the sake of public order, astrologers should be punished as agitators.²⁵ Although the huge success of almanacs enabled astrologers to make highly visible interventions in politics, this publicity came at a cost, for astrologers risked becoming associated with the losing side of a political rift.²⁶ What all this seemed to suggest

¹⁹ Steven Shapin, 'Discipline and bounding: the history and sociology of science as seen through the externalism–internalism debate', *History of Science*, 30 (1992), pp. 333–69.

²⁰ Alexandra Walsham, 'The Reformation and "the disenchantment of the world" reassessed', *Historical Journal*, 51 (2008), pp. 497–528.

²¹ Peter Wright, 'Astrology and science in seventeenth-century England', *Social Studies of Science*, 5 (1975), pp. 399–422; Hilary M. Carey, *Courting disaster: astrology at the English court and university in the later middle ages* (London, 1992), p. 13.

²² Pauline Ripat, 'Expelling misconceptions: astrologers at Rome', *Classical Philology*, 106 (2011), pp. 115–54.

²³ Monica Azzolini, 'The political uses of astrology: predicting the illness and death of princes, kings and popes in the Italian Renaissance', *Studies in the History and Philosophy of Biological and Biomedical Sciences*, 41 (2010), pp. 135–45.

²⁴ Ana Avalos, 'As above, so below: astrology and the Inquisition in seventeenth-century New Spain' (Ph.D. thesis, European University Institute, 2007), p. 296. For a similar situation in England, see Capp, *Astrology*, pp. 48–9.

²⁵ Barbara Mahlmann-Bauer, 'Attacks on judicial astrology, religious dissent and the rise of skepticism', in Pietro D. Omodeo and Volkhard Wels, eds., *Natural knowledge and Aristotelianism at early modern Protestant universities* (Wiesbaden, 2019), pp. 148–9.

²⁶ Curry, *Prophecy and power*; William E. Burns, 'A whig apocalypse: astrology, millenarianism, and politics in England during the Restoration crisis, 1678–1683', in James E. Force and Richard H. Popkin, eds., *Millenarianism and messianism in early modern European culture* (Dordrecht, 2013),

was that astrology's marginalization may at first have had more to do with its ability to yield and legitimize subversive information, rather than the epistemic status of that information.

Following social history's mandate to look beyond the world of the elite led to similar insights. As Keith Thomas and others looked to 'popular' religion and belief, including 'popular' astrology, they found that regardless of elite disinvestment, astrology continued to thrive in popular culture.²⁷ In an important response to Thomas, Curry distinguished between (1) 'high' astrology, concerned with cosmology, (2) 'middling' astrology, preoccupied with horoscopic prediction, and (3) 'popular' astrology, traditional practices serving the needs of labouring people. Curry argued that although after 1660 the first 'disappeared or died', the second 'declined', while the third 'survived'. For Curry, the growing separation of 'patrician society' from 'plebeian culture' in the late seventeenth century – which had by the 1990s been extensively studied by social and, increasingly, cultural historians – was a causal factor. Astrology was actively recast as a 'vulgar' practice, an association that could stick because the removal of astrology from universities and its popularization in vernacular culture meant that by the mid-seventeenth century astrologers were seen as uneducated and unrefined.²⁸ Almanacs were increasingly produced by those without university training, and were also gradually drained of their astrological content, partly due to political intervention.²⁹ Indeed, there was a strong political angle to all this, for from the later seventeenth century, European governments increasingly issued edicts against astrology with the aim of maintaining public order by means of eradicating superstition from the social body.³⁰ Astrology, in other words, began to be considered a

pp. 29–41; Luís Miguel Carolino and Carlos Ziller Camenietzki, 'Tokens of the future: comets, astrology and politics in early modern Portugal', *Cronos*, 9 (2006), pp. 33–58; idem, 'Astrologers at war: Manuel Galhano Lourosa and the political restoration of Portugal, 1640–1668', *Culture and Cosmos*, 13 (2009), pp. 63–85.

²⁷ Geneviève Bollème, *Les almanachs populaires aux XVIIe et XVIIIe siècles: essai d'histoire sociale* (Paris, 1969); Elide Casali, *Le spie del cielo: oroscopi, lunari, e almanacchi nell'Italia moderna* (Turin, 2003).

²⁸ Patrick Curry, 'Astrology in early modern England: the making of a vulgar knowledge', in Stephen Pumfrey, Paolo Rossi, and Maurice Slawinski, eds., *Science, culture, and popular belief in Renaissance Europe* (Manchester, 1991), pp. 274–91; P. Eisenstadt, 'Almanacs and the disenchantment of early America', *Pennsylvania History*, 65 (1998), pp. 143–69.

²⁹ Capp, *Astrology*, ch. 8; Maureen Perkins, *Visions of the future: almanacs, time, and cultural change, 1775–1870* (Oxford, 1996); Lodovica Braïda, 'Les almanachs italiens du XVIIIe siècle: véhicules de "faux préjugés" ou "puissants moyens d'éducation"?', in Hans-Jürgen Lüsebrink, ed., *Les lectures du peuple en Europe et dans les Amériques du XVIIe au XXe siècle* (Brussels, 2003), pp. 259–70; William E. Burns, 'Astrology and politics in seventeenth-century England: King James II and the almanac men', *The Seventeenth Century*, 20 (2005), pp. 242–53; Ryan J. Stark, 'The decline of astrology in the Jonathan Dove Almanac Series', *Renaissance and Reformation*, 30 (2006), pp. 43–66; William E. Burns, 'A scientist at astrology's funeral: Richard Saunder and the *Apollo Anglicanus*', in Michael R. Lynn, ed., *Magic, witchcraft, and ghosts in the Enlightenment* (London, 2022), pp. 148–66. For bans on predictions in almanacs, see, for example, Morten Fink-Jensen, 'Astrology in the early modern period in Denmark', in Henrik Bogdan and Olav Hammer, eds., *Western esotericism in Scandinavia* (Leiden, 2016), pp. 68–9.

³⁰ Hervé Drévilion, *Lire et écrire l'avenir: l'astrologie dans la France du grand siècle (1610–1715)* (Seysssel, 1996), pp. 65–6, 94–5, 224–6; Steven Vanden Broecke, 'From cosmic governance to governmentality:

socio-cultural as well as a political problem, and therefore elites worked to marginalize it. Again, it seemed that changes in ideas were preceded by changes in social, cultural, and political structures.

Finally, early modern Protestantism and Catholicism could also foster a culture in which it was ill-advised to engage with astrology. For centuries, astrology could largely accommodate itself to mainstream Christian theology,³¹ but there were many obstacles.³² The most pressing was the problem of free will and determinism. If human behaviour was determined or even conditioned by the stars, what did this mean for moral responsibility and future rewards and punishments? Astrologers had long attempted to temper these concerns by maintaining that while the stars incline, they do not compel.³³ Another way around the problem was to curtail types of prediction that impinged on free will, with theologians working to delineate an acceptable, legitimate astrology from an unacceptable, illicit one.³⁴ The Reformation and Counter-Reformation brought these issues to the fore,³⁵ as did Renaissance figures like Marsilio Ficino, who embraced a neo-Platonic version of astrology that made more room for the influence of the stars on the soul.³⁶ Although astrology was eminently useful in the legitimation of Protestantism,³⁷ Calvin's hostility towards astrology – perhaps predicated on its similarities to predestination – was influential amongst English Puritans and Presbyterians

shaping sublunary order in seventeenth century French critiques of astrology', in Miguel Ángel Granada, Patrick J. Boner, and Dario Tessicini, eds., *Unifying heavens and earth: essays in the history of early modern cosmology* (Barcelona, 2016), pp. 317–42.

³¹ E.g. Tim Hegedus, *Early Christianity and ancient astrology* (New York, NY, 2007).

³² For discussion and examples, see, for example, John North, 'Astrology and the fortunes of churches', *Centaurus*, 24 (1980), pp. 181–211; D. H. Darst, 'The role of witch hunting in the demise of astrology and magic and the birth of modern science in Renaissance Europe', *University of Dayton Review*, 20 (1989), pp. 57–67; Laura Ackerman Smoller, *History, prophecy, and the stars: the Christian astrology of Pierre d'Ailly, 1350–1420* (Princeton, NJ, 1994); Ugo Baldini, 'Cardano negli Archivi del Santo Uffizio', in M. Baldi and G. Canziani, eds., *Cardano e la tradizione dei saperi* (Milan, 2003), p. 495; Avalos, 'Astrology and the Inquisition', pp. 68–9; Claudia Brosseder, 'La ciencia entre la herejía y la adaptación: astrología natural y talismánica en el Perú colonial, siglos XVI–XVII', in R. Schmidt-Riese, ed., *Catequesis y derecho en la América colonial: fronteras borrosas* (Madrid, 2010), pp. 32–6.

³³ Justin Niermeier-Dohoney, 'Sapiens dominabitur astris: a diachronic survey of a ubiquitous astrological phrase', *Humanities*, 10 (2021).

³⁴ E.g. William E. Klingshirn, 'Isidore of Seville's taxonomy of magicians and diviners', *Traditio*, 58 (2003), pp. 59–90; William E. Klingshirn, 'Divination and the disciplines of knowledge according to Augustine', in Karla Pollman and Mark Vessey, eds., *Augustine and the disciplines: from Cassiciacum to Confessions* (Oxford, 2005), pp. 113–40.

³⁵ See now Neil Tarrant, *Defining nature's limits: the Roman Inquisition and the boundaries of science* (Chicago, IL, 2022).

³⁶ H. Darrel Rutkin, 'How to accurately account for astrology's marginalization in the history of science and culture: the central importance of an interpretive framework', *Early Science and Medicine*, 23 (2018), pp. 229–33.

³⁷ S. Kusukawa, *The transformation of natural philosophy: the case of Philip Melancthon* (Cambridge, 1995), pp. 124–73; C. Scott Dixon, 'Popular astrology and Lutheran propaganda in Reformation Germany', *History*, 84 (1999), pp. 403–18; Robin B. Barnes, *Astrology and reformation* (Oxford, 2016).

who wrote profusely against it.³⁸ Meanwhile, when Counter-Reformation authorities introduced the Index of Forbidden Books, they followed Aquinas in banning texts that taught the prediction of actions dependent on human volition if it was claimed these could be predicted with certainty. (Books with astrological judgements on natural events to do with navigation, agriculture, or medicine were permitted.) But Aquinas had elsewhere adopted a firmer stance on predictions relating to freely willed events, and this became the basis for stricter papal bulls in 1586 and 1631.³⁹

In practice, the deployment of this ecclesiastical legislature was far from consistent.⁴⁰ Yet, what the latest work suggests is that the church nevertheless indirectly impacted the standing of astrology by encouraging people to avoid its study and practise, at least publicly. This fostered a situation in which individuals might continue to privately study astrology or make judgements for private clients, while limiting public expressions of their astrological interests. Hence, Luís Ribeiro has drawn attention to a stark difference in Jesuit treatments of astrology in print compared to manuscript.⁴¹ If even before the Counter-Reformation, religious censure prompted astrological writers to self-censor, this only increased in the face of heightened regulation.⁴² Astrology was increasingly ignored in books in a variety of genres, including in countries

³⁸ Thomas, *Decline of magic*, pp. 425–40; Phebe Jensen, ‘Astrology and religion in the long Reformation: “Doctor Faustus in swaddling clouts”’, *Reformation*, 24 (2019), pp. 92–106.

³⁹ Germana Ernst, ‘Astrology, religion and politics in Counter-Reformation Rome’, in Pumfrey, Rossi, and Slawinski, eds., *Science, culture, and popular belief*, pp. 249–73; Daniel P. Walker, *Spiritual and demonic magic: from Ficino to Campanella* (University Park, PA, 2000), ch. 7; Brendan Dooley, *Morandi’s last prophecy* (Princeton, NJ, 2002); Donato Verardi, ‘Les enseignements sur l’astrologie d’Augustin d’Hippone et de Thomas d’Aquin dans la bulle *Coeli et terrae* de Sixte V’, *Revue des sciences philosophiques et théologiques*, 101 (2017), pp. 125–33; H. Darrel Rutkin, ‘Is astrology a type of divination?’, *International Journal of Divination and Prognostication*, 1 (2019), pp. 36–74; Neil Tarrant, ‘Reconstructing Thomist astrology: Robert Bellarmine and the papal bull *Coeli et terrae*’, *Annals of Science*, 77 (2020), pp. 26–49.

⁴⁰ Ugo Baldini, ‘The Roman Inquisition’s condemnation of astrology: antecedents, reasons, and consequences’, in Gigliola Fragnito, ed., *Church, censorship, and culture in early modern Italy* (Cambridge 2001), pp. 79–110; Tayra Lanuza-Navarro, ‘Astrología, ciencia y sociedad en la España de los Austrias’ (Ph.D. thesis, Valencia, 2005), pp. 326–44; Avalos, ‘Astrology and the inquisition’, ch. 3; Luís Miguel Carolino, ‘The Jesuit paradox: intellectual authority, political power, and the marginalization of astrology in early modern Portugal’, *Early Science and Medicine*, 22 (2017), pp. 438–63; Jonathan Regier, ‘Reading Cardano with the Roman Inquisition: astrology, celestial physics, and the force of heresy’, *Isis*, 110 (2019), pp. 661–79; Luís Campos Ribeiro, ‘The bounded heavens: defining the limits of astrological practices in the Iberian Indices’, *Annals of Science*, 77 (2020), pp. 54–7; Hannah Marcus, *Forbidden knowledge: medicine, science, and censorship in early modern Italy* (Chicago, IL, 2020) ch. 2; Francisco Malta Romeiras, ‘Putting the Indices into practice: censoring science in early modern Portugal’, *Annals of Science*, 77 (2020), pp. 81–2, 94; Tarrant, ‘Reconstructing Thomist astrology’, pp. 26–49. For a comparable example in Protestant lands, see Jason Philip Coy, *Divination and discipline in early modern Germany* (Charlottesville, VA, 2020).

⁴¹ Luís Ribeiro, ‘Jesuits and astrology: print versus manuscript’, *Journal of Jesuit Studies* (advance access, 2023).

⁴² Helena Avelar de Carvalho, ‘Preludes to the Inquisition: self-censorship in medieval astrological discourse’, *Annals of Science*, 77 (2020), pp. 10–25.

where Catholics set up missionary bases, from China to Peru.⁴³ Thus, as Ugo Baldini puts it, ‘a change in intellectual custom and institutional praxis came about earlier than a change in ideas’.⁴⁴

II

The literature surveyed thus far suggests that, in the early modern period, external circumstances – social, political, cultural, religious – worked together to push astrology out of mainstream public discourse. It looks as if the rejection of astrology was not an intellectualized position at first, but stimulated by conditions that made the practice or study of astrology inadvisable. This interpretation – which has seen historians downgrade the causal role of intellectual developments – has dominated this historiography since the 1970s. Yet in the past fifteen years, the tides have begun to change, and historians of astrology’s marginalization have increasingly returned to intellectual historical explanations. After all, if, as above, the ‘marginalization of astrology’ refers primarily to changes in learned, elite attitudes, then it would be surprising if intellectual changes had nothing to do with it. Indeed, a major transformation for which we still lack a full account is the rejection of astrology in academic circles. In late medieval and Renaissance Europe, astrology had an intellectual and institutional home in academic natural philosophy, astronomy, and medicine. By the eighteenth century, this was no longer the case. Changing social, political, and religious circumstances can help explain why scholars may have avoided specializing in astrology, but this is not the whole story. For in the very period in which astrology’s reputation was most in flux, its three disciplinary homes were redefined to the exclusion of astrology, and transformed in ways that undermined its conceptual foundations. New work has produced three important insights in this regard. First, in the early modern period there were profound empirical question marks about astrology, as new discoveries put pressure on long-standing theories. Second, changing academic fashions had consequences for the standing of astrology. Third, although humanist scholarship helped facilitate a vogue for astrology in the Renaissance, it ultimately led to reassessments of astrology’s relevance and epistemic status.

We can begin with natural philosophy, which through its medieval alliance with theology provided astrology with compelling conceptual foundations.⁴⁵ Although the de-institutionalization of Aristotelian natural philosophy across the early modern period is connected to the fate of astrology (as below), astrology began to be marginalized in this field *before* Aristotle’s institutional position shifted, most notably as a result of humanist reconsiderations of Aristotle’s thought. Pico’s rejection of astrology, for example, was partly an

⁴³ Han Qi, ‘From Adam Schall von Bell to Jan Mikolaj Smogulecki: the introduction of European astrology in late Ming and early Qing China’, *Monumenta Serica*, 59 (2011), p. 486; Brosseder, ‘Astrología natural y talismánica’, p. 30.

⁴⁴ Baldini, ‘Condemnation’, p. 109.

⁴⁵ Edward Grant, *Planets, stars, & orbs: the medieval cosmos, 1200-1687* (Cambridge, 1994); H. Darrel Rutkin, *Sapientia astrologica: astrology, magic and natural knowledge, ca. 1250-1800, I: Medieval structures (1250-1500): conceptual, institutional, socio-political, theologico-religious and cultural* (Cham, 2019).

attempt to reform Aristotelianism by removing medieval and Arabic accretions. He argued that occult celestial influence was not to be found in Aristotle's *Meteorology*: Aristotle had limited the influence of the heavens to light, heat, and motion.⁴⁶ Celestial bodies bar the sun and moon were too far away to impact terrestrial life.⁴⁷ Craig Martin has shown that, following Pico, early seventeenth-century Italian commentaries claimed that celestial influences beyond light and motion played no part in Aristotle's philosophy. Importantly, the same writers rejected astrological histories of religion not because they were impious, but because they were incompatible with Aristotle.⁴⁸ Even if many philosophers outside Italy continued to embrace an astrological reading of *Meteorology*,⁴⁹ these Italian writers influenced generations of European students.

A similar story is emerging for learned medicine. Astrology had long functioned as a handmaiden to medicine, providing optional guidance for determining diagnoses, prognoses, and treatments. While scepticism about astrology was not a new phenomenon amongst learned physicians, by c. 1600 many associated it with quackery. Medical astrology remained a thriving trade into the eighteenth century, but by this point most practitioners were not university trained.⁵⁰ The latest work is showing that humanist re-evaluations were crucial to the story. As medicine was configured in increasingly philosophical terms in the sixteenth century, the role of the heavens remained central, but while writers like Jean Fernel used theories of celestial heat to bring together astrology and Christianity with Plato, Aristotle, and Galen,⁵¹ many began to see such systems as conflicting with close readings of these thinkers. It did not help that Fernel relied on the

⁴⁶ H. Darrel Rutkin, 'Astrology', in Katharine Park and Lorraine Daston, eds., *The Cambridge history of science*, III (Cambridge, 2006), pp. 366–9; Vanden Broecke, *Limits of influence*, pp. 62–71.

⁴⁷ Ovanes Akopyan, 'Giovanni Pico della Mirandola on tides', *Bruniana & Campanelliana*, 24 (2018), pp. 135–45; Pietro D. Omodeo, 'The distant action of the heavens in Girolamo Borri's tidal theory', *Early Science and Medicine*, 27 (2022), pp. 460–85.

⁴⁸ Craig Martin, 'Astrological debates in Italian Renaissance commentaries on Aristotle's *Meteorology*', *Early Science and Medicine*, 24 (2019), pp. 311–39.

⁴⁹ Rienk Vermij, 'A science of signs: Aristotelian meteorology in Renaissance Germany', *Early Science and Medicine*, 15 (2010), pp. 648–74; idem, 'Seventeenth-century Dutch natural philosophers on celestial influence', in Miguel Ángel Granada, Patrick J. Boner, and Dario Tessicini, eds., *Unifying heaven and earth: essays in the history of early modern cosmology* (Barcelona, 2016), pp. 291–315.

⁵⁰ H. G. Dick, 'Students of physick and astrology: a survey of astrological medicine in the age of science', *Journal of the History of Medicine and Allied Sciences*, 1 (1946), pp. 300–15 and 419–33; Jeroen Salman, *Populair drukwerk in de Gouden Eeuw: de almanak als lectuur en handelswaar* (Zutphen, 1999); Thomas A. Horrocks, *Popular print and popular medicine: almanacs and health advice in early America* (Amherst, MA, 2008); Louise Hill-Curth, *English almanacs, astrology and popular medicine, 1550–1700* (Manchester, 2018).

⁵¹ E.g. Hiro Hirai, *Medical humanism and natural philosophy: Renaissance debates on matter, life and the soul* (Leiden, 2011); John Henry, 'Jean Fernel on celestial influences and the reform of medical theory', in Dario Tessicini and Patrick Boner, eds., *Celestial novelties on the eve of the scientific revolution, 1540–1630* (Florence, 2012), pp. 133–58; Elisabeth Moreau, 'Pestilence in Renaissance Platonic medicine: from astral causation to pharmacology and treatment', in Fabio Zampieri and Fabrizio Baldassarri, eds., *Scientiae in the history of medicine* (Rome, 2021), pp. 217–46; Jonathan Regier, 'A hot mess: Girolamo Cardano, the Inquisition, and the soul', *HOPOS*, 11 (2021), pp. 331–699.

pseudo-Aristotelian *De mundo*, which by the 1550s was deemed inauthentic. Influenced by their arts faculty colleagues, many medical writers dismissed stellar influence beyond light and motion and limited astrology's role in medicine.⁵²

Galen was reinterpreted in similar ways. Galen's credentials as a medical astrologer came primarily from his treatise on 'critical days' – which saw the stages of fevers in relation to lunar phases – and the *Prognostica de decubitu ex mathematica scientia* – which taught prognostication based on the arrangement of the heavens at the moment a patient took to their bed. However, as Greek manuscripts of Galenic writings spread through northern Italy in the late fifteenth century, and humanists in the following century sought to adumbrate 'pure' Galenic theories excised of Arabic and medieval accretions, it became clear that while Galen certainly had some interest in astrology, his technical skills left much to be desired.⁵³ It also emerged that most of his teachings did not actually require any commitment to astrology.⁵⁴ Furthermore, in the middle decades of the sixteenth century, the treatise *De decubitu* was deemed spurious.⁵⁵ Simultaneously, many learned physicians re-read critical days as an astronomical rather than an astrological doctrine and limited heavenly influence to climatic conditions.⁵⁶ Something similar happened with Hippocrates, as medical professors contended that when he referred to the 'heavens' as a cause of illness, he simply meant the ambient air.⁵⁷ What we still lack extended analysis of is the extent to which the undermining of Hippocratic–Galenic medicine by Paracelsianism and Helmontianism contributed to astrology's marginalization, even if both assumed some terrestrial–celestial connection.

Astronomy, too, was changing under the influence of humanism. Even if it was long thought that the two parts of the *scientia stellarum* were distinct, the terms *astronomia* and *astrologia* were often used interchangeably. Yet, across the early modern period, astronomers progressively distanced themselves from astrology. Rienk Vermij has argued this was partly a result of new humanist

⁵² José M. López Piñero, 'The Faculty of Medicine of Valencia: its position in Renaissance Europe', in Mordechai Feingold and Victor Navarro-Brotos, eds., *Universities and science in the early modern period* (Dordrecht, 2006), pp. 76–7; Craig Martin, 'Medicine and the heavens in Padua's Faculty of Arts, 1570–1630', *British Journal for the History of Science* (advance access, 2022), pp. 5–6, 8–11.

⁵³ Concetta Pennuto, 'The debate on critical days in Renaissance Italy', in Anna Akasoy, Charles Burnett, and Ronit Yoeli-Tlalim, eds., *Astro-medicine: astrology and medicine, east and west* (Florence, 2008), pp. 81–2; Glen Cooper, 'Hagar banished: anti-Arabism and the Aldine edition of Galen's critical days', *Early Science and Medicine*, 17 (2012), pp. 604–42; Glen M. Cooper, 'Approaches to the critical days in late medieval and Renaissance thinkers', *Early Science and Medicine*, 18 (2013), pp. 536–65.

⁵⁴ This was already argued by Nicole Oresme, and expanded upon by Pico: Pennuto, 'Critical days', pp. 85–6. See also Glen M. Cooper, 'Galen and astrology: a mésalliance?', *Early Science and Medicine*, 16 (2011), pp. 120–46; Vivian Nutton, *Galen: a thinking doctor in imperial Rome* (London, 2020), pp. 64–9.

⁵⁵ Vivian Nutton, *Renaissance medicine: a short history of European medicine in the sixteenth century* (Abingdon, 2022), pp. 113–14.

⁵⁶ Pennuto, 'Critical days', pp. 88–97; Nutton, *Renaissance medicine*, pp. 216–17.

⁵⁷ Martin, 'Medicine and the heavens', pp. 6–7.

scholarship: as humanists rewrote the history of astronomy in ways that distinguished it from astrology, astronomers in Leiden – where this scholarship thrived – retreated from astrology.⁵⁸ Anthony Grafton showed many years ago how Joseph Scaliger undermined astrology's founding myth, replacing it with a history of astrology's origins in pagan superstition.⁵⁹ These revisionist histories became ubiquitous in seventeenth-century critiques of astrology.⁶⁰ Even Sigüenza attacked astrology on these grounds. As Vermij argues, this impacted astronomers, for while the first astronomy professors at Leiden University (founded in 1575) were committed to restoring astrology to its presumed earlier glory, their successors wanted to restore only ancient *astronomical* knowledge, snubbing astrology. Some astronomers continued to practise astrology privately, but in their scientific publications increasingly ignored it.⁶¹

Under the influence of humanism, then, natural philosophy, medicine, and astronomy were changing in ways that diverted specialists away from astrology. But this is only part of the picture that recent work is illuminating, for theoretical and methodological developments also served to marginalize astrology within these disciplines. In medicine, learned physicians increasingly set aside remote causes in their analyses of disease, focusing instead on proximate causes.⁶² This developed out of the discipline's long-standing pragmatic disposition: because there was little practising physicians could do about remote causes, there was little point in doctors dedicating time to understanding them. By the late medieval period, medical discussions about proximate and remote causes often took plague as a point of departure, and while it had become standard to gesture to the heavens as a cause of plague, many physicians – including some who were otherwise great supporters of astrology – privileged proximate causes, sidelining astrology.⁶³ The use of astrology to understand epidemics continued into the eighteenth century, but mostly in popular almanacs, and by this point emerging disciplines of political economy and demography had begun to outperform any contribution astrology was thought to offer public health.⁶⁴

The transformation and ultimate removal of Aristotelian natural philosophy from academic structures also made astrology's position in universities more

⁵⁸ Rienk Vermij, 'Marginalization of astrology among Dutch astronomers in the first half of the 17th century', *History of Science*, 52 (2014), pp. 153–77.

⁵⁹ Anthony Grafton, *Joseph Scaliger* (2 vols., Oxford, 1983), I, pp. 185–222.

⁶⁰ Michelle Pfeffer, 'The Society of Astrologers (c. 1647–1684): sermons, feasts, and the resuscitation of astrology in seventeenth-century London', *British Journal for the History of Science*, 54 (2021), pp. 147–8.

⁶¹ Vermij, 'Marginalization'.

⁶² Samuel K. Cohn, *Cultures of plague: medical thinking at the end of the Renaissance* (Oxford, 2009), ch. 6.

⁶³ Danielle Jacquart, 'Theory, everyday practice, and three fifteenth-century physicians', *Osiris*, 6 (1990), pp. 146, 148; Craig Martin, 'Girolamo Cardano's meteorological predictions: Hippocratism, weather signs, winds, and the limits of astrology', *Perspectives on Science*, 30 (2022), p. 860.

⁶⁴ Michelle Pfeffer, 'Astrology, plague, and prognostication in early modern England: a forgotten chapter in the history of public health', *Past & Present* (advance access, 2023).

tenuous.⁶⁵ A useful case-study on this front is provided by the dual fates of action at a distance and occult qualities (the hidden, insensible properties of things), which were used to account for phenomena like tides. They also explained how celestial bodies might harbour specific virtues and impact life on earth.⁶⁶ As the story goes, while Aristotelian natural philosophers took occult qualities for granted, seventeenth-century experimentalists investigated and explained them.⁶⁷ Descartes claimed to have explained the previously inexplicable by paring back the causes of physical phenomena to the mechanical interaction of particles in motion. Thus, Cartesian natural philosophy, it would seem, did not leave space for a mechanism by which the stars could impact life on earth. By the mid-eighteenth century, Cartesian writings on tides could simply ignore astrological explanations, without bothering to refute them.⁶⁸ The extent to which these debates influenced astrological practice is unclear, for one could practise astrology without concerning oneself with the question of how celestial influence worked. Moreover, rather than Cartesian philosophy changing people's minds about astrology, it may be that Cartesianism became so popular in the first place because people had *already* rejected astrology, and now welcomed a philosophy that did not rely on occult causes.⁶⁹ But where the rise of new philosophies had a more direct influence was pedagogy. We now know that celestial influence could still find a place in the rival natural philosophies of the early modern period.⁷⁰ But those who advocated for a Cartesian or Newtonian astrology were not the Cartesians or Newtonians who most influenced university curricula. Instead, the textbooks of influential Cartesians like Jacques Rohault both excluded positive

⁶⁵ Rutkin, 'Astrology', pp. 457–63. The forthcoming third volume of Rutkin's monograph promises to confront this subject more fully: see the precis in Rutkin, *Sapientia astrologica*, I, pp. xxxviii–xlii. Cf. Tabitta Van Nouhuys, *The age of two-faced Janus: the comets of 1577 and 1618 and the decline of the Aristotelian world view in the Netherlands* (Leiden, 1998).

⁶⁶ Nicolas Weill-Parot, 'Astrology, astral influences, and occult properties in the thirteenth and fourteenth centuries', *Traditio*, 65 (2010), pp. 201–30; John D. North, 'Celestial influence – the major premise of astrology', in Paola Zambelli, ed., *'Astrologi hallucinati': stars and the end of the world in Luther's time* (Berlin, 2012), pp. 45–100.

⁶⁷ See now Xiaona Wan, *Handling 'occult qualities' in the scientific revolution* (Leiden, 2023), esp. ch. 1.

⁶⁸ Ovanes Akopyan, 'Discussing tides before and after Newton: Roger Joseph Boscovich's *De aestu maris*', *Perspectives on Science*, 30 (2022), p. 1052.

⁶⁹ Vermij, 'Marginalization', p. 172.

⁷⁰ Aaron Spink, 'Claude Gadoys and a Cartesian astrology', *Journal of Early Modern Studies*, 7 (2018), pp. 151–71; Pietro D. Omodeo, 'Epicurean astronomy? Atomistic and corpuscular stars in Kepler's century', in Patrick Boner, ed., *Kepler's new star (1604): context and controversy* (Leiden, 2020), pp. 181–203; idem, *Defending Descartes in Brandenburg-Prussia: the University of Frankfurt an der Oder in the seventeenth century* (Cham, 2022), ch. 4; Rodolfo Garau, 'Explaining astrological influence with Cartesian natural philosophy: Peter Megerlin's manuscript *Astrologia Cartestiana* (ASHB1530, circa 1680)', *Early Science and Medicine*, 27 (2022), pp. 486–525. For Newtonian cases, see Anna Marie Roos, 'Luminaries in medicine: Richard Mead, James Gibbs, and solar and lunar effects on the human body in early modern England', *Bulletin of the History of Medicine*, 74 (2000), pp. 433–57; Mark Harrison, 'From medical astrology to medical astronomy: sol-lunar and planetary theories of disease in British medicine, c. 1700–1850', *British Journal for the History of Science*, 33 (2000), pp. 25–48.

teachings of astrology and used Cartesian mechanism to attack it. Student notebooks at the University of Edinburgh show that regents frequently taught the anti-astrological chapter of Rohault's *Tractatus physicus* (1674), and at the same institution the prominent Newtonian David Gregory argued in his lectures that astrology had no place in natural philosophy, and therefore should not be taught at universities. When new natural philosophical textbooks replaced old ones, astrology lost a foothold in the curriculum.⁷¹

It has furthermore been argued that early modern interest in issues of epistemology – with growing emphasis on ‘experience’ and, eventually, ‘experiment’ as heuristic tools – made things difficult for astrology. Pre-modern astrology was an empirically and experientially based field, in that its practitioners had long collected huge amounts of data – historical, biographical, and meteorological – and compared it with the heavens, seeking to refine existing theories. But attempts to improve astrological theories have overshadowed the role of experimentation in the *rejection* of astrology. For astrology's detractors had long compiled their own repositories of data, and here failed predictions, about which Sigüenza complained, *did* prove important. John Henry thus argues that the mathematization of the world picture, premised on the certainty of mathematics, caused trouble for astrology.⁷² Already in the early fourteenth century, some physicians purposely let their blood at an hour that was not deemed astrologically propitious, and noticed no adverse effect.⁷³ In the late seventeenth century, Caspar Neumann compared death registers in Breslau with the heavens, finding no correlations between mortality rates and the moments of the moon.⁷⁴

Astrology was a flexible body of theory and was not easily shaken by these discrete investigations. Yet, these experiments need not have destroyed trust in astrology completely – or convinced everyone – for them to be relevant to our story. It is worth investigating further how the rhetorical power of ‘experiment’ in the early modern period was connected to astrology's shifting reputation. Gábor Almási has described a debate in the wake of the new star of 1572 and comet of 1577, in which many rejected astrology on philosophical and scientific grounds, in a discussion in which the rhetoric of ‘reason’ and ‘experience’ set the agenda.⁷⁵ Similarly, in Peru, the physician Juan Jerónimo Navarro rejected astrology because astrologers had neither the evidence of the senses (*evidencia de sentidos*), nor observation or experience (*observación o experiencia*), to demonstrate the influence of the heavens.⁷⁶ We also know

⁷¹ Jane Ridder-Patrick, ‘The marginalization of astrology in seventeenth-century Scotland’, *Early Science and Medicine*, 22 (2017), pp. 464–86.

⁷² John Henry, ‘The fragmentation of Renaissance occultism and the decline of magic’, *History of Science*, 46 (2008), p. 26.

⁷³ C. P. E. Nothaft, ‘*Vanitas vanitatum et super omnia vanitas*: the astronomer Heinrich Selder and a newly discovered fourteenth-century critique of astrology’, *Erudition and the Republic of Letters*, 1 (2016), p. 300.

⁷⁴ Pfeffer, ‘Astrology’.

⁷⁵ Gábor Almási, ‘Astrology in the crossfire: the stormy debate after the comet of 1577’, *Annals of Science*, 79 (2022), pp. 137–63.

⁷⁶ Margarita Suárez, *Astros, humores y cometas: las obras de Juan Jerónimo Navarro, Joan de Figueroa y Francisco Ruiz Lozano (Lima, 1645–1665)* (Lima, 2020), p. 51.

that some rejected astrology for essentially Popperian reasons: because they thought it could not be subject to experimental inquiry, and thus could not be a real science.⁷⁷

We are also learning that long-standing astrological doctrines were also called into question as a result of discoveries made in the new world. Not only were the seasons – critical to Ptolemaic astrology – inverted, but the Southern Hemisphere had different constellations to the Northern, ‘star clusters which are not in the ephemerides’ as the Peruvian astronomer Antonio de la Calancha dryly noted.⁷⁸ Astrologers were also confronted with new territories that had no traditional astrological associations, for Ptolemy had assumed the Southern Hemisphere was uninhabited. In the early seventeenth century, astrologers tried to build new theories for New Spain, but it was difficult to find a consensus.⁷⁹ There is still more work to be done on the shifting reputation of astrology in colonial contexts, but the story that is emerging is that the new world posed significant challenges to traditional astrological theories, if less so to its practice.⁸⁰ There is also much more to discover in regards to cultural and intellectual encounters between Europe and the Islamic world when it came to astrology; a comparative approach would again be useful here.

Shifts in the relevance and status of astrology were also closely tied to the early modern history of increased specialization. Although Robert Westman’s *The Copernican question* (2011) has been much criticized for its claims about Copernicus and astrology, one of Westman’s arguments is broadly in line with the emerging consensus that new preoccupation with planetary order saw sixteenth- and seventeenth-century astronomers neglect the astrological part of the science of the stars.⁸¹ In other words, as astronomy was defined in new ways – moving towards a preoccupation with the ‘real’ nature of the heavens – astronomers paid less attention to astrology. While earlier historians saw heliocentrism as a theoretical and empirical problem for astrology, it actually functioned more as a distraction, as specialists flocked to new, compelling research challenges. Other specialist preoccupations appeared in these years, too, including the characteristics of comets,⁸² and theories of the plurality of

⁷⁷ Rodolfo Garau, ‘Gassendi’s critique of astrology’, *Lias*, 47 (2020), pp. 150, 169.

⁷⁸ Claudia Brosseder, ‘Astrology in seventeenth-century Peru’, *Studies in History and Philosophy of Biological and Biomedical Sciences*, 41 (2010), p. 147.

⁷⁹ Tayra Lanuza-Navarro, ‘Adapting traditional ideas for a new reality: cosmographers and physicians updating astrology to encompass the new world’, *Early Science and Medicine*, 21 (2016), pp. 156–81; Suárez, *Astros, humores y cometas*, pp. 38–40.

⁸⁰ Luís M. C. Ribeiro, ‘Transgressing boundaries? Jesuits, astrology and culture in Portugal (1590–1759)’ (Ph.D. thesis, Lisbon, 2021), ch. 9.

⁸¹ Robert Westman, *The Copernican question: prognostication, skepticism, and celestial order* (Berkeley, CA, 2011). For important critiques of the book, see Noel M. Swerdlow, ‘Copernicus and astrology, with an appendix of translations of primary sources’, *Perspectives on Science*, 20 (2012), pp. 353–78; Michael Shank, ‘Made to order’, *Isis*, 105 (2014), pp. 167–76.

⁸² Natural philosophers were also increasingly preoccupied with comets as efficient causes, rather than signs. Anna Jerratsch, ‘Celestial phenomena in early modernity: the integrated image of comets’, in Omodeo and Wels, eds., *Natural knowledge*, pp. 187–208; Sarah Schechner Genuth, *Comets, popular culture, and the birth of modern cosmology* (Princeton, NJ, 1997); Simon

worlds.⁸³ In this sense, astrology was left to suffocate without the oxygen of astronomers' attention.

This was also the case for the *practice* of astrology, for astrology was far from the only practical application of astronomy. As Mario Biagioli suggested in a classic article, the period 1450 to 1600 saw more opportunities for 'professional niches' open up to mathematicians, partly as a result of developments in technologies of warfare and water management. Although branches of practical mathematics were traditionally associated with lower social status, in this period they moved into 'socio-professionally higher roles' and became more central to university education. Although Biagioli only hinted that 'the quite slow decline of astrology' was 'associated with this process of disciplinary branching', it now seems clear that the marginalization of astrology within mathematics was partly a consequence of the emergence of a range of new and newly legitimized alternative specialisms, which could also be highly lucrative.⁸⁴

Specialization in other aspects of the science of the stars had direct impacts on teaching. For despite the programmes prescribed in university statutes, professors across Europe had a good deal of freedom to teach according to their interests. Case-studies in Spain and Scotland have shown how academic astronomers in the seventeenth century lost interest in astrology and stopped teaching it, regardless of the statutes.⁸⁵ This lack of interest passed over to students, who in turn could prompt changes in curricula: in mid-seventeenth-century Salamanca, astrology was one of several subjects that did not attract many students and thus there were proposals to suppress it.⁸⁶ Changes in teaching styles could also exacerbate shifts in content. David Lines argues that across the early modern period, teaching in Bologna became increasingly specialized, as lecturers concentrated on 'particular (sub-)branches of learning'. Rather than moving sequentially through textbooks, they homed in on particular topics. Although Lines does not go this far, this may mean that lecturers could more easily ignore the astrological sections of prescribed textbooks, focusing only on the themes that interested them. What Lines does suggest is that astronomy professors became 'progressively less enthused' with astrology, and by the end of the sixteenth century focused most of their teaching on astronomy. This was partly a result of their preoccupation with practical problems like calendar reform.⁸⁷

Schaffer, 'Newton's comets and the transformation of astrology', in Curry, ed., *Astrology, science, and society*, pp. 219–43.

⁸³ James E. Christie, *From influence to inhabitation: the transformation of astrobiology in the early modern period* (Cham, 2019).

⁸⁴ Mario Biagioli, 'The social status of Italian mathematicians, 1450–1600', *History of Science*, 27 (1989), pp. 41–95.

⁸⁵ Tayra M. C. Lanuza Navarro, 'From intense teaching to neglect: the decline of astrology at the University of Valencia and the role of the Spanish Novatores', *Early Science and Medicine*, 22 (2017), pp. 410–37; Ridder-Patrick, 'Scotland', p. 473.

⁸⁶ Richard L. Kagan, *Students and society in early modern Spain* (Baltimore, MD, 2019; orig. edn. 1974), p. 213 and n. 32.

⁸⁷ David A. Lines, *The dynamics of learning in early modern Italy: arts and medicine at the University of Bologna* (Florence, 2023), pp. 203, 210–11, 218.

These intellectual developments impacted how academics in a range of fields engaged with astrology. Yet there is more to this story, for academia was not immune to the political and religious pressures that we saw at work in section I. Just as they are today, specialisms in academic contexts were socially, politically, and culturally conditioned. Michael Hunter has argued that the reason the Royal Society largely ignored astrology and magic was not because its Fellows thought they were beyond their purview, but because their views on these issues were so diverse, and to avoid clashes they ignored contentious subjects. The unintended consequence, though, was that astrology began to be seen as outside the bounds of science.⁸⁸ Meanwhile, although leading medical professors in early seventeenth-century Padua who were allied with powerful Venetian factions posed influential critiques of medical astrology, when the political tide changed in the 1620s the university made new hires sympathetic to pro-Roman factions who now endorsed astrological medicine.⁸⁹ The institutional tide of opinion could shift as a result of social or political conditions as well as intellectual ones.

Shifting patterns of specialization were also related to the developing academic profile of mathematicians. The need for mathematicians to craft and assert their professional identity emerged in part from a public relations problem: in the sixteenth century, many saw mathematics and astronomy as useless pursuits and poor sources of income.⁹⁰ Moreover, because they performed marvels – successful astrological predictions, but also the construction of machines – mathematicians were often mistaken for conjurers.⁹¹ The contested religious status of astrology, too, contributed to an image problem, as did the growth of unregulated practitioners without university education.⁹² Here is a parallel with alchemy: in the early eighteenth century, anti-alchemical rhetoric emphasizing the duplicitousness of quacks became more powerful because at this moment chemistry was being professionalized. Anxious about their reputations, chemists separated chemistry from alchemy.⁹³ Almási has similarly traced Tycho Brahe's retreat from astrology in his public communications to his attempts to fashion an identity as an observational astronomer.⁹⁴

⁸⁸ Michael Hunter, 'The Royal Society and the decline of magic', *Notes and Records of the Royal Society of London*, 65 (2011), pp. 103–19.

⁸⁹ Martin, 'Medicine and the heavens', pp. 12–13.

⁹⁰ John Henry, "'Mathematics made no contribution to the public weal': why Jean Fernel became a physician", *Centaurus*, 53 (2011), pp. 193–220.

⁹¹ J. Peter Zetterberg, 'The mistaking of "the mathematicks" for magic in Tudor and Stuart England', *The Sixteenth Century Journal*, 11 (1980), pp. 83–97; Katherine Hill, "'Juglers or schollers?': negotiating the role of a mathematical practitioner", *British Journal for the History of Science*, 31 (1998), pp. 253–74.

⁹² Pfeffer, 'Society of Astrologers'.

⁹³ Lawrence Principe, *The transmutations of chymistry: Wilhelm Homberg and the Académie Royale des Sciences* (Chicago, IL, 2020).

⁹⁴ Gábor Almási, 'Tycho Brahe and the separation of astronomy from astrology: the making of a new scientific discourse', *Science in Context*, 26 (2013), pp. 3–30.

We can thus close this section with Sigüenza, for Victor Navarro and Anna More have argued that Sigüenza's rejection of astrology was tied to the construction of his professional identity. Sigüenza was made cosmographer to the kingdom in 1680, then chaplain to El Hospital Real del Amor de Dios in 1685, both of which distracted him from his astrological pursuits and forced him to rethink his professional identity. As a Creole mathematician whose academic leadership had recently been questioned by a prominent European, Sigüenza's position before his colleagues and patron was particularly delicate.⁹⁵ His printed attacks on astrology, which he dedicated to the viceroy's wife, functioned as a tool for asserting his academic authority as well as defending the science of his *patria*.⁹⁶ Sigüenza's loss of interest in astrology thus must be understood not only in connection to the social, political, and religious circumstances discussed above, but also in the context of reorganizations of scientific knowledge, as the social role and disciplinary boundaries of astronomy were negotiated and the appeal of astrology as an academic specialism declined.

III

As indicated above, the historiography of astrology's marginalization and the historiography of 'disenchantment' have followed similar patterns, in that for many decades both have sidelined intellectual historical explanations. Writing in the 1960s about declining belief in the reality of witchcraft, Hugh Trevor-Roper argued that 'in matters of ideology', 'it is not generally the ideas which convince'.⁹⁷ In the following decade, Keith Thomas wrote that 'most sociologically-minded historians' would be of the view that 'changes in belief are preceded by changes in social and economic structure'.⁹⁸ Now, Michael Hunter's *Decline of magic* (2019) argues that Enlightenment intellectuals rejected magic not for 'good' (intellectual) reasons, but for 'bad' (non-intellectual) ones. Hunter (himself an intellectual historian) writes that 'the detailed debates that we reconstruct from erudite tomes might as well not have happened'. Although Thomas's *magnum opus* included several chapters on astrology, Hunter's book largely avoids it, for its 'trajectory...followed separate lines from...magic'.⁹⁹ An academic subject for much of its history, astrology would indeed sit very uneasily within the shibboleth of the

⁹⁵ Víctor Navarro, 'La Libra astronómica y filosófica de Sigüenza y Góngora: la polémica sobre el cometa de 1680', *Cronos*, 2 (1999), pp. 105–44; Anna More, 'Thinking with the Inquisition: heretical science and popular knowledge in seventeenth-century Mexico', *Romantic Review*, 103 (2012), pp. 111–32.

⁹⁶ Anna More, 'Cosmopolitanism and scientific reason in New Spain: Sigüenza y Góngora and the dispute over the 1680 comet', in Daniel Bleichmar et al., eds., *Science in the Spanish and Portuguese empires, 1500–1800* (Stanford, CA, 2009), p. 119. See also Nydia Pineda de Ávila, 'The fabric of the skies: Carlos de Sigüenza y Góngora and the Academia Mexicana', *Galilæana*, 20 (2023), pp. 65–82.

⁹⁷ Hugh Trevor-Roper, *The crisis of the seventeenth century: religion, the Reformation and social change* (New York, NY, 1969), p. 134.

⁹⁸ Thomas, *Decline of magic*, p. 787.

⁹⁹ Hunter, *Decline of magic*, pp. 46, 2.

'disenchantment of the world'. Be that as it may, historians of both have long eschewed the causal role of ideas, partly, as I have suggested, due to the difficulty of finding new arguments against astrology and magic. This appears to me misguided on several counts, and in this section I offer some commentary as well as suggestions for what intellectual history might still have to offer these fields.

My first point is relatively simple. As we saw in the previous section, in the early modern period there were new arguments against the legitimacy of astrology as well as intellectual developments that contributed to its marginalization. Brian Vickers noticed thirty years ago that historians had been hesitant to pay much attention to intellectual critiques of astrology, as if doing so 'would be the mark of crass nineteenth-century positivism'.¹⁰⁰ But it seems to me rash to dismiss the argumentation that early moderns so carefully compiled against astrology. Considering the role of experimentation in astrology's marginalization, for instance, is not equivalent to assuming that the reasons why one might reject astrology today are the same reasons why astrology was rejected in the past. It is an attempt to take seriously what clearly mattered to many historical actors. Similarly, if the marginalization of astrology was taken by contemporaries to be an intellectual event, we also need to take this seriously, rather than accuse them of hubris.¹⁰¹ In any case, pace the historians to whom Vickers refers, the latest scholarship along these lines is by no means a revival of the old story of science's inevitable conquest of superstition.¹⁰² The same might be said for renewed interest in Pico's *Disputationes*.¹⁰³ On the contrary, recent scholarship refuses to take science's role for granted, and adopts the methods of intellectual history as it is best practised today: with an appreciation of the social construction of knowledge and the importance of educational institutions to cultural and intellectual change.

Secondly, while it is indeed the case that many arguments against astrology (or magic) were by c. 1700 centuries old, to dismiss the effectiveness of ideas on this account is to abstract them from their context, as if ideas existed in a disembodied chain outside of human societies. The power of particular arguments lies not only in their cogency (which is itself historically determined),

¹⁰⁰ Brian Vickers, 'Critical reactions to the occult sciences during the Renaissance', in Edna Ullmann-Margalit, ed., *The scientific enterprise* (Dordrecht, 1992), p. 44.

¹⁰¹ See Alec Ryrie's similar point for the Reformation in *The Gospel and Henry VII: evangelicals in the early English Reformation* (Cambridge, 2003), p. 157.

¹⁰² An exception is Robert Alan Hatch, 'Between astrology and Copernicanism: Morin – Gassendi – Boulliau', *Early Science and Medicine*, 22 (2017), pp. 487–516.

¹⁰³ See especially the work of Sheila Rabin and Darrel Rutkin, beginning with their respective doctoral theses: Sheila Rabin, 'Two Renaissance views on astrology: Pico and Kepler' (Ph.D. thesis, City University of New York, 1987); H. Darrel Rutkin, '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"' (Ph.D. thesis, Indiana, 2002). See also Marco Bertozzi, ed., *Nello specchio del cielo: Giovanni Pico della Mirandola e le Disputationes contro l'astrologia divinatoria* (Florence, 2008); Ovanes Akopyan, *Debating the stars in the Italian Renaissance* (Leiden, 2021).

but in a host of material, social, cultural, and institutional factors, not least the character of their author or mediator, or the wiles of their publisher.¹⁰⁴ We cannot assume that just because an idea or argument was uttered – or even published – that it was accessible to everyone, let alone compelling. Indeed, it may well be the case that as well-known arguments became commonplaces, they lost much of their persuasive power (take, for example, the very old argument against astrology based on the different lives of twins). In any case, as social scientists continue to show, bare ‘facts’ rarely change minds on their own, but gain much of their persuasive power from the interpersonal relationships, emotions, and narratives through which they move in the world. Importantly, however, if social, political, and other interests help determine what does and does not count as legitimate knowledge in any given context, this does *not* mean that the intellectual content of this knowledge is moot or irrelevant. Appreciating the social construction of knowledge need not lead to epistemological nihilism.¹⁰⁵ As Robin Attfield wrote nearly forty years ago, ‘ideas certainly have but a limited power to uphold or to subvert beliefs and practices until the social conditions are propitious...But when social conditions are right...revolutions in thought and belief can prove crucial’.¹⁰⁶ The re-presentation of (in some cases, very old) arguments against astrology or magic could make them more or less compelling in different contexts.¹⁰⁷

All this is a much easier case to make for the learned elite, but I would suggest that it also applies to the world beyond academic circles. For in the very period in which the reputation of astrology (and magic) was changing most perceptibly, Europe witnessed profound developments in the diffusion of knowledge. Elite ideas were increasingly accessible to the middling sort through the expansion of cheap print, the development of new genres (e.g. newspapers and journals), and the proliferation of public libraries. Although the history of reading teaches us that the dissemination of knowledge is never straightforward – and although the current political climate reminds us that elites often fail to take their societies with them – we should avoid the fallacy that uneducated, ‘ordinary’ people in this period had no intellectual life. Scholarship on disenchantment has tended to emphasize a rigid distinction between educated and popular belief, yet we should be more attentive to transactions of knowledge between specialists, amateurs, and lay people, transactions that were not simply one way: increasingly, lay people not only

¹⁰⁴ The classic statement is Steven Shapin, *A social history of truth* (Chicago, IL, 1994). For the latter in relation to magic, see, for example, Andrew Fix, ‘What happened to Balthasar Bekker in England? A mystery in the history of publishing’, *Church History and Religious Culture*, 90 (2010), pp. 609–31.

¹⁰⁵ Bruno Latour, ‘Why has critique run out of steam? From matters of fact to matters of concern’, *Critical Inquiry*, 30 (2004), esp. p. 227: ‘While we spent years trying to detect the real prejudices hidden behind the appearance of objective statements, do we now have to reveal the real objective and incontrovertible facts hidden behind the *illusion* of prejudices?’

¹⁰⁶ Robin Attfield, ‘Balthasar Bekker and the decline of the witch-craze: the old demonology and the new philosophy’, *Annals of Science*, 42 (1985), pp. 383–95.

¹⁰⁷ E.g. Mark S. Dawson, ‘“No God by onely nature”: explaining astrology’s decline in Stuart England’, *Parergon*, 39 (2022), pp. 27–54.

consumed scholarship, but also produced their own, seeking to contribute to debates in the public sphere.

Indeed, the sixteenth and seventeenth centuries witnessed something of an educational revolution, as universities expanded considerably, with huge increases in matriculations that would not be seen again until the late nineteenth century. The student body also became more diverse.¹⁰⁸ Even if the university educated made up only a small fraction of early modern society, what was studied in universities had profound impacts on the culture of the period. Universities trained men who went on to make up the social and political elite, from the clergy and learned physicians to administrators of church and state – in other words, those who taught the laity, treated the laity, and wrote the laws that prescribed the bounds of civil behaviour.¹⁰⁹ When astrology was no longer taught in universities, generations of university-trained astrologers gradually died out and the art was deprived of the backing of mainstream intellectual culture. Even if the intellectual changes discussed in the previous section were taking place predominantly in institutions of higher learning, this should not prevent us from investigating the impact of these developments outside these smaller, elite circles.

Finally, the fact that not everyone was immediately dissuaded from astrology on the basis of compelling arguments against it does not mean that arguments or ideas were irrelevant. Here, my thinking draws on recent work by William Pooley, who argues that historiographical emphasis on the binary categories of ‘belief’ and ‘unbelief’ has led to a homogenizing and flattening of past attitudes to magic, as if the masses shared ‘absolute faith in witchcraft’. Although doubts are difficult to locate in the archive (for they are often unexpressed or even subconscious), Pooley reminds historians of disenchantment that ‘rather than many fervent believers, there have always been many people who were undecided: doubters’.¹¹⁰ If the ‘decline of magic’ or the marginalization of astrology were not one hundred and eighty degree turns from full belief to full disbelief, we have a much less difficult historical problem to solve! And if we are only looking for complete belief or unbelief in the historical record, then we may miss the more nuanced ways that individuals’ thinking was influenced by intellectual debates.

Pooley does not go this far, for he argues that ‘doubts about witchcraft behave more like emotions than ideas’, and thus ‘the traditional tools of the intellectual historian may not answer questions on why attitudes change’.¹¹¹ While this might be true for more traditional approaches to intellectual history, today the interests, and opportunities, of intellectual history are far broader. The best intellectual history today pays attention not only to

¹⁰⁸ The classic piece is Lawrence Stone, ‘The educational revolution in England, 1560–1640’, *Past & Present*, 28 (1964), pp. 41–80.

¹⁰⁹ Rosemary O’Day, ‘Universities and professions in the early modern period’, in Peter Cunningham, Susan Oosthuizen, and Richard Taylor, eds., *Beyond the lecture hall: universities and community engagement from the middle ages to the present day* (Cambridge, 2009), pp. 79–102.

¹¹⁰ William Pooley, ‘Doubt and the dislocation of magic: France, 1790–1940’, *Past & Present* (advance access, 2023), esp. pp. 10, 30–1.

¹¹¹ *Ibid.*, p. 9.

propositional content, but also (inter alia) to ways of knowing, scholarly practices, intellectual networks, and to the cultural history of knowledge in general, as also to the circumstances in which ideas move through the world (e.g. texts, objects, institutions), and the real, embodied human beings who shape and share them. Relatedly, it is now clear that intellectual historians cannot ignore the history of emotions; as John Tresch reminds us, 'even if the pursuit of truth has been presented as a struggle against the passions, suppressed emotion remains an emotional state'.¹¹² Social history and the history of emotions are not the antitheses of intellectual history. As Alec Ryrie notes in his new history of atheism, 'most of us tend to make our lives' great choices – beliefs, values, identities, purposes – intuitively, with our whole selves, embedded as we are in our social and historical contexts', as emotional, social, and intellectual creatures.¹¹³ Our explanatory theories of astrology's marginalization are all the richer when populated with the experiences of real people, with all their messy humanness.

If intellectual history is not just about the propositional content of books, which is indeed often *ex post facto* justification for positions or beliefs reached by other means, I would suggest that intellectual biography remains a dependable procedure for looking beyond the finished product and examining the journey: for recovering and tracing the development and oscillations of belief, doubt, and unbelief in individuals, as they unfold through reading, conversation, and reflection, through emotion, through relationships with others, and through more collective material, social, and political experiences. The history of astrology is replete with individuals like Sigüenza whose changing attitudes would make rich case-studies in this vein, from the Swedish Professor of Astronomy Laurentius Paulinus Gothus – who despite writing extensively in favour of astrology in the 1590s had decisively rejected it by 1617 – to the Philadelphian almanac-maker Jacob Taylor – who at the turn of the eighteenth century found that his 'fancy for Astrology [had] grown very cold, (which had been burning hot)' – or the Londoner Sarah Cowper – whose diaries evince her acceptance of astrology up until around 1701, by which point she had changed her mind.¹¹⁴ The concept of generational change may be an additional heuristic tool for shedding light on the differences between those who changed their mind about astrology over the course of their lives – the many who, like Sigüenza, compared their 'enlightened' adulthood with their credulous youth – and those who were raised

¹¹² John Tresch, 'Cosmologies materialised: history of science and history of ideas', in Darrin M. McMahon and Samuel Moyn, eds., *Rethinking modern European intellectual history* (Oxford, 2014), p. 160. For a wonderful recent example of how to study the 'emotional economy of science', see Henry-James Meiring, 'Reading morals: Charles Darwin and the descent of morality' (Ph.D. thesis, University of Queensland, 2022). I am grateful to Henry-James Meiring for sharing his dissertation with me.

¹¹³ Alec Ryrie, *Unbelievers: an emotional history of doubt* (London, 2019), p. 4.

¹¹⁴ Martin Kjellgren, *Taming the prophets: astrology, orthodoxy, and the word of God in early modern Sweden* (Lund, 2011), pp. 17–18; Eisenstadt, 'Disenchantment', pp. 153–4; Dawson, 'Astrology's decline', pp. 49–52.

from the start in disbelief.¹¹⁵ Or, for that matter, those who in the sixteenth and seventeenth centuries still felt the need to signal their rejection of astrology – often by satirizing it – and those who, particularly in the eighteenth century, simply ignored it.¹¹⁶

IV

Steven Vanden Broecke recently asked whether astrology ‘became marginal’ to early modern elites or whether it was ‘actively marginalized by them’. The first he calls the ‘status loss’ interpretation, according to which astrology always relied on external support, and thus when external support corroded, so did astrology. The second is the ‘censorship’ interpretation, which instead posits that early modern elites intentionally targeted astrology’s legitimacy.¹¹⁷ This division can be helpful, yet the binary opposition would seem to eliminate the likelihood that astrology’s marginalization involved both. While there were many direct attacks against astrology, at other times its status was more indirectly impacted. If one thing emerges clearly from recent historiography, it is that there is no one-dimensional explanation. Astrology held multiple roles in the pre-modern world, and its marginalization was accordingly a multi-faceted phenomenon. Siguenza’s experience alone is suggestive of this.

It seems likely that future work will confirm a role for most of the explanations canvassed in this review. After all, these general stories are not necessarily in conflict. In the final analysis, it is probably impossible to disentangle the material, social, political, religious, cultural, intellectual, and institutional strands of our story. Although Vanden Broecke is ultimately critical of the ‘status loss’ interpretation, because he sees it as ‘tacitly reinforc[ing] the widespread judgement that astrology has no connection with outside reality’,¹¹⁸ this seems to overlook one of the most significant insights of history and philosophy of science of the previous century: that *all* knowledge requires external support to be counted as knowledge. After all, the ‘social’ and the ‘intellectual’ are not mutually exclusive. Intellectual history certainly cannot be the only solution to the problem of the marginalization of astrology, or the history of ‘disenchantment’. It does not hold all the answers. Yet, as I have argued in this review, intellectual history was prematurely sidelined in a field to which it still has the ability to make significant contributions. Intellectual history remains a valuable piece of equipment in the historical toolkit, a complement to other ways of approaching the past.

¹¹⁵ For the latest on ‘generational change’ as a heuristic tool, see Alexandra Walsham, *Generations: age, ancestry, and memory in the English Reformations* (Oxford, 2023).

¹¹⁶ For satire and the marginalization of astrology, see, for example, Helena Avelar de Carvalho, ‘Astrology and sarcasm in three medieval Portuguese songs of mockery’, *Culture and Cosmos*, 22 (2018), pp. 47–55; John McTague, ‘“There is no such man as Isaack Bickerstaff”: Partridge, Pittis, and Jonathan Swift’, *Eighteenth-Century Life*, 35 (2011), pp. 83–101; Hugh Roberts, ‘Mocking the future in French Renaissance mock-prognostications’, in Andrea Brady and Emily Butterworth, eds., *The uses of the future in early modern Europe* (London, 2010), pp. 198–214.

¹¹⁷ Vanden Broecke, ‘Cosmic governance’, pp. 317–18.

¹¹⁸ *Ibid.*, p. 318.

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