



## STARS AND SYSTEMS: TWO WORKS ON THE ASTRAL SCIENCES

BOTTERI (G.), CASAZZA (R.) *The Astronomical System of Aristotle. An Interpretation.* Translated by Agustina Casero and María Sara Loose. (History of Science and Medicine Library 58.) Pp. xviii + 326, figs, ills, map. Leiden and Boston: Brill, 2023 (originally published as *El sistema astronómico de Aristóteles. Una interpretación*, 2015). Cased, €147. ISBN: 978-90-04-52552-8.

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What moves the stars, and what do their movements mean for life on earth? As conventionally divided, even if the distinction of cognates was complicated already in antiquity, the answers to these questions belong respectively to astronomy and astrology. Graeco-Roman astrology generally dispensed with explanations of causes – perhaps because systems proposed by the likes of Aristotle, the topic of B. and C., were taken as given – to focus on describing and linking effects to the dispositions of celestial bodies believed to produce them. This review article considers the substantial contributions of L. as well as B. and C., focused on astrology and astronomy respectively, to a growing field of interdisciplinary inquiry – besides Classics, key contributors are Assyriology, Egyptology and History of Science – on the astral sciences. This field takes account of scholarly engagement with the stars, of their alleged effects on earth and of a wider cultural and historical embedding, reflected in religion, literature and art. The three books under review provide richly contextualised studies of individual sources relevant to the astral sciences, from a primarily philological standpoint, which will be instrumental in assessing the place of their ancient authors in the history of knowledge.

From origins that demand closer study – transfer of knowledge among Greece, Babylonia, birthplace of the zodiac, and Egypt, cradle of doctrines such as the *dodekati(r)opos* and the decans – a refined system of astrology was available in Roman times, asserting itself as a unifying theory. Better to abandon traditional religion and pay cult to the planets, claim the ‘Manethoniana’ (1.196–207), the work of at least four poets transmitted as a unified six books in their medieval tradition, and an underexploited

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resource for the study of this astrology. These 3,000 hexameters, richly manifesting post-Classical Greek literature, are the subject of L.'s critical edition, translation and commentary in a magisterial two volumes. Although a 2017 edition by C. De Stefani was available, it admits improvement, and that of H. Koechly (1862) remains a common point of access; L.'s is also the first published modern-language translation.

Someone, between antiquity and the ninth-century copying of the chief witness, attached the name of Manetho, aiming to evoke the Egyptian priest and scholar who wrote a history of Pharaonic Egypt, a fundamental source for dynastic chronology. Two books of the *Manethoniana* (1, 5) address a Ptolemaic king and insert themselves into other Egyptian traditions, of the sage Petosiris and Hermetic revelations (at 5.5 ἀπομαξόμενος might refer to the poet [κεκόμεσμαι in the same line], rather than the god, as L. suggests: a wax copy of the divine stelae-inscriptions). Convention assigns the poems to Roman times, but Roman realia are thin (e.g. ἀυτοκράτωρ [vol. 2, pp. 18–19], but 'forum' for ἀγορή [3.31] is tendentious) in comparison to Hellenistic, with kings, satraps (5.39) and the aristocratic world of the gymnasium. The *Suda* assigns Manetho astral hexameters, and the fellow astrologer Hephaestion of Thebes (born 380 CE) cites book 1 as 'Manetho', but the earliest presentation of the full collection as Manetho's is the ninth-century codex L (Florence, Plut. 28.27).

That well-preserved but 'very corrupt' (vol. 1, p. x) witness is the centre of L.'s edition. Beyond her attention to its possible context in philosophical study in Constantinople, reflections of practical aspects of astrology (some still unpublished) in codex L, which also transmits the hexameters of Maximus on catarchic astrology, would repay further study: a table of planetary exaltations and depressions; extensive paratextual matter with one of the earliest full sets of astrological sigla in Greek; a table of rising-times for each zodiac-sign (fols 47v–48r), which could serve the life-time calculation method set out in Book 3; a Sibylline assignment of the 24 Greek letters to the seven planets (fol. 48r), supplemented in a later hand with a psephistic method for casting a birth-horoscope using personal names. The convergence with practical astrology is already attested in one of the papyri of Manetho: *P.Oxy.* XXXI 2546 (Π<sup>1</sup>) was re-used to copy forecasts from the astrological conditions of the rise of Sirius–Sothis.

Papyrological attestations of Manetho, including recent discoveries (*P.Oxy.* LXXXVII), augment growing evidence for ancient circulation of authors on the astral sciences. Besides Anubion, discussed by L., there is Aratus (*P.Hamb.* II 121), Ptolemy (*P.Oxy.Astr.* 4167–71), and anonymous authors who shared sources with Vettius Valens (*P.Oxy.* LXV 4476) and with Pliny's discussion of planetary motion (*P.Mich.* III 149).

L. divides her two volumes over three books of Manetho each, the earlier (2, 3, 6) and later (1, 4, 5) respectively. Extensive introductory material (nearly 800 pages across the two volumes) gives a thorough orientation to the poems. Vol. 1 introduces astrology and the difficulty of categorising it, an uncomfortable fit as this features science and a 'peculiar variant' of divination (vol. 1, p. 17), with which the poems express a complex relationship (e.g. 6.473–5; add the horoscope-preface *BKT* IX 102 for *astronomia* in terms of *mantikē*). If it is a science, astrology is a peculiarly 'human' one in scope and mechanism, beginning with the personification of heavenly bodies.

The workings of Manetho, of whose astrology L. writes exegesis rather than history, are assumed to start from planetary positions calculated from tables based on the fundamental parameter received from a client: time of birth. Raw data are interpreted through 'systematic catalogues', not, excepting projected lifetimes (3.399–428), calculations. A helpful chapter (vol. 1, supplemented in vol. 2) delves into comparanda in authors on technical astrology – Anubion, Dorotheus, Firmicus Maternus, probably the tradition of 'Nechepso' and 'Petosiris'; Ptolemy and Antiochus for the later books, but a claimed

'dearth of interpretative material in the papyrological record' (vol. 1, p. 53) is surprising. In Greek we have no fewer than 60 astrological treatises on papyrus (the most recent list is found in: D. Baccani, *Oroscopei greci* [1992], pp. 32–4), some substantial: *P.Mich.* III 149, for example, a bookroll of at least 22 columns.

L.'s discussion of poetics focuses on the laborious development of a suitable technical vocabulary. Analysis of orthography doubles as justification of editorial practice. Borrowings of diction and content from earlier Greek hexameters are traced, and techniques for presenting dense information are evaluated. A chapter on metre (7, vol. 1) is especially detailed: the hexameters align with gnomic and didactic verse in the manner of Hesiod.

'The world of astrology' (vol. 1, Part 3) draws in other astrologers, divination and contemporary literature including the Gospels. This mine of material for the history of society and mentality is especially revealing on professions: concerns about *πρῶξις* reflect the strivings of a middle class. An expansion in vol. 2 attends to questions of audience and focalisation.

A welcome innovation by L. is the careful deployment of disparate and difficult astrological comparanda. Parallels are also reprinted at the foot of the relevant pages of the edition. On the latter L. notes the potential for 'real contributions to [the] basic emendation' (vol. 1, p. x) of codex L, and she has not failed to deliver. Reading L alongside the new edition, I was struck by a sense of distance. This was not because of L.'s editorial skill: one finds very few inaccuracies (e.g. 2.464 read *καὶ* for *αἰ*; 3.132a prefer *ρέξουσι* to *ρέξουσι*, as the marginalia from which L. restores have the former, not the latter as reported; 4.31 *ρέξει* L has been misread as *ρέξει*; conversely, 6.394 L has *ἐφεζομένουσ*, not *ἐφεζομένουσ*; 6.609 *ἦ* [*ἦ* in L] is missing from the beginning). The feeling, down to a matter of taste, comes from the aggregate effect of large-scale intervention in orthography, details like connectives and perceived corruptions. More liberal use of in-text brackets to mark additions (as sporadically: 1.305; 5.141, 311) and deletions would help readers keep track. Occasionally emendations seem sensible but, to my taste, unnecessary: 6.223 L *σχήματα*, for example, which describes well the configurations of the stars governing marriage (*γάμοιο*), to *σήματα*. I reacted similarly to *ἔζηται* → *ιστήται* (6.287) and liked L *βροτόν* in 6.484, with *ἀλίπλαγκτον* in the following verse, better than the corrected *βροτῶ*. The multi-redaction *Fachliteratur* approach generally leaves the papyri in the apparatus, though a whole line from Π<sup>1</sup> is introduced (4.568a). I was especially tempted by \**κακόθοινοσ* from the same witness (4.564) in place of *κακόθυμοσ* (L), matching the food-centred epithets closing the line (*ἀθεσμοφάγοσ, ἀτράπεζοσ*).

The accompanying translation is helpfully set on facing pages to the text. L. opts for the iambic pentameter, citing the advantage of clearer correspondence of lines between Greek and English. But the challenges for Manetho in rendering technical vocabulary in verse become the verse translator's too. Some slippage in renderings of technical terms is regretted: that *δῶνον* *περὶ κέντρον* is a position in a cardinal point (the Descendant), for example, is lost in 'where he [sc. Saturn] sets' (3.18). Despite some knotty parts – I stumbled over 'And with kings or companions of the great | Enlists in amity; of revenues | Forms agents' (2.151–3) – there are delightful effects in L.'s verse, such as the admirable 'conspiring harm | In secret, such are born, to none their mind | Baring, with venom deadlier than snakes' (2.194–6), capturing the poetic enlivenment of dense catalogues.

The commentary balances attention to astrological and to poetic questions. The result, throughout which manifests the commentator who called the verses 'a commentator's dream' (vol. 1, p. x) and 'a commentator's paradise' (vol. 2, p. vii), is massively learned (over 300 pages in vol. 1, nearly 500 in vol. 2), and good indexes help to make the commentary a wider scholarly point of reference. On 5.154–8 I missed a reference to

S. Ferrando (*Maia* 60 [2008], 24–6) on Manetho’s presentation of sponges and diving, including some of the Homeric echoes.

What sort of astrology do the poems offer? They have a claim to be systematic, though confined to personal natal forecasts (from configurations of planets and stars at individual human births) as opposed to catarthic or political. The methods are simple, even if L.’s ‘nursery-school astrology’ (vol. 1, p. 46) is not quite right – one can go lower: the so-called zodiologia (cf. *CCAG* X 101–2), comparable to modern newspaper ‘horoscopes’ based purely on birth-signs. Some apparent absences from Manetho, as of the decans, may be effects of redaction: medieval codices preserve an understudied prose version (cf. W. Gundel, *Dekane und Dekansterbilder* [1936], pp. 415–16) of natal *apotelesmata* attributed to Manetho, from decanal positions of the ascending lunar node. The earlier books begin, echoing Aratus, by cataloguing constellations, eventually focusing on the zodiacal ones central to Graeco-Roman astrology. Effects of ‘hosting’ of planets in zodiac-signs belonging to others as ‘houses’ are considered, of their occupancy of the Ascendant and the other three ‘cardinal points’ of the zodiac, and of geometrical relations (‘aspects’) with other planets, the chief concern of the later books. Doctrinal sophistication culminates in a method for calculating length of life; sample horoscopes reflect ‘some of astrology’s classic topics’ (vol. 1, p. 65), but shade into concerns of catarthic astrology: whether one should raise a child or not, and how to identify ‘servile’ birth – attractive, one would think, in a Roman world of socially mobile freedmen and attendant frictions. Recusing the sensitive topic of royal horoscopes – on which Book 5 touches (35ff.), mentioning Alexander and his successor, the poet’s purported patron, Ptolemy – the poet of the early books sets a seal with his own horoscope, undated (conventionally 27–29 May 80 CE [vol. 1, pp. 868–9]; to humour Manetho’s Ptolemaic posture, a birthdate in late June 158 BCE might also be considered, requiring only an error in the Moon’s position [cf., e.g., *P.Oxy.Astr.* 4240]) and uninterpreted, as if an invitation to apply the preceding teachings.

L. finds the poems ‘certainly Egyptian’ (vol. 1, p. 374) despite dilution of local specificity. One poet makes himself a resident of Αἴγυπτος (1.2, 15) – but would a resident of Alexandria, scholarly and artistic centre of the day, have put it so? Among the ‘greatest source of plausibly Egyptian details’ (vol. 2, p. 117), the κάτοχοι (1.239) were not confined to Egypt: they occur in Asia Minor and the Near East (D. Martínez-Chico and M. Zellmann-Rohrer, *ZPE* 221 [2022], 157–64).

L.’s work takes its place among the fruits of renewed attention to astrological authors, commented editions of Greek astrological texts with serious consideration of their doctrines. Critodemus (C. Tolsa, *The Orphic Astrologer Critodemus* [2023]); ‘Antiochus’ (A. Pérez-Jiménez, *MHNH* 14 [2014]); Antigonus of Nicaea (S. Heilen, *Hadriani genitura* [2015]); and Vettius Valens (J.-F. Bara [1989]; Riley’s translation, which L. cites from an online version, is now in print [2022]) have already benefited. Our most extensive surviving Greek didactic poem on astrology, a unique witness to the worlds of its purported clients – everyone, as the poets would have it –, gains an authoritative presentation for a suitably wide audience.

What of astronomy, the study of causative celestial motions and their causes? The aim of B. and C. is to reconstruct a cohesive account from a short, incomplete text, but one so seminal for later thought as to justify the endeavour, a text that L. Judson called ‘the most exciting book of the *Metaphysics*’ in his 2019 translation and commentary in the Clarendon Aristotle series (p. 1; not mentioned by B. and C.) and the best reflection of his astronomy.

The ambition is a synthesis of ‘Aristotle’s ideas about the whole of planetary motions’ (p. 1), exemplified by a single chapter (8) of *Met. A*, taken (following W. Jaeger) to be a later addition to the surrounding discussion of the prime mover but nevertheless consistent with the fundamental principles of *Met. (contra* Jaeger; with P. Merlan and I. Düring).

The resulting model fills in missing explanations in the outline-form of the surviving *Met.* from established Aristotelian principles. The promise is ‘to account for the need of multiple Unmoved Movers ... to explain celestial motions’, and sublunary processes of generation and corruption, in a cohesive system (p. 2). Much of the book is devoted to reconstructing the details of celestial motion with which Aristotle seems unconcerned in his surviving works, tracing his innovation of integrating planetary systems causally with the rest of the heavens rather than segregating them, like Eudoxus and Callippus.

B. and C. arrive (Chapter 4) at the now-shadowy theories of these direct predecessors of Aristotle – Seneca’s claim of an Egyptian background for the theory of Eudoxus in the epigraph is not pursued – in reconciling apparently irregular planetary motion with the uniform, spherical ideal after a background discussion of pre-Aristotelian approaches – serviceable, though no further discussion is offered for the surprising attribution to Babylonia of a ‘paradigm that conceives the cosmos as a sphere’ (p. 11). A mathematically dense second part of this chapter reconstructs planetary motion as predicted by these theories, tough going for non-specialist readers and missing the pay-off of clear comparisons with modern observations, beyond the impression of figure 25.

Metaphysical reasons for unmoved movers are grounded in Aristotelian thought in the central Chapter 5. Additional homocentric spheres proposed by Eudoxus and Callippus to account for the phenomena are moved by these invisible and immaterial forces, unmoved – hence proper to metaphysics – but subordinate to the divine prime mover. Aristotle’s added ‘rewinding’ spheres, cancelling effects of upper on lower systems, produce a total of 55 spheres. The multiple movers, distinguished by the effects of their motion, also counteract an otherwise inevitable sameness: eternal circular motion is the only kind that explains persistent change. B. and C. defend Jaeger’s position that the unmoved movers are final, not efficient causes of celestial motion. A more original proposal takes the spheres as a dynamic continuity, not connected by material axes (p. 147); contact between the surfaces of the spheres allows transfer of motion that can simultaneously be rewound. Alongside a comparative perspective from Newtonian kinematics and dynamics, distinguishing pure study of motion from study of its causes, B. and C. reflect (p. 129) on how alien to the practice of Aristotle modern attempts to predict planetary motion from his system (and evaluate it) might be: terrestrial representations follow different physics from celestial phenomena.

The unmoved movers are also contextualised in a ‘genetic’ model of the development of Aristotle’s thought (Chapter 6), following Jaeger in seeing them as late and Düring in accepting their coherence with Aristotelian theology. Context in theology is considered (7) – ‘meta-astral oligotheism’, linking celestial and divine – and the difficult question of whether celestial bodies have souls (8). Closing considerations (9) offer additional perspectives on the system and reflect on the lasting scientific significance of Aristotle’s use of geometrical abstraction to understand celestial phenomena. There is passing reference to modifications, like the epicycles and eccentric or non-homocentric spheres of Ptolemy, but the focus falls on the reception of the strictly Aristotelian system. An appendix gives text and translation for Aristotle’s astronomical ‘fragments’ – not in the philological sense but as *membra disiecta* of systematic thought.

The book is a translation of another that appeared in Spanish in 2015, connected with the work of the Argentine Grupo del Estudio del Cielo, an effort to understand classical writings on astronomy through the practice – accounting for a change of hemisphere – of observation of the heavens with the naked eye. Aside from the interest of that exercise, a strength in this extensive discussion of astronomical aspects of *Met.* is the presentation of physicists’ perspectives alongside those of philosophers.

Core arguments, however, that *Met. A* is consistent with Aristotelian thought and the cutting-edge astronomical theories of the day and that it offers comprehensive causes of celestial motion, and that the mathematically superfluous spheres are metaphysically necessary, had been made in 2003 with brevity and clarity by J. Beere (*AGPh* 85 [2003], 1–20), as the authors seem unaware. I.M. Bodnár's analysis of difficulties in reconciling the celestial mechanics of *A* 8 with Aristotle's causal principles (*Apeiron* 38 [2005], 257–75) is also missed. In a seminal edited volume on *A* by M. Frede and D. Charles (2000) G.E.R. Lloyd already concludes in a critique of the central chapter 8, not cited by B. and C., that 'Aristotle *cannot avoid* some such account as *A* 8 offers' (emphasis in the original). C.I. Noble's discussion of the (apparent) contradiction of the unwinding spheres to Aristotelian avoidance of contrary circular motions goes unmentioned (*Apeiron* 46 [2013], 391–418).

Opportunities for bibliographical updates in the translation process have also been missed. The critical editions of *A* by S. Fazzo (2012) and S. Alexandru (2014) are not taken into account, nor is the translation and commentary by L. Judson (2019) with extensive discussion of *A* 8. His synthesis on Aristotle's 'astrophysics' and its significance (*OSAPh* 49 [2015], 151–92) is curiously absent. I also missed engagement with the 2016 collection of essays on *A* edited by C. Horn. M.J. White has recently considered a possible vitiation of Aristotle's claim in *A* 8 of the uniqueness of heaven and cosmos, resulting in multiple worlds distinct from ours (*Apeiron* 55 [2022], 97–118).

What about observation? That Aristotle shared an interest in this pursuit is assumed (e.g. 'It is easy to imagine Aristotle . . . devoting time to the patient contemplation of the celestial night parade over the Aegean', p. 149) rather than proven; turns of phrase like 'the Moon always shows us its face' (p. 10 n. 7) do not establish that Aristotle *based* his theory on direct observation of the Moon. A passage cited in passing (p. 97 n. 13), on an eclipse of Mars by the Moon (*De cael.* 292a5), might have provided more substance.

There is much to think with, if not a definitive account, in these meditations on a philosophical text that deserves further attention of non-philosophers.

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