Aestimatio
Sources and Studies in the History of Science

Hellenistic Astronomy: The Science in Its Contexts edited by Alan C. Bowen and Francesca Rochberg

M. J. Geller

Volume 2, numéro 1, 2021

URI : https://id.erudit.org/iderudit/1087177ar
DOI : https://doi.org/10.33137/aestimatio.v2i1.37730

Aller au sommaire du numéro

Éditeur(s)

Institute for Research in Classical Philosophy and Science

ISSN

1549-4470 (imprimé)
1549-4497 (numérique)

Découvrir la revue

Citer ce compte rendu

Geller, M. (2021). Compte rendu de [Hellenistic Astronomy: The Science in Its Contexts edited by Alan C. Bowen and Francesca Rochberg]. *Aestimatio*, *2*(1), 188–194. https://doi.org/10.33137/aestimatio.v2i1.37730

Hellenistic Astronomy: The Science in Its Contexts edited by Alan C. Bowen and Francesca Rochberg

Leiden/Boston: Brill, 2020. Pp. xxxii + 751. ISBN 978–90––24336–1. Cloth €197.00, $236.00

Reviewed by
M. J. Geller*
University College London
mark.geller@fu-berlin.de

One of the daunting challenges involved in reviewing a 750-page standard tome on a subject like astronomy is being able to evaluate all aspects of the volume, covering technical data as well as any possible impact of subject matter on other disciplines. The editors, mindful of their readership consisting of both "insiders" and "outsiders", have taken decisive steps towards making Hellenistic astronomy accessible and comprehensible, with an appropriate balance between complex graphs and arithmetic equations and more general topics, as well as a glossary of technical terminology. The present reviewer, an unrepentant "outsider", will attempt to focus on some key issues involving the connections between Babylonian and Greek astronomy in the period in question, as well as the impact of astronomy as a whole.

Without necessarily intending to do so, this volume highlights a basic difference between Greek and Babylonian approaches to astronomy but goes beyond the common view that Babylonians excelled in observation while Greeks excelled in theory. What becomes clear from several chapters is that Babylonians did not engage in an inner-Greek debate regarding the relationships between natural science (φυσική) and astronomy (ἀστρολογία), which persisted from Aristotle to Plotinus [chapters 4.2 and 14.2], involving arguments regarding the differences and relative importance of these disciplines. The lack of any Babylonian perspective on this issue reflects Francesca Rochberg's novel and provocative hypothesis that no one before

* M. J. Geller served as Professor für Wissensgeschichte at the Free University Berlin from 2010 to 2018 on secondment from University College London. During this period, he was principal investigator of a European Research Council Advanced Grant BabMed, on ancient Babylonian medicine. Since 2018, he has returned to University College London but has been a fellow at the Institut d'Études Avancées de Paris for 2020–2021.

the Greeks (including Babylonians) held an abstract notion of "nature" (φύσις), which was a uniquely Greek concept.[1] Whether one accepts Rochberg's viewpoint, it seems abundantly clear from the evidence presented in this volume that Babylonians did not have a corresponding notion of "natural science". Babylonians noted the movements of celestial bodies and interpreted the data for predictions (including astrology), but they did not engage with Greek questions of causation or why celestial bodies moved in a certain way, which were designed as explanations of nature.

The fact that Babylonian celestial observations were mostly adopted but not reproduced by Greek astronomy has an analogous parallel in the field of medicine. The Babylonian *Diagnostic Handbook* consists of a collection of roughly 15,000 anatomical symptoms organized from head to foot.[2] But as in astronomy, these observations were never reproduced by Greek medicine; however, enough similarities with prognostics in the Hippocratic corpus suggest that this work was known to Greek physicians [Labat 1951, xxxvii]. Instead, as Greek medicine developed, a theory of humors slowly replaced the importance of observing a myriad of external anatomical symptoms, which provided a relatively unified system of causation for disease based upon imbalances of bodily humors, which could also be conveniently related to primordial elements in natural science and zodiacal *melothesia* [357]. In effect, the tendency towards Greek medical theory reduced the dependence upon empirical data derived from extensive observation of symptoms.[3]

The impact of astronomy on the Hellenistic world should not be underestimated, despite the technical nature of the data and its intrinsic difficulty, which makes mathematical astronomy a topic unlikely to be widely understood by the general public. Nevertheless, the ancients relied upon combinations of celestial observation and mythology to sell the importance of astronomy to a wider audience, with constellations being described as graphic illustrations of characters well-known to the popular imagination. Beyond

[1] Francesca Rochberg points out that while Babylonians constructed a rigorous mathematical system for prediction, they were not interested in conceptual developments which depended upon a concept of "nature" [Rochberg 2016].

[2] For a convenient English translation, see Scurlock 2014, 13–272. A new edition and German translation by E. Schmidtchen will appear shortly (de Gruyter, Berlin).

[3] One of the volume's contributors, C. Montelle, remarks that mathematical astronomy relied on "mathematics to advance astronomical speculation so that the amount of empirical data…required for theorizing was reduced" [127]. This closely approximates the different approaches taken by Greek and Babylonian medicine.

this, however, the public did not need to follow abstruse astronomical calculations in order to appreciate the effects of astronomy on everyday life.

Two aspects of the popularity of astronomy come immediately to mind. First, there was the creation of more precise lunisolar calendar which was mathematically worked out rather than dependent upon the arbitrary decisions to intercalate months. Second, there was the rising use of astronomy for predictions, virtually replacing other, less accurate forms of divination such as oracles and the use of entrails, augury, and other subjective means. Moreover, astronomy influenced the healing disciplines in the form of astral medicine and astral magic [chapter 9.3], associating therapy and magical rituals with optimal times for effective applications. Perhaps most importantly, advances in astronomy changed perceptions of the cosmos, even in Mesopotamian and similar societies in which religion and theology dominated virtually every aspect of daily life, since the cosmos could no longer be seen to be guided by gods but by mathematically determined motion. The divine plan for the heavens could then be abandoned as a cosmology, and this realization may well have paved the way for Presocratic philosophy among Greek intellectuals.

One of the topics raised by many contributors in the volume under review concerns the increased interest in accurate time reckoning as a result of developments in mathematical astronomy. The ramifications of this widespread interest, from the second half of the first millennium BC onwards, involved the use of water clocks, sundials, and mathematical schemes for dividing daylight and nighttime hours into more precise divisions (usually of 12 hours), based upon mathematical schemes. Whichever system was invented or employed, the overall result was noticeable: more attention was being paid to time reckoning. One indication of this is that, at some point during this period, the idea of a seven-day week developed, although no one has as yet been able to explain how this came about. A chapter devoted to the Book of Jubilees (in which the week is the crucial structural motif) only refers to a 364-day year that is divisible by 52 weeks [534]; the astronomical context is not considered.

Another result of advanced astronomy is how the increased interest in time reckoning may have influenced vernacular language. The present reviewer once suggested that an important syntactical phenomenon within Aramaic had been largely overlooked: while pre-Achaemenid Aramaic from Mesopotamia generally followed Akkadian sentence structure, *Reichsaramäisch* showed a marked syntactical change, from aspect to tempus in verbal forms [Geller 2005]. The shift towards more time-associated action (tempus) rather than completed *vs* incomplete action (aspect) became standard in post-Persian period Aramaic, even within Eastern Aramaic of Mesopotamia, as well as influencing post-biblical Hebrew.[4] While previously attributing this change to the Indo-European influence of an Iranian/Aramaic *Sprachbund*, later reinforced by the use of Greek in the Levant, a new, unforeseen possibility may possibly be inferred from Hellenistic astronomy. Instead of being an entirely linguistic affair, the widespread shift to a tense system (past-present-future) may have been influenced by an increased interest in time reckoning in the Persian period, as a result of advances in astronomy.

Another issue arising from these studies is the general picture of astronomy in Egypt compared to Mesopotamia, in terms of the level of competence and advancement of the science, particularly during the Hellenistic period. With the rise of Alexandria's scholastic prominence, the center of gravity appears to shift towards its institutions, culminating in Ptolemy's *Almagest* and other works. At the same time, astronomy in pre-Ptolemaic Egypt was based on a very different cosmology and mythology which had little in common with its neighbors, nor is there evidence of observation or mapping the heavens [chapter 4.8]. While taking into account the spirited defense of Egyptian astral sciences as descending from Middle Egyptian origins [chapter 11.1], the lack of any solid evidence for a continuous Egyptian school curriculum, comparable with Mesopotamia's "stream of tradition", may partly explain the slower advances in Egyptian astronomy before the founding of Alexandria. The picture is further clouded by the penetration of Babylonian astronomy into Egyptian records [164], which raises interesting questions regarding *Wissenstransfer*.

In order to understand this, there are several relevant factors to consider. There is the crucial question regarding the "survival" of cuneiform writing and how long the script remained legible and understandable. There is a good deal of misunderstanding about this. First, the latest datable cuneiform tablet, from 75 AD, was an almanac [277], which means that the text was composed and not simply copied [Hunger and de Jong 2014, 182], hardly indicating the end of cuneiform writing. Second, there is abundant evidence of Akkadian genres and terminology appearing in later Aramaic texts, e.g.,

[4] The change from aspect to tempus did not affect Akkadian, which by the Achaemenid period had become a language of scholarship and literature, with Aramaic becoming colloquial.

in Mandaic astrology [489, chapter 13.4], as well as Mandaic magic [Drower 1946], and in medical passages in the Babylonian Talmud. The importance of this data is that Babylonian astronomical expertise may have been available for much longer than has presently been surmised.[5] Nevertheless, what is lacking is any anecdotal evidence for *Wissenstransfer*, describing some kind of putative forum or arena for the exchange of data and ideas between Babylonian, Greek, and Egyptian scholars. No account has come down to us of any face-to-face symposium or written correspondence or bilingual translations of astronomical literature which would explain how data crossed linguistic and geographical boundaries. Even the famous case of Berossus' writings in Greek on Babylonian astronomy turns out to be bogus [439], since it is highly unlikely that the high priest of the Marduk temple in Babylon would seek or find a Greek readership. It is much more likely that Berossus wrote in Aramaic or Akkadian and that his *oeuvres* were later translated into Greek, as happened with many Aramaic and Hebrew apocrypha and pseudepigrapha, their originals having been completely lost. On the other hand, the idea suggests that Aramaic could have served as an intermediary between Akkadian and Greek, considering that the alphabetic script of Aramaic may have been easier for Greeks and others to cope with, rather than the complexities of cuneiform script. With this in mind, Aramaic texts based upon Akkadian astronomy, e.g., those found in Qumran or in the Astronomical Book of 1 Enoch or the Mandaic *Asfar Malwasha* (*Book of the Zodiac*) [see chapter 13.4], render disappointing results. Aramaic astronomy references classical texts such as MUL.APIN or *Enūma Anu Enlil*, but not Babylonian mathematical astronomy.

This volume explains with admirable clarity that much of Ptolemy's work shows considerable awareness of all aspects of Babylonian astronomy [chapter 4.7], but it is also important to bear in mind that Ptolemy was born only 25 years after the last dated Babylonian astronomical almanac, mentioned above. In the absence of any narratives, we need to look for some kind of mechanism to explain *how* the complexities of Babylonian mathematical astronomy would have been known to Ptolemy, especially since cuneiform script and its sexagesimal numbers were integral to Babylonian astronomy [431], which made it inherently difficult to translate. One possible solution

[5] It is challenging to explain how a late author, Hephaestio of Thebes (*flor.* AD 415), included omens in his work which resemble celestial omens in *Enūma Anu Enlil*. See also Misiewicz 2016, 393.

presents itself. A group of some 20 tablets from Babylon comprise exemplars of Graeco-Babyloniaca, having cuneiform on the obverse and a Greek transliteration on the reverse. Since these can best be dated *via* Greek paleography, papyrologists have assigned these tablets to the first century BC, extending to 2nd century AD and perhaps even later.[6] Although usually assumed to be script-learning exercises, no convincing specific usage for the Graeco-Babyloniaca has as yet been proposed.

The intriguing feature of the Graeco-Babyloniaca tablets is that neither script is rudimentary, since both cuneiform and Greek scripts appear to be written by a scribe or scribes who were proficient and professional. One possible context for these exercises can be found in Babylonian astronomical diaries, which refer to royal decrees being written on leather, to be read out in public. Since leather was an unlikely medium for writing cuneiform, and since the diaries do not refer to translations, the most reasonable inference is that Akkadian was being phonetically transliterated on leather in Greek script, which had the advantage (over Aramaic) of preserving the vocalization of Akkadian. This, in fact, may well be the precise mechanism for *Wissenstransfer* which we are seeking, since a transliteration of technical Akkadian astronomy on leather might have made the texts accessible to Greek speakers. Astronomical and even astrological texts are not the Epic of Gilgamesh but employ a limited technical vocabulary, and it would thus be possible for a learned Chaldaean[7] within the Roman *oikoumene* to offer basic instructions on Babylonian astronomy, without having his colleagues grapple with the burdensome complexities of cuneiform script.

The present review has hardly expounded all of the considerable merits of this impressive tome, but some small quibbles could be mentioned in passing. The historical glossary provided by the editors is both useful and informative; but some important items are missing, such as the term "syzygy" (conjunction of the Sun and Moon [130]). The present reviewer was also puzzled by a repeatedly used expression, "save the phenomena" (e.g., page 92, but not found in the glossary), but fortunately one of the editors in private

[6] This information was provided to the present writer by colleagues Herwig Maehler and Walter Cockle. The essential information for the Graeco-Babyloniaca can be found in Geller 1997.

[7] It would not be impossible to imagine that a Stoic philosopher like Diogenes of Babylon might have been partly responsible for bridging the gap between Greek and Babylonian science [615]. Other candidates have been suggested by Z. Misiewicz [2016, 351].

correspondence explained that this idiom "explains away the phenomena of planetary station and retrogradation". Finally, while attempts were made to cover all major sources of Hellenistic astronomy and astrology, one lapse is the absence of a chapter on astrology in the Syriac *Book of Medicine*, which contains a mixture of Greek and Indigenous late Babylonian astronomy [Rudolf 2018]. Despite these minor flaws, this volume has secured its place as a standard reference work on astronomy and astrology in a crucial period for knowledge transfer.

BIBLIOGRAPHY

Drower, E. S. 1946. "A Phylactery for Rue (An Invocation of the Personified Herb)". *Orientalia* ns 15: 324–346.

Geller, M. J. 1997. "The Last Wedge". *Zeitschrift für Assyriologie* 87: 43–95.

—— 2005. "Persian Influence on Aramaic?". Pp. 31–39 in E. Dabrowa ed. *Ancient Iran and Its Neighbours: Studies in Honour of Prof. Jósef Wolski on Occasion of his 95th Birthday*. Cracow.

Hunger, H. and T. de Jong. 2014. "Almanac W22340 from Uruk: The Latest Datable Cuneiform Tablet". *Zeitschrift für Assyriologie* 104: 182–194.

Labat, R. 1951. *Traité akkadien de diagnostics et pronostics médicaux*. Paris/Leiden.

Misiewicz, Z. 2016. "Mesopotamian Lunar Omens in Justinian's Constantinople". Pp. 350–395 in J. M. Steele ed. *The Circulation of Astronomical Knowledge in the Ancient World*. Leiden/Boston.

Rochberg, F. 2016. *Before Nature: Cuneiform Knowledge and the History of Science*. Chicago.

Rudolf, S. 2018. *Syrische Astrologie und das Syrische Medizinbuch*. Berlin.

Scurlock, J. 2014. *Sourcebook for Ancient Mesopotamian Medicine*. Atlanta, GA.