Wisdom Between East and West:
Mesopotamia, Greece and Beyond
edited by Francesco Sironi and Maurizio Viano

Astronomy, *Ṭupšarrūtu*, and Knowledge in the Cuneiform World

Francesca Rochberg
University of California, Berkeley, USA

Abstract This paper aims to critique a historiography of science that sees Greek science as exemplary. It discusses the entry of Babylonian astronomy into the history of science and defines the cuneiform scribal-scholarly knowledge termed *ṭupšarrūtu* as a basis for understanding the scope and character of cuneiform science without comparison to Greek or later sciences.

Keywords Astronomy. Cuneiform world. Episteme. Nēmequ. Science. Scientia. Tupšarrūtu.

As compared with the classical Greek world, the cuneiform world at the time of its discovery in the middle of the nineteenth century by British and European archaeologists offered new and hitherto unexplored historical territory. Even though well-educated colonial agents of foreign governments may have been versed in the Bible and *The Histories* of Herodotus and very likely were able to read Greek, Latin, and possibly Hebrew, as a matter of firsthand documentation, the discovery of cuneiform tablets in sites around Iraq and its surrounding areas would eventually offer new possibilities for assessing the biblical and classical narratives. Because the lands of the ancient Middle East (Sumer, Akkad, Babylonia, Assyria, Elam, Persia, the kingdom of the Hittites, to limit the list to cuneiform cultures) were previously known to Europeans only through the lens of biblical and classical writers, the mid-nineteenth-century decipherment of the cuneiform

Edizioni Ca'Foscari

Antichistica 36 | Studi orientali 13
e-ISSN 2610-9336 | ISSN 2610-881X
ISBN [ebook] 978-88-6969-776-0 | ISBN [print] 978-88-6969-777-7

Peer review | Open access
Submitted 2023-11-07 | Accepted 2024-03-04 | Published 2024-07-09

DOI 10.30687/978-88-6969-776-0/002

script opened a door to native traditions without the filter of the Bible or the Greek historians.

Toward the end of the nineteenth century, something unforeseen and unexpected came to light among the cuneiform tablets from Babylonia, namely ephemerides of the moon and the five naked-eye classical planets, Saturn, Jupiter, Mars, Venus, and Mercury, that were not derivative of other ancient forms of astronomy known.[1] The realization of what these tables of cuneiform numbers represented was the result of the collaboration between an Assyriologist, J.N. Strassmaier, and a Jesuit mathematician and astronomer, Josef Epping. By the turn of the twentieth century, the Jesuit F.X. Kugler in *Die Babylonische Mondrechnung* (1900) had penetrated the Babylonian lunar theory, exploding any presupposition, widespread at that time, about the inability of so-called Oriental cultures to produce science.

The study of cuneiform astronomical texts began in the 1880s, when Epping and Strassmaier first revealed that the numerical table texts written on cuneiform tablets were lunar and planetary ephemerides **[fig. 1]**.[2] This revelation had a certain gravitas, because the tables analyzed by these pioneer scholars of Babylonian astronomy could be recognized as the oldest mathematical astronomy, the oldest exact science. As Otto Neugebauer pointed out:

> Epping fully realized the significance of his discoveries. The two columns from a lunar ephemeris which he had deciphered, he said, "give us more information about Babylonian science than all the notices from classical antiquity combined" – a fact which cannot be emphasized too often. And he [Epping] foresaw clearly that the new material would become of great importance for ancient chronology, for Assyriology in general, and even for modern astronomy.[3]

Portions of this essay have appeared in Rochberg 2017; 2018; 2024.

1 Swerdlow 1993, 309-11.

2 Epping, Strassmaier 1889.

3 Neugebauer 1975, 349 fn. 6.

Figure 1 Babylonian lunar ephemeris. Neugebauer [1955] 1983, no. 122 (BM 34580). I thank the Trustees of the British Museum for providing the image

During the very period of the recovery and decipherment of the cuneiform astronomical texts, another scholarly movement was under way that would directly relate to the eventual incorporation of the new field of Babylonian astronomy and astrology into a deeper understanding of the astral sciences of the entire ancient Mediterranean and Middle East. A contemporary of Epping, Strassmaier, and Kugler, the Belgian classical philologist and historian Franz Cumont together with classical philologists Franz Boll and Wilhelm Kroll were engaged in what would ultimately be the 12-volume *Catalogus Codicum Astrologorum Graecorum* (CCAG).[4]

The collection of the Greek astrological texts would open new possibilities for the study of how astronomy and astrology were interdependent and how the astral sciences functioned within the lands of the Hellenistic *oikoumene*, including, of course, the cultural-geographical area of the ancient Middle East (and beyond). In 1911, for example, in the *Sitzungsberichte* of the Heidelberg Academy of Sciences, Boll, together with Semitist and Orientalist Carl Bezold,[5] set out extensive parallels between the then newly available cuneiform celestial omen texts and certain Greek works from the *Catalogus Codicum Astrologorum Graecorum* as well as, for example, the sixth-century CE John the Lydian, or 'Lydus', work on divination titled *De Ostentis* (On Signs). This material was proof of an extensive transmission of Babylonian astronomical knowledge, a phenomenon that would occupy many historians of Babylonian astronomy throughout the twentieth century, such as Otto Neugebauer and David Pingree.

4 See Boll, Cumont, Kroll 1898-1953.

5 Bezold, Boll 1911.

Roughly half a century after the foundation was laid by the Jesuits for the field of Babylonian astronomy, Neugebauer brought out a critical edition of the entire corpus of cuneiform lunar and planetary tables and procedure texts from Babylon and Uruk of the fifth to the first centuries BCE.[6] This work, *Astronomical Cuneiform Texts* (ACT), is still a cornerstone for the field. In that three-volume work, two basic calculation methods, coined by Neugebauer as Systems A and B, were elucidated, and ACT superseded the early work of Epping, Strassmaier, and Kugler.

The recovered astronomical cuneiform texts would ultimately change the face of the history of astronomy and, by extension, the history of science itself. Neugebauer's three-volume *A History of Ancient Mathematical Astronomy* (1975) placed Babylonian astronomy firmly in line with the tradition of Ptolemy's *Almagest* and all later Western astronomy up to Copernicus. Neugebauer credited to F.X. Kugler[7] the discernment of Ptolemy's debt to the Babylonians underlying the Hipparchan lunar parameters used in the *Almagest*,[8] specifically from the lunar System B. The recovery of the bones of Babylonian astronomy made it possible to trace survivals of its parameters and methods not only in Greek but also in Indian and medieval European astronomy.

After Neugebauer, the direct link from Babylon to the West through the transmission of astronomical knowledge[9] to Greece and the Greco-Roman world would come to occupy a central place in assessing the relation of Babylonian knowledge to later science. The impact of the initial decipherment and later explication of cuneiform astronomical texts on the historiography of science of the late nineteenth and early twentieth centuries, therefore, had explosive potential because the most entrenched idea about the history of science of that entire era was the idea that science originated with the Greeks. This potential was a long time in coming, as various arguments were put forward to explain and justify the claim to the Greek invention[10] even after Babylonian astronomy was a known quantity, at least to specialists.

One example, from 1954, the year before the appearance of Neugebauer's ACT, is found in Erwin Schrödinger's book *Nature and the Greeks*. In the chapter titled "Return to Antiquity" he quoted Theodor

6 Neugebauer [1955] 1983.

7 Neugebauer 1975, 305-6.

8 Ptol. *Alm.* 6.2.

9 By 'astronomical knowledge', I refer to all forms of knowledge of the heavens and heavenly phenomena in antiquity, including technical astronomy, astrology, and all related interests in the phenomena.

10 Critiqued in Rochberg 2004, 14-43.

Gomperz, a somewhat older contemporary of Kugler, from his work *Griechische Denker*, first published in 1893 and in its third edition in 1911, still relevant for Schrödinger and his audience in the mid-1950s:

> Nearly our entire intellectual education originates from the Greeks. A thorough knowledge of these origins is the indispensable prerequisite for freeing ourselves from their overwhelming influence. […] Not only has their [Plato's and Aristotle's] influence been passed on by those who took over from them in ancient and in modern times; our entire thinking, the logical categories in which it moves, the linguistic patterns it uses (being therefore dominated by them) – all this is in no small degree an artefact and is, in the main, the product of the great thinkers of antiquity.[11]

The salient point about the Greek invention of science was that it inaugurated a particular kind of thinking – "our entire thinking", as Schrödinger said, implying all forms of rational thought. This quality of mind was, we would have to deduce from his statement, independent of the entirety of cognitive history before Greek philosophy. The fact that Babylonian astronomical ideas and parameters enabled the development of Greek mathematical astronomy, a historical fact known by 1911 when Gomperz wrote and well known by the mid-twentieth century, was still not seen as in any way part of the history of 'thought'.

Today the rhetoric of a Greek monopoly on rationalist scientific thought in antiquity has an essentialist, crude, and artificial ring to it. This began to change when Neugebauer and his Brown University colleagues' attention to sources outside of the Greek corpus, which opened the way to understanding the complexities of the culture, or the cultures, of astronomical science in the Hellenistic world. The study of the non-Greek sources for the astronomical sciences – within which I include observational, predictive, and mathematical astronomy, genethlialogical astrology, and celestial divination – in Babylonian, Egyptian, Judean, and Indian texts showed that traditions coexisted and were transmitted, received, adopted, and reformulated. In other words, the 'Greek way' of thinking about science was itself, in no small measure, formed by contact and exchange with cuneiform and other cultures with which Greek intellectuals came in contact through the political and cultural world established after Alexander's conquests.

Even though early twentieth-century historiographies of science were fraught with prejudice against 'Orientals' and 'primitives' (i.e. non-Greek ancient peoples), the original cuneiform astronomical

11 Gomperz 1991, in Schrödinger 1996, 19-20.

texts made it clear that Greek astronomy did not spring as Athena full grown from the head of Zeus but itself had a sizable debt to Babylon. The claims about Chaldean astronomy found in Greco-Roman sources such as Geminus, Ptolemy, Pliny, Diodorus, and others could finally be assessed against cuneiform texts, and a basis for comparison was thus established. Once one took account of the units (sexagesimal numbers, the 360-degree circle, the cubit, and the finger), observations (e.g. lunar eclipse observations given in Ptolemy's *Almagest*),[12] and parameters and period relations (e.g. the length of the mean synodic lunar month as 29;31,50,8,20 days in the lunar System B, the 19-year lunisolar cycle also known as the Metonic cycle, the Saros cycle to predict eclipses) adopted from Babylonia by Greek, Greco-Egyptian, and Greco-Roman astronomers and astrologers, it became clear how extensive the Babylonian contribution to Hellenistic astronomical science, in fact, was.

Where Babylon had influenced Greece, a greater relevance or legitimacy could be attributed to the Babylonian tradition by virtue of its making the advances of Greek science possible. This was part of a piece with other aspects of cuneiform culture, its urbanism, law codes, and well-developed military capacities, which were viewed as continuous with and contributing to the construct of 'Western Civilization'. Thus the Fertile Crescent came to represent the 'Cradle of Civilization', where civilization is synonymous with that of the West. Speaking from a broad historiographical standpoint rather than specifically about science, Marc van de Mieroop observed that "the predilection to see the Ancient Near East primarily as a precursor of the Judeo-Christian and Greco-Roman legacy tacitly presents the European cultural development as the superior one in the world and measures the relevance of other traditions only in relationship to it".[13] Similarly, insofar as Babylonian science anticipated Greek developments, it took its place in the history of science.

The importance of Babylonian astronomical sciences to the Greeks, Romans, Judeans, and Indians spearheaded a major effort to trace the transmission of Babylonian knowledge to these other cultures. The work to trace Babylonian number notation style, parameters, methods, and schemata to other cultures began in 1911,[14] was expanded and deepened by David Pingree,[15] and continues to this day.[16] Not only is Van de Mieroop's observation, therefore, a critique of historiographical teleology because it can result in assessing earlier tradition

12 Ptol. *Alm.* 5.14, 4.6.

13 Van de Mieroop 1997, 288.

14 Bezold, Boll 1911.

15 Pingree 1997.

16 Misiewicz 2018; Brown et al. 2018.

as less developed and less sophisticated and therefore lesser in all respects than what comes later; it is also an invitation to take the cuneiform sources on their own terms. Although science was not part of Van de Mieroop's remit, the question about teleological historiography is particularly fraught for historians of science.

Arguably the most important of the elements at the intersection of Assyriology with the history of science, is that of our developing study of the cuneiform scientific culture itself. Taken as a totality, the sciences of the cuneiform world of circa 2000 BCE to circa 100 CE, including divination, astronomy, astrology, magic, and medicine, have an enormous significance for the historiography of science. Their significance is due to the unique combination of the kinship of certain aspects of the tradition with conventional ways of identifying science as well as presenting a radical otherness in other respects. The sciences in question comprise the knowledge corpora and associated practices of *ṭupšarrūtu*, the term for the component scribal scholarly disciplines that organized knowledge of the phenomenal world and the practices that depended upon that organization.

Morphologically an abstract noun from the professional designation 'scribe' (DUB.SAR = *ṭupšarru*), *ṭupšarrūtu* is defined (CAD, s.v. meaning 2) as 'scribal learning, scholarship'. The forms of scribal scholarship encompassed by the term *ṭupšarrūtu* produced a distinct textual and intellectual culture. Moreover, in *ṭupšarrūtu* we see the marks not only of a textual and intellectual culture but also of a scientific culture.[17]

From the second millennium BCE, the cuneiform scholar-scribes, the *eruditi*, produced and stewarded a diverse learned textual culture. The textual compendia of omens, lexical lists, lamentations, and incantations that these scribes composed, copied, and preserved over many generations comprised a system of knowledge held in high regard in terms of the authority conveyed upon that scholarly enterprise because of its close connection to the divine and to divinities. This relationship forged an identity for scribes who constituted a literate elite, an intelligentsia (without political influence after the seventh century BCE). As a unifying notion, access to the wisdom (*nēmequ*) of various gods (Nabû, Nisaba, Ea, Asalluhi/Markuk, Šamaš, Adad), and thus to texts considered to contain divine secrets, was a critical component of the identity of that elite. This idea can be traced back to the second millennium BCE[18] but continues throughout the cuneiform tradition despite the change in political and administrative contexts for the members of this intelligentsia.

17 The relationship between *ṭupšarrūtu* as cuneiform knowledge and our term 'science' is also discussed in Rochberg 2016, 9-10, 34-5, 61-102 and in Robson 2019.

18 Lenzi 2008, 27-45.

The textual evidence for *ṭupšarrūtu* is available from the Neo-Assyrian period (seventh century BCE) and the Late Babylonian or Neo-Babylonian to Seleucid periods (fifth-second centuries BCE).[19] Considerable changes in the institutional context of the highly specialized scribes with knowledge of astronomy, divination, and medicine occurred during the gap between these periods. During the seventh century, the scribes who produced and used the texts that *ṭupšarrūtu* comprised were court appointees and advisors to the Assyrian monarch in Nineveh.

Following the fall of the Assyrian Empire in 609 BCE, the scholarly scribal culture in the period from the sixth century onward moved south into the major cities of Babylonia, mainly Babylon and Uruk, and into the temples of Marduk/Bēl (Esagil) and Anu (Rēš). Textual sources for astronomy and genethlialogical, or zodiacal astrology are more numerous from the fifth century onward, although the royal correspondence between the Assyrian monarch and his scholars[20] sheds a kind of light sorely missing from the Late Babylonian period. In the new context of the temples, the fields of knowledge known before as the cornerstones of *ṭupšarrūtu*, namely, astronomy, celestial omens, extispicy, and medical texts, saw profound innovation and change as well. The most revolutionary of these changes was in mathematical astronomy, but significant change is also evident in celestial divination, both natal omens and horoscopy, and in the combination of the new astrology with physiognomy, medicine, and even extispicy.[21]

In the colophons to scholarly texts stored in Assurbanipal's palace during the seventh century BCE, the tablets comprising the various fields of *ṭupšarrūtu* were described as *nisiq ṭupšarrūti* 'the highest level of scribal scholarship', *nēmeq Nabû* 'the wisdom/skill of Nabû, patron deity of writing', and *tikip sattakki* 'the cuneiform signs'. Learning fell under the patronage of the gods, expressed as *nēmeq Nabû* 'wisdom/skill of Nabû' and *nēmeq Ea* 'wisdom/skill of Ea', which is said of a scholarly tablet, and the scribe who wrote it was expressed as "one who understood the entirety (*kullatu*) of *ṭupšarrūtu*".[22] Divine patronage of learning is seen in every corner of the texts that *ṭupšarrūtu* comprised.

This divine patronage was frequently identified with the patron of writing, the god Nabû, and his goddess Tašmētu.[23] Also the god Ea, as patron of wisdom and knowledge of incantations and magic and resident of Apsû, the subterranean watery region where knowledge

19 Robson 2019, 52-3.

20 Hunger 1992; Parpola 1993.

21 Rochberg 2016, 150-5.

22 Hunger 1968, no. 330:5, 331:6; both Assurbanipal palace colophons.

23 Robson 2019, 53-85.

of magic and incantations originated, was a central figure in scribal accounts of their debt to the gods. Rituals for the diviner who inspected the exta (*bārû*) appealed directly to the divine patrons of divination, Šamaš and Adad, who communicated their decisions by writing on the liver.[24]

The idea of divine wisdom is also attested in Late Babylonian astronomical ephemerides, where the contents of the tablet are described in colophons,[25] much as in the Neo-Assyrian colophons, as *nēmeq anūti* ('the wisdom of Anu-ship'). As *anūtu* is the abstract form of the divine name Anu, the divine head of the pantheon and god of the heavens, *nēmeq anūti* is the highest order of wisdom and knowledge/skill. *Nēmeq anūti* was also held to be a secret of the great gods, and the possession of the *ummânu*, the absolute scribal masters of *ṭupšarrūtu*. On the upper edge of ephemerides from Late Babylonian Uruk, the sky god and his goddess, Anu and Antu, were invoked, Bēl and Bēltīja in the texts from Babylon,[26] with the formula *ina amat Anu/Bēl u Antu/ Bēltīja lišlim*: 'By the command of Anu/Bēl and Bēl/Bēltīja, may it go well/remain intact'.

In the main, *ṭupšarrūtu* consisted of a wide variety of multi-tablet omen compendia. The omens compiled in these formalized text series (e.g. the series *Enūma Anu Enlil* comprised 70 tablets) were based on the observation not only of the details of human experience but also of terrestrial and celestial phenomena. Intrusions of one into the other may be found for all seven of the major compilations:[27]

- *Enūma Anu Enlil* ('When Anu and Enlil', the celestial omen series);
- *Šumma ālu* ('If a City', the terrestrial omen series);
- *Sakikkû* (omens devoted to symptoms of an illness, both prognostic and diagnostic);
- *Alamdimmû* ('If the Form', the series for physiognomy and morphoscopy, with its poorly attested subseries *Nigdimdimmû* 'If the Appearance' and *Kataduggû* 'If the Utterance');[28]
- *Šumma izbu* ('If an Anomalous Birth', the series for omens from malformed fetuses and other irregularities of births);
- *Ziqīqu* (the series for dream omens);

24 Starr 1983.

25 Hunger 1968, no. 98; also in Neugebauer [1955] 1983, 18 as Colophon U.

26 Also in a horoscope text, Rochberg 1998, Text 14.

27 As outlined in Rochberg 2004, 54.

28 An important discussion of the relations and connections among the series *Sakikkû*, *Alamdimmû*, *Nigdimdimmû*, *Kataduggû*, *Šumma sinništu* ('If a Woman'), *Šumma liptu* ('If a Spot [on the Body]'), and even *Šumma ālu* is Schmidtchen 2018.

- *Iqqur īpuš* ('He Demolished, He Built', the series for the propitiousness of dates for undertaking various activities or for someone born on certain dates).

These series comprised omens from so-called unprovoked signs, things that happen independently of the diviner's actions to 'provoke' them. The omens resulting from the diviner's provocations were the result of actions that appealed to the gods Šamaš and Adad, providing them with a medium of communication, such as the sacrificed sheep, dropping oil into water, releasing smoke from a censer, or sprinkling flour. Of the provoked omens, extispicy (inspection of the entrails) had an extensive series for omens from the inspection of various entrails, such as the liver, gall bladder, intestines, and lung. The provoked omens came under the heading *barûtu*, meaning 'inspection by extispicy'. Accordingly, the *bārû* ('diviner', literally 'the one who makes an inspection') was the diviner specializing in provoked omens from the exta, oil, and smoke.

Apart from the vast collection and systematization of omens and their different series, *ṭupšarrūtu* also encompassed the sciences of astronomy and medicine. What we call astronomy consisted of a number of well-defined genres of such texts devoted to astronomical observation, schematization, and prediction,[29] including horoscopes.[30] What we call medicine consisted of a number of interrelated and interdependent forms of the science of healing, namely, *āšipūtu* (knowledge and practice of conjuration against evil, and incantation and prayer literature) and *asûtu* (medical practice and knowledge of medicines).[31]

The *āšipu* was a specialist in techniques of appealing to the gods to heal the sick, such as incantations and rituals for ridding the patient of whatever consequences he would suffer from bad omens (*namburbû*), especially those responsible for illness. This specialist did not simply come in after diagnosis to heal through ritual and incantation but was a master of the medical diagnostic omen series *Sakikkû* and the physiognomic series *Alamdimmû*. Together these omen compendia combined knowledge of symptoms, diagnostics, prognoses of illness (recovery or death) in the case of certain symptoms, and all the anatomical regularities and irregularities of the human body.

The *āšipu*'s colleague, the *asû*, specialized in the practice of administering medicine in the form of drugs, the many preparations made from a wealth of materia medica, as well as the use of bandages. The texts of *asûtu* were cataloged in the so-called Assur Medical

29 A survey of which can be found in Hunger, Pingree 1999.

30 Rochberg 1998.

31 Geller 2010; Schwemer 2019, 39-41.

Catalogue.[32] As Geller and Steinert have shown,[33] there was considerable overlap between the two kinds of medical practice, while nonetheless being internally classified under two rubrics (*āšipûtu* and *asûtu*). Thus the separation of the two into medicine (*asûtu*) and magic (*āšipūtu*) as though these distinctions parallel our own separation of medicine from 'alternative medicine' makes for a false dichotomy and a misclassification of the evidence.

If we focus on the textual culture of the Assyrian scribes in the period ending with the fall of the Assyrian Empire, the evidence from Nineveh and elsewhere in the Empire, such as from Assur (Qal'at Sharqāṭ), Kalhu (Nimrud), and Huzirina (Sultantepe),[34] differs from that which comes to light in Babylonia of the second half of the first millennium, principally from Babylon and Uruk. Assyrian scribes derived their textual culture from Babylonia. Colophons on Assyrian scholarly texts tell us that a tablet was copied from a Babylonian original with the phrase *gabarî Bābili kīma labīrišu šaṭir* 'copy from Babylon, written according to its original'.

We can only imagine the wealth of scholarly material from southern Babylonia unrecovered as of today. Assyrian scholars focused their interest in astronomical phenomena on the omen series *Enūma Anu Enlil* and its supporting compendium, MUL.APIN. Mathematical astronomy, lunar and planetary ephemerides, and diaries were the product of the later period in the Babylonian cities of Babylon and Uruk. With respect to both the Assyrian and later Babylonian scribal communities, the integrated nature of the texts comprising *ṭupšarrūtu* is a notable feature of the scientific repertoire. For the Assyrian period, *ṭupšarrūtu* included omen texts, incantations, medical prescriptions, ritual instructions, and astronomy alike. A rare glimpse into the textual domain of *āšipūtu* is found in a text listing the text series and subjects to be mastered by the *āšipu*, a priest whose duties included the conjuration of demons for the purpose of healing the sick and also diagnoses of illness.

The text in question (KAR 44)[35] opens with "The incipits [i.e. titles] of exorcism compositions, established for study and reading [lit. 'viewing'], named in their entirety".[36] It names the rituals and prayers to be known by the specialist in *āšipūtu* followed by a number of omen texts belonging to this scribe's repertoire, namely, *Sakikkû*, *Alamdimmû*, *Nigdimdimmû*, and *Kataduggû*. Further incantations, purification rituals, prayers, and spells are also listed, as well as

32 Steinert 2018, 11, 13-14, 172-84; Panayotov 2018, 89-120.

33 Geller 2010, 9; Steinert 2018, 187-92.

34 Robson 2013 discusses the various locations of 'libraries' throughout the Assyrian Empire.

35 Geller 2018, 292-312.

36 Geller 2018, 297.

> predictions from stars, birds, oxen, and flocks, oracles (based) on stones (or) flour, on incense, (and) on a god, in their totality, 'explanatory stone lists', 'explanatory plant lists', the 'tablet of stones', the 'tablet of drugs', 'strings' and 'pendants'.[37]

This summation of celestial and terrestrial omens together with the knowledge of the healing plants and amuletic stones all belong to *ṭupšarrūtu*.

In another clear indication of the range of subjects included under the rubric *ṭupšarrūtu*, King Assurbanipal, monarch of Assyria at the height of its imperial period, boasted of his extensive learning in an inscription, as follows:

> Marduk, the sage of the gods, gave me wide understanding and broad perceptions as a gift. Nabû, the scribe of the universe, bestowed on me the acquisition of all his wisdom as a present. Ninurta and Nergal gave me physical fitness, manhood and unparalleled strength. I learnt the lore of the wise sage Adapa, the hidden secret, *the whole of the scribal craft* (*kullat ṭupšarrūtu*). I can discern celestial and terrestrial portents and deliberate in the assembly of the experts. I am able to discuss the series "If the liver is a mirror image of the sky" with capable scholars. I can solve convoluted reciprocals and calculations that do not come out evenly. I have read cunningly written text in Sumerian, dark Akkadian, the interpretation of which is difficult.[38] (Emphasis added)

This totality of the sciences of *ṭupšarrūtu* is important to take into account in any history of the cuneiform scientific culture and how it differed from what emerged in later periods in the scientific cultures of the West.

The sciences of *ṭupšarrūtu* expose the questionable nature of a historiography of science that reduces the aims and characteristics of science to those that stem from a modern sensibility about science, mainly one aimed at discovering and then representing the physical workings of nature. If science is to be defined only with reference to such modern ideas, then the knowledge systems and practices of antiquity and the Middle Ages into the Renaissance pose problems of classification and identity, or they are deemed simply to be wrong, superseded stages on the way to the sciences of today. Some of the premodern sciences, such as Ptolemaic and Copernican astronomy, medieval natural magic, alchemy (as well as metaphysics), and Renaissance astrology have already played a role in a reappraisal of

37 Geller 2018, 299-300.

38 K 2694 + 3050, from Livingstone 2007, 100, ll. 10-18.

the scientific revolution.[39] The more remote and distant sciences of *ṭupšarrūtu* present another and somewhat different opportunity for a reassessment of the meaning of science in historical contexts.

Whether *ṭupšarrūtu* stands as a term for the sciences or for a scientific culture depends on how we define science and what sources, methods, and goals we decide belong to science. The evidence of *ṭupšarrūtu* indicates that certain bodies of knowledge, as well as their associated practices, were component parts of a discrete but multifaceted textual and intellectual and scientific culture.[40] Nevertheless, *ṭupšarrūtu* is distinct from episteme or *scientia*. The fact that *ṭupšarrūtu* incorporated fields of learning concerning observed, ordered, and systematized phenomena under one encompassing heading, similar to the way modern science serves as a general category for the disciplines of physics, biology, astronomy, chemistry, and so on, is one way of looking at a functional similarity. Methodological similarities are also key, such as use of empirical and predictive methods across the board and the overall systematic character of the whole.

Both similarities and dissimilarities to later sciences are found in the subjects encompassed by *ṭupšarrūtu*. Similar are astronomy and to a degree medicine, but divination, which looms large in the cuneiform corpus, is at complete odds with the fields fixed by modern science, to say the very least. The centuries up to the Early Modern period saw parallels in knowledge and practice that make for a consistent picture with the fields of *ṭupšarrūtu*, including such sciences as magic and astrology and theories of causality not always based on physical or mechanical processes such as, in particular, Hume's constant conjunctions or connections made by analogies, or correlation, rather than physical causality.[41] There are methodological resemblances (empirical, rational, predictive) that serve to unify the sciences, but to make the term science work in the cuneiform world, we cannot reduce the ancient evidence only to these unifying similarities, leaving some of the central characteristics of *ṭupšarrūtu* on the margins.

The cuneiform world has much to offer to the history of science by way of a different perspective, particularly in the clear value placed

39 Lindberg, Westman 1990.

40 The unity of *ṭupšarrūtu* is also suggested by the relationship its series had to secret knowledge, which is discussed in Rochberg 2004, 214-17 and Lenzi 2008, 143. Lenzi says, "Late second and early first millennium sources on secrecy and scribalism use a word familiar to this study to describe the scribal craft: *niširtu*. The excursus to chapter one of this study noted the semantic proximity of *niširtu* and *pirištu* based on a synonym list (Aa = nâqu II/4 52-3). Interestingly, the very next word in this list is *ṭupšarrūtu*, 'the scribal craft'. This list, it seems, sets the three terms into a close semantic relationship. If there is evidence for attaching secrecy to the scribal craft in general, this text, originating in the twelfth century, is the first glimpse of it".

41 Rochberg 2011, 279-80.

on observable signs for prognostication of human events. Some of the signs on which the scribes focused their observational and interpretive techniques were what we would classify as natural phenomena, in particular many of the celestial phenomena. However, the questions for which the observational and interpretive techniques were developed were not those of the later natural sciences.

The observation of regularities and irregularities, and the way deviations from a norm or an ideal were made amenable to schemata, models, calculation, and prediction, did not proceed from a conception of nature as a heuristic or explanatory framework. And because the overriding objective of knowledge was ominous signs of all kinds (astronomical, medical, physiognomic, behavioral, etc.), what was heuristic and explanatory were the meanings and relationships between words and the world conceived primarily through the associative and analogical reasoning employed in the science of interpretation.

Furthermore, an understanding of cuneiform science cannot be based on or defined by a supposed relationship of the gods to nature. The misbegotten nature of the presumption of a divide between the gods and nature extends well beyond cuneiform science even into the Greek and Greco-Roman realms, which may come as a surprise to those who may still regard Anaximander (and other early Greek philosophers) as purely naturalist in his thinking. To quote Daryn Lehoux, "Although many histories of science and of philosophy try to downplay the fact, *the gods never really go away in ancient science* (nor does mythology, for that matter…)" (emphasis added).[42] This suggests that nature did not drive out and replace the gods for purposes of scientific thought and scientific explanation, but as Lehoux pointed out, even in contexts where nature frames scientific inquiry, the gods continue 'to interact' with nature well into the Roman imperial period.[43]

In reference to the cuneiform world, however, the relationship of the gods to nature is not the question but rather how we as historians can reimagine a framework for phenomena that does not involve all-encompassing nature. The relationship between what we, in direct descent from Greek thought, think of as natural phenomena and how cuneiform scribes understood the phenomena of their interest is the crux of this difference. How the objects of the scribes' inquiry were understood, then, is a question of central importance for both historical epistemologies and ontologies. The kind of knowledge science produces and the relation it has to its world underscore the integrated nature of epistemologies and the ontologies supporting them, regardless of cultural or historical context.

42 Lehoux 2019, 20.

43 Lehoux 2019, 22-6.

Bibliography

Bezold, C.; Boll, F. (1911). *Reflexe astrologischer Keilinschriften bei griechischen Schriftsteller*. Heidelberg.

Brown, D. et al. (2018). *The Interactions of Ancient Astral Science*. Bremen.

Cumont, F.; Boll, F.; Kroll, W. (eds) (1898-1953). *Catalogus Codicum Astrologorum Graecorum*. 12 vols. Brussels.

Epping, J.; Strassmaier, J. (1889). *Astronomisches aus Babylon, oder das Wissen der Chaldäer über den gestirnten Himmel. Stimmen aus Maria-Laach*. Freiburg im Breisgau.

Geller, M.J. (1992). *Astrological Reports to Assyrian Kings*. Helsinki.

Geller, M.J. (2010). *Ancient Babylonian Medicine: Theory and Practice*. Oxford.

Geller, M.J. (2018). "The Exorcist's Manual (KAR 44)". Steinert , U. (ed.), *Assyrian and Babylonian Scholarly Text Catalogues: Medicine, Magic and Divination*. Boston, 292-304. https://doi.org/10.1515/9781501504914-010.

Gomperz, T. [1893] (1911). *Griechische Denker: Eine Geschichte der antiken Philosophie*. 3 Bde. 3e Aufl. Berlin.

Hunger, H. (1968). *Babylonische und Assyrische Kolophone*. Neukirchen-Vluyn.

Hunger, H. 1992. *Astrological Reports to Assyrian Kings*. Helsinki.

Hunger, H.; Pingree, D. (1999). *Astral Sciences in Mesopotamia*. Leiden.

Kugler, F.X. (1900). *Die Babylonische Mondrechnung. Zwei Systeme der Chaldäer über den Lauf des Mondes und der Sonne*. Freiburg im Breisgau.

Lehoux, D. (2019). "'All Things Are Full of Gods': Naturalism in the Classical World". Harrison, P.; Roberts J.H. (eds), *Science Without God? Rethinking the History of Scientific Naturalism*. Oxford, 19-36. https://doi.org/10.1093/oso/9780198834588.003.0002.

Lenzi, A. (2008). *Secrecy and the Gods: Secret Knowledge in Ancient Mesopotamia and Biblical Israel*. Helsinki.

Lindberg, D.C.; Westman, R.S. (eds) (1990). *Reappraisals of the Scientific Revolution*. Cambridge; New York.

Livingstone, A. (2007). "Ashurbanipal: Literate or Not?". *ZA*, 97, 98-118.

Misiewicz, Z. (2018). "The Importance of Experts: Agents in the Transfer of Knowledge between Hellenistic Mesopotamia and the Greek-Speaking World". Crisostomo, C.J. et al. (eds), *"The Scaffolding of Our Thoughts": Essays on Assyriology and the History of Science in Honor of Francesca Rochberg*. Leiden, 317-32. https://doi.org/10.1163/9789004363380_017.

Neugebauer, O. (1975). *A History of Ancient Mathematical Astronomy.* 3 vols. Berlin.

Neugebauer, O. [1955] (1983). *Astronomical Cuneiform Texts*. 3 vols. 2nd edition. London.

Panayotov, S.V. (2018). "Notes on the Assur Medical Catalogue with Comparison to the Nineveh Medical Encyclopaedia". Steinert 2018, 89-120. https://doi.org/10.1515/9781501504914-005.

Parpola, S. (1993). *Letters from Assyrian and Babylonian Scholars*. Helsinki.

Pingree, D. (1997). *From Astral Omens to Astrology: From Babylon to Bikaner*. Rome.

Robson, E. (2013). "Reading the Libraries of Assyria and Babylonia". König, J.; Oikonomopoulou, K.; Woolf, G. (eds), *Ancient Libraries*. Cambridge, 37-56. https://doi.org/10.1017/CBO9780511998386.004.

Robson, E. (2019). *Ancient Knowledge Networks: A Social Geography of Cuneiform Scholarship in First-Millennium Assyria and Babylonia*. London. https://doi.org/10.2307/j.ctvhn0csn.

Rochberg, F. (1998). *Babylonian Horoscopes*. Philadelphia.

Rochberg, F. (2004). *The Heavenly Writing: Divination, Horoscopy and Astronomy in Mesopotamian Culture*. Cambridge. https://doi.org/10.1017/CBO9780511617409.

Rochberg, F. (2011). "Divine Causality and Cuneiform Divination". Frame G. et al. (eds), *A Common Cultural Heritage: Studies in Mesopotamia and the Biblical World in Honor of Barry L. Eichler*. Bethesda (MD), 279-94.

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

Rochberg, F. (2017). "These Bones Live!". *KNOW: A Journal on the Formation of Knowledge*, 1, 67-83.

Rochberg, F. (2018). "The Near Eastern Heritage in Greco-Roman Astronomy." Schmidtke, S. (ed.), *Studying the Near and Middle East at the Institute for Advanced Study*. Princeton, 11-20. https://doi.org/10.31826/9781463240035-006.

Rochberg, F. (2024). Worldmaking and Cuneiform Antiquity: An Anthropology of Science. Cambridge; New York.

Schmidtchen, E. (2018). "Esagil-kīn-apli's Catalogue of Sakikkû and Alamdimmû". Steinert, U. (ed.), *Assyrian and Babylonian Scholarly Text Catalogues*. Berlin, 137-57. https://doi.org/10.1515/9781501504914-007.

Schrödinger, E. (1996). *Nature and the Greeks*. 2nd ed. Cambridge.

Schwemer, D. (2019). "Mesopotamia". Frankfurter, D. (ed.), *Guide to the Study of Ancient Magic*. Leiden, 36-64.

Starr, I. (1983). *The Rituals of the Diviner*. Malibu.

Steinert, U. (ed.) (2018). *Assyrian and Babylonian Text Catalogues: Medicine, Magic and Divination*. Berlin. https://doi.org/10.1515/9781501504914.

Swerdlow, N.M. (1993). "Montucla's Legacy: The History of the Exact Sciences". *Journal of the History of Ideas*, 54, 299-328. https://doi.org/10.2307/2709984.

Van de Mieroop, M. (1997). "On Writing a History of the Ancient Near East". *BiOr*, 54, 285-305.