The Cultural Locus of Astronomy in Late Babylonia

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Of all the aspects of Mesopotamian culture that continued into the Hellenistic and Arsacid periods, only astronomy and astrology ultimately took hold in other cultures, Greek, Indian, and later, Arabic. Greek borrowing of Babylonian astronomy throughout the Achaemenid and Seleucid periods seems to confirm the vitality of this Babylonian tradition in its own context at a late date.[1] But more importantly, the continuation of the traditional Babylonian repertoire both of astrological omens and a wide variety of astronomical texts, as well as, presumably, the practices which required their use, is assured on the basis of dated or datable cuneiform texts until the end of the first millennium B.C., and even into the first millennium A.D.[2]

The extraordinary longevity of Babylonian astronomy and astrology not only enabled the transmission of both beyond native institutions, but accounts for the association of Babylonians (or Chaldeans) with these two disciplines by Greeks and Romans until the first century of the Common Era.[3] As a direct result of this, astronomy and astrology became the legacy of Mesopotamian culture to the Greco-Roman, hence Western world. While the internal characteristics of Babylonian astronomy and astrology have been the object of study since the beginnings of Assyriology – one need only mention the names of the pioneers of this

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[1] See A. Jones, „The Adaptation of Babylonian Methods in Greek Numerical Astronomy", *Isis* 82 (1991), pp. 441-453, as well as his „Babylonian and Greek Astronomy in a Papyrus Concerning Mars", *Centaurus* 33 (1990), pp. 97-114.

[2] This material is best represented by the tablets published in Pinches and Sachs, *Late Babylonian Astronomical and Related Texts* (Brown University Press, 1955).

[3] See F. Rochberg-Halton, „Elements of the Babylonian Contribution to Hellenistic Astrology", JAOS 108 (1988), pp. 51-62.

study, such as Epping, Strassmaier, Kugler, Neugebauer, Virolleaud, and Weidner – the cultural context of science in late Babylonia is of much more recent interest. Astronomical and astrological texts, among other scholarly genres, have long been associated with the two major temple complexes of Hellenistic Babylonia, the Esagila in Babylon and the Reš in Uruk. In this paper, I would like to consider the evidence for the late Babylonian temple as the principle institution that supported scholarship and, intentionally or not, produced „science" in the period just after ca. 500 B.C. At issue here is how the emergence of science is to be defined, to what cultural context it belonged, and when we recognize its appearance. The identity of the temple personnel involved in the transmission of celestial divination and astronomy to the very end of the cuneiform text tradition will be the central focus of my discussion.

By the late Arsacid period, which in Babylonia ran from the mid-second century B.C. to 225 A.D. (the Arsacid Era [AE] began in 247 B.C.), Babylon had already been displaced as a royal capital by the Hellenistic *polis* Seleucia-Tigris, founded at the end of the 4th century B.C.[4] As early as the 1950's,[5] scholarship of Hellenistic Babylonia has acknowledged that the establishment of the Macedonian Greek regional political center,[6] Seleucia-Tigris, and even the occasional removal of citizenry from Babylon to the new capital[7] did not result in the immediate transformation of that city to a ghost town. On the contrary, the existence of Seleucia-Tigris seems to have delayed the hellenization of the city

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[4] The founding of Seleucia on the Tigris by Seleucus I on his becoming king in 305/4, is attested to by Strabo 16.1.5 (738) ; Appian Syr. 58; Pausanias 1.16.3; see also W. Dittenberger (ed.) *Orientalis Graeci Inscriptiones Selectae* 2 vols. (Leipzig, 1903-5).

[5] See the paper written in 1953 of O. K. Sarkisian, „City Land in Seleucid Babylonia", in *Ancient Mesopotamia* (1969), p. 319.

[6] S. Sherwin-White, „Seleucid Babylonia: a case study for the installation and development of Greek rule", in A. Kuhrt and S. Sherwyn-White edd., *Hellenism in the East* (Berkeley and New York, 1987), pp. 18-21, and R. J. van der Spek, „The Babylonian City", in the same volume, pp. 57-74.

[7] Reported in the Babylonian diary of -273, see Sachs-Hunger, *Astronomical Diaries and Related Texts from Babylonia* Vol.I (Vienna, 1988) , pp. 344-348, with literature cited in the comments to line 29' to the end. The late classical source Pausanias *Attica* I xvi 3 mentions the deportation of Babylonians to the time of Seleucus I.

Babylon, since evidence of Greek presence in the city, in the form of personal names, references in cuneiform texts to *polites*, meaning Greek or hellenized citizens,[8] material culture, and architectural style, is comparatively late (third and late second century B.C.). The turning point in the history of the hellenization of Babylon seems to be placed at Antiochus IV (175 B.C.). Either despite or because of the fact that Babylon was no longer the administrative or commercial center of Mesopotamia, the continuation of the Babylonian temple in most of its capacities remains one of the remarkable features of late Babylonian culture. Indeed, it would seem to be the single institution of Mesopotamian civilization that remained in this late period, and so was the sole carrier of cultural forms such as cuneiform writing, Babylonian cult, so-called „cuneiform law", and of course, astronomy and astrology.

During the long period from ca. 500 B.C. to A.D. 75, conditions within the temples of the major urban centers of southern Mesopotamia must have varied considerably with economic and political pressures. But despite administrative turnovers and individual differences between cities, as between Babylon and Uruk (e.g., the likelihood of the creation by the early second century of a *polis*-like enclave for the Macedonian elite within the city of Babylon but not at Uruk), deterioration of those native Mesopotamian cultural traditions which served the concerns of the temple is not in evidence. Neither the unstable period just before Antiochus IV nor the transition to Arsacid Parthian rule itself (141 B.C. in Mesopotamia) seems to have disrupted the flow of cuneiform texts within the Babylonian temples of the perhaps not so thoroughly hellenized Babylonian cities of Babylon and Uruk.[9]

For early signs of the importance of astronomy and related disciplines for the temple, the Bit Reš sanctuary at Uruk provides some interesting evidence because of the rise of the sky-god Anu to prominence there during the late period. The dating of the inception of this cult, and by

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[8] See the diary of 169/8 (=July to November 143 SE), translated by Pinches 1902, 480-1, the relevant lines (15-16) of which are quoted by van der Spek, „The Babylonian City", p. 67; also LBAT 516: 15'. See also J. Oelsner, *Materialien zur babylonischen Gesellschaft und Kultur in hellenistischer Zeit* (Budapest, 1986), p. 125 and note 498.

[9] For archaeological finds pertaining to Babylon in the Seleucid period, see Oelsner, *Materialien*, p. 124f., and for Uruk in the Parthian period, ibid., p. 88.

implication its relation to other activities within the temple complex, is difficult because archaeological as well as textual evidence for it comes relatively late, during Seleucid times. But Oelsner has remarked that „das Aussehen der Stadt [Uruk] zwischen dem ausgehenden 6. Jh. v.u.Z. und der Errichtung den Tempelneubauten im 3. Jh. ist praktisch unbekannt. Es ist nicht auszuschließen, daß die bei der Ausgrabung nachgewiesenen Vorgängerbauten des Bit Reš und des Irigal bereits unter den späteren Achämeniden und nicht erst in frühhellenistischer Zeit errichtet wurden."[10] The direction of this kind of speculation is compatible with the relatively recent suggestion that, contrary to the traditional Seleucid period dating of the rise of the gods Anu and Antum within the Uruk pantheon, an earlier dating to sometime in the fifth or early fourth century be considered on the basis of the many Achaemenid personal names containing the theophoric element Anu.[11] A. Kuhrt speculated that the rise in the cult of the sky-god Anu (perhaps identified with the Iranian sky and creator god Ahuramazda) be dated around the reign of Artaxerxes II and to be attributable to increasing Iranian cultural and religious influence at this time. The appearance of horoscopes and the transmission of terrestrial and astral omens from Babylonia to India during the Achaemenid period were mentioned by Kuhrt as related phenomena.[12] But what would the reason have been for receptivity to a supposed Iranian influence, unless the elements of Iranian origin were simply imposed? The degree to which horoscopy represents a break with native Babylonian omen tradition, to be explained by outside influence, is not a clear cut matter, but certainly can be argued as a purely internal

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[10] Oelsner, *Materialien*, p. 95.

[11] See A. Kuhrt, „Survey of Written sources available for the History of Babylonia under the Later Achaemenids", in H. Sancisi-Weerdenburg, ed., *Achaemenid History I: Sources. Structures and Synthesis* (Leiden, 1987) , p.151; R. J. van der Spek, „The Babylonian City", in *Hellenism in the East*, p. 70, citing Oelsner, „Kontinuitat und Wandel in Gesellschaft und Kultur Babyloniens in hellenistischer Zeit", *Klio* 60 (1978), p. 103; and idem, „Gesellschaft und Wirtschaft des seleukidischen Babyloniens: einige Beobachtungen in den Keilschrifttexten aus Uruk", *Klio* 63 (1981), p. 44, and K. Kessler, „Duplikate und Fragmente aus Uruk. Teil II", *Baghdader Mitteilungen* 15 (1984).

[12] Kuhrt, „Survey", p. 151, and for the transmission of Babylonian omens to India, see D. Pingree, „Mesopotamian Astronomy and Astral Omens in Other Civilizations", in H.-J. Nissen, and J. Renger eds., *Mesopotamien und seine Nachbarn* (25th Rencontre Assyriologique, Berlin, 1982), p. 617-8.

development. The rise of a cult to the sky god, as well as providing a reason for the willingness to incorporate the Iranian sky god within it, may itself be explainable without impulse from outside if it is placed in the context of the surge, on many levels, of scholarly interest in the heavens. In any case, whether this is a case of cultural inertia waiting for external stimulus or not cannot be decided. One can only observe that the change in the cult seems to correlate with a change in scribal activities in the field of celestial inquiry.

Nor can the timing of the emergence of mathematical astronomy be omitted from this context. Some Achaemenid period astronomical texts already attest to the kind of astronomical interests, methods, and even parameters characteristic of the later mathematical astronomy, e.g., the investigation of the Saros cycle,[13] the generation of lunar longitudes at syzygy and longitudes of Mercury at last visibility,[14] and in particular the parameters of col. Φ and col. F of the System A lunar theory.[15] Such texts show that these mathematical astronomical methods were laid down by the end of the fifth or beginning of the fourth century B.C., precisely in the period of the transition in the Uruk cult, if the revised dating is indeed correct.

It is therefore abundantly clear that a many-faceted expansion and change in Babylonian astronomy and astrology occurred just after 500 B.C. or so. The highlights of this change are the invention of mathematical astronomy, the break in the tradition of astrological forecasting represented by the introduction of horoscopy, the reception by other cultures, namely Greek and Indian, of some of these developments, and perhaps too the changes in cult which show a greater interest in the cosmos as opposed to merely the state, as reflected in the choice of deity to worship. Given the sources, the aetiology of these changes is quite out

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[13] For the Saros Cycle texts, which list dates of lunar (and one text with solar) eclipse possibilities in consistent arrangement by 18-year (or 223 month) cycles, see Aaboe, Britton, Henderson, Neugebauer, and Sachs, „Saros Cycle Dates and Related Babylonian Astronomical Texts", *Proceedings of the American Philosophical Society* 81, Part 6 (1991).

[14] Ibid., Texts L, F, and M.

[15] „Text S, „ see the discussion in J. P. Britton, „An Early Function for Eclipse Magnitudes in Babylonian Astronomy", *Centaurus* 32 (1989), pp. 1-52.

of our reach. Equally out of reach is the answer to the question whether astronomy was a catalyst for a new sky-god cult at Uruk, or a result of it.

Reasons for assuming that the temple functioned as cultural locus for astronomy comes out of an investigation of the scribes of the scientific texts, their professional designations, their capabilities, and their institutional affiliations. The professional title associated with the scribes of astronomical as well as astrological texts is *ṭupšar Enūma Anu Enlil*. The canonical *Enūma Anu Enlil* texts and their scholia are not at all informative about the scribes themselves due to the infrequent presence of – or preservation of – colophons to identify their names, ancestors, kings, or cities. The tradition from which *Enūma Anu Enlil* derived is traceable to Old Babylonian times (ca. 18th century B.C.).[16] On the basis of this extensive compilation of omens, experts watched for and interpreted celestial „signs" as indicating change in the future. In addition to the widely accepted notion that the heavens encoded knowledge of the future was the belief that one could act on that knowledge, either to take advantage of or avoid what was portended in the skies. But while the series *Enūma Anu Enlil* represented the foundation of the scribes' knowledge, and mastery of the text itself was obviously the chief defining feature of the „*Enūma Anu Enlil* scribe", evidence spanning the Neo-Assyrian to Hellenistic periods points to the fact that the capabilities of the *ṭupšar Enūma Anu Enlil* were certainly not limited to the practice of celestial divination.[17]

The royal correspondence between Neo-Assyrian scholars and the kings Esarhaddon and Assurbanipal attests to the fact that a number of the celestial omen experts were not only in complete command of the *Enūma Anu Enlil* omen literature, but also of the incantations, rituals and sacrifices necessitated by ominous signs. Akkullanu, for example, who was also an *ēreb bīti* or „Enterer of the temple" of Aššur,[18] not only

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[16] Publication of the Old Babylonian lunar eclipse omen texts is in preparation by the author.

[17] G. J. P. McEwan, *Priest and Temple in Hellenistic Babylonia* (Wiesbaden, *Freiburger Altorientalische Studien* 4, 1981), p. 16 has already made this point, but I am not persuaded by his interpretation of astrology as „an additional activity of other professions", confirmed in his view by the fact that the *Enūma Anu Enlil* scribes did not constitute a separate clan as did the *kalû* or *āšipu*.

[18] See Parpola, LAS 302.

carried out celestial observation and „research" in the *Enūma Anu Enlil* series, but personally supervised the sacrifices he recommended be performed. Being a scribe of *Enūma Anu Enlil* during the seventh century B.C., as portrayed in the Neo-Assyrian royal correspondence, seems to have involved not only knowing what to watch for in the heavens and when, as well as where to find the corresponding prognostication in the encyclopedic *Enūma Anu Enlil*, but also required knowing what to do about one's findings there and to advise the king accordingly.[19] What is notable about those who observed the heavens and consulted *Enūma Anu Enlil* is that they were not confined in their activities to astrological and other divinatory matters. They necessarily possessed knowledge not available in the canonical *Enūma Anu Enlil* literature of astronomical periods, both lunar and planetary, as well as of the apotropaic rites and incantations that complemented the practice of divination. The impact these scholars had on Assyrian state affairs was considerable. The power to influence the state stemmed from knowledge based on literacy – and literacy in a range of subjects we have difficulty in recognizing as compatible, since „religion" – referring here to divination and ritual apotropaism – and „science" – meaning observation and prediction of phenomena – seem everywhere to overlap.

When we turn again to the late period, after 500 B.C., the dramatic changes manifest in the development of mathematical astronomy and horoscopy pose new problems for a reconstruction of the fields of knowledge of the scholar-scribe as well as the place or position of the scholar within the social and institutional dimensions of science in the Persian and Hellenistic periods. The implications of reconstructing this picture accurately (or inaccurately) are broad, for they point toward the larger cultural status of late Babylonian science. If the situation of the late period can be seen as consistent in any respect with what has been

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[19] The major source is the corpus of „reports" (*u'ilātu ša ṭupšar* UD AN ^{d}EN.LÍL) sent to Sargonid kings, presented in the form of succinct communications of astronomical observations accompanied by a collection of relevant omens extracted from the *Enūma Anu Enlil* series. H. Hunger, *Astrological Reports to Assyrian Kings* (Helsinki, State Archives of Assyria 8, 1992) and R.C. Thompson, *The Reports of the Magicians and Astrologers of Nineveh and Babylon* (London, 1900). So far the most significant study of these documents is the article of A.L. Oppenheim, „Divination and Celestial Observation in the Last Assyrian Empire", *Centaurus* 14 (1969), pp. 97-135.

described above with respect to the Neo-Assyrian period, a continued interrelationship rather than progressive separation of divination and magic from „science" should be assumed. In his last published article, „From Assyriology to Renaissance Art", Neugebauer wrote that, „no more drastic discontinuity in the history of ancient astronomy can be imagined than the creation of mathematical astronomy in the Babylonian ephemerides and procedure texts... in the Seleucid period. If astronomical phenomena had been considered since the earliest Mesopotamian period as celestial omina (or, in later periods, indicative of astrological facts) the authors of the ACT material („Scribes" from the temples of Babylon and Uruk) dropped all these traditional connections and analyzed lunar and planetary motion in a strictly mathematical fashion comparable only to the approach of Hipparchus and Ptolemy".[20] He follows this by saying that the authors of the planetary and lunar ephemerides constituted a professional group separate from the scribes of the Diaries and omens and that „nothing compels us to assume that these two groups of professional men considered one another with particularly kind feelings".[21] The identity of the scribes who produced mathematical astronomical texts is the central problem.

The main questions are whether or not these astronomers constituted a group totally separate from astrologers, and if so, how they interacted, or if the evidence is better interpreted to show that they formed one and the same group, consistent therefore with what seems to be the case earlier, before the „invention" of mathematical astronomy. Neugebauer refers specifically to the „authors" of the ephemerides, i.e., the inventors of the mathematical techniques employed in the ephemerides to compute the phenomena of the moon and planets. But their intellectual descendants, the transmitters of the ACT tradition, must also be included in the group he saw as wholly separate from the scribes of the Diaries and of *Enūma Anu Enlil*. What evidence can be gleaned about late Babylonian astronomer scribes does not seem to me to be sufficient to answer all these questions with any assurance, but the more notable sources of evidence are offered in what follows.

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[20] O. Neugebauer, „From Assyriology to Renaissance Art", *Proceedings of the American Philosophical Society* 133 (1989), p. 392.

[21] Ibid., p. 393.

The tablets contained in the personal library of an early fourth century scribe, the well-known Iqiša of Uruk, provide one way of establishing the interests and presumably the expertise of an individual scribe. While not a *ṭupšar Enūma Anu Enlil* himself but rather an MAŠ.MAŠ[22] and *ēreb bīti* of Anu and Antu, he was a member of the clan of Ekur-zakir, an *āšipu*, chief priest of Anu and Antu, and *ṭupšar Enūma Anu Enlil* of Uruk.[23] The breadth of Iqiša's learning is represented by the tablets of which he was either „owner" (*ṭuppi* Iqiša...) or copyist (*qāt* Iqiša). This collection of tablets was found in a private house at Warka,[24] evidently the remains of Iqiša's personal library. Among the works identified as belonging to Iqiša are omens, both celestial (*Enūma Anu Enlil*) and terrestrial (*Šumma ālu*, *Šumma izbu*, medical and diagnostic), commentaries, incantations, lexical tablets (vocabularies and synonym lists, e.g., Hh IX, Erimhuš V) and astronomical texts, including an ephemeris computed by the scheme of „System A".[25] Iqiša is also known to have prepared two tablets coordinating celestial omens, zodiacal signs, and incantations.[26] Despite the fact that Iqiša himself was not a *ṭupšar Enūma Anu Enlil*, although his ancestry claimed Ekur-zakir who did hold that title, the integration of scribal learning concerning divination, ritual, as well as mathematical astronomy is basically consistent with the picture of the Neo-Assyrian court intellectuals who held the title *ṭupšar Enūma Anu Enlil*. In Iqiša we find a case of a priestly scribe who did not belong to the select group holding the title Scribe of *Enūma Anu Enlil*, yet he seems to have been literate in the astronomical omen as well as computational astronomical traditions.

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[22] To be read *mašmaššu* or, preferably *āšipu*, see discussion of W. Farber, „Neues aus Uruk: Zur Bibliothek des Iqīša", *Welt des Orients* 18 (1987), p. 29 note 11 and McEwan, *Priest and Temple*, p. 73.

[23] See the colophon of K.3753, photo published in Weidner, *Gestirn-Darstellungen*, Tf. 11/12, and transcription in McEwan, *Priest and Temple*, pp. 174-176.

[24] The tablets were found by the German exacavation during the 27th, 29th, and 30th campaigns. For a list of texts and the identification of Iqiša's library, see von Weiher, UVB 29/30 96ff., and SpTU II.

[25] See Hunger, Uruk No.98.

[26] BRM 4, 19 and 20, see A. Ungnad, „Besprechungskunst und Astrologie in Babylon", *AfO* 14 (1941/4), pp. 251ff.

Because a good deal of obscurity surrounds most of these scholars as individuals, any document making reference to or containing the names of *ṭupšar Enūma Anu Enlil*'s becomes of particular interest. One of a small group of Arsacid period documents from the Esagila temple of Marduk in Babylon (CT 49, 144)[27] provides an unusual glimpse into the lives of such scribes. The document records a session of the temple administrative body (or, perhaps, more a board of directors) termed *kiništu*, in the year 118 B.C. The board, headed by the *šatammu*, decided to transfer the support given in silver and arable land from one *ṭupšar Enūma Anu Enlil* to another, who had laid claim to it.[28] Since the parties in question are named, the document furnishes data establishing prosopographical connections to scribes known from the colophons of astronomical ephemerides, procedure texts, atypical astronomical texts, and even MUL.APIN.[29] The affiliation of these men is thereby secured to the temple and by extension, the practice of astronomy is secured not only within the sacred precinct of the temple, but as a part of a whole series of activities that had come to be housed there, such as divination and probably horoscopy.

Because the duties of the *Enūma Anu Enlil* scribes are enumerated and placed clearly in the context of temple business, this single administrative

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[27] Edited McEwan, *Priest and Temple*, pp. 18-20; cf. review of van der Spek, „The Babylonian Temple During the Macedonian and Parthian Domination", *Bibliotheca Orientalis* 42 (1985), pp. 547-562, especially pp. 547-553.

[28] See also BOR 4 (1890), 132ff. and CT 49, 186.

[29] A full-scale study of these individuals should now be undertaken, but suffice it to point out here that the astronomer called Bel-aba-uṣur, a *ṭupšar Enūma Anu Enlil*, descendant of Ea-epuš-ilani, whose pay (or ration) from the temple is under discussion in the protocol text, is already known as the scribe of ACT 123a, a text described in its colophon as a „*tērsētu* of Kidinnu", and which computes new and full moons according to System B. His son, Bel-uṣuršu, also a *ṭupšar Enūma Anu Enlil*, is to take over his father's income, and perform the duties of his father with a number of other astronomers named, i.e., sons of Itti-Marduk-balaṭu, known as a scribe of MUL.APIN (Source K in the edition of Hunger and Pingree, *MUL.APIN: An Astronomical Compendium in Cuneiform*, *Archiv für Orientforschung*, Beiheft 24 (1989), p. 123), and sons of Bel-bulissu, one of whom, Iddin-Bel, is known from a number of astronomical texts, viz., „Text E and F" in Neugebauer and Sachs, „Some Atypical Astronomical Cuneiform Texts I", JCS 21 (1967), p. 123ff., and „Text K" in JCS 22, p. 92ff., as well as ACT 811, a procedure text for the outer planets.

document affords more insight into cultural and sociological aspects of the work of the *ṭupšar Enūma Anu Enlil* than any single scientific text. This document, produced by the *kiništu*, determines the share of income for the sons of a retired *ṭupšar Enūma Anu Enlil* who were to carry out the nightly systematic watch termed *naṣāru*, now associated with astronomical diary writing, and for computation of astronomical texts termed *tērsētu* and *meš-ḫi*^{meš}, both of which terms appear in the colophons of astronomical texts. *Meš-ḫi* I have taken to refer to an abbreviation of the heading found for what we now call „almanacs". The heading can occur as *meš-ḫi ša šatti* (MU)... „measurements of the year such-and-such", or in the more complete form *meš-ḫi ša kašādi ša libbi ša šatti* „measurements of the zodiacal entrances (literally, „reachings") of the planets of year such-and-such".[30] As its rubric suggests, an almanac presents in twelve (or thirteen) sections the location of each planet in the zodiac through the year. Degrees within signs, however, are never given. Dates of predicted entries of planets into signs are the focus, expressed with the verb *kašādu* „to reach". As Sachs pointed out, boundaries between signs are the most difficult to observe, and the crossing of those boundaries is astrologically significant. In addition to predicting the positions in the zodiac of the planets month-by-month for one Babylonian year, dates of synodic phenomena are included in the appropriate order, as are the lunar phenomena *na* and KUR, and the dates of equinoxes and solstices. Occasionally also the heliacal appearances of Sirius are predicted, as are eclipses. The chronological range for the extant almanac texts is -261 to A.D. 75. ACT 123a, a text which contains new and full moons, is, according to its colophon, a *tērsētu* copied by „the hand of Bel-aba-uṣur, son of Bel-rimannu, descendant of Ea-epuš-ilani, „ who appears in the court protocol in question. *Tērsētu* is found as a colophon title for a number of other astronomical ephemerides from Babylon. These are ACT 122, which formed the basis for Kugler's reconstruction of the lunar System B in his 1900 *Babylonische Mondrechnung*, and ACT 80 which is a lunar daily motion table. Neugebauer was very cautious about interpreting *tērsētu* as a term for „Mondrechnungstabelle", as Kugler had done. Instead he leaned more heavily in the direction of the general interpretation of the term as „necessary equipment", or „tool", in accordance with the analysis of San Nicolo and Ungnad in the glossary to their *Neubabylonische Rechts- und*

[30] See Sachs, „A Classification of the Babylonian Astronomical Tablets of the Seleucid Period", JCS 2 (1948), p. 279-280.

Verwaltungsurkunden.[31] The precise translation of the term *tērsētu* aside, though, these texts represent the highly refined and thoroughly mathematical treatment of astronomical phenomena in tabular form, and are now known to be part of the responsibilities of the *ṭupšar Enūma Anu Enlil.* Astronomical activities which appear to be separate and unrelated not only by their separation into distinct textual genres, i.e., diaries v.s. mathematical ephemerides, but also by a fundamental difference in methodology, are here seen to be performed by one and the same group of scribes who are referred to as scribes of *Enūma Anu Enlil.*

Confirmation from colophons that there truly was no separation between astronomers on one hand and the scribes of the diaries and omens on the other would be highly desirable. But because scribes rarely put their names on the diary texts, little about the professional as well as personal identity of the diary scribes is known from the diaries archive itself.[32] The usual practice was to conclude the text only with the rubric „regular observation... „ (*naṣāru ša ginê...*), giving the dates covered and the reigning king. By contrast with the situation of the diaries' lack of colophons, in the late Hellenistic period for the astronomical texts from Uruk, extensive colophons are preserved containing the names, titles, and ancestry of the scribes who wrote the mathematical ephemerides. These colophons show that some of these scribes belonged to the elite group of *ṭupšar Enūma Anu Enlil*'s. The astronomers' professional affiliations were to the *kalû* „appeaser of the gods", or *āšipu* „exorcist", which are titles not within an „academy", but the priesthood. The primary feature shared by these various priests was literacy. Indeed, in the late period, „priest" (*šangû)* and „scribe" (*ṭupšarru*) could each be written with the logogram ^{lú}ŠID, and as a result can be difficult to distinguish in some contexts.[33] A knowledge of the literatures of omens and incantations, combined with the increasingly sophisticated ability to compute and predict astronomical phenomena, seems to be characteristic for the scribes whose names are associated directly or indirectly with the „field" of *Enūma Anu Enlil* scholarship.

In the light of CT 49, 144, then, as well as in a small number of other contemporary texts in which its protagonists are named as scribes, the

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[31] Neugebauer ACT, Vol. I, p. 13

[32] LBAT 212 rev. 27'f.

[33] See AHw s.v. *šangû* and *ṭupšarru.*

scribes of *Enūma Anu Enlil* may be said to have been members of the priesthood and had their hands in divination, observational astronomy, and exact science (i.e., mathematical astronomy) simultaneously. As the evidence from earlier periods confirms such a view of the cultural dimensions of the scribes associated with scientific texts, it would appear that what is represented in the protocol text reflects a general situation and not some unique case.

An excellent example may be seen in the person of Anu-aba-uter, a *ṭupšar Enūma Anu Enlil*, of the Sin-leqe-unninni family of Uruk, who prepared both ACT 600 (written S.E. 118, or 193 B.C.) which computes first stations of Jupiter according to System A, and the astrological text published in Weidner's monograph *Gestirn-Darstellungen*, in which lunar eclipse omens, zodiacal signs and associations with cities, temples, stones, and plants are systematically related.[34] Some of the associations are related to the „opening of the gate" (*pīt bābi*) ceremony performed at dawn in the temple, marking the end of the night vigil and so may reveal a connection to the cult in addition to the more obvious astrological aspect of the text.[35] As shown in various mathematical astronomical text colophons, this scribe held the titles *ṭupšar Enūma Anu Enlil* and *kalû Anu u Antu*. His father, Anu-belšunu, while apparently not a *ṭupšar Enūma Anu Enlil*, appears as a tablet owner of many astronomical table texts. The personal horoscope of Anu-belšunu is now known to us as well. Anu-belšunu's horoscope adds to the evidence for the integration of the astronomical and astrological sides of the Babylonian study of heavenly phenomena. This particular horoscope provides a rare example of the computation of solar and lunar positions using degrees and fractions of degrees within zodiacal signs, otherwise known only in the ephemerides and indeed obtainable only from the arithmetical procedures characteristic of the ACT schemes. Another notable feature of Anu-belšunu's horoscope as compared against other examples of the genre is the inclusion of omen apodoses as the interpretation of the computed planetary positions.[36]

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[34] VAT 7815, Weidner, *Gestirn-Darstellungen*, p. 47.

[35] Weidner, *Gestirn-Darstellungen*, p. 24f., McEwan, *Priest and Temple*, p. 165f.

[36] For example: „At that time, the sun was in $9^1/_2°$ Capricorn, the moon was in 12° Aquarius: His days will be long". (Lines 3-4). The publication of this text,

In terms of the fields of knowledge and relevant literature comprising the *ṭupšar Enūma Anu Enlil*'s discipline, the nature of the *ṭupšar Enūma Anu Enlil* in the hellenistic evidence seems not so very different from that of its Neo-Assyrian counterpart. Evidence for the political advisory role of the scribes in the later periods, however, is not traceable. Indeed, the later counterparts to the Neo-Assyrian scholars, probably already from Achaemenid times, were employed not by the palace but by the major temples, namely the Marduk temple Esagila in Babylon, and the Anu temple Reš in Uruk. Precisely in what way astronomy served the cult, such as whether the determination of a date or a time of day or to select a propitious moment became a function of the temple astronomers, is not really known. The ability to make observations and computations, as we have seen in the temple protocol from the Esagila, was of some importance to the temple, and was the contribution of its *ṭupšar Enūma Anu Enlil*'s. Even long after the dissolution of royal scribes functioning as an astrological advisory committee to a king, the association of such trained personnel with the temple *as priests* ensured the survival of Babylonian astronomy for many more centuries, indeed until the ultimate expiration of the Babylonian temple itself. That the temple was the last Babylonian institution to survive in the Hellenistic-Parthian world of the first century, accounts for the continued production of astronomical texts until 75 A.D., at approximately the same time when Pliny observed that the „temple of Jupiter-Belus" still stood in the city of Babylon, which had otherwise „reverted to desert".[37]

In conclusion, I would offer the following comments in full acknowledgement that our evidence is patchy and quite possibly misleading. On the basis of the available sources, however, my impression is, that the integrated nature of astronomical computation and astrological forecasting appears continuous over the very long history of Babylonian scribal scholarship. And this relationship does not seem to change even despite radical changes in the actual content of the two fields, comparing, for example, material from before 500 B.C. with that after, which is to say omens versus horoscopes or MUL.APIN style astronomy versus mathematical astronomy. Therefore, while mathematical astronomy represents a technical advance and so in a sense

MLC 1231, dated 63 S.E., the second day of Tebetu (= -248 Dec. 29), is in preparation by P. -A. Beaulieu and F. Rochberg.

[37] Pliny, N.H. VI, xxx, 121-2.

a discontinuity with what went before, the technical development which made possible the ephemerides and procedures of ACT ought not be mistaken for a cultural discontinuity becoming manifest within Babylonian intellectual history. It may only be incidental that elements with affinities to modern science are to found within the boundaries of Babylonian mathematical astronomy. While quantitative methods, the ability to predict physical phenomena, and an aesthetic elegance to the underlying theory, be it physical or purely mathematical, are aspects which do anticipate modern science, the fact that Babylonian astronomy is characterizable by such aspects should not limit our consideration of it to those aspects alone, nor force us to separate this part of Babylonian science from the culture of the sacred, of divination, and of magic, with which it was clearly associated, for the sake of establishing continuity between an ancient and modern science. Further, the affiliation of the scribes of *Enūma Anu Enlil* with the temple, and so by extension attachment to the sacred as opposed to the temporal, need not be interpreted merely as a function of the cultural circumstances of late Babylonia, when all that was essentially Babylonian was confined to that institution,but rather, as the persistence of a historical and cultural continuity that maintained the interrelation of astronomy with divination and magic.

Die Rolle der

Astronomie

in den Kulturen Mesopotamiens

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