Chapter 7: Mesopotamia and the Middle East

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The earliest known written sources dealing with astronomy come from the regions of ancient Assyria and Babylonia located in what is now Iraq and its neighbours. These sources are written in the Akkadian language using cuneiform writing on clay tablets. Because clay is a non-perishable material, especially when baked (either intentionally in an oven or in sunlight, or unintentionally in a burning building), several hundred thousand cuneiform tablets have been recovered from archaeological sites in Mesopotamia, and many more are almost certainly still in the ground. Only a small proportion of cuneiform tablets, perhaps around 1%, concern astronomy, but this translates into about 5000 tablets dealing with astronomical observation, prediction, theory and astrology. Of these 5000 tablets, probably between one half and two thirds have been studied and published; work continues on the slow process of publishing the remainder.

Textual evidence indicates that in Mesopotamia the sun, moon, planets, and certain stars and constellations had already been named by the 3rd millennium BC. Also by this time, and quite possibly much earlier, a luni-solar calendar was in use comprising twelve lunar months which began on the evening of first lunar-crescent visibility with intercalations roughly every three years. By the Old Babylonian period (first half of the 2nd millennium BC), the earliest mathematical schemes for modelling changes in celestial phenomena (the length of day and night) had been developed. Also around this time we find the earliest celestial omens based upon the appearance of the moon during an eclipse.

In the 1st millennium BC we find evidence of a large range of astronomical activity in Assyria and Babylonia. This includes: regular and systematic observation; the identification of lunar, solar and planetary periodicities; the development of empirical methods of predicting future astronomical phenomena such as passages of planets by reference stars, lunar and solar eclipses and the dates of first and last visibility and stations of the planets; the development of mathematical methods of calculating lunar and planetary phenomena; the astrological interpretation of celestial events; and the advance prediction of the calendar. Many aspects of Mesopotamian astronomy were transmitted to Greece, India and other cultures, including: the zodiac; the sexagesimal number system; many numerical parameters that underlie the astronomical theories of Ptolemy and other astronomers; whole systems of mathematical astronomy; and, indeed, the very notion that astronomical events can be analysed numerically and predicted.

The astronomical heritage from Mesopotamia is largely in two forms: (i) tangible moveable heritage, namely cuneiform tablets containing astronomical texts; and (ii) intangible heritage, namely the legacy of Mesopotamian astronomy in the astronomy of other cultures. No tangible immovable heritage is known; for example, no buildings have been identified as astronomical observatories or sites, there is little evidence for the use of astronomy in town planning, etc. Given these facts, it is difficult to imagine being able to make a case for heritage status for any ancient Mesopotamian site on astronomical grounds.

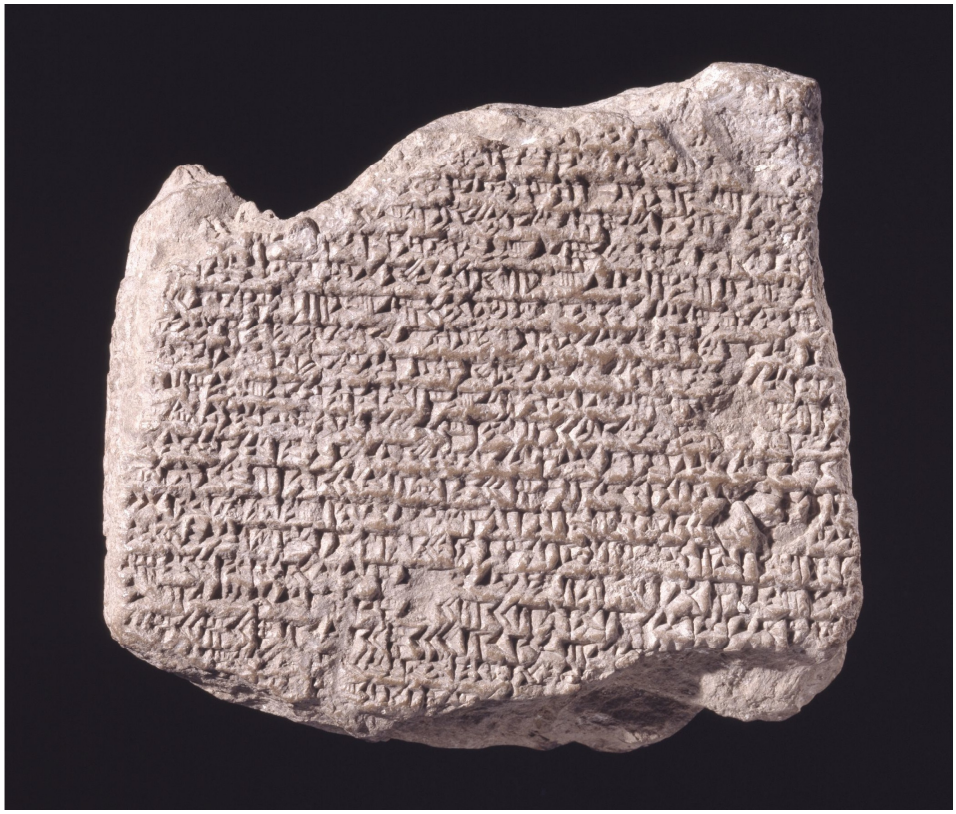

Fig. 7.0.1. An astronomical diary from Babylon containing astronomical records from the last months of year 175 of the Seleucid Era (137–136 BC). Among the observations reported is a detailed account of the total solar eclipse of 15 April 136 BC. BM 45745. © Trustees of the British Museum

Astronomical Cuneiform Tablets from Assyria and Babylonia

Astronomical cuneiform tablets have been recovered from a number of sites throughout Mesopotamia. Almost all preserved tablets date to the Neo-Assyrian (c. 750–600 BC) and Late Babylonian (c. 750 BC – AD 75) periods, although some are clearly copies of earlier works. From Assyria, several hundred astronomical tablets have been recovered from Nineveh, with smaller numbers found at Ashur and Nimrud. From Babylonia, more than four thousand tablets have been recovered from Babylon, a few hundred from Uruk, and a handful from each of Sippar, Nippur and Ur. Outside of Mesopotamia proper, a small number of astronomical cuneiform tablets were found at the Neo-Assyrian city of Sultantepe.

Like most types of cuneiform tablets, astronomical tablets have been recovered in three different ways:

(i) Purchases (19th and early 20th century) by museums of tablets from antiquities dealers. Almost always with purchased collections, no—or at best very little—information concerning provenance is available. Even the assignment of tablets to particular cities is sometimes open to question: usually this assignment is only possible through internal evidence of the text itself and by comparison with other material purchased in the same lot.

(ii) Non-scientific excavations (19th and early 20th century). It is often the case that tablets recovered by early excavations have almost as little provenance information as material from purchased collections.

(iii) Scientific excavations (early 20th century onwards). Beginning with the German excavations of Ashur, Babylon and Uruk, detailed excavation notes indicate the exact find-spots of individual (or sometimes groups of) tablets.

No astronomical tablets are currently known that are in private collections from recent illicit excavations and the illegal antiquities trade.

The various ways that cuneiform tablets have been recovered, and changing laws governing excavated items, have meant that astronomical tablets are now located in at least 17 museums in Europe, the Middle East and the USA. The following table summarises the museums that hold astronomical cuneiform tablets known to the author as of July 2009.

Museum	**Number of Astronomical Tablets**	**Source of Tablets**
Ankara Archaeological Museum	11	Sultantepe
Arkeoloji Müzeleri, Istanbul	c. 150	Uruk
Ashmolean Museum, Oxford	1	Babylon
Birmingham Museum and Art Gallery	4	Babylon
British Museum, London	> 4000	Babylon, Nineveh, Sippar, Ur
Columbia University Library, New York	4	Babylon
Dropsie College, Philadelphia	1	Babylon
Harvard Semitic Museum, Cambridge, Mass.	2	Babylon
Heidelburg	c. 10	Uruk
Iraq Museum, Baghdad	c. 20	Babylon, Uruk, Sippar
Kelsey Museum of Archaeology, Ann Arbor	1	Babylon
Louvre, Paris	c. 15	Uruk, miscellaneous purchased tablets
Metropolitan Museum, New York	11	Babylon
Musée de Rouen	1	Babylon
Oriental Institute, Chicago	27	Uruk
University Museum, Philadelphia	18	Babylon, Nippur
VAM, Berlin	c. 100	Babylon, Uruk, Ashur
Yale Babylonian Collection, New Haven	10	Uruk

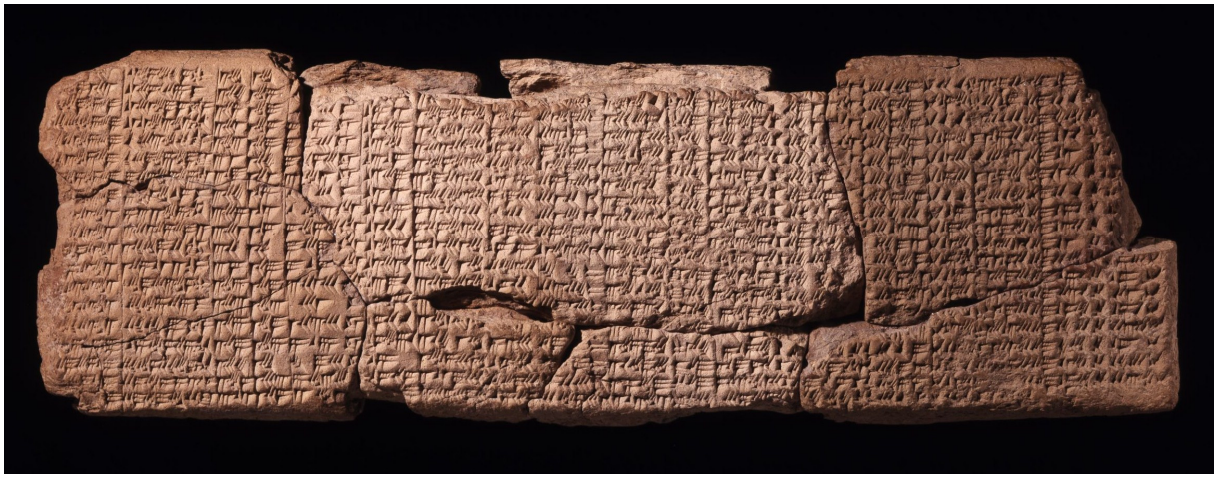

Fig. 7.0.2. A lunar ephemeris from Babylon calculated using ‘System B’. The tablet covers the years 208–210 of the Seleucid Era (104/103 – 102/101 BC). Since this photograph was taken, four small fragments of the tablet have been identified by the author among the holdings of the British Museum and rejoined to this large fragment. The process of identifying and joining tablets is an important part of working with cuneiform astronomical tablets. BM 34580+42690. © Trustees of the British Museum

The wide spread of astronomical cuneiform tablets throughout different museums poses challenges for assessing the astronomical heritage of Mesopotamia. The most extreme example of this is when fragments from an original tablet end up in different museums, making it impossible to study both parts of the text together, or to join the tablets together. Different museums operate different policies with regard to access to their collections. For example, the British Museum operates an open access policy, where anyone can study and publish any tablet. The VAM in Berlin, however, aims to coordinate the publication of their collection so that all material excavated together is published together. Both policies have their advantages and disadvantages: the British Museum's open access policy means that anyone can study any astronomical tablet at any time, but can lead to 'cherry picking', where tablets that are hard to read, badly preserved, or considered uninteresting never get published. The Berlin policy ensures that everything is published, and published in a way that preserves the archaeological context in which the tablets were found, but can lead to long periods of time during which the material is unavailable to scholars. Political circumstances mean that access to the collections of some museums is difficult or even impossible at the present time.

Astronomical Heritage in the Broader Middle East: Qumran

The Dead Sea Scrolls discovered in caves in Qumran include a number of texts dealing with astronomy and the calendar. Prominent among them are fragments of the so-called 'Astronomical chapters' of the Book of Enoch, commentaries on these chapters, and texts concerned with related calendrical and astronomical schemes. Some of this material has clear links with earlier Mesopotamian astronomy and with later Ethiopic astronomy. Publication of all the Dead Sea Scroll texts is underway in the series *Discoveries in the Judaean Desert*.

Select bibliography

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