Babylonian Eclipse Observations from 750 BC to 1 BC edited by Peter J. Huber and Salvo De Meis

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This book has been long awaited—it has often been cited as 'Huber 1973'—and it has circulated privately as a 'manuscript' over many years before this *editio princeps*. The most extensive previous study, based on the relevant data, appeared in Steele 2000; it remains to be seen if any of Steele's conclusions need to be modified. As indicated in the preface, in 1973 the manuscript was only 123 pages in length (with 172 lunar and 32 solar eclipse possibilities); and it grew slowly over the years as new information became available, until shortly before the actual publication (now with 269 lunar and 90 solar eclipse possibilities).

As has been widely recognized, Babylonian eclipse records are fundamental both to astronomy and to the history of astronomy, since they come from the most extensive archive of observational data to survive from antiquity. The proper discussion and analysis of them calls for a variety of skills; it is indeed most fortunate that the authors have the requisite background in astronomy, mathematics, and Assyriology. This technical study is filled with transliterations and translations of Babylonian texts as well as tables of data and charts of eclipses.

For historians of astronomy the main interest is in having a reliable discussion in one place of Babylonian eclipse observations that meets the standard set by O. Neugebauer for the study of Babylonian astronomical theories. The authors indicate that it is not a trivial task to distinguish between calculated and observed data in Babylonian texts. As a working tool, they use the concept of 'eclipse possibility', meaning a syzygy (conjunction or opposition of the Sun and the Moon) at which the Sun is within half a month's progress

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from a lunar node [7]. There are 38 such possibilities in 223 months or about 18 years, as the Babylonians had discovered. Generally, an eclipse report was dated by the regnal year and name of the king, month, and day. But many of the tablets are broken and only parts of them survive; hence, the dates of the reports often have to be reconstructed.[1]

Astronomy in the Greek tradition is based on a handful of observations, and most of those from antiquity are only extant in Ptolemy's *Almagest* (*ca.* AD 150). Ptolemy cited a small number of lunar eclipses observed at Babylon, and they have been discussed by John Britton [1992]. A proper assessment of the influence of the Babylonian astronomical tradition on Greek science is greatly enhanced by the availability of this observational record. In fact, far and away the longest continuous set of such detailed records at a single location comes from Babylon, dating from -746[2] [76–77] to -9 [174]. As such, it is worthy of study in its own right as one of the crowning achievements of Babylonian civilization, regardless of its impact on later scientific work. But this astronomical tradition presents a puzzle to historians. For, though Babylonian astronomical theories are very successful in accounting for positional data of the planets (including the Sun and the Moon) and times of eclipses, and therefore must be based in some way on observational data, the Babylonians themselves do not address the derivation of their models and parameters from the data, and there has been no consensus among historians on the methods they used. Perhaps this database will help in reconstructing their practice.

For astronomers and geophysicists the main interest lies in the determination of Δt, the difference between Ephemeris Time and Universal Time. Ephemeris Time assumes that the rotation of the Earth is constant, and Universal Time is based on meridian crossings of celestial bodies at Greenwich. It has long been known that Universal Time is not uniform because of slow and irregular changes in the rate of the Earth's rotation. The best way to determine Δt is from lunar eclipses, and the Babylonian records considerably extend

[1] For a list of the kings who ruled Babylon with the dates of their reigns, see page 11.

[2] The dating of this report is somewhat uncertain. In technical astronomy, the year preceding AD 1 is year 0, in turn preceded by year -1, and so on.

the database. In 1952 D. Brouwer tabulated Δt from 1621 onwards [see Nautical Almanac Office 1961, 90–91]; but extrapolations to premodern times have been much disputed. In the volume under review this topic is discussed in §§2.9–10 where the authors introduce a Brownian motion model (first proposed in Huber 2000).

In sum, the authors have produced a scholarly masterpiece, and it will be consulted with profit for many years to come.

Since the book is lacking a table of contents, I offer it here to serve as a guide [see p. 125, below].

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