Models and Precision:

The Quality of Ptolemy's Observations and Parameters

JOHN PHILLIPS BRITTON

GARLAND PUBLISHING INC.

NEW YORK and LONDON

1992

Finally, I should note that throughout this discussion the term 'error' (alternatively, Δ) denotes simply the difference between a datum calculated from modern theory and that reported by Ptolemy, always in the sense of a correction to Ptolemy's datum. Thus, the term embraces all sources of error in a given datum such as errors of measurement, recording, reduction, transmission, interpretation, and so on, in addition to any error in the modern theory on which the calculation is based.

7 Cambyses: 17/18 Phamenoth

> one hour before midnight in Babylon, the Moon was eclipsed from the north half of its diameter.

This is the only eclipse Ptolemy reports which is also mentioned in an extant cuneiform text [Strm. Kambys. 400 rev.]. This text, which was published by Kugler [1907–1924, i 71], differs from the general form of Babylonian astronomical Diaries [cf. Sachs 1948, 271 ff.] and, as Kugler remarks [1900, 65], seems to contain both computed and observed data concerning the Moon and planets. Kugler translates the description of the eclipse as follows:

Year 7, month IV, night of the 14th, $1\frac{2}{3}$ double hours after the beginning of the night a lunar eclipse; the whole course is visible; it was eclipsed from the north more than one half.

According to Professor A. Sachs (private communication), a correct reading of Kugler's transcription is:

Year 7, month IV, night of the 14th, $1\frac{2}{3}$ double hours in the night a 'total' lunar eclipse took place [with only] a little remaining [uneclipsed]. The north wind blew.

Lunar Eclipse-Data	Computed	Ptolemy	Babylonian	Δ
Sunset (Babylon)	19; 4^h			
Beginning at Babylon	22;35		22;24^h	+0;11^h
1^h before midnight		23; 0^h		−0;25
$1^{s.h.}$ before midnight		23;11		−0;36
Midpoint at Babylon	23;56			
1^h before midnight		23; 0		+0;56
$1^{s.h.}$ before midnight		23;11		+0;45
Midpoint at Alexandria	22;58	22;10		+0;48
Magnitude	6.1^d	6.0^d	($\approx 11.0^d$)	$+0.1^d$

Eclipse No. 5: −522 Jul 16

Ptolemy assumes that the time which he quotes refers to mid-eclipse, and in subsequent calculations he takes 'hour' to mean an equinoctial hour. Fotheringham [1932a, 338] and van der Waerden [1951, 25] draw attention to the discrepancy between the time stated by Ptolemy and that given in the Babylonian text, and both offer the explanation that the time was converted to seasonal hours in Babylon in accordance with a crude scheme for the length of daylight (or night) based on the ratio 2:1 for the lengths of the longest and shortest day. By this explanation the time, the unit of time, and the phase described by Ptolemy are all incorrect. However, the discrepancy between the observed magnitude in the Babylonian text and that given by Ptolemy (which agrees very well with the computed magnitude) makes it difficult to draw any secure conclusions from this text alone.

The phase assumed by Ptolemy and the magnitude reported in the Babylonian text are clearly incorrect, while the Babylonian and computed times for the beginning of the eclipse are in good agreement. Such close agreement may well be fortuitous, since the same text describes another eclipse (−521 Jan 10) as follows (translated by A. Sachs):

> Month X, night of the 14th, $2\,1/2$ double hours of the night remaining to dawn, a total lunar eclipse took place. During it the south and the north wind blew.

From P. V. Neugebauer [1934] we find, with the corrections from appendix 2 (below):

Lunar Eclipse-Data	Computed Babylonian		Δ
Sunrise (Babylon)	$7;\ 1^h$		
Beginning (Babylon)	$3;\ 2$	$2;\ 1^h$	$+1;\ 1^h$
Magnitude	22.1^d	Total	

All in all the Babylonian text raises more problems than it solves. We may conclude only that Ptolemy's description of the magnitude and the Babylonian time of beginning agree with modern theory, and that the time Ptolemy uses in his computation is badly in error.