CHAPTER FOURTEEN

A BABYLONIAN RISING TIMES SCHEME IN NON-TABULAR ASTRONOMICAL TEXTS

Introduction

One of the elements of Babylonian astronomy adopted in Greco-Roman astronomy and astrology before the first century A.D. was the concept of the rising times of the twelve consecutive 30° signs of the zodiac, the Greek ἀναφοραί (anaphora). Neugebauer indicated that

the historical significance of the Babylonian schemes for the rising times reaches far beyond their applications in the solar and lunar theory. Since Greek mathematical geography characterized the latitude of a locality by its maximum daylight $M$ the Babylonian method of finding the function $C(\lambda)$ of daylight depending on the solar longitude was properly modified, but under preservation of the arithmetical types A or B for the rising times. The geographical system of the ‘seven climata’ preserved vestiges of the Babylonian oblique ascensions until deep into the Middle Ages. On the other hand one finds the unaltered set of Babylonian rising times of System A in Indian astronomy of the sixth century A.D. without any consideration for India’s far more southern position. Rising times and related patterns have thus become an excellent indicator of cultural contacts, ultimately originating in Mesopotamia.¹

A rising time ($\alpha$) is the time required for one zodiacal sign to cross the eastern horizon. Since both horizon and ecliptic are great circles on the celestial sphere, at any moment, one-half of the ecliptic (6 zodiacal signs) is above the horizon and the other half is below. During the interval of sunrise to sunset, 180° of the ecliptic will have crossed the horizon. As Neugebauer showed, evidence for the rising times of the zodiac in Babylonian astronomy is embedded in the ephemerides, in the column for generating length of daylight (Column C).²

¹ HAMA, p. 371.
assumption that if the rising time of each individual zodiacal sign is known, the length of daylight for any day of the year is also known, underlies the computation of daylight length in column C, which derives the length of daylight from the sum of the rising times for the appropriate half of the zodiac that rises on the day in question, beginning with the position of the sun (C₁ [daylight length for a given solar position] = α₁ + α₂ + α₃ + ... + α₉, C₂ = α₂ + α₃ + α₆ + ... + α₇, and so on).³ Cognizance of the connection between the position of the sun in the ecliptic and the length of daylight is expressed in this scheme. Column C in fact presupposes the lunar longitudes of Column B, from which solar longitudes are easily substituted, being either the same at conjunction, or 180° apart at full moon. This notion of the variation of daylight as an astronomical phenomenon is quite different from earlier attested calendric schemes, such as we find in the Astrolabe texts⁴ and MUL.APIN,⁵ which account for the change in the length of the day throughout the year strictly as a function of the calendar month. The Babylonian values (α) for the rising times are only implicit in the computed daylight lengths of Column C of the ephemerides, as the values themselves are not found in those texts.

In a group of non-tabular late Babylonian astronomical texts (sources are given below sub II), rising times of twelve micro-zodiac “portions” (HA.LA = zittu), each representing 2 1/2° of the ecliptic (see Figure 1), are given, as are totals (PAP) for the sign as a whole in a number of instances.⁶ That such totals in fact represent values of α is clear, although complete agreement with the System A rising times is not found. The reason for the discrepancy between the rising times scheme underlying System A and that of the “micro-zodiac” texts is clarified below. Suffice it to say here that these texts provide the only direct evidence thus far for values of the rising times of the zodiac in cuneiform sources.

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³ Ibid., and see also HAMA, pp. 368–371.
⁵ H. Hunger and D. Pingree, MUL.APIN.
⁶ The rising time for the sign itself is given for Aries (Text B rev. 27 and 29), Scorpius (Text A:14 and 16), and Pisces (Text C:11). See Section II below.