17. The Wrong Planet: P.Berol. inv. 21226 Revisited

Plate XVIII

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Abstract: *P.Berol. inv. 21226 is a "Monthly Almanac" for Saturn, not Jupiter as previously identified, covering the years A.D. 44–58. The model of planetary motion underlying the computed planetary positions employed arithmetical sequences in the Babylonian manner. A corrected transcription and translation is given here.*

Keywords*: Astronomy, astrology, almanac, calendar*

P.Berol. inv. 21226 is a 12.3 x 13.5 cm fragment of papyrus broken on all sides, bearing parts of eight lines of a document of unidentified nature (paleographically first century) on the front side and parts of four columns of numerals with a few cryptic abbreviations on the back side. At the time of its original publication in 1973 no close parallels were known for the table, and Neugebauer's commentary is a characteristically methodical exercise in the identification of columns of data of unknown meaning[1]. Thanks to the considerable enlargement of the corpus of published astronomical papyri, the Berlin papyrus can now be recognized as an instance of a recurring type of astronomical table now known as Monthly Almanacs[2]. Neugebauer's identifications of practically all elements in the format and contents of the table turn out to have been correct.

Monthly Almanacs were tabulations in chronological order of successive dates and corresponding computed longitudes (positions in the zodiac) either of all five planets known in antiquity (Saturn, Jupiter, Mars, Venus, and Mercury) or of a single planet. One date was chosen for each calendar month through a series of consecutive years, either a date of special significance for the planet's motion (such as a stationary point, when the planet ceases to progress eastwards and begins westward, retrograde motion, or *vice versa*) or, if no such event fell within the month, the first day of the month. The corresponding longitudes were expressed as zodiacal sign — either by name or numbering the signs eastward

[1] W. Brashear and O. Neugebauer, Zwei Berliner Papyri: ein Horoskop und eine Jupiter-Tafel, Anzeiger der phil.-hist. Klasse der Österreichischen Akademie der Wissenschaften 110, 1973, 306–312.

[2] A. Jones, A Classification of Astronomical Tables on Papyrus, in N.M. Swerdlow, ed., Ancient Astronomy and Celestial Divination, Cambridge (U.S.A.), 1999, 299–340, esp. 326–330.

starting with Virgo — and degrees and minutes. Monthly Almanacs were probably resources for astrologers to make it possible to determine approximate longitudes for the planets on arbitrary dates by interpolating between the tabulated longitudes.

The transcription of P.Berol. inv. 21226 appended to the present article differs from the *editio princeps* in several readings. For the most part these would not have affected Neugebauer's analysis. The most important of the divergences are discussed in the notes.

The Berlin almanac appears to be an almanac for a single planet. Column by column from left to right it covers a series of years including a year numbered 84 (πδ∟) beginning in the middle of column iii and a year earlier in the 80s (π∟ or, as Brashear and Neugebauer assumed, π[̣]∟) beginning in the middle of column ii. Somewhat inconveniently for the table's user, the months are not named or numbered, but it appears that there were regularly twelve lines for the twelve months with no thirteenth line for the epagomenal days (contrary to Neugebauer's assumptions, for which see the notes to col. ii line 5 and col. iii line 12).

The question is, which planet? Assuming that each column covered about a year and a half of planetary motion (so that not many lines would be missing above or below the preserved fragment), Neugebauer inferred that the preserved part of column ii contained the end of year 81 and the beginning of year 82, continuing in column iii with most of year 83 and the beginning of year 84, and in column iv with the rest of year 84 and year 85. Hence according to the table the planet was moving forward about one sign (30°) per year, being in sign 6 (Aquarius) at the beginning of year 82, sign 7 (Pisces) at the beginning of year 83, sign 8 (Aries) at the beginning of year 84, and sign 9 (Taurus) at the beginning of year 85. A motion of about 30° per year is characteristic of Jupiter, and not possible for any other planet.

Neugebauer found what he considered to be satisfactory agreement between the longitudes in cols. ii–iii of the papyrus and Jupiter's longitudes as computed by modern theory for the years 81–84 according to the reformed Egyptian calendar and the Era Augustus (an astronomical convention extrapolating the regnal years of Augustus), thus A.D. 51–55. Nevertheless he noted some apparent errors that he ascribed to carelessness on the part of the compiler of the almanac. In fact the longitudes are much less satisfactory as a representation of Jupiter's motion than he realized, as can be seen most readily if we graph the papyrus' longitudes as a function of the dates as Neugebauer restored them and compare with modern theory (Fig. 1). While the longitudes keep reasonably close to Jupiter's true position for the last part of year 83 and the beginning of 84, they diverge significantly as we move back towards the beginning of 83, with the longitudes in the papyrus being consistently higher. Similarly the papyrus' longitudes in years 81 and 82 start off higher than the true longitudes, but the difference rapidly diminishes as we approach the middle of 82. Moreover, the planet's progress over a synodic cycle (the period of its recurring pattern of forward and retrograde motion) ought to be roughly within the range 28°–38° for every cycle, but here if we compare the three longitudes of second stationary points (when the planet begins forward motion) we find that the progress between the first pair is more than 42°, whereas the progress between the second pair is less than 14°.

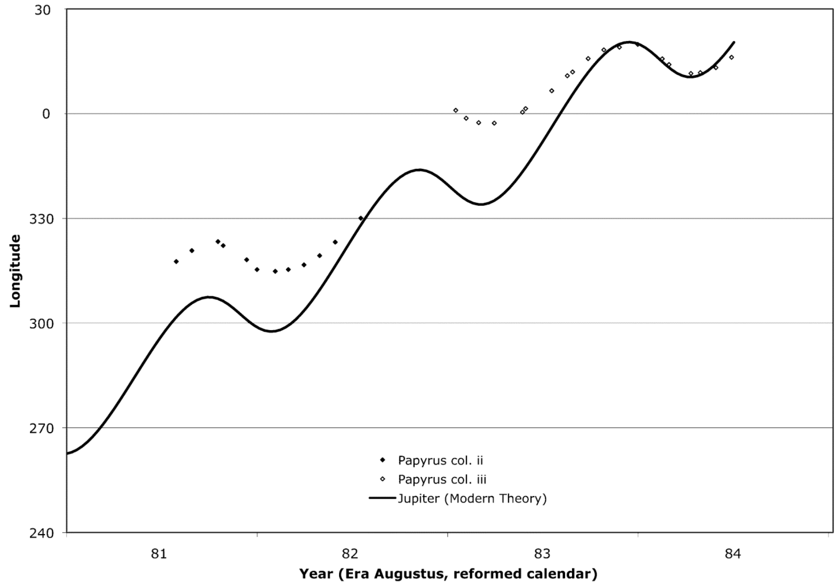

Fig 1. Longitudes in P.Berol. inv. 21226 as dated by Neugebauer, compared with Jupiter's longitudes according to modern theory.

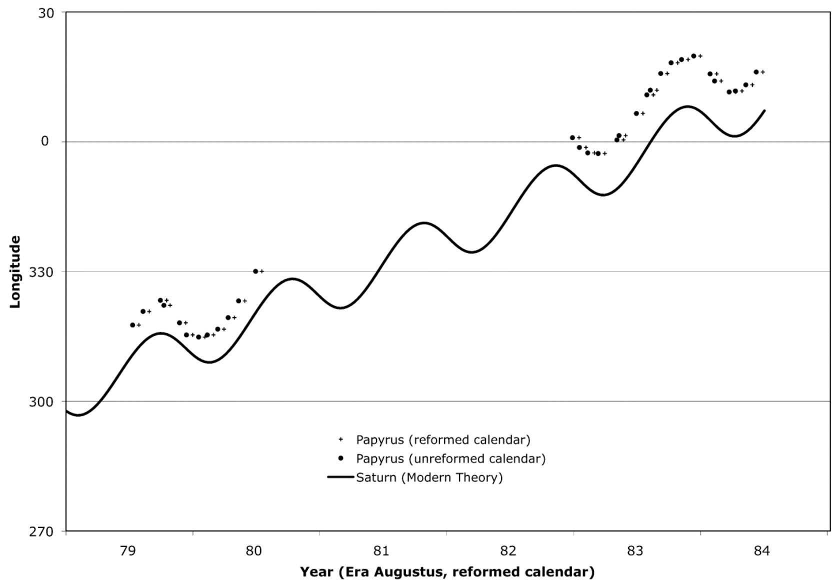

Fig. 2. Longitudes in P.Berol. inv. 21226, compared with Saturn's longitudes according to modern theory.

A synodic arc of about 14° is, however, within the range (roughly 11°–14°) possible for Saturn. Obviously Saturn cannot progress 42° in a single synodic cycle, but since there is a gap between the preserved portions of columns ii and iii that Neugebauer assumed to cover less than a year but that actually could amount to as much as about two and a half years, there could be room for three synodic cycles between the second stationary point preserved in column ii and the earlier second stationary point preserved in column iii. As Fig. 2 shows, if the years of column ii were 79 and 80 (A.D. 49–51), the papyrus' longitudes maintain a more or less steady interval ahead of Saturn's true longitudes over the two preserved stretches. The first stationary points align slightly better if the dates in the papyrus are assumed to be according to the unreformed Egyptian calendar, which was often retained in astronomical tables, but the second stationary points align better using the reformed calendar (Table 1, first five lines). Underlying this conflict is the fact that the papyrus was evidently based on a theory according to which Saturn's retrogradations last around 110 days, whereas the interval is actually around 140 days; this is a significant fact as we shall see presently. (For additional equivocal evidence regarding which calendar was used, see the notes to col. ii line 1, col. iii lines 7–8, and col. iv line 16).

	Papyrus (unreformed)	*Papyrus (reformed)*	*Modern Theory*
A.D. 49, 1st stn.	May 28	June 15	May 16
A.D. 49, 2nd stn.	Sept. 15	Oct. 3	Oct. 3
A.D. 53, 2nd stn.	Nov. 8	Nov. 27	Nov. 22
A.D. 54, 1st stn.	Aug. 5?	Aug. 24?	July 23
A.D. 54, 2nd stn.	Nov. 20	Dec. 9	Dec. 5
A.D. 57, 1st stn.	Aug. 30	Sept. 19	Sept. 4
A.D. 57/58, 2nd stn.	Dec. 18	Jan. 7	Jan. 16

Table 1. Comparison of dates of stationary points in P.Berol. inv. 21226.

If we assume that the dates in the papyrus are according to the reformed calendar, the excess of the papyrus' longitudes over modern theory average approximately 6.2° in col. ii and 10.3° in col. iii; using the unreformed calendar the averages increase only slightly, to 6.7° and 10.8°[3]. A large part of the excess can be attributed to the fact that Greek astronomical tables of this period usually reckoned longitudes according to a sidereal frame of reference such that in the mid first century the boundaries between the zodiacal signs were considered to be somewhere in the neighborhood of 5° degrees west of the boundaries according to

[3] The standard deviations are approximately 0.92 (col. ii) and 1.01 (col. iii) using the reformed, and 1.74 (col. ii) and 1.53 (col. iii) assuming the unreformed calendar.

the tropical frame of reference used in modern astronomy[4]. The remaining discrepancies would be well within the margin of error allowable because of inaccuracies in the ancient model assumed for Saturn's motion, with the mean error increasing between col. ii and col. iii probably as the result of a small overestimate of the planet's total progress per synodic cycle. The identification of the planet as Saturn and the confirmation that the years are according to the Era Augustus are beyond doubt.

The bottom of the surviving fragment must have been near the original bottom of the papyrus, since there is vacant space below the line for the seventh month of year 84 in col. iii; on the other hand traces of the ends of lines at the bottom of col. ii show that all twelve months of year 80 were in that column, which thus extended about one line further down than col. iii. Col. iii must have contained the whole of years 81–83 as well as the first part of 84, and including heading lines the column height was approximately 47 lines, taking up about 26 cm excluding margins, say about 30 cm in all, which is a plausible height for a papyrus roll. Each pair of columns probably contained seven years' motion. Col. i would therefore have begun with year 74, and the extant line ends of this column should belong to 76 and 77.

The preserved line beginnings of col. iv should belong to 86 and 87. This is confirmed by the legible numerals for the zodiacal signs, which indicate that Saturn was in sign 9 (Taurus) at the end of 86 and through most of 87, moving into sign 10 (Gemini) in the final months of that year, making the transition somewhere between Pharmuthi 1 and Payni 1 (A.D. 58 March 7 to May 6 in the unreformed calendar, March 27 to May 26 in the reformed). The first stationary point in year 87 again agrees best with modern theory if the date is according to the unreformed calendar, while the second station agrees best using the reformed calendar (Table 1, last two lines). The complete almanac thus covered *at least* the fourteen years Augustus 74–87 (A.D. 44–58), and likely had more columns of data either preceding col. i or following col. iv or both, since the table's user would have wanted access to several decades of the planet's positions.

A planetary almanac such as P.Berol. inv. 21226 has much value as evidence for the methods that were available during the first centuries of our era for obtaining the astronomical data required by astrology. Individual horoscopes on papyri, though numerous, provide only a single dated position for each heavenly body. Even when this position is stated to a precision of degrees and minutes (which is true of only a minority of the horoscopes) it tells us little if anything about the underlying method of computation. From this perspective the most instructive documents are the comparatively rare so-called primary tables that were the direct products of the theories and algorithms describing planetary motion; these include tables like those of Ptolemy's *Almagest* and *Handy Tables* that employed trigonometrical functions to represent geometrical theories

[4] A. Jones, Ancient Rejection and Adoption of Ptolemy's Frame of Reference for Longitudes, in A. Jones, ed., Ptolemy in Perspective (forthcoming), esp. sections 2 and 3.

constructed from combinations of uniform circular orbital motions, but also tables generated by purely arithmetical algorithms. The arithmetical methods are especially interesting because they were heavily influenced by the Babylonian astronomy known from cuneiform tablets of the last four centuries B.C. A number of papyrus tables that came to light since the late 1990s have revealed that Babylonian algorithms for calculating dates and longitudes of planetary cardinal phenomena such as first and last visibilities and stationary points were known and used in Roman Egypt in nearly unaltered form as late as the third century, but there also existed modifications of these algorithms and extensions of them to expedite the determination of a planet's positions on dates between the cardinal phenomena[5].

P.Berol. inv. 21226 is not a primary table, but the circumstance that it preserves about thirty dated longitudes of a single planet together with several dates of cardinal phenomena makes it a potentially rich source of information about the transition from the prediction of cardinal phenomena to the prediction of longitudes on arbitrary dates, concerning which we still have only patchy knowledge. I will not undertake an analysis along these lines here, but I will show that we are definitely dealing with a Babylonian-style arithmetical approach rather than geometrical modeling.

A strong, though not absolutely conclusive, sign of the use of arithmetical methods is the mere presence of cardinal phenomena among the recorded positions: stationary points as discussed above, but also first and last visibilities and acronychal risings (i.e. risings at sunset, close to diametrical opposition to the Sun). Such phenomena can indeed be computed using tables based on geometrical models, but only as a secondary product once one has calculated a run of longitudes at closely spaced intervals.

What a geometrical theory could not yield is retrogradations that are at the same time too short in duration and too large in the number of degrees that Saturn moves backwards between the two stationary points. Ptolemy's theory in *Almagest* Book 12, for example, leads to retrogradations lasting between 136 and 141 days and having retrograde arcs between about 7.1° and 7.3°, so that both the durations and the arcs average slightly more than the true values (about 133–142 days and 6.6°–7.0°). A more defective geometrical theory would either lead to longer *and* wider or shorter *and* narrower retrogradations. In the papyrus almanac, however, we have three preserved retrogradations that are clearly much briefer than their true duration but at least two of which cover a significantly larger retrograde arc:

79 Payni 21 – 80 Phaophi 6 = 110 days, 8.0°
84 Thoth 1 (or a few days earlier) – Choiac 13 = 102+ days, 8.3+°
87 Thoth 22 – Tybi 12 = 110 days, arc unknown

[5] A. Jones, Studies in the Astronomy of the Roman Period III: Planetary Epoch Tables, Centaurus 40, 1998, 1–41.

In Babylonian astronomy, retrogradations were treated in the first instance as directly observable and measurable phenomena. The dates of planetary stations are difficult to determine accurately by observation, especially for Saturn with its extremely slow daily motion. The observers at Babylon who produced the so-called Astronomical Diaries seem to have tended to establish the dates of Saturn's stationary points in such a way that the interval between them was a few days short of four lunar months (i.e. less than 118 days)[6]. This expectation was codified in certain texts belonging to the tradition of Babylonian mathematical astronomy as a rule that the interval was a constant 1 7/8 lunar months (i.e. approximately 111 days), with a synodic arc of 6 2/3 ° or 8° depending on Saturn's location in the zodiac[7]. Among the Greek astronomical papyri that reflect original developments based on the Babylonian methodology, PSI 15.1492 sets out a "template" pattern of Saturn's day-by-day motion over a synodic cycle of 378 days in which the retrogradation covers an arc of approximately 8.1° in exactly 110 days. P.Berol. inv. 21226 was apparently composed using a different modification of Babylonian theory in which the retrograde arcs were made even larger.

[6] I found eleven pairs of dates of stationary points (observed or expected) within a single year in nine observational texts in A. Sachs and H. Hunger, Astronomical Diaries and Related Texts from Babylonia vols. 1–3 and 5–6, Österreichische Akademie der Wissenschaften, phil.-hist. Klasse, Denkschriften 195, 210, 246, 299, and 346, Wien, 1988–2006. The mean interval between the dates is about 6 days less than four lunar months (approximately 112 days), and none is longer than 6 days beyond four lunar months (approximately 124 days).

[7] O. Neugebauer, A History of Ancient Mathematical Astronomy, 3 vols., Berlin, 1975, v. 1, 439–441.

Transcription.

i		ii					iii					iv		
]		κ̣σ⁄.	[			]	ι̣ζ	η̣	7̣	νς		[		
]		α	[			]	ζ	ζ	κη	μ	α̣[΄κ]	[		
]		α	ς	ιζ̣	λζ		α	ζ	κζ	κε	σ΄β	κ[		
]		α	ς	κ̣	μς		α	ζ	κζ̣	ις		κη̣	[	
]		κα	ς	κ̣γ	κ	σ΄[α]	κε	η	7	κε		α	[	
]		α	ς	κβ	ι̣α̣		α	η	α	κε		α	θ	[
].		ις	ς	ιη	η	α΄κ̣	⟨κ⟩ασ⁄	η	ς	λβ			[	
]		———					κασ⁄.	η	ι	ν		κβ	[	
]		α̣		πL			α	η	ια	νε		α	[	
].		α	ς	ιε	κ̣		α	η	ιε	μς		ιζ	θ	[
]ε̣	σ΄α	ς	ς	ιδ̣	ν	σ΄β̣	α	η	ιη	ιε		α	θ	[
]		α	ς	ιε	κ		α	η	ιθ			ιβ	θ̣	[
]	α΄κ	α	ς	ις	μ				πδL			α	θ̣	[
]	σ̣΄β	α	ς	ιθ	κ		α	η	ιθ	μθ		α	θ	[
]———		α	ς	κγ	ιβ		ιη	η	⟨ι⟩ε	μα	α΄κ	α	θ	[
]		κ	ζ	7	β		α	η	ιδ	β̣		κβσ⁄.	[	
]α̣		α	[			]	ιγ	η	ι̣α	λ	σ΄β	α	ι̣	[
]		[				]	α	η	ι[α]	μδ̣		[		
]		[				]	α	η	ιγ	θ̣		[		
]		[				σ΄]α	α	η	ις	ζ		———[		
]		[			]———				(*vac.*)		[			

i		ii					iii					iv		
	]	20♂✓	[			]	17	8	0	56		[		
	]	1	[			]	7	7	28	40	acr.	[		
	]	1	6	17	37		1	7	27	25	st. 2	2[x		
	]	1	6	20	46		1	7	27	16		28	[	
	]	21	6	23	20	st. 1	25	8	0	25		1	[	
	]	1	6	22	11		1	8	1	25		1	9	[
]x		16	6	18	8	acr.	⟨2⟩1♂✓	8	6	32			[	
	]						21♂✓	8	10	50		22	[	
	]	$1^{?}$		Yr. 80			1	8	11	55		1	[	
]x		1	6	15	20		1	8	15	46		17	9	[
]5	st. 1	6	6	14	50	st. 2	1	8	18	15		1	9	[
]		1	6	15	20		1	8	19			12	9	[
]	acr.	1	6	16	40				Yr. 84			1	9	[
]	st. 2	1	6	19	20		1	8	19	49		1	9	[
]		1	6	23	12		18	8	⟨1⟩5	41	acr.	1	9	[
]		20	7	0	2		1	8	14	2		22♂✓	[	
]1		1	[			]	13	8	11	30	st. 2	1	10	[
	]	[				]	1	8	1[1]	44		[		
	]	[				]	1	8	13	9		[		
	]	[				st.] 1	1	8	16	7		[		
	]	[			]				(*vac.*)		[			

col. i.

7 A horizontal stroke running about half a centimeter from the edge of the papyrus cannot be the long paragraphus-like stroke separating years, since it comes too soon before the year division at line 15. It might be an extended final stroke of α, ε, or ς.

11 Here and elsewhere, the first stationary points are marked following the longitude by the abbreviation c(τηριγμὸc) α, and the second stationary points by c(τηριγμὸc) β; cf. the monthly almanacs P.Oxy. Astr. 4200 and 4202.

13 Brashear and Neugebauer (henceforth BN) read the abbreviations marking dates of opposition here and elsewhere as α΄β, the meaning of which they were unable to explain. Unlike in the indications of second stationary points, the presumed betas are not the two-looped but the open-topped form, and comparison with other monthly almanacs (P.Oxy. Astr. 4199: ακρ; 4200 and 4201: ακρω) show that the correct reading is ἀκ(ρόνυχοc), i.e. acronychal rising (rising at sunset).

14 Second station.

15 Assuming that the preserved traces in col. i belong to years 76–77, extrapolation backwards from col. ii shows that the two stationary points in lines 11 and 14 must be towards the end of year 76, with the second point occurring in the last month of the year, so that lines 11–14 belong to Pachon through Mesore. The horizontal stroke leading a few millimeters from the left edge just below line 14 therefore is the separating line between years 76 and 77.

col. ii.

1–7 Year 79, months Mecheir through Mesore.

1 A diagonal stroke following the kappa is probably a symbol indicating that this is the date of Saturn's first visibility; cf. col. iii lines 7–8. The date, if correctly read, is 121 days before the subsequent first station in line 5. The conjunction should have preceded this event by about 15 days (cf. col. iii lines 7–8), thus about Mecheir 5. According to modern theory the conjunction took place on A.D. 50 January 27, which was Mecheir 20 according to the unreformed calendar but Mecheir 2 according to the reformed calendar, so that the reformed calendar gives a much better alignment; but compare the notes to col. iii lines 7–8 and col. iv line 16.

3 ιζ λζ: BN read ιθ̣ λα.

5 First station. κγ: BN read [κβ]. Kappa is represented by a speck that would belong to the top of its left vertical stroke, while of gamma we have part of the horizontal stroke. Neugebauer (in Tables II and III on pp. 310–311) assumed that in cases like this line where the date is other than the first of the month, we have a second event taking place during the same month as the preceding line, so that (for example) he identifies the months of lines 1–4 of this column as Phamenoth through Payni instead of Mecheir through Pachon. Comparison with other monthly almanacs shows that the standard practice was to give one line and one longitude per month, as I have assumed for the present papyrus, and the resulting assignment of dates also results in a much more astronomically accurate pattern of the planet's motion.

7 Acronychal rising.

9 The alpha is not reported by BN. It may have been deleted, since there is no reason to have a numeral preceding the year number. BN read π[β]L, assuming a lost letter in the fairly narrow space between the pi and the year-symbol.

10–17 Year 80, months Thoth through Pharmuthi.

11 Second station. ς^{1}: BN read α.

13 μ: BN read κα.

15 κγ: BN read κς.

16 The absence of a symbol like the ones in col. iii lines 7 and 8 suggests that the event chosen for this month is not the last visibility (which would have been predicted not far from this date) but the date of the planet's passing from sign 6 (Aquarius) to sign 7 (Pisces). The usual form of the zero symbol in astronomical papyri is a dot or circle below a horizontal stroke. The variant found in this papyrus, a horizontal stroke meeting an upwards-tending diagonal, also occurs in P.Berol. inv. 21236 (paleographically late first century), and in P.Oxy. Astr. 4138 (paleographically fourth or fifth century). For other forms see A. Jones, *Astronomical Papyri from Oxyrhynchus*, Memoirs of the American Philosophical Society 233, 2 vols. in one, Philadelphia, 1999, vol. 1 p. 62.

col. iii.

1 ι̣ζ η̣: BN read α̣ζ, indicating a trace of an unidentified letter in the preceding line (numbered 0) that is probably the stroke here identified as belonging to η (it is horizontally aligned with the preceding letters of line 1). It is not clear why the longitude for Thoth 17 was tabulated. This date is too close to the acronychal rising in line 2 to be the first station (the station was almost certainly listed for a date in Year 82 Mesore), and the transition from sign 8 (Aries) back into sign 7 (Pisces) must have been a few days later if the longitude on this date was still almost a whole degree into Aries.

2 Acronychal rising.

3–4 The second station is marked on line 3, but this date is just 24 days after the acronychal rising, whereas the longitude given on line 4 is less and the interval since acronychal rising, 54 days, agrees with the corresponding intervals elsewhere in the papyrus. I assume that the scribe accidentally wrote the abbreviation one line too high.

7–8 An upward-tending diagonal stroke beginning with a small loop or spot was a standard symbol indicating the first or last visibility of a planet; cf. P.Oxy. Astr. 4177 and 4199–4203a. The phenomenon of line 7, probably 110 days after the preceding second station (see next note), must be the last visibility. That of line 8, 30 days after the last visibility and roughly 127 days before the subsequent first station (see note to line 14), must be the first visibility. Conjunction with the Sun ought to be about halfway between the two dates, i.e. about Pharmuthi 6. According to modern theory, conjunction took place on A.D. 54 March 20, which was Pharmuthi 13 according to the unreformed calendar but Phamenoth 24 according to the reformed calendar, so the alignment is slightly better if the almanac used the unreformed calendar.

7 For continuity with the preceding and following positions, I assume that either ι or κ was omitted by scribal error before α, since otherwise the planet's speed would be far too slow for what ought to be the most rapid stage of its synodic cycle. κα seems preferable since the interval of Saturn's invisibility is in reality close to 30 days (and in two papyrus "templates" for Saturn, P.Oxy. Astr. 4166 and PSI 15.1492, the interval is respectively 30 and 32 days).

12 The space for the minutes was left blank. It is not clear whether this is a scribal error or an indication of zero minutes. Neugebauer (Table II on p. 310) assigned this line to Epagomenae 1, thus shifting the preceding lines one month later relative to my identifications; this would result in a very poor alignment of the visibility phenomena in lines 7–8 with the actual conjunction no matter which calendar we assume.

14 This line marks Saturn's greatest tabulated longitude before the retrogradation, but it is not marked as the first station. In col. ii lines 5–11 and col. iv lines 8–12 we have an interval of 55 days from first station to acronychal rising, followed by 55 days from acronychal rising to second station. If the first station here was 55 days before the acronychal rising, it would have fallen on year 83 Mesore 28. The longitude would have been only a few minutes greater than the one tabulated eight days later in line 14, Aries 19° 49'.

15 Acronychal rising. The position of ε relative to the preceding and following lines suggests that a preceding (astronomically necessary) ι was accidentally left out by the scribe, though loss through abrasion cannot be ruled out.

17 Second station.

18 μδ: BN read μα.

19 θ: BN read ε.

Col. iv.

3–6 Year 86, months Pachon through Mesore.

8–17 Year 87, months Thoth through Payni.

8 First station.

10 Acronychal rising.

12 Second station.

16 κβ$\sigma\!\!/$̣: BN read κβ ι̣, but the only trace I can see to the right of β is an upwards-tending diagonal very nearby, thus almost certainly the symbol for last visibility. The date is 130 days after the preceding second station (cf. col. iii lines 7–8). Conjunction should fall about 15 days later, i.e. about Payni 7. According to modern theory, the conjunction took place on A.D. 58 May 18, which was Payni 13 according to the unreformed calendar but Pachon 23 according to the reformed calendar, so that in this instance the unreformed calendar gives the best alignment.