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CONTENTS

"MORE VALUABLE THAN ALL GOLD": PTOLEMY'S ROYAL CANON AND BABYLONIAN CHRONOLOGY

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Omni auro pretiosior! Thus Seth Calvisius described Ptolemy's Royal Canon when a manuscript of it first emerged in the Latin West together with Ptolemy's *Handy Tables*, of which it is part, soon after 1609, the year in which Joseph Scaliger died. Scaliger, the founder of the modern study of chronology, had only known faulty versions of the Canon near the end of his life (see 2.*F* below).[1] This paper presents an updated historical guide to the Canon's Babylonian segment.[2] The most recent substantial surveys, Ginzel's (1906–14, vol. 3, 138–47, 149) and Kubitschek's (1928, 57–63),[3] are now several decades old, and for no segment are they more obsolete than for the Babylonian one. An exhaustive treatment of the whole Canon, a document relevant to Biblical, Byzantine, Egyptian, Greek, Macedonian, Mesopotamian, Persian, and Roman history would require a global reassessment of the chronology of the first millennium BCE, the period for which the document is most valuable. Placing the Canon at the beginning of such a reassessment would draw that period's chronology back to its proper axis, as it were. Pending such a treatment, it is hoped that the following survey is helpful. Section 1 contains general, introductory remarks. Section 2 is a journey through time, from the eighth century BCE to the fifteenth century CE, in pursuit of the Canon's intellectual contents, especially the Babylonian segment, as it was transmitted from clay tablet to papyrus roll to parchment codex to printed paper book. Section 3 provides practical guidelines for using the Canon's Babylonian section.

1. 161,695 Days of Chronographic Bliss

Table 1 features an adaptation from the Greek manuscript sources of the Canon's ancient Near Eastern segment. It begins with Year 1 of Nabonassar's reign, the Canon's beginning, and ends with Year 22 of Cleopatra VII's reign. Roman and Byzantine emperors follow this segment, beginning with Augustus, who annexed Egypt in 30 BCE. The main focus of the present paper is the

1. In his biography of Scaliger, Grafton (1993, 721) writes, "[W]ithin a few years after [Scaliger's] death, John Overall, the Dean of St Paul's turn[ed] up the original text of the canon in a manuscript of Ptolemy's *Handy Tables*. This he gave to the Palatinate dignitary Abraham Scultetus, who passed it on to Calvisius in May 1613. Printed editions soon appeared: one by Johannes Behm in 1618, and one by Calvisius (1620) himself. John Bainbridge published another version of Ptolemy's text of the canon with his edition of the *Sphaera* attributed to Proclus, also in 1620." For the statement by Calvisius quoted in the title and at the beginning of this paper, see Grafton (1993, 727).

2. An abbreviated version of this paper was presented at the Two Hundred and Fifth Meeting of the American Oriental Society on 28 March 1995 in Salt Lake City, Utah. I thank David Pingree for helpful suggestions and this journal's editor for encouraging an Egyptologist to make a contribution on a document that is both relevant to Mesopotamian history and made in Egypt.

3. Kubitschek earlier wrote on the Canon in two contributions to the *Real-Encyclopädie* (1894, 615–16 and 1921, 1025–33); more recently, some lines in this work's entry on Ptolemy were devoted to the Canon (van der Waerden 1959, 1823–25 passim).

TABLE 1
Ptolemy's Canon of Kings: The Ancient Near Eastern Segment

	Nationality	*King's name*	*Years reigned*	*Total from beginning*
1	Babylonian	Nabonassar	14	14
2	Babylonian	Nabu-nadin-zeri (Nadinu)	2	16
3	Chaldaean; Assyrian	Mukin-zeri and Pul	5	21
4	Assyrian	Ululayu	5	26
5	Chaldaean	Merodach-baladan	12	38
6	Assyrian	Sargon II	5	43
7		First Kingless Period	2	45
8	Babylonian	Bel-ibni	3	48
9	Assyrian	Ashur-nadin-shumi	6	54
10	Babylonian	Nergal-ushezib	1	55
11	Chaldaean	Mushezib-Marduk	4	59
12		Second Kingless Period	8	67
13	Assyrian	Esarhaddon	13	80
14	Assyrian	Shamash-shuma-ukin	20	100
15	Chaldaean?	Kandalanu	22	122
16	Chaldaean?	Nabopolassar	21	143
17	Chaldaean?	Nebuchadrezzar	43	186
18	Chaldaean?	Amel-Marduk	2	188
19	Chaldaean?	Neriglissar	4	192
20	Chaldaean?	Nabonidus	17	209
21	Persian	Cyrus	9	218
22	Persian	Cambyses	8	226
23	Persian	Darius I	36	262
24	Persian	Xerxes I	21	283
25	Persian	Artaxerxes I	41	324
26	Persian	Darius II	19	343
27	Persian	Artaxerxes II	46	389
28	Persian	Artaxerxes III	21	410
29	Persian	Arses	2	412
30	Persian	Darius III	4	416
31	Macedonian	Alexander the Great	8	424
32	Macedonian	Philip Arrhidaeus	7	7
33	Macedonian	Alexander IV	12	19
34	Egyptian-Macedonian	Ptolemy I Soter	20	39
35	Egyptian-Macedonian	Ptolemy II Philadelphus	38	77
36	Egyptian-Macedonian	Ptolemy III Euergetes	25	102
37	Egyptian-Macedonian	Ptolemy IV Philopator	17	119
38	Egyptian-Macedonian	Ptolemy V Epiphanes	24	143
39	Egyptian-Macedonian	Ptolemy VI Philometor	35	178
40	Egyptian-Macedonian	Ptolemy VIII Euergetes II	29	207
41	Egyptian-Macedonian	Ptolemy IX Soter II	36	243
42	Egyptian-Macedonian	Ptolemy XII Neos Dionysus	29	272
43	Egyptian-Macedonian	Cleopatra VII Philopator	22	294
(44	Roman	Augustus	43	337)

Canon's Babylonian segment, numbers 1 to 33 in Table 1, encompassing 31 kings who ruled over Babylon and, in numbers 7 and 12, two periods called "kingless." The Babylonian segment lasts from 26 February[4] 747 BCE, the Canon's first day, to 7 November[5] 305 BCE, the last day of the reign of Alexander IV, number 33 in Table 1, according to the Canon. This segment spans 443 Egyptian years of 365 days—the Egyptian civil calendar has no leap years—for a total of 161,695 (443 × 365) days, not quite a tenth of the 1.8 to 1.9 million days that make up history. The Julian beginning and end dates of each of the Babylonian segment's 443 Egyptian years are provided in Table 2 below. For what has been touted as "perhaps the most important single document for establishing the chronology of ancient history" (Grafton 1993, 116), the Canon may not seem impressive at first sight. Yet it forms the backbone of the chronology of the period covered in Table 1. From Augustus onward, other reliable tools such as the lists of consuls are available. With the Canon, as with a body's backbone, it is not immediately obvious that most everything else is somehow attached to it.[6]

The Canon's first column contains the names of rulers. The second and third columns contain the lengths of their reigns in integer numbers of Egyptian years. Since the Egyptian calendar has no leap years, its 365 day year slowly recedes in relation to the solar year, which is just under $365\frac{1}{4}$ days long. A given day, for example, new year, occurring in, say, winter, recedes gradually in relation to the seasons, first into fall, then into summer and spring, to return to its point of departure in winter after about 1460 solar years or exactly 1460 Julian years.[7] The Egyptian year is therefore called a "wandering" year, *annus vagus* in Latin.[8]

Column 1: The specific assortment of Assyrian, Babylonian, Chaldaean, Egyptian-Macedonian (or Ptolemaic), Macedonian, and Persian (or Achaemenid) rulers can be explained in terms of two preeminent centers of learning, Babylon and Alexandria. The 28 kings in numbers 1 to 30, which also include two periods called "kingless," appear in the Canon because they were rulers—and mostly also residents—of Babylon. Numbers 34 to 43 were rulers of Egypt and residents of Alexandria. The Canon shifts from Babylon to Alexandria with Numbers 31, 32, and 33. Alexander the Great, his retarded half-brother Philip Arrhidaeus, and his son Alexander IV ruled, *de facto* or nominally, over both Babylon and Alexandria. Tablets are dated at Babylon to their reigns until about 305, when Seleucus I assumed the title *basileus* "king." The articulation between number 33, Alexander IV, and number 34, Ptolemy I, is expressed at Leidensis BPG 78, f. 64v by a line separating the two kings, with the following statement about Ptolemy I and his successors, οὗτοι Αἰγύπτου ἐκράτουν "these ruled Egypt." In the Canon's "Babylonian-Egyptian portion," numbers 31 to 33, an important articulation occurs at Alexander's death, from Year 1 of Philip. From this point, years are counted according to the Era of Philip (see below). The founding of the Alexandrian Museum under Ptolemy I accounts for the Canon's geographical shift from Babylonia to Alexandria. The Canon's Roman and earlier Byzantine emperors, as rulers

4. In historical terms, the *morning* of 26 February; in astronomical terms, a few hours later, *noon* of 26 February (see 2.G below).

5. In historical terms, the *morning* of 7 November; in astronomical terms, a few hours later, *noon* of 7 November (see 2.G below).

6. The Canon allows an extension of absolute dating from 747 BCE back to the late tenth century BCE by means of the Assyrian eponymic lists (cf. Ginzel 1906–14, 1:141–43). The pivotal eclipse mentioned in those lists is known only by year and month, not by day, date (Kugler 1907–24, 2:333), and cannot therefore be identified with certainty with that of 763 BCE without the Canon. In this regard, Ginzel's statement that "the Canon's reliability has been upheld since the discovery of Assyrian *limu* dating" (1906–14, 1:141) seems circular because *limu* dating relies on the Canon. But it is true that *limu* dating and the Canon do not obviously contradict one another.

7. Since a Julian year is on average exactly $365\frac{1}{4}$ days long, 1460 Julian years (1095 × 365 + 395 × 366 days) equal 1461 Egyptian years (1461 × 365 days).

8. The gradual regression of the Egyptian year against the Julian year can be followed in Table 2 below. On the *annus vagus*, see Depuydt (1995a, the description of the difference between sideral year and tropical year at p. 44, note 6 is inaccurate); see now also Hagedorn and Worp (1994).

of Egypt, can still be considered part of its Alexandrian segment. But by the Muslim Conquest of Egypt around 640 CE at the latest, the Canon exhibits a second shift from Alexandria to Constantinople.

Column 2 converts the lengths of the reigns into integer numbers of Egyptian years. When the Egyptian civil calendar became obsolete in late antiquity in favor of the Alexandrian calendar (cf. Hagedorn and Worp 1994), astronomers, following Ptolemy, kept counting Egyptian years from Nabonassar down to early modern times. For the purpose of computation, the simplicity of a calendar whose years are uniformly 365 days long, consisting of 12 months of 30 days plus five added days, must have been much appreciated. When the Canon emerged in the early seventeenth century, it must easily have been realized that it used Egyptian years.[9] An examination of chronological studies of that period might reveal who first explicitly stated this obvious fact.

Column 3 adds up the numbers of the regnal years in column 2. There are therefore two ways of referring to an Egyptian year using the Canon, by combining the royal name in column 1 with the regnal year number given in, or inferred from, column 2, or by means of the number given in, or inferred from, column 3. The second method is simpler because it involves only one item of information. In fact, column 3 led a life of its own as the 'Era of Nabonassar, called thus after the Canon's first king. Another era derived from the Canon is that of Philip, counting from Philip's Year 1, Year 425 of Nabonassar. In the *Handy Tables* of which the Canon is part, Ptolemy counts from Philip; in his earlier *Almagest*, from Nabonassar (Stahlman 1960, 4; Toomer 1984, 10, note 16).

Counting 365 day units from 26 February 747 BCE in continuity, as astronomers did using the Era of Nabonassar, has no necessary relationship to historical reality. In fact, when the links between historical reality and the Canon weakened from the later Roman emperors onward, this weakening did not affect in any way the usefulness, for astronomical purposes, of the Era of Nabonassar that had sprung forth from the Canon. The prime cause of this weakening was the institution of the Alexandrian calendar soon after Octavian's conquest of Egypt in 30 BCE. The Alexandrian calendar is identical in structure to the Egyptian civil calendar, except that a leap day is added at the end of the year every four years, so that the calendar is fixed in relation to the solar year. The leap day falls at the end of August in the Julian calendar, and in mid September in the Gregorian calendar—about half a year before the Julian-Gregorian calendar's leap day in February. The Egyptian civil calendar became gradually obsolete in favor of the Alexandrian calendar. This process was probably complete by the fourth century CE (cf. Hagedorn and Worp 1994). At the same time, the Canon became less reliable (Usener 1898, 445–46). "I do not doubt," writes Usener (1898, 445 top), "that, from the fifth and sixth centuries CE onward, the wandering years according to the Era of Philip were gradually beginning to be equated to fixed Alexandrian years" (cf. Neugebauer 1975, 3:1071). The Canon's Byzantine segment would deserve further examination, but there is less incentive for examining that segment because other, superior, chronological tools are available for the period its covers.

As regards nomenclature, the Canon is sometimes called "mathematical" or "astronomical." The Byzantine author Syncellus (ca. 800 CE) uses both terms. Indeed, the Canon was not created for historians, but for astronomers. On the other hand, even if it served as a κανών "measuring-stick" for the mathematical-astronomical material in Ptolemy's *Handy Tables*, the Canon is not itself mathematical or astronomical.

Another designation often encountered is "Ptolemaic Canon." This term may be interpreted as linking the Canon somewhat less directly to Ptolemy than "Ptolemy's Canon." After all, Ptolemy only compiled the Canon from material available to him. Moreover, the Canon was continued after

9. "No ancient calendar ... was better understood in the sixteenth century than the Egyptian," writes Grafton (1993, 197), and he quotes an imaginary dialogue from E. O. Schreckenfuchs's *Opus posthumum* (1576) in which a teacher reprimands a disciple for failing to comprehend the Egyptian calendar.

his time. The use of "Ptolemy's Canon" in the present paper recognizes Ptolemy's pivotal role in the Canon's history, as well as the fact that the Canon's Ancient Near Eastern segment portion discussed here preceded his time and was entirely known to him.

In his introduction to the *Handy Tables*, accepted as genuine, Ptolemy himself calls the Canon both προκανόνιον[10] "little introductory canon" and βασιλέων χρονογραφία "chronography of kings" (Heiberg 1907, 160:8–9).

2. A Brief History of the Royal Canon

A. *Babylon (Eighth Century BCE to First Century CE)*

The history of the Canon begins, together with that of astronomy, in Babylon sometime in the early first millennium BCE. The Canon was designed for astronomical purposes. Its history is therefore intertwined with that of astronomy. Neugebauer (1975, 1:2) distinguishes three periods in the latter: (1) the prehistory until about 700 BCE, "when (probably) Mesopotamian astronomy begins"; (2) the ancient and medieval period to the mid seventeenth century CE; and (3) modern astronomy beginning with Newton. The Canon squarely belongs in period (2). Its history is about twenty-three centuries long, from the first Babylonian astronomical observations in the eighth century BCE for the dating of which it was designed to the end of the reign of the last ruler whose name was added to it in the fifteenth century CE in Byzantine manuscripts. From 1602 onward, the Canon became the object of antiquarian and historical pursuits (see 2.*F*).

The sources suggest a marked increase in intellectual activity in Babylonia, including astronomical observations, from about the reign of Nabonassar in the eighth century BCE onward.[11] First, later historiographers describe Nabonassar's reign as a new beginning.[12] Second, none of the absolutely dated cuneiform astronomical texts that have come to light so far are earlier than BM 32312, written in 652 BCE, which is the earliest fragment of the so-called Diaries (Sachs 1974, 44, 48, Figure 3).[13] Third, the cuneiform Babylonian Chronicle also begins with the reign of Nabonassar.[14] And fourth, eclipse reports preserved on later tablets go back to the second half of the eighth century BCE (Sachs and Hunger 1988–89, 1:12, with note 4).

All this is not evidence, however, that there ever existed a historical Era of Nabonassar in Mesopotamia, with years counted according to the Babylonian calendar with its years of twelve or thirteen lunar months.[15] The Era is in all likelihood a product of Hellenistic times, for use by astronomers only, and perhaps dates to about the second century BCE.

Astronomers did not date their observations for the benefit of historians. This fact does not diminish, however, the benefits that historians can draw from astronomical datings and tools like the Canon. On the other hand, it also follows that

10. In Greek dictionaries, I have found the word only in Demetrakos (1949–53). It is characterized as "medieval" and one source, dating to ca. 1300 CE, is cited.

11. For surveys of the sources, see Neugebauer (1975, 1:351–53) and Aaboe (1991). Cuneiform observational records have been found at Babylon and Uruk, and there is so far no reason to suspect that there were other centers, except perhaps Sippar. A sophisticated astronomical theory came about later, probably in the fifth or fourth century BCE. It is preserved in tablets dating from about 300 BCE to nearly the end of the cuneiform tradition around 50 CE.

12. For a survey of the sources, see Hallo (1988).

13. The Venus tablets of Ammiṣaduqa are about a millennium older, but their absolute date is not certain; on these tablets, see Reiner and Pingree (1975). On the relation between the astronomical diaries and the chronicles, with a discussion of BM 32312, see Brinkman (1990, 95–97).

14. On Assyrian and Babylonian Chronicles, see Grayson (1975). On the Babylonian Chronicle, see now also Brinkman (1990). On its beginning, see Brinkman (1990, 97, note 137 and 83–84, note 60). It cannot be confirmed that the Chronicle began with Year 1 of Nabonassar. But this need not have been the case. When the Era of Nabonassar was constructed in Hellenistic times to encompass a historical tradition that began sometime in Nabonassar's reign, it must have seemed only natural to begin the Era with the beginning of his reign.

15. "The Era of Nabonassar does not result from a political decision or a reorganization of the calendar, but reflects the fact that Nabonassar's reign was the beginning of more careful observation of the movement of planets and stars" (Kugler 1907–24, 2:368).

students of ancient astronomy need not be concerned with the historical implications of such datings. Here, the paths of the historian and the astronomer part, and Neugebauer could justifiably state in his history of ancient astronomy, "the chronological tables and their ancestors in ancient oriental king lists contain many difficult historical problems but are fortunately of no concern to us here" (1975, 2:1025).

B. Hipparchus (Second Century BCE)

The great astronomer Claudius Ptolemaeus (ca. 100–ca. 170 CE), a Greek-speaking Egyptian who probably spent most of his life in Alexandria,[16] uses Babylonian observations. How did this information travel from Babylon to Alexandria, shifting from clay to papyrus, from tablet to roll, from Babylonian to Greek language, and from lunisolar calendar to Egyptian civil calendar? It is now generally accepted that Greek astronomy is indebted in many ways to Babylonian astronomy.[17] An example of borrowing is the sexagesimal system. It must have been during the transfer of astronomical knowledge that dates according to the Babylonian lunisolar calendar were converted to the Egyptian year of 365 days used in the Canon. Ptolemy himself does not seem to have been involved in the conversion (cf. Aaboe 1991, 290). Everything points to Hipparchus, that other great Greek astronomer (see already Ideler 1806, 173).[18] It has even been suggested, as a probable historical scenario, that Hipparchus "must have visited Babylon, have persuaded one or more of the astronomer scribes there to communicate to him enough of their records and methods for him to grasp the extent of the first and basic principles of the second, and have spent enough time there to have his informant extract and translate for him a considerable number of observations" (Toomer 1988, 359).[19] Most of Hipparchus's work is lost, but Ptolemy uses it while giving due credit. Since some of Ptolemy's Babylonian observations are explicitly attributed to Hipparchus, Hipparchus may well have been the source of all of them (Toomer 1988, 353, note 2). Furthermore, Pliny's statement (*Natural History* II, 53) that Hipparchus predicted solar and lunar eclipse records for a period of 600 years has very plausibly been interpreted as a "misunderstanding of a compilation by Hipparchus of eclipse records for the 600 years preceding his time, that is, stretching back to the reign of Nabonassar" (Toomer 1988, 355, referring to Neugebauer 1975, 1:319–21).

When the Babylonian dates had to be converted, perhaps by Hipparchus, the Egyptian calendar may have been chosen for its simplicity. On the other hand, Egypt controlled a good part of the Eastern Mediterranean for much of the third and second centuries BCE. The calendar was therefore probably well known outside Egypt and therefore an obvious choice. Hipparchus spent his later years in Rhodes (Toomer 1978, 207–8).

For the purpose of establishing the exact Egyptian date for each Babylonian date, meticulous records of the lengths of Babylonian lunar months dating back to the beginning of Nabonassar's reign must have been available. To convert Babylonian dates successfully into Egyptian dates, it would have been necessary to know for each single lunar month whether it had been either twenty-nine or thirty days long, as determined by observation. An error of one day in a single month would throw off all the subsequent dates by one day. Since Ptolemy's Babylonian observations, presented in Greco-Egyptian garb, have all been verified, the transmission must have been flawless. Meticulous cuneiform records of the required information do in fact survive, albeit in

16. On Ptolemy, see Toomer (1975).

17. See Aaboe (1974), Neugebauer (1975, vol. 1), Pedersen (1987), and Toomer (1988).

18. On Hipparchus, see Toomer (1978).

19. A Greek papyrus fragment from Roman Egypt identified by Neugebauer (1988) has recently added a new dimension to the study of the transmission of astronomical knowledge from Babylon to the Greek world. It contains Babylonian astronomical tables concerning the numerical analysis of lunar motion. This fragment brings Hipparchus out of isolation. One now senses a larger tradition. No dates are preserved in the text, but one would expect them to have been Egyptian civil dates, even when referring to lunar months.

fragmentary form, in the cuneiform Diaries.[20] It must have been relatively simple to derive from these Diaries the historical sequence of twenty-nine and thirty day lunar months for Babylon. There are about 7500 lunar months from the eighth to the second century BCE. The long list could be conveniently subdivided by king and regnal year—or later by the year according to the Seleucid Era. It would suffice to provide, in two columns, the Egyptian month and day date corresponding to Day 1 of each Babylonian lunar month.[21] No such tool is preserved, but one like it must have existed. The Egyptian day number would remain the same after a thirty day lunar month and decrease by one after a twenty-nine day lunar month; after the five epagomenal days, it would drop by five. Egyptian dates for the other days of the Babylonian lunar months could easily be inferred from the list. If about sixty equivalences between Babylonian and Egyptian dates were inscribed on one page in two double columns, about 125 pages of text would be sufficient. It would certainly not be necessary to write out the Babylonian-Egyptian equivalences for each of the more than 200,000 days contained in the period in question. Since the papyrus roll was the standard writing vehicle at the time, distributing the text over several rolls would facilitate consulting the list. Once it was decided to begin the list with Year 1 of Nabonassar, it would be natural to add up the totals of regnal years for each reign,[22] with the Era of Nabonassar as result.

This process of conversion can only be reconstructed hypothetically, but its accuracy is guaranteed. Computation confirms that astronomical events that Ptolemy says were observed at Babylon occurred on the Egyptian day and hour he says they did, as has long been known.

This possible scenario makes the Canon as much Ptolemy's work as a list of rulers compiled from various sources in a modern textbook can be considered the work of that book's author. The Canon just happens to be preserved in Ptolemy's *Handy Tables* in the layout in which Ptolemy chose to present it.

C. *Ptolemy (Second Century CE)*

Ptolemy's Μαθηματικὴ σύνταξις "Mathematical Composition," better known as the *Almagest*, a work "superior to any ancient scientific textbook" (Toomer 1975, 196), contains all the tables necessary for computation. Ptolemy later combined these tables into a separate work, Πρόχειροι κανόνες "Handy Tables,"[23] adding the Canon and other auxiliary tables. The Canon is sometimes erroneously considered part of the *Almagest*. A first factor that may have contributed to this confusion is that the *Almagest* is Ptolemy's best known work, whereas his *Handy Tables* are little known, being available only in Nicolas B. Halma's outdated early nineteenth century edition; Halma did not use manuscripts older than the thirteenth and fourteenth centuries CE.[24] Second, the *Almagest* may not contain the Canon, but it does contain *dates according to* the Canon and the Era of Nabonassar. Third, the reason the Canon begins no earlier than the reign of Nabonassar can be derived from a statement in the *Almagest*, namely at III 7, where Ptolemy states that his computations of the sun's mean motions begin with Nabonassar because "the beginning of Nabonassar's reign . . . is the era beginning from which the

20. For the designation "Diaries," see the standard classification of Babylonian astronomical texts by Sachs (1948). For the texts themselves, see Sachs and Hunger (1988–89). On Hipparchus's use of the information contained in the Diaries, see Toomer (1988, 358–60).

21. Since the Babylonian day lasts from sunset to sunset and the Egyptian day from sunrise to sunrise, the Babylonian and Egyptian dates would only overlap for the time of daylight.

22. It may be assumed that the Egyptian wandering years counted from 26 February 747 BCE are not just artificially retro-calculated, but correspond to historical reality. On this matter, see Depuydt (1995a).

23. On the *Handy Tables*, see Toomer (1975, 196–97).

24. W. D. Stahlman (1960) has studied the version of the *Handy Tables* in Vatican Greek 1291, and he provides the variants of Paris Greek 2399 and 2493. Recently, Tihon (1992) has examined the uncial manuscripts of the *Handy Tables*, which date to the eighth to tenth centuries CE. Tihon dates the manuscripts in the title of her study to the "ninth to tenth" centuries CE, but now accepts (personal communication, 27 February 1995) Wright's dating of Vatican Greek 1291 to the eighth century (Wright 1985, independently confirming an unpublished opinion by Ihor Ševčenko).

ancient observations are still (ὡς ἐπίπαν[25]) preserved to our time" (Toomer 1984, 166). In fact, the earliest observation mentioned in the *Almagest* dates to 721 BCE.[26]

An interesting exercise would be to see which chronological conclusions can be drawn from the *Almagest* alone, assuming the Canon had not been preserved. The geographer Gerardus Mercator tried in his *Chronologia* (1576), but failed (Grafton 1993, 131–33). A few decades later, the Canon surfaced, and no one seems to have made the attempt since. Much depends on what else one may be supposed to know for the purpose of the exercise.

D. Theon (Fourth Century CE)

The mathematician Theon (*fl.* second half of fourth century CE),[27] the last attested member of the Alexandrian Museum, wrote a *Greater Commentary* and *Lesser Commentary* on the *Handy Tables*.[28] However, tbe traditional view that the *Handy Tables*, which contain the Canon, have survived in a revision by Theon has recently been contested by Tihon (1992, 48). It is true that the *Handy Tables* are often joined to Theon's *Lesser Commentary* in medieval manuscripts, but the union of these two works appears to be of later date, about 1400 CE. For example, in Leidensis BPG 78 and Laurentianus 28–26 (see below), the *Tables*, written in an uncial hand of the ninth or tenth century, are preceded by the *Lesser Commentary* in a minuscule hand of about 1400. In fact, Toomer (1975, 196; 1976, 323) had already noted that nothing in Ptolemy's introduction to the *Handy Tables* (Heiberg 1907, 159–85) indicates that the extant version of the Tables is not his. Likewise, Stahlman had suggested that Theon's name became associated with the *Tables* because he wrote commentaries on it (1960, 7). Finally, Neugebauer, finding no positive indication for Theon's alleged role, had stated that "nothing definitive can be said about a Theonic edition of the Handy Tables without an investigation of all the manuscripts," adding that "[i]t may be significant . . . that the late Neoplatonists, Proclus and his followers, never refer to Theon in connection with tables" (1975, 2:968; cf. 1044, notes 14 and 15; cf. also 1045). In conclusion, the version of the *Handy Tables* that we have, with the chronographic Canon that is part of it, is in all probability Ptolemy's.

E. Constantinople (ca. Fifth to Fifteenth Centuries CE)

Ptolemy wrote his *Handy Tables* on papyrus rolls. This material and format were soon challenged, however. Papyrus, manufactured from the plant with the same name, was rivaled by parchment, obtained by stretching and drying animal skin, an irreversible chemical process. Papyrus became obsolete about the tenth century CE, shortly after paper reached the Arab world from China; parchment a few centuries later, with the arrival of the printing press in the fifteenth century. As regards format, the codex—consisting of folded sheets gathered in quires bound together and placed between two covers, essentially the format of the modern book—had emerged just decades before Ptolemy's birth, and gradually replaced the role in the first to fourth centuries CE. This transition from roll to codex occurred earlier in Christian manuscripts. Classical works kept being copied on rolls. Plato's works, for example,

25. Literally, "as all (that we have)." Liddell-Scott treats ἐπίπας and σύμπας as synonyms. Ὡς ἐπίπαν, which cannot be translated literally, appears to imply that, although there may or may not have been observations before Nabonassar, those from Nabonassar onward are all (ἐπίπας) that is preserved. In other words, Ptolemy implies that he does *not* know whether earlier observations had been made (how could he have?), but the possibility is not excluded. Accordingly, Sachs (1974, 44) interprets Ptolemy's statement as referring to texts "still available," and Halma, in his translation of Ptolemy's *Almagest*, renders ὡς ἐπίπαν rather circumstantially, though correctly in my opinion, as "depuis le temps d'où nous les avons" (1813, 202). Toomer's "on the whole" (1984, 166; cf. Aaboe 1991, 290) and Manitius's "im großen ganzen" (1912, 183), as synonyms of "in general," imply a different view: Ptolemy somehow *does* know about earlier observations. There are indeed such observations from before Nabonassar (see note 13). The question arises: How did he know about them, if he had no access to them? Finally, Neugebauer suggests both "by and large" (1975, 1:320) and "almost completely" (ibid., 352).

26. For a list of dated observations in Ptolemy's *Almagest*, see Pedersen (1974, 408–22).

27. On Theon, see Toomer (1976).

28. For the texts, see Mogenet and Tihon (1985) and Tihon (1978, 1991).

were typically not inscribed on codexes. The same may be assumed for Ptolemy's works, including the *Handy Tables*. When the codex format attained complete dominance in the fourth century CE, a selection must have occurred. The small number of classical works that was transferred into this new format has survived to the modern day. Everything else has been lost, except for what has surfaced in the papyri. Ptolemy's *Handy Tables* made the cut.

Soon after Constantinople succeeded Alexandria as intellectual center of the Eastern Mediterranean, the Canon continued its active life in Byzantine parchment codexes.[29] Scribes expanded the list of kings with Byzantine rulers up to the emperor in whose reign they wrote, as in Vatican Greek 1291, the earliest version of the *Handy Tables*, dated to the eighth century CE (Wright 1985). The last emperor written in the scribe's hand roughly dates a given manuscript. Later additions are common, in some copies to include Turkish rulers.[30]

The decline and fall of Constantinople precipitated the westward migration of manuscripts, some, including the Canon, just when the printing press made access to knowledge possible on a new scale, allowing many disciplines, including the study of chronology, to make giant strides forward. The three oldest copies of the *Handy Tables* are Byzantine uncial manuscripts of the eighth to tenth centuries CE now preserved in Leiden, Rome (Vatican City), and Florence. The manuscripts of the *Handy Tables* do not all include the Canon, but these three do, the Leiden manuscript even two copies. Of these four oldest copies of the Canon (Tihon 1992, 48, 57, 59, 62, 65), *(1)*, *(2)*, and *(3)* contain the Babylonian segment; *(4)* begins with Philip Arrhidaeus.

(1) Vaticanus graecus 1291, ff. 16v–17r
The Babylonian section is found at f. 16v.

(2) and *(3)* Leidensis BPG 78, ff. 54r–55r and 64r–65v
The Babylonian section appears twice, at ff. 54r and 64r.

(4) Laurentianus 28–26, f. 39r–v

Usener (1898, 447–55) published *(2)*, *(3)*, and *(4)*. *(1)* remains unpublished.[31] No critical edition of the *Handy Tables*, encompassing both the superior uncial manuscripts and the large number of later, minuscule manuscripts, exists.

F. Scaliger (1540–1609 CE)

About a century separates the latest entry of a ruler's name in a manuscript of the Canon written in the Greek East from Joseph Scaliger's pioneering work on chronology in the Latin West. The study of the Canon did not have an auspicious start. Scaliger only became acquainted with the document near the end of his life. In 1602, he obtained a copy of Georgius Syncellus's Chronography, written in the early ninth century CE and hence about as old as the earliest manuscripts of the Canon (Grafton 1993, 540).[32] Syncellus describes the Canon as "based on the very accurate astronomy of the Chaldeans and standard in Greek astronomy as well" (Grafton 1993, 720), but his two versions differ from one another and both contain errors (Grafton 1993, 721–27). Only after Scaliger's death did an authentic copy emerge, as noted at the outset of this paper. The early study of the Canon in the seventeenth and eighteenth centuries CE would repay further study.[33]

G. Ideler's and Ginzel's Handbooks (1825–26; 1906–14)

Ludwig Ideler's handbook of mathematical and technical chronology, which treats the Canon (Ideler 1825–26, 1:109–22), predates the great decipherments and the rise of papyrology. It is typical for this work's place in the study of chronology that the decipherment of the hieroglyphic script

29. A full account of the Canon should include the Arabic versions, such as al-Battānī's, derived from Greek Byzantine manuscripts.

30. As in Ambrosianus H. 57 sup., copied in 1358 CE, described by Pingree (1982).

31. Toomer (1984, 9–12) includes variants from this manuscript in his modernized version of the Canon.

32. Scaliger had been told about the Syncellus manuscript, Paris Greek 1711, in August of 1601 (Laqueur 1932, 1390).

33. See, for example, Ideler (1806, 36–64), Usener (1898, 441, note 5), Toomer (1984, 10, with note 15).

in 1822 came just too late to receive mention (cf. Depuydt 1995a, 48, note 22). Ideler's handbook was updated by Friedrich Karl Ginzel (1906–14), who was able to include native Egyptian and Mesopotamian sources. His survey of the Canon (Ginzel 1906–14, 1:138–43) contains inaccuracies, however. Ptolemy is dated to the third century CE instead of the second (p. 138). 27 February 747 BCE is given as the calendrical beginning of the Era of Nabonassar and noon of 26 February 747 as the astronomical beginning (pp. 138, 139). The latter is correct, but the Canon's calendrical beginning is the *morning* of *26* February 747. The Egyptian civil calendar had a morning epoch (Parker 1950, 10; Neugebauer and Van Hoesen 1959, 167–69; Neugebauer 1975, 2:1067–69; Toomer 1984, 12), that is, it began in the morning. The astronomical beginning of noon of 26 February is the result of Ptolemy's search for a fixed time in the day that could serve as a point of reference for calculations. Morning, the beginning of the Egyptian day, is not suitable. It begins at different times in different seasons and has a certain extension in time. If one waits a few hours, however, the sun reaches the halfway mark on its journey in the sky. Noon, when the sun crosses the meridian, is in observational terms, the most easily measurable fixed point in time of the twenty-four hour day. Each noon is removed exactly twenty-four hours from the previous and the next. Ptolemy therefore chose noon as his astronomical epoch, beginning with noon of Day 1 of the Era of Nabonassar. Does this mean that noon of 26 February is the beginning of the Era? The answer differs for Ptolemy and Copernicus. Ptolemy was not only an astronomer, but also an inhabitant of ancient Egypt.[34] To the extent that he was raised in the traditions of his native country, he will have thought of the morning of 1 Thoth or 26 February 747 as the beginning of the Era. Noon of 26 February was then not the Era's beginning, but just noon of Day 1 of the Era, a point in time convenient for computation. But for astronomers living after Ptolemy outside Egypt, like Copernicus, the Era was detached from all historical context and acquired an abstract quality. Copernicus's Era of Nabonassar was ahistorical and began definitely at noon of 26 February 747 BCE. 26 February 747 has no known significance in the history of Babylon. It was chosen as beginning of the Era of Nabonassar because it is the Egyptian new year preceding the Babylonian new year of 23/24 March 747 BCE, 1 Nisan, the beginning of Nabonassar's first Babylonian regnal year.

As noted above, the surveys of the Canon are most outdated for the Babylonian segment. Indeed, no survey describes the mechanism by which Mesopotamian rulers' reigns are converted into Egyptian years. It was Kugler who first clearly explained this mechanism (Kugler 1907–24, 2:390–91), which is clarified in section 3.*B* below. Since the last surveys of the Canon, studying the Canon's Babylonian segment has been facilitated also by Parker's and Dubberstein's *Babylonian Chronology* (1956), where it is confirmed that the Canon is, with the help of classical sources, "[t]he general basis for the chronology of the period here treated" (1956, 10). Since 1956, many new tablets have been published, and the *Babylonian Chronology* could now be updated in matters of detail (cf. Sachs and Hunger 1988–89, 1:14, note 9).

3. Practical Remarks on the Canon's Babylonian Section

A. Is the Canon True?

It is assumed here that the Canon is true. No one has, to my knowledge, refuted any aspect of the Canon on good grounds. On the other hand, to demonstrate the Canon's accuracy positively would not be easy. In the vast network of facts and inferences making up first millennium BCE chronology, the correctness of the Canon is at certain crucial junctures simply accepted as an axiom. To locate those junctures would be no small feat. It has long been known that the Canon is *astronomically* reliable. Observations dated according to it can all be authenticated. But this does not automatically mean that it is *historically* dependable. The relations between the regnal years in

34. On Copernicus's use of the Era of Nabonassar, see Swerdlow and Neugebauer (1984, 183–88).

column 2 and the years according to the Era in column 3 might have become garbled in the tradition on which the Canon is based. As long as an eclipse is assigned to the correct Egyptian wandering year in column 3, the Canon's usefulness for astronomical purposes would not suffer, whatever king and regnal year a year of Nabonassar was equated with.

The Canon's reliability has on occasion been an article of faith. This was especially the case before the great decipherments, when no contemporary sources were available; classical authors writing on the Near East rarely exhibit the desired degree of precision in matters of chronology. For example, Ideler, in his handbook (1825–26, 1:117), makes the vague statement that many students of chronology have doubted the reliability of the Canon, but he feels that the more insightful historians agree on its importance. Occasional distrust of the Canon can be noted still more recently. In his work on the chronology of the Ptolemaic Dynasty in Egypt, Skeat states that the Canon is "absolutely accurate—a fact which historians have been curiously unwilling to recognise" (1969, 3). Only an examination of a much larger scope than the present paper might be able to allay all doubts regarding the Canon, or at least reveal what it is that we owe exclusively to the Canon and to no other source.

In the meantime, one important item of evidence in favor of the Canon's reliability is that the Egyptian date of the eclipse of 16 July 523 BCE mentioned in the *Almagest* at V 14, namely Month 7 Day 17 Year 7 of Cambyses, can be matched with the Babylonian date of an eclipse mentioned in the cuneiform tablet Camb. 400, namely Month 4 Day 16 Year 7 of Cambyses (Oppert 1891; Parker 1941, 294, note 26; Pinches 1955, *1477). Both texts mention that the eclipse began about an hour before midnight and what its characteristics were. The fact that this Greco-Egyptian date from the *Almagest*, which dates according to the Canon, can be matched with a Babylonian date in a Babylonian document adds little for the astronomer, but a great deal for the historian. It does much to guarantee that the portion of the Canon from the Persian period onward is reliable. As regards the earlier rulers, the Canon would need to be compared with the cuneiform record on a reign by reign basis, considering all the dates in the literary and non-literary sources, to establish if, and where, the Canon conflicts with cuneiform sources. Agreement seems to be the rule, but this would have to be confirmed.

B. The Canon's Dating Technique

The Canon only lists years, no months or days (see Table 1 above). Each year is 365 days long, as detailed in Table 2. Years marked in italics include a 29 February, e.g. Year 3 of Nabonassar, which lasts from 26 February until 24 February. Year 2 and Year 3 of Nabonassar therefore both begin on 26 February and are equally long, but Year 2 ends on February 25 whereas Year 3 ends one day sooner on February 24 because it includes a 29 February. Julian leap years are those that can be divided by four after subtracting one, such as 745 (745 − 1 = 744; 744 : 4 = 186).

In one instance, the year number to the left in the column entitled "Extension of Wandering Year" in Table 2 does not decrease by one, namely in the transition from Year 1 to Year 2 of Darius II, that is, from Year 227 to Year 228 of the Era. The reason is that Year 227, 365 days long, fits entirely in Julian 521 BCE, a 366 day leap year. Year 228 therefore begins on 31 December 521 BCE, in the same Julian year.

What does it mean when a ruler of Babylon begins his reign on a given Egyptian date in the Canon? Take for example the beginning of Cambyses's reign, dated by the Canon to 3 January 529 BCE, the beginning of Year 219 from Nabonassar. One thing that can certainly *not* be concluded is that Cambyses began his reign on that day. If he had, that would be a matter of pure coincidence. In fact, in Cambyses's case, it is known from other sources that he did not. What happened, then, on 3 January 529 BCE? A distinction is necessary between Egypt and Babylon.

As regards *Babylon*, there is no reason, nor any need, to assume that anything special happened on 3 January 529. The lunar month Kislimu, Month 9, had begun about twenty days earlier

TABLE 2
The Canon's Babylonian Segment:
Julian Equivalents of the Egyptian Years

Era of Nabonassar	*Canon's Regnal Year*	*Extension of Wandering Year (Annus Vagus)*
1	Nabonassar 1	26 Feb 747–25 Feb 746
2	Nabonassar 2	26 Feb 746–25 Feb 745
3	Nabonassar 3	*26 Feb 745–24 Feb 744*
4	Nabonassar 4	25 Feb 744–24 Feb 743
5	Nabonassar 5	25 Feb 743–24 Feb 742
6	Nabonassar 6	25 Feb 742–24 Feb 741
7	Nabonassar 7	*25 Feb 741–23 Feb 740*
8	Nabonassar 8	24 Feb 740–23 Feb 739
9	Nabonassar 9	24 Feh 739–23 Feb 738
10	Nabonassar 10	24 Feb 738–23 Feb 737
11	Nabonassar 11	*24 Feb 737–22 Feb 736*
12	Nabonassar 12	23 Feb 736–22 Feb 735
13	Nabonassar 13	23 Feb 735–22 Feb 734
14	Nabonassar 14	23 Feb 734–22 Feb 733
15	Nabu-nadin-zeri 1	*23 Feb 733–21 Feb 732*
16	Nabu-nadin-zeri 2	22 Feb 732–21 Feb 731
17	Mukin-zeri (and Pul) 1	22 Feb 731–21 Feb 730
18	Mukin-zeri (and Pul) 2	22 Feb 730–21 Feb 729
19	Mukin-zeri (and Pul) 3	*22 Feb 729–20 Feb 728*
20	(Mukin-zeri and) Pul 4	21 Feb 728–20 Feb 727
21	(Mukin-zeri and) Pul 5	21 Feb 727–20 Feb 726
22	Ululayu 1	21 Feb 726–20 Feb 725
23	Ululayu 2	*21 Feb 725–19 Feb 724*
24	Ululayu 3	20 Feb 724–19 Feb 723
25	Ululayu 4	20 Feb 723–19 Feb 722
26	Ululayu 5	20 Feb 722–19 Feb 721
27	Merodach-baladan 1	*20 Feb 721–18 Feb 720*
28	Merodach-baladan 2	19 Feb 720–18 Feb 719
29	Merodach-baladan 3	19 Feb 719–18 Feb 718
30	Merodach-baladan 4	19 Feb 718–18 Feb 717
31	Merodach-baladan 5	*19 Feb 717–17 Feb 716*
32	Merodach-baladan 6	18 Feb 716–17 Feb 715
33	Merodach-baladan 7	18 Feb 715–17 Feb 714
34	Merodach-baladan 8	18 Feb 714–17 Feb 713
35	Merodach-baladan 9	*18 Feb 713–16 Feb 712*
36	Merodach-baladan 10	17 Feb 712–16 Feb 711
37	Merodach-baladan 11	17 Feb 711–16 Feb 710
38	Merodach-baladan 12	17 Feb 710–16 Feb 709
39	Sargon II 1	*17 Feb 709–15 Feb 708*
40	Sargon II 2	16 Feb 708–15 Feb 707
41	Sargon II 3	16 Feb 707–15 Feb 706
42	Sargon II 4	16 Feb 706–15 Feb 705
43	Sargon II 5	*16 Feb 705–14 Feb 704*
44	1st Kingless Period 1	15 Feb 704–14 Feb 703
45	1st Kingless Period 2	15 Feb 703–14 Feb 702
46	Bel-ibni 1	15 Feb 702–14 Feb 701
47	Bel-ibni 2	*15 Feb 701–13 Feb 700*
48	Bel-ibni 3	14 Feb 700–13 Feb 699
49	Ashur-nadin-shumi 1	14 Feb 699–13 Feb 698
50	Ashur-nadin-shumi 2	14 Feb 698–13 Feb 697
51	Ashur-nadin-shumi 3	*14 Feb 697–12 Feb 696*
52	Ashur-nadin-shumi 4	13 Feb 696–12 Feb 695
53	Ashur-nadin-shumi 5	13 Feb 695–12 Feb 694
54	Ashur-nadin-shumi 6	13 Feb 694–12 Feb 693
55	Nergal-ushezib 1	*13 Feb 693–11 Feb 692*
56	Mushezib-Marduk 1	12 Feb 692–11 Feb 691
57	Mushezib-Marduk 2	12 Feb 691–11 Feb 690
58	Musbezib-Marduk 3	12 Feb 690–11 Feb 689
59	Mushezib-Marduk 4	*12 Feb 689–10 Feb 688*
60	2d Kingless Period 1	11 Feb 688–10 Feb 687
61	2d Kingless Period 2	11 Feb 687–10 Feb 686
62	2d Kingless Period 3	11 Feb 686–10 Feb 685
63	2d Kingless Period 4	*11 Feb 685–9 Feb 684*
64	2d Kingless Period 5	10 Feb 684–9 Feb 683
65	2d Kingless Period 6	10 Feb 683–9 Feb 682
66	2d Kingless Period 7	10 Feb 682–9 Feb 681
67	2d Kingless Period 8	*10 Feb 681–8 Feb 680*
68	Esarhaddon 1	9 Feb 680–8 Feb 679
69	Esarhaddon 2	9 Feb 679–8 Feb 678
70	Esarhaddon 3	9 Feb 678–8 Feb 677
71	Esarhaddon 4	*9 Feb 677–7 Feb 676*
72	Esarhaddon 5	8 Feb 676–7 Feb 675
73	Esarhaddon 6	8 Feb 675–7 Feb 674
74	Esarhaddon 7	8 Feb 674–7 Feb 673
75	Esarhaddon 8	*8 Feb 673–6 Feb 672*
76	Esarhaddon 9	7 Feb 672–6 Feb 671
77	Esarhaddon 10	7 Feb 671–6 Feb 670
78	Esarhaddon 11	7 Feb 670–6 Feb 669
79	Esarhaddon 12	*7 Feb 669–5 Feb 668*
80	Esarhaddon 13	6 Feb 668–5 Feb 667
81	Shamash-shuma-ukin 1	6 Feb 667–5 Feb 666
82	Shamash-shuma-ukin 2	6 Feb 666–5 Feb 665
83	Shamash-shuma-ukin 3	*6 Feb 665–4 Feb 664*
84	Shamash-shuma-ukin 4	5 Feb 664–4 Feb 663
85	Shamash-shuma-ukin 5	5 Feb 663–4 Feb 662
86	Shamash-shuma-ukin 6	5 Feb 662–4 Feb 661

TABLE 2, *cont.*

Era of Nabonassar	*Canon's Regnal Year*	*Extension of Wandering Year (Annus Vagus)*
87	Shamash-shuma-ukin 7	*5 Feb 661-3 Feb 660*
88	Shamash-shuma-ukin 8	4 Feb 660-3 Feb 659
89	Shamash-shuma-ukin 9	4 Feb 659-3 Feb 658
90	Shamash-shuma-ukin 10	4 Feb 658-3 Feb 657
91	Shamash-shuma-ukin 11	*4 Feb 657-2 Feb 656*
92	Shamash-shuma-ukin 12	3 Feb 656-2 Feb 655
93	Shamash-shuma-ukin 13	3 Feb 655-2 Feb 654
94	Shamash-shuma-ukin 14	3 Feb 654-2 Feb 653
95	Shamash-shuma-ukin 15	*3 Feb 653-1 Feb 652*
96	Shamash-shuma-ukin 16	2 Feb 652-1 Feb 651
97	Shamash-shuma-ukin 17	2 Feb 651-1 Feb 650
98	Shamash-shuma-ukin 18	2 Feb 650-1 Feb 649
99	Shamash-shuma-ukin 19	*2 Feb 649-31 Jan 648*
100	Shamash-shuma-ukin 20	1 Feb 648-31 Jan 647
101	Kandalanu 1	1 Feb 647-31 Jan 646
102	Kandalanu 2	1 Feb 646-31 Jan 645
103	Kandalanu 3	*1 Feb 645-30 Jan 644*
104	Kandalanu 4	31 Jan 644-30 Jan 643
105	Kandalanu 5	31 Jan 643-30 Jan 642
106	Kandalanu 6	31 Jan 642-30 Jan 641
107	Kandalanu 7	*31 Jan 641-29 Jan 640*
108	Kandalanu 8	30 Jan 640-29 Jan 639
109	Kandalanu 9	30 Jan 639-29 Jan 638
110	Kandalanu 10	30 Jan 638-29 Jan 637
111	Kandalanu 11	*30 Jan 637-28 Jan 636*
112	Kandalanu 12	29 Jan 636-28 Jan 635
113	Kandalanu 13	29 Jan 635-28 Jan 634
114	Kandalanu 14	29 Jan 634-28 Jan 333
115	Kandalanu 15	*29 Jan 633-27 Jan 632*
116	Kandalanu 16	28 Jan 632-27 Jan 631
117	Kandalanu 17	28 Jan 631-27 Jan 630
118	Kandalanu 18	28 Jan 630-27 Jan 629
119	Kandalanu 19	*28 Jan 629-26 Jan 628*
120	Kandalanu 20	27 Jan 628-26 Jan 627
121	Kandalanu 21	27 Jan 627-26 Jan 626
122	Kandalanu 22	27 Jan 626-26 Jan 625
123	Nabopolassar 1	*27 Jan 625-25 Jan 624*
124	Nabopolassar 2	26 Jan 624-25 Jan 623
125	Nabopolassar 3	26 Jan 623-25 Jan 622
126	Nabopolassar 4	26 Jan 622-25 Jan 621
127	Nabopolassar 5	*26 Jan 621-24 Jan 620*
128	Nabopolassar 6	25 Jan 620-24 Jan 619
129	Nabopolassar 7	25 Jan 619-24 Jan 618
130	Nabopolassar 8	25 Jan 618-24 Jan 617
131	Nabopolassar 9	*25 Jan 617-23 Jan 616*
132	Nabopolassar 10	24 Jan 616-23 Jan 615
133	Nabopolassar 11	24 Jan 615-23 Jan 614
134	Nabopolassar 12	24 Jan 614-23 Jan 613
135	Nabopolassar 13	*24 Jan 613-22 Jan 612*
136	Nabopolassar 14	23 Jan 612-22 Jan 611
137	Nabopolassar 15	23 Jan 611-22 Jan 610
138	Nabopolassar 16	23 Jan 610-22 Jan 609
139	Nabopolassar 17	*23 Jan 609-21 Jan 608*
140	Nabopolassar 18	22 Jan 608-21 Jan 607
141	Nabopolassar 19	22 Jan 607-21 Jan 606
142	Nabopolassar 20	22 Jan 606-21 Jan 605
143	Nabopolassar 21	*22 Jan 605-20 Jan 604*
144	Nebuchadrezzar 1	21 Jan 604-20 Jan 603
145	Nebuchadrezzar 2	21 Jan 603-20 Jan 602
146	Nebuchadrezzar 3	21 Jan 602-20 Jan 601
147	Nebuchadrezzar 4	*21 Jan 601-19 Jan 600*
148	Nebuchadrezzar 5	20 Jan 600-19 Jan 599
149	Nebuchadrezzar 6	20 Jan 599-19 Jan 598
150	Nebuchadrezzar 7	20 Jan 598-19 Jan 597
151	Nebuchadrezzar 8	*20 Jan 597-18 Jan 596*
152	Nebuchadrezzar 9	19 Jan 596-18 Jan 595
153	Nebuchadrezzar 10	19 Jan 595-18 Jan 594
154	Nebuchadrezzar 11	19 Jan 594-18 Jan 593
155	Nebuchadrezzar 12	*19 Jan 593-17 Jan 592*
156	Nebuchadrezzar 13	18 Jan 592-17 Jan 591
157	Nebuchadrezzar 14	18 Jan 591-17 Jan 590
158	Nebuchadrezzar 15	18 Jan 590-17 Jan 589
159	Nebuchadrezzar 16	*18 Jan 589-16 Jan 588*
160	Nebuchadrezzar 17	17 Jan 588-16 Jan 587
161	Nebuchadrezzar 18	17 Jan 587-16 Jan 586
162	Nebuchadrezzar 19	17 Jan 586-16 Jan 585
163	Nebuchadrezzar 20	*17 Jan 585-15 Jan 584*
164	Nebuchadrezzar 21	16 Jan 584-15 Jan 583
165	Nebuchadrezzar 22	16 Jan 583-15 Jan 582
166	Nebuchadrezzar 23	16 Jan 582-15 Jan 581
167	Nebuchadrezzar 24	*16 Jan 581-14 Jan 580*
168	Nebuchadrezzar 25	15 Jan 580-14 Jan 579
169	Nebuchadrezzar 26	15 Jan 579-14 Jan 578
170	Nebuchadrezzar 27	15 Jan 578-14 Jan 577
171	Nebuchadrezzar 28	*15 Jan 577-13 Jan 576*
172	Nebuchadrezzar 29	14 Jan 576-13 Jan 575
173	Nebuchadrezzar 30	14 Jan 575-13 Jan 574
174	Nebuchadrezzar 31	14 Jan 574-13 Jan 573
175	Nebuchadrezzar 32	*14 Jan 573-12 Jan 572*
176	Nebuchadrezzar 33	13 Jan 572-12 Jan 571

TABLE 2, *cont.*

Era of Nabonassar	*Canon's Regnal Year*	*Extension of Wandering Year (Annus Vagus)*
177	Nebuchadrezzar 34	13 Jan 571–12 Jan 570
178	Nebuchadrezzar 35	13 Jan 570–12 Jan 569
179	Nebuchadrezzar 36	*13 Jan 569–11 Jan 568*
180	Nebuchadrezzar 37	12 Jan 568–11 Jan 567
181	Nebuchadrezzar 38	12 Jan 567–11 Jan 566
182	Nebuchadrezzar 39	12 Jan 566–11 Jan 565
183	Nebuchadrezzar 40	*12 Jan 565–10 Jan 564*
184	Nebuchadrezzar 41	11 Jan 564–10 Jan 563
185	Nebuchadrezzar 42	11 Jan 563–10 Jan 562
186	Nebuchadrezzar 43	11 Jan 562–10 Jan 561
187	Amel-Marduk 1	*11 Jan 561–9 Jan 560*
188	Amel-Marduk 2	10 Jan 560–9 Jan 559
189	Neriglissar 1	10 Jan 559–9 Jan 558
190	Neriglissar 2	10 Jan 558–9 Jan 557
191	Neriglissar 3	*10 Jan 557–8 Jan 556*
192	Neriglissar 4	9 Jan 556–8 Jan 555
193	Nabonidus 1	9 Jan 555–8 Jan 554
194	Nabonidus 2	9 Jan 554–8 Jan 553
195	Nabonidus 3	*9 Jan 553–7 Jan 552*
196	Nabonidus 4	8 Jan 552–7 Jan 551
197	Nabonidus 5	8 Jan 551–7 Jan 550
198	Nabonidus 6	8 Jan 550–7 Jan 549
199	Nabonidus 7	*8 Jan 549–6 Jan 548*
200	Nabonidus 8	7 Jan 548–6 Jan 547
201	Nabonidus 9	7 Jan 547–6 Jan 546
202	Nabonidus 10	7 Jan 546–6 Jan 545
203	Nabonidus 11	*7 Jan 545–5 Jan 544*
204	Nabonidus 12	6 Jan 544–5 Jan 543
205	Nabonidus 13	6 Jan 543–5 Jan 542
206	Nabonidus 14	6 Jan 542–5 Jan 541
207	Nabonidus 15	*6 Jan 541–4 Jan 540*
208	Nabonidus 16	5 Jan 540–4 Jan 539
209	Nabonidus 17	5 Jan 539–4 Jan 538
210	Cyrus 1	5 Jan 538–4 Jan 537
211	Cyrus 2	*5 Jan 537–3 Jan 536*
212	Cyrus 3	4 Jan 536–3 Jan 535
213	Cyrus 4	4 Jan 535–3 Jan 534
214	Cyrus 5	4 Jan 534–3 Jan 533
215	Cyrus 6	*4 Jan 533–2 Jan 532*
216	Cyrus 7	3 Jan 532–2 Jan 531
217	Cyrus 8	3 Jan 531–2 Jan 530
218	Cyrus 9	3 Jan 530–2 Jan 529
219	Cambyses 1	*3 Jan 529–1 Jan 528*
220	Cambyses 2	2 Jan 528–1 Jan 527
221	Cambyses 3	2 Jan 527–1 Jan 526
222	Cambyses 3	2 Jan 526–1 Jan 525
223	Cambyses 5	*2 Jan 525–31 Dec 524*
224	Cambyses 6	1 Jan 524–31 Dec 524
225	Cambyses 7	1 Jan 523–31 Dec 523
226	Cambyses 8	1 Jan 522–31 Dec 522
227	Darius I 1	*1 Jan 521–30 Dec 521*
228	Darius I 2	31 Dec 521–30 Dec 520
229	Darius I 3	31 Dec 520–30 Dec 519
230	Darius I 4	31 Dec 519–30 Dec 518
231	Darius I 5	*31 Dec 518–29 Dec 517*
232	Darius I 6	30 Dec 517–29 Dec 516
233	Darius I 7	30 Dec 516–29 Dec 515
234	Darius I 8	30 Dec 515–29 Dec 514
235	Darius I 9	*30 Dec 514–28 Dec 513*
236	Darius I 10	29 Dec 513–28 Dec 512
237	Darius I 11	29 Dec 512–28 Dec 511
238	Darius I 12	29 Dec 511–28 Dec 510
239	Darius I 13	*29 Dec 510–27 Dec 509*
240	Darius I 14	28 Dec 509–27 Dec 508
241	Darius I 15	28 Dec 508–27 Dec 507
242	Darius I 16	28 Dec 507–27 Dec 506
243	Darius I 17	*28 Dec 506–26 Dec 505*
244	Darius I 18	27 Dec 505–26 Dec 504
245	Darius I 19	27 Dec 504–26 Dec 503
246	Darius I 20	27 Dec 503–26 Dec 502
247	Darius I 21	*27 Dec 502–25 Dec 501*
248	Darius I 22	26 Dec 501–25 Dec 500
249	Darius I 23	26 Dec 500–25 Dec 499
250	Darius I 24	26 Dec 499–25 Dec 498
251	Darius I 25	*26 Dec 498–24 Dec 497*
252	Darius I 26	25 Dec 497–24 Dec 496
253	Darius I 27	25 Dec 496–24 Dec 495
254	Darius I 28	25 Dec 495–24 Dec 494
255	Darius I 29	*25 Dec 494–23 Dec 493*
256	Darius I 30	24 Dec 493–23 Dec 492
257	Darius I 31	24 Dec 492–23 Dec 491
258	Darius I 32	24 Dec 491–23 Dec 490
259	Darius I 33	*24 Dec 490–22 Dec 489*
260	Darius I 34	23 Dec 489–22 Dec 488
261	Darius I 35	23 Dec 488–22 Dec 487
262	Darius I 36	23 Dec 487–22 Dec 486
263	Xerxes I 1	*23 Dec 486–21 Dec 485*
264	Xerxes I 2	22 Dec 485–21 Dec 484
265	Xerxes I 3	22 Dec 484–21 Dec 483
266	Xerxes I 4	22 Dec 483–21 Dec 482

TABLE 2, *cont.*

Era of Nabonassar	*Canon's Regnal Year*	*Extension of Wandering Year (Annus Vagus)*
267	Xerxes I 5	*22 Dec 482–20 Dec 481*
268	Xerxes I 6	21 Dec 481–20 Dec 480
269	Xerxes I 7	21 Dec 480–20 Dec 479
270	Xerxes I 8	21 Dec 479–20 Dec 478
271	Xerxes I 9	*21 Dec 478–19 Dec 477*
272	Xerxes I 10	20 Dec 477–19 Dec 476
273	Xerxes I 11	20 Dec 476–19 Dec 475
274	Xerxes I 12	20 Dec 475–19 Dec 474
275	Xerxes I 13	*20 Dec 474–18 Dec 473*
276	Xerxes I 14	19 Dec 473–18 Dec 472
277	Xerxes I 15	19 Dec 472–18 Dec 471
278	Xerxes I 16	19 Dec 471–18 Dec 470
279	Xerxes I 17	*19 Dec 470–17 Dec 469*
280	Xerxes I 18	18 Dec 469–17 Dec 468
281	Xerxes I 19	18 Dec 468–17 Dec 467
282	Xerxes I 20	18 Dec 467–17 Dec 466
283	Xerxes I 21	*18 Dec 466–16 Dec 465*
284	Artaxerxes I 1	17 Dec 465–16 Dec 464
285	Artaxerxes I 2	17 Dec 464–16 Dec 463
286	Artaxerxes I 3	17 Dec 463–16 Dec 462
287	Artaxerxes I 4	*17 Dec 462–15 Dec 461*
288	Artaxerxes I 5	16 Dec 461–15 Dec 460
289	Artaxerxes I 6	16 Dec 460–15 Dec 459
290	Artaxerxes I 7	16 Dec 459–15 Dec 458
291	Artaxerxes I 8	*16 Dec 458–14 Dec 457*
292	Artaxerxes I 9	15 Dec 457–14 Dec 456
293	Artaxerxes I 10	15 Dec 456–14 Dec 455
294	Artaxerxes I 11	15 Dec 455–14 Dec 454
295	Artaxerxes I 12	*15 Dec 454–13 Dec 453*
296	Artaxerxes I 13	14 Dec 453–13 Dec 452
297	Artaxerxes I 14	14 Dec 452–13 Dec 451
298	Artaxerxes I 15	14 Dec 451–13 Dec 450
299	Artaxerxes I 16	*14 Dec 450–12 Dec 449*
300	Artaxerxes I 17	13 Dec 449–12 Dec 448
301	Artaxerxes I 18	13 Dec 448–12 Dec 447
302	Artaxerxes I 19	13 Dec 447–12 Dec 446
303	Artaxerxes I 20	*13 Dec 446–11 Dec 445*
304	Artaxerxes I 21	12 Dec 445–11 Dec 444
305	Artaxerxes I 22	12 Dec 444–11 Dec 443
306	Artaxerxes I 23	12 Dec 443–11 Dec 442
307	Artaxerxes I 24	*12 Dec 442–10 Dec 441*
308	Artaxerxes I 25	11 Dec 441–10 Dec 440
309	Artaxerxes I 26	11 Dec 440–10 Dec 439
310	Artaxerxes I 27	11 Dec 439–10 Dec 438
311	Artaxerxes I 28	*11 Dec 438–9 Dec 437*
312	Artaxerxes I 29	10 Dec 437–9 Dec 436
313	Artaxerxes I 30	10 Dec 436–9 Dec 435
314	Artaxerxes I 31	10 Dec 435–9 Dec 434
315	Artaxerxes I 32	*10 Dec 434–8 Dec 433*
316	Artaxerxes I 33	9 Dec 433–8 Dec 432
317	Artaxerxes I 34	9 Dec 432–8 Dec 431
318	Artaxerxes I 35	9 Dec 431–8 Dec 430
319	Artaxerxes I 36	*9 Dec 430–7 Dec 429*
320	Artaxerxes I 37	8 Dec 429–7 Dec 428
321	Artaxerxes I 38	8 Dec 428–7 Dec 427
322	Artaxerxes I 39	8 Dec 427–7 Dec 426
323	Artaxerxes I 40	*8 Dec 426–6 Dec 425*
324	Artaxerxes I 41	7 Dec 425–6 Dec 424
325	Darius II 1	7 Dec 424–6 Dec 423
326	Darius II 2	7 Dec 423–6 Dec 422
327	Darius II 3	*7 Dec 422–5 Dec 421*
328	Darius II 4	6 Dec 421–5 Dec 420
329	Darius II 5	6 Dec 420–5 Dec 419
330	Darius II 6	6 Dec 419–5 Dec 418
331	Darius II 7	*6 Dec 418–4 Dec 417*
332	Darius II 8	5 Dec 417–4 Dec 416
333	Darius II 9	5 Dec 146–4 Dec 415
334	Darius II 10	5 Dec 415–4 Dec 414
335	Darius II 11	*5 Dec 414–3 Dec 413*
336	Darius II 12	4 Dec 413–3 Dec 412
337	Darius II 13	4 Dec 412–3 Dec 411
338	Darius II 14	4 Dec 411–3 Dec 410
339	Darius II 15	*4 Dec 410–2 Dec 409*
340	Darius II 16	3 Dec 409–2 Dec 408
341	Darius II 17	3 Dec 408–2 Dec 407
342	Darius II 18	3 Dec 407–2 Dec 406
343	Darius II 19	*3 Dec 406–1 Dec 405*
344	Artaxerxes II 1	2 Dec 405–1 Dec 404
345	Artaxerxes II 2	2 Dec 404–1 Dec 403
346	Artaxerxes II 3	2 Dec 403–1 Dec 402
347	Artaxerxes II 4	*2 Dec 402–30 Nov 401*
348	Artaxerxes II 5	1 Dec 401–30 Nov 400
349	Artaxerxes II 6	1 Dec 400–30 Nov 399
350	Artaxerxes II 7	1 Dec 399–30 Nov 398
351	Artaxerxes II 8	*1 Dec 398–29 Nov 397*
352	Artaxerxes II 9	30 Nov 397–29 Nov 396
353	Artaxerxes II 10	30 Nov 396–29 Nov 395
354	Artaxerxes II 11	30 Nov 395–29 Nov 394
355	Artaxerxes II 12	*30 Nov 394–28 Nov 393*
356	Artaxerxes II 13	29 Nov 393–28 Nov 392

TABLE 2, *cont.*

Era of Nabonassar	*Canon's Regnal Year*	*Extension of Wandering Year (Annus Vagus)*
357	Artaxerxes II 14	29 Nov 392–28 Nov 391
358	Artaxerxes II 15	29 Nov 391–28 Nov 390
359	Artaxerxes II 16	*29 Nov 390–27 Nov 389*
360	Artaxerxes II 17	28 Nov 389–27 Nov 388
361	Artaxerxes II 18	28 Nov 388–27 Nov 387
362	Artaxerxes II 19	28 Nov 387–27 Nov 386
363	Artaxerxes II 20	*28 Nov 386–26 Nov 385*
364	Artaxerxes II 21	27 Nov 385–26 Nov 384
365	Artaxerxes II 22	27 Nov 384–26 Nov 383
366	Artaxerxes II 23	27 Nov 383–26 Nov 382
367	Artaxerxes II 24	*27 Nov 382–25 Nov 381*
368	Artaxerxes II 25	26 Nov 381–25 Nov 380
369	Artaxerxes II 26	26 Nov 380–25 Nov 379
370	Artaxerxes II 27	26 Nov 379–25 Nov 378
371	Artaxerxes II 28	*26 Nov 378–24 Nov 377*
372	Artaxerxes II 29	25 Nov 377–24 Nov 376
373	Artaxerxes II 30	25 Nov 376–24 Nov 375
374	Artaxerxes II 31	25 Nov 375–24 Nov 374
375	Artaxerxes II 32	*25 Nov 374–23 Nov 373*
376	Artaxerxes II 33	24 Nov 373–23 Nov 372
377	Artaxerxes II 34	24 Nov 372–23 Nov 371
378	Artaxerxes II 35	24 Nov 371–23 Nov 370
379	Artaxerxes II 36	*24 Nov 370–22 Nov 369*
380	Artaxerxes II 37	23 Nov 369–22 Nov 368
381	Artaxerxes II 38	23 Nov 368–22 Nov 367
382	Artaxerxes II 39	23 Nov 367–22 Nov 366
383	Artaxerxes II 40	*23 Nov 366–21 Nov 365*
384	Artaxerxes II 41	22 Nov 365–21 Nov 364
385	Artaxerxes II 42	22 Nov 364–21 Nov 363
386	Artaxerxes II 43	22 Nov 363–21 Nov 362
387	Artaxerxes II 44	*22 Nov 362–20 Nov 361*
388	Artaxerxes II 45	21 Nov 361–20 Nov 360
389	Artaxerxes II 46	21 Nov 360–20 Nov 359
390	Artaxerxes III 1	21 Nov 359–20 Nov 358
391	Artaxerxes III 2	*21 Nov 358–19 Nov 357*
392	Artaxerxes III 3	20 Nov 357–19 Nov 356
393	Artaxerxes III 4	20 Nov 356–19 Nov 355
394	Artaxerxes III 5	20 Nov 355–19 Nov 354
395	Artaxerxes III 6	*20 Nov 354–18 Nov 353*
396	Artaxerxes III 7	19 Nov 353–18 Nov 352
397	Artaxerxes III 8	19 Nov 352–18 Nov 351
398	Artaxerxes III 9	19 Nov 351–18 Nov 350
399	Artaxerxes III 10	*19 Nov 350–17 Nov 349*
400	Artaxerxes III 11	18 Nov 349–17 Nov 348
401	Artaxerxes III 12	18 Nov 348–17 Nov 347
402	Artaxerxes III 13	18 Nov 347–17 Nov 346
403	Artaxerxes III 14	*18 Nov 346–16 Nov 345*
404	Artaxerxes III 15	17 Nov 345–16 Nov 344
405	Artaxerxes III 16	17 Nov 344–16 Nov 343
406	Artaxerxes III 17	17 Nov 343–16 Nov 342
407	Artaxerxes III 18	*17 Nov 342–15 Nov 341*
408	Artaxerxes III 19	16 Nov 341–15 Nov 340
409	Artaxerxes III 20	16 Nov 340–15 Nov 339
410	Artaxerxes III 21	16 Nov 339–15 Nov 338
411	Arses 1	*16 Nov 338–14 Nov 337*
412	Arses 2	15 Nov 337–14 Nov 336
413	Darius III 1	15 Nov 336–14 Nov 335
414	Darius III 2	15 Nov 335–14 Nov 334
415	Darius III 3	*15 Nov 334–13 Nov 333*
416	Darius III 4	14 Nov 333–13 Nov 332
417	Alexander the Great 1	14 Nov 332–13 Nov 331
418	Alexander the Great 2	14 Nov 331–13 Nov 330
419	Alexander the Great 3	*14 Nov 330–12 Nov 329*
420	Alexander the Great 4	13 Nov 329–12 Nov 328
421	Alexander the Great 5	13 Nov 328–12 Nov 327
422	Alexander the Great 6	13 Nov 327–12 Nov 326
423	Alexander the Great 7	*13 Nov 326–11 Nov 325*
424	Alexander the Great 8	12 Nov 325–11 Nov 324
425	Philip Arrhidaeus 1	12 Nov 324–11 Nov 323
426	Philip Arrhidaeus 2	12 Nov 323–11 Nov 322
427	Philip Arrhidaeus 3	*12 Nov 322–10 Nov 321*
428	Philip Arrhidaeus 4	11 Nov 321–10 Nov 320
429	Philip Arrhidaeus 5	11 Nov 320–10 Nov 319
430	Philip Arrhidaeus 6	11 Nov 319–10 Nov 318
431	Philip Arrhidaeus 7	*11 Nov 318–9 Nov 317*
432	Alexander IV 1	10 Nov 317–9 Nov 316
433	Alexander IV 2	10 Nov 316–9 Nov 315
434	Alexander IV 3	10 Nov 315–9 Nov 314
435	Alexander IV 4	*10 Nov 314–8 Nov 313*
436	Alexander IV 5	9 Nov 313–8 Nov 312
437	Alexander IV 6	9 Nov 312–8 Nov 311
438	Alexander IV 7	9 Nov 311–8 Nov 310
439	Alexander IV 8	*9 Nov 310–7 Nov 309*
440	Alexander IV 9	8 Nov 309–7 Nov 308
441	Alexander IV 10	8 Nov 308–7 Nov 307
442	Alexander IV 11	8 Nov 307–7 Nov 306
443	Alexander IV 12	*8 Nov 306–6 Nov 305*
(444	Ptolemy I Soter 1	7 Nov 305–6 Nov 304)

with the evening observation of the first crescent soon after the conjunction or new moon of 13 December 530 BCE at 7:53PM (Goldstine 1973, 40), when sun, moon, and earth, in that order, had positioned themselves on a single line. Parker and Dubberstein (1956, 29) give the evening of 15 December as the beginning of Day 1 of Kislimu. Accordingly, the one day period from the evening of 2 January to the evening of 3 January of 529 BCE would be 19 Kislimu. If the first crescent had already been observed on 14 December 530 BCE, 2/3 January would correspond to 18 Kislimu. If this observation had been delayed due to bad weather until 16 December, 2/3 January would be 20 Kislimu. It is certain that the Babylonians did not celebrate Cambyses's accession to the throne on 18, 19, or 20 Kislimu in early 529 BCE. On the one hand, his reign had already begun *before* that date, in August 530 BCE (Parker and Dubbersteiu 1956, 14). On the other hand, his Year 1 began, in accordance with Babylonian regnal dating practice, *after* that date on the reign's first Babylonian new year in the spring, 1 Nisan, which fell on 12 April in 529 BCE. On 3 January 529 BCE, Cambyses was in his "accession year," the period that lasts from the accession to the throne to the reign's first new year or beginning of Year 1 in the spring.

In *Egypt*, however, 3 January 529 did have significance. It was the beginning of a new year, I *3ḫt* 1 or 1 Thoth.[35] This year lasted from the morning of 3 January to the morning of 4 January. How did this Egyptian new year of 3 January 529 BCE come to mark the beginning of the Babylonian reign of Cambyses in the Canon? First of all, the Canon operates with .whole Egyptian years. Any Babylonian reign converted into Canon years is therefore bound to begin on an Egyptian new year. The ever receding Julian dates of all the Egyptian new year days relevant to the Canon are found in Table 2. The question remains: Which Egyptian new year? It appears that 3 January 529 BCE was chosen as the beginning of Cambyses's reign in the Canon because it is the Egyptian new year that *precedes* the beginning of the Babylonian Year 1 of Cambyses, which occurred on the first new year *following* the beginning of his reign.

This conversion procedure has much of a zigzag motion. Both its components have historical equivalents.

On the one hand, the choice of the Egyptian new year *before* the beginning of Babylonian Year 1 reflects the Egyptian regnal dating practice called predating. During much of Egyptian history except the New Kingdom, a reign's Year 1 began on the day of accession and lasted until the first new year, when Year 2 began. It follows that the beginning of regnal Year 2 falls *before* the first anniversary of the accession, that is, *before* the beginning of the reign's *full* Year 2. Hence the term *pre*dating or *ante*dating. In other words, following the Egyptian calendar, the Canon predates.

On the other hand, in Babylon, Year 1 did not begin on the day of the accession, but on the first new year in the spring. It follows that the beginning of regnal Year 2 falls *after* the first anniversary of the accession, that is, *after* the beginning of the reign's *full* Year 2. Hence the term *post*dating.

It may be concluded that the Canon, following Egyptian regnal dating practice, not only *pre*dates, but, following Babylonian regnal dating practice, also *post*dates. There is a hierarchy in the Canon's predating and postdating, however. The postdated Babylonian regnal years are predated according to the Egyptian calendar. In other words, the Canon *pre*dates *post*dating. Or, it exhibits *pre*dating of *post*dating. For example, Cambyses's Babylonian Year 1 began on the new year of 12 April 529 BCE, several months after the actual beginning of the year. The Canon treats this postdated beginning of the reign, and not the actual beginning of the reign, in Egyptian predating fashion by taking it as the beginning of Year 1 and beginning Year 2 with the next Egyptian New Year's Day on 2 January 528 BCE.

It should be noted that the postdating system was abandoned from Alexander onwards. This

35. I am assuming that the Canon's Egyptian years are historical. They certainly are from 473 BCE onwards, and I see no reason to doubt that they also were before that date (on this matter, see Depuydt [1995a]).

TABLE 3

Predating of Postdating Applied to Three Babylonian Reigns

A. The dates of the *artificial beginnings of the reigns according to the Canon*, that is, the Egyptian new year or 1 Thoth immediately preceding the beginning of the Babylonian Year 1 or the reigns' first new year (1 Nisan):

Xerxes I:	23/24[36]	December	486
Darius II:	7/8	Decemher	424
Artaxerxes II:	2/3	December	405

B. The dates of the *beginnings of Babylonian Year 1* (1 Nisan):[37]

Xerxes I:	3/4[38]	April	485
Darius II:	10/11	April	423
Artaxerxes II:	9/10	April	404

C. The approximate dates of the *actual beginnings* of the reigns:

Xerxes I:	late November 486[39]
Darius II:	between 24 December 424 and 13 February 423[40]
Artaxerxes II:	between 17 September 405[41] and 9/10 April 404 (1 Nisan)

D. *Comparison* of the *beginnings of the reigns according to the Canon* (A) with the *actual beginnings* (C):

Xerxes I: The actual beginning of late November 486 *precedes* the Canon's beginning of 23/24 December 486. The interval postdated forward by the Canon from late November 486 to 3/4 April 485 (1 Nisan; Babylonian new year) is *greater* than the interval predated backward from 3/4 April 485 to 23/24 December 486 (1 Thoth; Egyptian new year).

Darius II: The actual beginning, which fell between 24 December 424 and 13 February 423, *follows* the Canon's beginning of 7/8 December 424. The interval postdated forward by the Canon from 24 December 424–13 February 423 to 10/11 April 423 (1 Nisan) is *smaller* than the interval predated backward from 10/11 April (1 Nisan) to 7/8 December 424 (1 Thoth).

Artaxerxes II: The Canon's beginning of 2/3 December 405 could he either earlier or later than the actual beginning, which fell between 17 September 405 and 9/10 April 404.

affects numbers 31, 32, and 33 in the Canon. For example, Year 1 of Philip begins, according to the Canon, on 12 November 324 BCE. As with all the other rulers of Babylon in the Canon, the beginning of Philip's reign is predated in Egyptian fashion from the beginning of the Babylonian Year 1. But in the case of Philip, the beginning of Year 1 was itself not postdated. It coincided with the *actual* beginning of his reign, and Year 2, not Year 1 as with most other rulers of Babylon mentioned in the Canon, began on the first new year of the reign. For Philip Arrhidaeus and

36. Sunrise to sunrise.

37. For these dates, see Parker and Dubberstein (1956, 31, 33).

38. Sunset to sunset.

39. Depuydt 1995b, 157, note 22.

40. Depuydt 1995b, 159, note 28.

41. Louvre AO 17603 (Durand [1981, Plate 36], Joannès [1982, 93 no. 30]). I owe this reference to Matthew Stolper.

Alexander IV, and it would seem also for Alexander the Great, the Canon does not predate postdating, but just predates.

What does the Canon tell us, then, about the actual beginnings of Babylonian reigns? There are two possibilities, excluding numbers 31, 32, and 33 (see above). The actual beginning of the reign can *precede* or *follow* the Canon's beginning. Predating of postdating has been described above as a zigzag procedure consisting of two movements in opposite directions: postdating forward from the actual beginning of the reign to the first Babylonian new year, that is, the beginning of the Babylonian Year 1, which always falls around the spring equinox, and predating backward from the beginning of the Babylonian year 1 to the Egyptian new year, which in the period covered by the Babylonian segment of the Canon falls from 8 November to 26 February. All depends on which of the two movements is the greatest. If a ruler comes to the throne *between the Egyptian new year and the Babylonian new year*, less time is postdated forward to the first Babylonian new year than predated backward from the Babylonian new year to the preceding Egyptian new year, and the Canon's Year 1 begins *before* the actual beginning of the reign. But if a ruler comes to the throne *between the Babylonian new year and the Egyptian new year*, more time is postdated forward to the first Babylonian new year than predated backward to the preceding Egyptian new year, and the Egyptian Year 1 will end *after* the first anniversary of accession.

Three examples from the Persian period are Xerxes I, Darius II, and Artaxerxes II (see Table 3). In the case of Xerxes, *more* is postdated forward than predated backward. In the case of Darius II, *less* is postdated forward than predated backward. In a third case, Artaxerxes II, the order of the reign's actual beginning and the Canon's beginning is not known because of a lack of evidence from the tablets. For the same reason, it remains unknown whether Nabonassar already ruled on 26 February 747 BCE, at the beginning of the Era named after him.

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