



CALENDARS I. PRE-ISLAMIC CALENDARS

i. Pre-Islamic Calendars

Although evidence of calendrical traditions in Iran can be traced back to the 2nd millennium B.C., before the lifetime of Zoroaster (see discussion of the Zoroastrian calendar below), the earliest calendar that is fully preserved dates from the Achaemenid period.

The Old Iranian calendar. The Old Persian calendar was lunisolar, like that of the Babylonians, with twelve months of thirty days each; the days were numbered but not named (with the exception of the last day of the month, Jiyamna “the decreasing one(?)” in the expression *Jiyamnam patiy*, DB 2.62; Kent, *Old Persian*, pp. 122, 124). Only eight month names are mentioned in the Old Persian inscriptions (cf. Kent, *Old Persian*, pp. 128, 131; see also individual months): *Ādukanaiša* (Kent, *Old Persian*, p. 167; Brandenstein and Mayrhofer, p. 101, with refs.; Cornillot; lit. meaning and etymology uncertain), *Θūravāhara*, possibly “(month) of strong spring” (Kent, *Old Persian*, p. 188; cf. Brandenstein and Mayrhofer, p. 147), *Θāigraciš* “garlic-collecting month” (Kent, p. 187, with ref. to Justi), *Garmapada* “heat-station (month)” (Kent, *Old Persian*, p. 183), *Bāgayādiš*, probably “(month) of the worship of *baga* (i.e., *Miθra*)” (Kent, *Old Persian*, p. 199, and *bāgayādiš*), *Āçiyādiya* “(month) of the worship of the fire” (Kent, *Old Persian*, p. 166), *Anāmaka* “month of the nameless god(?)” (Kent, *Old Persian*, p. 167), and *Viyax(a)na* “digging-up



(month)” (Kent, *Old Persian*, p. 208). The Old Persian names of the remaining four are known in Elamite transcription, but only two—the eight and the eleventh—have received probable etymologies (for the remaining two see Hinz, pp. 68-69): *Vrkazana “(month) of wolf killing,” Elamite Mar-ka-ca-na° (DB 3.88; Kent, *Old Persian*, pp. 126, 128; Weissbach, 1911, pp. 56-57; cf. Brandenstein and Mayrhofer, p. 152; Hinz, p. 68), and *Ōwayauvā “the terrible one,” Elamite Samiyamaš/Samiyamantaš (Hinz, p. 69, comparing Av. *θβa-iiahuuant-* “terrible”; cf. the Ossetic name of January/February: “month of threat”). The absence of the three other names and uncertainty about the order of the months led H. C. Rawlinson, J. Oppert, G. F. Unger, F. Justi, J. Prášek, and J. Markwart to propose different sequences (cf. Ginzel, I, p. 296 table), which were shown to be incorrect after A. Poebel (1938, pp. 130-65, 285-314; 1939, pp. 121-45) was able to specify the three missing names from newly discovered Akkadian and Elamite sources. A list of Old Persian month names (only partial in Old Persian script but complete in Elamite script) is thus available for comparison with the lists in Elamite and Babylonian (see [Table 20](#)).

As E. J. Bickerman has shown, the Achaemenids used the lunisolar calendar at least until 459 B.C. Between 471 and 401 the Babylonian calendar was still used in Aramaic documents issued by the Persian administration (almost all found at the colony of Elephantine in Egypt). The testimony of Quintus Curtius Rufus (3.3.10) *Magos trecenti et sexaginta quinque iuvenes sequebantur puniceis amiculis velati, diebus totius anni pares numero; quippe Persis quoque in totidem dies descriptus est annus* (The magi were followed by three hundred and sixty-five young men clad in purple robes, equal in number to the days of a whole year; for the Persians also divided the year into that number of days), referring to the year 333 B.C., seems to indicate the existence of a somewhat later solar calendar, though opinions differ on this point (Bickerman, 1967, p. 205 n. 41).

Another problem is posed by the system of intercalation used in the Achaemenid calendar, for which no direct and explicit testimony survives. Hallock (1969, p. 74) maintains that the Old Persian calendar followed the same system of intercalation as the Babylonian calendar. Hartner’s interpretation differs: “The Old Persian and the Babylonian calendars will then have had different systems of intercalation. The latter we have seen operated with irregular, empirical Ulūlu and Addāru intercalations down to 527, then passed over to the octaëteris and finally, when in the 19th year of



Darius the beginning of the year coincided with spring equinox, to the 19-year cycle" (1985, p. 747).

BIBLIOGRAPHY

T. Benfey and M. A. Stem, *Ueber die Monatsnamen einiger alter Völker ...*, Berlin, 1836.

E. J. Bickerman, "The "Zoroastrian" Calendar," *Archív orientální* 35, 1967, pp. 197-207.

R. Borger, *Die Chronologie des Darius-Denkmal am Behistun-Felsen*, Göttingen, 1982.

Boyce, *Zoroastrianism* II, pp. 23-25.

W. Brandenstein and M. Mayrhofer, *Handbuch des Altpersischen*, Wiesbaden, 1964.

G. G. Cameron, *Persepolis Treasury Tablets*, Chicago, 1948.

F. Cornillot, "Le secret d'Adukanaiš," *IJJ* 24, 1982, pp. 205-13.

W. Eilers, *Der alte Name des persischen Neujahrfestes*, Abh. der Akademie der Wissenschaften und der Literatur in Mainz, Geistes- und sozialwissenschaftliche Klasse, Wiesbaden, 1953, no. 2.

R. Fruin, "Der Anfang des susischen Jahres I: Zur Zeit der elamitischen Könige; II: Zur Zeit der persischen Könige," *Acta Orientalia* 13, 1935, pp. 319-23.

I. Gershevitch, "No Old Persian spāθmāida," in *Studies in Diachronic, Synchronic, and Typological Linguistics. Festschrift for Oswald Szemerényi ...*, ed. B. Brogyanyi, I, Amsterdam, 1979, pp. 290-95.

F. K. Ginzel, *Handbuch der mathematischen und technischen Chronologie* I, Leipzig, 1906, pp. 275-98.



L. H. Gray, "Calendar (Persian)," in J. Hastings, ed., *Encyclopaedia of Religion and Ethics* III, Edinburgh, 1910, pp. 128-31.

Idem, "The Iranian Calendar," in *Zoroastrian Studies*, 2nd ed., New York, 1965, pp. 124-31.

R. T. Hallock, *Persepolis Fortification Tablets*, Chicago, 1969, pp. 74-75.

W. Hartner, "Old Iranian Calendars," in *Camb. Hist. Iran* II, 1985, pp. 714-92.

W. Hinz, *Neue Wege im Altpersischen*, Wiesbaden, 1973, pp. 64-70 (names of months).

S. H. Horn and L. H. Wood, "The Fifth-Century Jewish Calendar at Elephantine," *JNES* 13, 1954, pp. 1-20.

T. Hyde, *Veterum Persarum et Parthorum et Medorum Religionis Historia*, 2nd ed., Oxford, 1760.

F. Justi, "Die altpersischen Monate," *ZDMG* 51, 1897, pp. 233-51.

A. Kohut, "The Talmudic Records of Persian and Babylonian Festivals Critically Illustrated," *AJSLL* 14, 1897-98, pp. 183-94.

H. Lewy, "Le calendrier perse," *Orientalia*, 1941, pp. 1-64.

Th. Nöldeke, "Zur persischen Chronologie," *ZDMG* 50, 1896, p. 141.

J. Oppert, "Le calendrier perse," in *Actes du onzième Congrès International des Orientalistes* I, Paris, 1897, pp. 327-48.

Idem, "Der Kalender der alten Perser," *ZDMG* 52, 1898, pp. 259-70.

J. A. Paine, "The Eclipse of the 7th Year of Cambyses," *JAOS* 14, 1890, pp. xl-xliii.

A. Poebel, "The Names and the Order of the Old Persian and Elamite Months during the Achaemenid Period," *AJSLL* 55, 1938, pp. 130-41.

Idem, "Chronology of Darius' First Year of Reign," *AJSLL* 55, 1938, pp. 142-65, 285-314.

Idem, "The Duration of the Reign of Smerdis the Magian and the Reigns of Nebuchadnezzar III and Nebuchadnezzar IV," *AJSLL* 56, 1939, pp. 121-45.



Idem, "Critical Note. The King of the Persepolis Tablets the Nineteenth Year of Artaxerxes," *AJSLL* 61, 1939, pp. 301-04.

J. Prášek, "Die ersten Jahre Dareios' des Hystaspiden and der altpersische Kalender," *Beiträge zur alten Geschichte* I/1, Leipzig, 1901, pp. 26-50.

M. Sprengling, "Chronological Notes from the Aramaic Papyri. The Jewish Calendar. Dates of the Achaemenians (Cyrus-Darius IV)," *AJSLL* 27, 1910-1911, pp. 233-66.

S. H. Taqizadeh, "Sur le calendrier iranien," in *Atti del XIX Congresso Internazionale degli Orientalisti*, Rome, 1935, pp. 268-75.

Idem, *Gāhšomārī dar Īrān-e qadīm*, Tehran, 1316 Š./1937.

Idem, *Old Iranian Calendars*, London, 1938.

Idem, "The Old Iranian Calendars Again," in *Studies Presented to Vladimir Minorsky*, *BSOS* 14, 1952, pp. 603-11.

F. H. Tolman, "Ancient Persian Month Garmapada," *American Journal of Philology* 32, 1911, pp. 444-45.

F. H. Weissbach, "Über einige neuere Arbeiten zur babylonischen Chronologie," *ZDMG* 55, 1901, pp. 195-220.

Idem, "Zur Neubabylonischen und Achämenidischen Chronologie," *ZDMG* 62, 1908, pp. 629-47.

Idem, *Keilinschriften der Achämeniden*, Leipzig, 1911, p. lxxi.

The Seleucid and Parthian calendar systems. Alexander probably used the Macedonian calendar, but the Achaemenid system seems not to have been abolished. In the time of Seleucus I (321-281 B.C.) the Babylonian calendar was adopted, but the original names of the months were replaced by the Macedonian names, in which Nisannu corresponded to Artemisios and so on (cf. Bickerman, 1980, p. 20). The Arsacid kings followed the same practice, but it appears from material discovered at Nisa (2nd-1st century B.C.) and [Avroman](#) (1st cent. A.D.) that the Zoroastrian solar calendar (see below) was also used. The names of the months are shown in [Table 21](#). The names of the days are only partly attested (see Boyce, pp. 814-15). For dates in documents using the Seleucid calendar, see dating.



E. J. Bickerman, "Notes on Seleucid and Parthian Chronology," *Berytus* 7/2, 1944, pp. 73-83.

Idem, "The "Zoroastrian" Calendar," *Archív orientální* 35, 1967, pp. 197-207.
Idem, *Chronology of the Ancient World*, 2nd ed., London, 1980.

M. Boyce, "Iranian Festivals," in *Camb. Hist. Iran* III/2, pp. 792-815. I. M. D'yakonov and V. Livshits, *Dokumenty iz Nisy*, Moscow, 1960.

J. Harmatta, "Late Bactrian Inscriptions," *Acta Antiqua Academiae Scientiarum Hungaricae* 17, 1969, pp. 297-432.

J. Oppert, "L'éclipse lunaire de l'an 232 de l'ère des Arsacides (23 mars 24 a. J.-C.)," *ZA* 4, 1889, pp. 174-85.

R. Schmitt, "Zu den alten armenischen Monatsnamen," *Annual of Armenian Linguistics* 6, pp. 91-100.

The Zoroastrian calendar. Reconstruction of a calendrical tradition from before the time of Zoroaster is based on hypothetical derivations from Avestan texts and on comparison with the Vedic tradition (see Taqizadeh, 1938, pp. 10-11; Hartner, pp. 749-55). The precise differences between a supposed Old Avestan and a Later Avestan calendar seem ambiguous, however, given that both have been reconstructed on the basis of the same Avestan and Pahlavi sources. In Belardi's view (pp. 113-49) the earliest calendar may originally have been lunar and sidereal, consisting of thirteen months of twenty-seven days ($27.3 \times 13 = 354.9$ days), with Miθra at the midpoint of each. Traces of a synodical cycle have also been transmitted in the Avesta, however (cf. *Māh yašt* 2: "fifteen days the moon waxes, fifteen days the moon wanes"). Traces of an ancient lunar calendar also persisted in the Pahlavi texts (cf. Belardi, *passim*), especially the *Dēnkard* (bk. 3, ed. Madan, I, pp. 274-76; ed. Dresden, pp. 624-23; tr. Menasce, pp. 262-64), where there is a description of a lunar year used by Zoroastrians (cf. Harmer, 1985, pp. 778-79).

The Zoroastrian calendar consisted of twelve months of thirty days each (cf. *Y.* 16.3-6; see *Sī-rōzag xwurdag* and *Sī-rōzag wuzurg*, Dhabhar, pp. 175-81, 223-59; [Table 22](#), [Table 23](#)), Avestan sources give the names of all thirty days but of only seven of the twelve months (cf. Belardi, p. 77). That the names of the days are of Old Iranian origin and not merely Middle Iranian innovations may be



inferred from the fact that they are recorded in their correct Old Iranian genitive singular forms, governed by an understood “day of.” The internal structure of the months has been considered by different scholars to have been quadripartite (Nyberg, 1931, pp. 128-34) or bipartite (Lewy, p. 64 n. 2). Belardi (pp. 59-139) attempted to establish the central position of Miθra (the fourteenth of twenty-seven days was named Mihr).

This lunar calendar, with the addition of the epact in each year, became the Sasanian “civil” calendar. In a second calendar, the cumulative lag of an additional quarter-day per year was corrected, theoretically at least, by the intercalation of one month in every 120 years. According to Bīrūnī (*Āṭār*, p. 11; tr. Sachau, pp. 12-13; but see *Dēnkard*, bk. 3, ed. Madan, I, pp. 402-05; ed. Dresden, pp. 519-16; tr. Menasce, pp. 374-79), another system of intercalation was also used: insertion of one month in every 116 years in order to recover the quarter-days plus an additional one-fifth of an hour per year.

The date on which the intercalary calendar was introduced is a matter of debate. W. E. West put it in 505 B.C. (pp. xxvii-xxviii), Markwart lowered it to 493-90 (Marquart, p. 210 n. 1), and Taqizadeh proposed 441 (1938, pp. 36-37). All these hypotheses are based on the same assumptions about the way in which intercalations were performed in the 120-year system. The first intercalary month was supposed to have been inserted after the twelfth month of the 120th year and to have been given the same name as the first month of the year. The five Gathic days were then inserted after the extra month in order to avoid confusion. In this way the first month of the intercalated calendar corresponded to the second month of the civil calendar; after another 120 years the first month corresponded to the third month in the civil calendar and so on until the eighth addition, after which intercalation was no longer practiced. Multiplying the 120 years of the cycle by the number of intercalations made should thus yield the full number of years in which the calendar was in use, and simple subtraction should produce the date on which the calendar was introduced.

The sources are contradictory, however. The astronomer Abu'l-Ḥasan Kūšyār (fl. ca. 990/1000; Ger. tr., p. 291) reported that in the time of Kōsrow II (531-79) the sun entered Aries in Āḍar and the five epagomenal days were added at the end of Ābān (the eighth month and thus the eighth intercalation); then following the fall of the Sasanian empire intercalation was no longer practiced until it was reintroduced in 375 Yazdegerdī (a.d. 1006). Bīrūnī (*Āṭār*, p. 45; tr. Sachau, pp. 55-56), on the other hand, declared that in the time of Yazdegerd b.



Šāpūr (399-420) two extra months were inserted, one to correct the cumulative lag, the other to forestall future errors. On that occasion, too, the epagomenal days were added at the end of Ābān.

Taqizadeh (1938, pp. 36-37), relying on Bīrūnī, took the first year of the reign of Yazdegerd I as his point of reference and, multiplying 120 by 7 (the 8th intercalation being for the future), arrived at 441 B.C. for the date on which this system of intercalations was introduced. This and other solutions have been contradicted, however, by the documents assembled by Bickerman (1967, pp. 197-207); the earliest (aside from the Avesta) in which the use of the Zoroastrian calendar is attested is an ostrakon referring to the month Hrwt (Av. Haurvatātō) of the year 90 B.C. (see also Boyce, 1970).

More recently (1985, pp. 759-72) Hartner, noted that the shorter, 116-year cycle of intercalations would accord well (at the beginning dates) with the sidereal year (365.25636 days; multiplying Bīrūnī's figures yields 365.2586 days), and, from comparisons with later dates and with the Egyptian (Sōthic) calendar, arrived at the date 503 for the introduction of the Zoroastrian calendar. Nevertheless, the problem remains open (cf. Bickerman, 1983).

The late Avestan (probably Sasanian) text *Āfrīnagān gāhānbār* 3.2, 7-12, and Pahlavi texts mention six seasonal holidays (*gāhānbār*; see [Table 24](#)), the origins of which are problematic (Taqizadeh, 1939, pp. 6-12). Hartner (1985, pp. 749-56) maintains that they were fixed on the basis of observations at Persepolis of the acronical risings and cosmical settings (observable at sunset and sunrise respectively) of different stars in the late 6th century B.C. The intervals between the *gāhānbār* were sixty days from the first to the second, seventy-five from the second to the third, thirty from the third to the fourth, eighty from the fourth to the fifth, seventy-five from the fifth to the sixth, and forty-five from the sixth to the first (*Āfrīnagān* 3.7-13; cf. Bīrūnī, *Ātār*, pp. 215-33; tr. Sachau, pp. 199-219).

The five days of the epact took their names from the five Gathas, which have been transmitted with several variants in the Zoroastrian literature (cf. Belardi, pp. 77-81). Bīrūnī (*Ātār*, pp. 43-44; tr. Sachau, pp. 53-54) mentions six different sets of names for the epagomenal days. In the district of Natanz, among others, the epagomenal days are still inserted after the eleventh month, Bahman.

In addition to information on the standard Zoroastrian calendar and its variants, Bīrūnī (*Ātār*, p. 11; tr. Sachau, p. 13) reported that the so-called



“Pišdādian” kings of the Persians had calculated the length of the year as 360 days, with twelve months of thirty days each. Every six years an intercalary month was inserted and every 120 years two months, in the first instance to recover five days for each year (the uncomputed epagomenal days), in the second to recover the remaining quarter-days. It is doubtful, however, that such a calendar ever existed (Hartner, 1985, p. 750 n. 2; Belardi, p. 82).

J. S. Bailly, *Histoire de l'astronomie ancienne ...*, 2nd ed., Paris, 1781.

W. Belardi, *Studi Mithraici e Mazdei*, Rome, 1977.

E. J. Bickerman, “The “Zoroastrian” Calendar,” *Archív orientální* 35, 1967, pp. 197-207.

Idem, “Time-Reckoning,” in *Camb. Hist. Iran* III/2, pp. 778-91.

M. Boyce, “On the Calendar of the Zoroastrian Feasts,” *BSOAS* 33, 1970, pp. 513-39.

W. B. Henning, “An Astronomical Chapter of the Bundahishn,” *JRAS*, 1942, pp. 229-48.

K. R. Cama, “The Zoroastrian Calendar,” in *Spiegel Memorial Volume*, ed. J. J. Modi, Bombay, 1908, pp. 230-36.

Idem, “The Interval of Time between one Gahambar and Another,” in *Actes du 6e Congrès International des Orientalistes* III, Leiden, 1885, pp. 583-92.

E. Cavaignac, “Note on the Origin of the Zoroastrian Calendar (tr. H. D. Banaji),” *Journal of the K. R. Cama Oriental Institute* 22, 1932, pp. 1-6.

Idem, “Note sur l'origine du calendrier zoroastrien,” *JA* 202, 1923, pp. 106-10.

J. Darmesteter, *Le Zend-Avesta*, Paris, 1892; repr. 1960, I, pp. 33-41.

B. N. Dhabhar, ed., *Zand i Kūrtak Avistāk*, Bombay, 1927; Eng. tr. Bombay, 1963.

J. Duchesne-Guillemin, “Yasna 45 and the Iranian Calendar,” *BSOAS* 13, 1950, pp. 635-48.

N. Fréret, “De l'ancienne année des Parses,” in *Histoire de l'Académie Royale*



des Inscriptions et Belles Lettres 16, Paris, 1751, pp. 233-85; repr. in Fréret, *Œuvres complètes*, 4 vols., London, 1775.

W. Geiger, *Ostiranische Kultur im Altertum*, Erlangen, 1882, pp. 314-27.

I. Gershevitch, "No Old Persian *spāθmaida*," in *Studies in Diachronic, Synchronic, and Typological Linguistics. Festschrift for Oswald Szemerényi ...*, ed. B. Brogyanyi, I, Amsterdam, 1979, pp. 290-95.

J. B. Gibert, "Nouvelles observations sur l'année des anciens Perses," *Mémoires de l'Académie des Inscriptions et Belles Lettres* 31, 1768, p. 68.

F. K. Ginzel, *Handbuch der mathematischen und technischen Chronologie* I, Leipzig, 1906, pp. 275-309.

L. H. Gray, "Der iranische Kalender," in *Grundriss* II, pp. 675-78.

Idem, "Medieval Greek References to the Avestan Calendar," in *Avesta, Pahlavi and Ancient Persian Studies in Honour of ... P. B. Sanjana*, Strassburg, 1904, pp. 167-75.

A. von Gutschmid, "Über das iranische Jahr," in *Kleine Schriften* III: *Schriften zur Geschichte und Literatur der nichtsemitischen Völker von Asien*, Leipzig, 1892, pp. 209-15.

C. de Harlez, "Le calendrier persan et les pays originaires du zoroastrisme," *Bulletin de l'Athénée Orientale* 1881/2, pp. 79-97, 159-83.

Idem, *Le calendrier avestique et les pays originaire de l'Avesta*, Louvain, 1882.
W. Hartner, "Old Iranian Calendars," in *Camb. Hist. Iran* II, pp. 714-92.

Idem, "The Young Avestan and Babylonian Calendars and the Antecedents of Precession," *Journal for the History of Astronomy* 10, 1979, pp. 1-22.

M. N. Kuka, "The Antiquity of the Iranian Calendar and the Era of Zoroaster," *Journal of the South Indian Association*, 1913, pp. 1-25.

Abu'l-Ḥasan Kūšyār b. Labbān Jīlī, in L. Ideler, *Handbuch der mathematischen und technischen Chronologie* II, Berlin, 1825-26, pp. 547, 624; Ger. tr. in F. K. Ginzel, *Handbuch der mathematischen und technischen Chronologie* I, Leipzig, 1906, p. 291; Eng. tr. W. Hartner, "Old Iranian Calendars," in *Camb. Hist. Iran* II, p. 758.



- H. Lewy, "Le calendrier perse," *Orientalia*, N.S. 10, 1941, pp. 1-64.
- J. Markwart, *Untersuchungen zur Geschichte von Eran II*, Leipzig, 1905.
- D. N. MacKenzie, "Zoroastrian Astrology in the Bundahišn," *BSOAS* 27, 1964, pp. 351-529.
- N. P. Metha, "A Study of the Zoroastrian Calendar," *Journal of the Cama Oriental Institute* 34, 1940, pp. 1-36.
- J. D. Nadershah, "The Zoroastrian Months and Years with their Division in the Avestaic Age," in *The K. R. Cama Memorial Volume*, Bombay, 1900, pp. 244-73.
- H. S. Nyberg, "Questions de cosmogonie et de cosmologie mazdéennes," *JA* 219, 1931, pp. 1-134.
- Idem, "Texte zum mazdayasnischen Kalender," *Uppsala Universitets Årsskrift*, Uppsala, 1934.
- R. Roth, "Der Kalender des Avesta und die sogenannten Gahanbār," *ZDMG* 34, 1880, pp. 698-720.
- J. J. Scaliger, *Thesaurus Temporum*, Amsterdam, 1658.
- Idem, *De Emendatione Temporum*, Geneva, 1962.
- A. S. Shahbazi, "The 'Traditional Date of Zoroaster' Explained," *BSOAS* 40, 1977, pp. 25-35.
- W. E. West, *Pahlavi Texts V: Marvels of Zoroastrianism*, SBE 47, Oxford, 1880; repr. Delhi, 1965, 1977.

Calendars derived from the Zoroastrian calendar.

1. The Cappadocian calendar. That the Cappadocian solar calendar, with twelve months of 360 days plus five epagomenal days, was an imitation of the Zoroastrian calendar is especially clear from the names and order of the months. The names have been transmitted only in Greek characters, however (Nyberg, p. 479; see [Table 25](#)). According to Markwart's calculations (Markwart, p. 210), the Cappadocian calendar must have begun in 490 B.C.; Duchesne-Guillemin (1948, pp. 108-13) put the date between 490 and 480. Bickerman objected (p. 198) that its system was only a local form of the Julian calendar,



but the names of the months (which are in the genitive) are preserved in linguistic forms of an earlier period (Duchesne-Guillemin, loc. cit.; Belardi, p. 76).

This calendar is attested in the texts of the Greek astronomers (Lagarde, 1899, pp. 259-60) with a few variants in the spelling of the month names (see, e.g., *Hemerologium Florentinum* in Ginzel). It is not certain when it was introduced in Cappadocia, but it was in use before the Roman conquest, from the time of King Archelaos (34 B.C.-A.D. 17) until that of King Epiphanios (A.D. 400; Ginzel).

W. Belardi, *Studi Mithraici e Mazdei*, Rome, 1977.

F. J. Bickerman, "The "Zoroastrian" Calendar," *Archív orientální* 35, 1967, pp. 197-207.

J. Duchesne-Guillemin, *Zoroastre*, Paris, 1948, pp. 108-13.

Idem, *La religion de l'Iran ancien*, Paris, 1962.

K. F. Ginzel, "Kappadokischer Kalender," in Pauly-Wissowa, X/2, col. 1917.

K. Hannel, "Das Menologium des Liber glossarum," *Bulletin de la Société des Lettres de Lund*, 1931-32, pp. 7-38.

P. de Lagarde, *Gesammelte Abhandlungen*, Leipzig, 1866.

J. Marquart, *Untersuchungen zur Geschichte von Eran II*, Leipzig, 1905.

J. H. Moulton, *Early Zoroastrianism. Lectures ...*, London, 1913; repr. London, 1926, pp. 33, 103-07, 430-37.

H. S. Nyberg, *Die Religionen des alten Iran*, tr. H. H. Schaeder, Leipzig, 1938, p. 479.

2. The Armenian calendar. The Armenian calendar also has twelve months of thirty days each plus five epagomenal days (*aweleac*). The names and order of the months are given in [Table 26](#). At least four of the twelve month names are clearly of Iranian origin: Nawasard-i "month of the new year" from **naṣa-sarda*; *Trē*, obviously derived from Middle Persian *tīr*; *Mehekan-i* "month of Mithra" from **Miθrakāna*-, probably via Parthian **Mihrakān* (cf. Gr.



Midrákana, MPers. *Mihragān*); *Ahekan-i* “month of the fire” from **Aθrakāna*. All twelve month names are in the genitive form, originally governed by *amis* “months of ...” (cf. Schmitt, pp. 91-100). In a.d. 1084 this calendar ceased to be used when John the Deacon adopted the Julian calendar.

H. S. Badalyan, *Ōrac'uyč'i patmuṭyun* (=G. S. Badalyan, *Istoriya kalendarya*), Erevan, 1970.

V. Bânâteanu, “Le calendrier arménien et les anciens noms des mois,” *Studia et Acta Orientalia* 10, 1980, pp. 33-46.

E. Dulaurier, *Recherches sur la chronologie arménienne. Technique et historique I: Chronologie technique*, Paris, 1859.

N. Fréret, “De l’année arménienne, ou suite des observations sur l’année vague des Perses,” *Mémoires de l’Académie des Inscriptions et Belles Lettres* 19, 1953, pp. 95-114.

F. K. Ginzel, *Handbuch der mathematischen und technischen Chronologie* III, Leipzig, 1914, pp. 314-21.

L. H. Gray, “On Certain Persian and Armenian Month-Names as Influenced by the Avesta Calendar,” *JAOS* 28, 1907, pp. 331-34.

V. Grumel, *La chronologie*, Paris, 1958.

F. Macler, “Calendar (Armenian),” in J. Hastings, ed., *Encyclopaedia of Religion and Ethics* III, Edinburgh, 1910, pp. 70-73.

J. Marquart, *Untersuchungen zur Geschichte von Eran* II, Leipzig, 1905.

A. K. Sanjian, *Colophons of Armenian Manuscripts, 1301-1480. A Source for Middle Eastern History*, Cambridge, Mass., 1969.

R. Schmitt, “Zu den alten armenischen Monatsnamen,” *Annual of Armenian Linguistics* 6, 1985, pp. 91-100.

B. E. Tumanian, “Measurement of Time in Ancient and Medieval Armenia,” *Journal for the History of Astronomy* 5, 1974, pp. 91-98.

3. The Sogdian calendar. The Sogdian calendar, which was described by Bīrūnī (*Ātār*, pp. 45-47; tr. Sachau, pp. 56-57), is better known today, owing to the



discovery and decipherment of original Sogdian sources (cf. Henning, 1939, pp. 87-95). It consisted of twelve months of thirty days each. The names of the days correspond closely to those of the Zoroastrian calendar (Table 27), while those of the months did not. According to Bīrūnī, the five epagomenal days were added at the end of the year, rather than at the end of Ābān, which resulted in some disjunctions between the two calendars. The order of the months is given in Table 28 according to the documents from Mount Mug, the Manichean texts, and Bīrūnī. According to the Sogdian text M 18400, the year was divided into three seasons of four months each (Kudara and Sundermann, p. 340).

In Manichean texts we also find a system of seven weekdays (Table 29), called by their Middle Persian names: *šmbyd*, *ʾyw-šmbyd* (or *i-šmbyd*), ... *pṇč-šmbyd*, *ʾyng* (Henning, 1945, e.g. pp. 149ff., where both systems are used; also attested in a Chinese text, Pelliot, 1913, pp. 162-65, 176) or by the names of the seven “planets” (Müller, p. 458). It is possible that this planetary week was diffused by the Nestorian and Manichean communities in Central Asia and from them found their way to China, where they are attested in Chinese astrological texts, in which they are attributed to Mani (Pelliot, 1913, pp. 161-77). See also Henning, loc. cit.; Belardi, pp. 65, 80-81; and Boyce, pp. 814-15.

M. Boyce, “Iranian Festivals,” in *Camb. Hist. Iran* III/2, pp. 792-815.

É. Chavannes and P. Pelliot, eds., “Un traité manichéen retrouvé en Chine,” *JA*, 10th ser., 18, 1911, pp. 191-201; 11th ser., 1, 1913, pp. 99-199, 261-394, esp. pp. 167-77.

M. J. Dresden apud M. Boyce, “Iranian Festivals,” in *Camb. Hist. Iran* III/2, pp. 814-15.

A. A. Freiman, *Datirovannye sogdiiskie dokumenty s gory Mug v Tadzikistane*, Leningrad, 1936; repr. in his *Sogdiiskie dokumenty s gory Mug I: Opisanie, publikatsii i issledovanie dokumentov s gory Mug*, Moscow, 1962, pp. 27-45.

Idem, “Sogdiiskiĭ rukopisnyiĭ dokument astrologicheskogo soderzhaniya (kalendar’),” *VDI*, 1938, 2/3, pp. 34-49; repr. in *Sogdiiskie dokumenty ...*, pp. 46-60.

W. B. Henning, “Zum soghdischen Kalender,” *Orientalia*, 1939, pp. 87-95 (*Selected Papers* I, Acta Iranica 5, Tehran and Liège, 1977, pp. 629-37).



Idem, "The Manichaean Fasts," *JRAS*, 1945, pp. 146-64 (*Selected Papers II*, *Acta Iranica* 6, pp. 205-23).

K. Kudara and W. Sundermann, "Zwei Fragmente einer Sammelhandschrift buddhistischer Sūtras in soghdischer Sprache," *AoF* 14, 1987, pp. 334-49.

F. W. K. Müller, "Die "persischen" Kalenderausdrücke im chinesischen Tripitaka," *SPAW*, 1907, pp. 458-65.

R. Schmitt, "Zu den alten armenischen Monatsnamen," *Annual of Armenian Linguistics* 6, 1985, pp. 91-100.

K. Usman, "Un calendario sogdiano della scuola di Ulug Beg," in *VII Centenario della nascita di Marco Polo*, Venice, 1955, pp. 319-25.

4. The Choresmian calendar. This calendar consists of twelve months of thirty days each with the epagomenal days inserted after the last month. According to Bīrūnī (*Āṭār*, pp. 47-49; tr. pp. 57-58), the five days of the epact were not individually named. The names of the months are given in [Table 30](#) in the forms found on the ossuary of Tok-kala (a.d. 8th century; for a comparison of these names with those given by Bīrūnī, see Livshits, 1968, pp. 444-46; for the names of the days, see Livshits, loc. cit., and Boyce, pp. 814-15; for the Choresmian *gāhānbār*, see Bīrūnī, *Āṭār*, pp. 236-38; tr., pp. 223-26; Henning, 1953, passim; and for the reform of the Choresmian calendar, see Bīrūnī, *Āṭār*, pp. 241-42; tr., pp. 229-30).

M. Boyce, "Iranian Festivals," in *Camb. Hist. Iran* III/2, pp. 792-815.

Henning, "Mitteliranisch," pp. 20-116 (see also pp. 56-58, 109-20).

Idem, *A Fragment of a Khwarezmian Dictionary*, ed. D. N. MacKenzie, London, 1971.

V. A. Livshits, "Khorezmiiskii kalendar' i èry drevnego Khorezma," in *Istoriya, kul'tura, yazyki narodov Vostoka*, Moscow, 1970, pp. 5-16; Eng. tr. "The Khwarezmian Calendar and the Eras of Ancient Chorasmia," *Acta Antiqua Academiae Scientiarum Hungaricae* 16, 1968, pp. 433-46.

5. The calendar of Sīstān. Thanks to Bīrūnī (*Āṭār*, p. 42; tr., pp. 52-53), the structure of the calendar of Sīstān has been recorded; it consisted of twelve months of thirty days each plus five epagomenal days inserted according to



the Persian custom (Taqizadeh, 1938, p. 2 n. 2). The names of the months are given in [Table 31](#), though the spelling is uncertain. The names of the days are unknown.

Duodecennial calendars.

1. The Khotanese calendar. The names of the months are known from private and official letters, reports, and receipts, as well as from medical texts translated from Sanskrit or Tibetan (especially Ravigupta's *Siddhasāra* "The perfect selection" and the *Suvarṇabhāsasūtra* "Sutra of golden light"). In the medical texts translated from Sanskrit two divisions of the year are recorded, one of four seasons (summer, autumn, winter, spring) of three months each, and one of six seasons of two months each (see [Table 32](#)). In a passage of the *Siddhasāra* that is not translated from the Sanskrit or Tibetan, the seasons in the sixfold division are counted from the middle rather than the beginning of the first month. Since only the four seasons have special names in Khotanese, this may be the indigenous division; the exact distribution of the months in this division, however, is not known. In the *Book of Zambasta* a somewhat different four-part division is found (names of months are in Khotanese, of seasons in Sanskrit); the winter season (*hemanta*) goes from the middle of the fourth month to the middle of the eighth (= four months), then summer (*grīṣma*) to the middle of the twelfth (= four months), then the rainy season (*varṣa*) to the middle of the first (= one month), and finally the long rainy season (*dīrgha-varṣa*) to the middle of the fourth month (= three months). The various divisions no doubt reflect the differences between the actual seasons of India and Khotan. (For editions of the private and official documents see especially Bailey, 1961; 1968. For the Sanskrit and Tibetan text of *Siddhasāra* 1.4, see Emmerick, 1981, p. 17, 1982, pp. 14-15; for the Khotanese text see Bailey, 1969, p. 6. For the chapter on healing from the *Suvarṇabhāsasūtra*, see Skjærvø, pp. 454-57, with references. For the *Book of Zambasta*, see Emmerick, 1968, pp. 260-61. See also Bailey, 1937.) The origin of the month names is still conjectural (Bailey, 1982, p. 30).

The years are named according to the central Asian animal cycle, in which one animal presides over one year in the twelve-year cycle, which is then repeated ([Table 33](#)), and are also numbered according to the regnal year of the ruling king. In the view of L. Bazin (p. 355), the Khotanese animal cycle must have been of Chinese origin, but sinologists are still debating this question (Needham, pp. 405-06). A complete list of the animal years in Khotanese is found in the text edited by Bailey (1937, pp. 924-30) in which it is explained



how a man's destiny is linked to the year of his birth. For the identification of years by regnal years, see, e.g., Bailey, 1937, pp. 933-36, and dating. The day was divided into twelve double hours, each governed by one of the twelve animals of the animal cycle (Bailey, 1937, p. 924).

H. W. Bailey, "Hvatanica (I)," *BSO(A)S* 4, 1937, pp. 923-36; repr. in Bailey, *Opera Minora* I, Shiraz, 1981, pp. 336-50.

Idem, *Khotanese Texts* IV, Cambridge, 1961, p. 11.

Idem, *Khotanese Texts* I-III, Cambridge, 1969.

Idem, *Saka Documents. Text Volume*, Corp. Inscr. Iran. II/V, London, 1968.

Idem, *The Culture of the Sakas in Ancient Iranian Khotan*, New York, 1982, pp. 29-31, 41.

L. Bazin, "Histoire et philologie turque," *Annuaire de l'École pratique des hautes études*, 4th sec., 1973, pp. 353-56.

R. E. Emmerick, *The Book of Zambasta. A Khotanese Poem on Buddhism*, London, 1968.

Idem, *The Siddhasāra of Ravigupta*, Verzeichnis der orientalischen Handschriften in Deutschland, Suppl. 23, 1-2, Wiesbaden, I: *The Sanskrit Text*, 1980; II: *The Tibetan Version with Facing English Translation*, 1982.

S. Konow, "The Calendar," *Acta Orientalia* 20, 1948, pp. 293-94.

Idem, "The Dates in Saka Texts from Khotan and Tun-huang," *Acta Orientalia* 7, 1928, pp. 66-76.

H. Lüders, "Zur Geschichte des ostasiatischen Tierkreises," *SPAW*, 1933, pp. 1-27.

J. Needham, *Science and Civilisation in China* III: *Mathematics and the Sciences of the Heavens and the Earth*, Cambridge, 1959.

P. O. Skjærvø, "The Old Khotanese Fragment H 147 NS 115 and Remarks on Old Khotanese *haṃdrāvāto*, *patīśu*, *vya* and *ya*," *BSOAS* 44/3, 1981, pp. 453-67.

2. The calendar of Tumšuq. The months of the calendar of Tumšuq were



named by number or name. Only three names are known, all from private letters (genitive singular or adjectival forms): Ahverjane (cf. Man. So. Xwrjnyc), (perhaps) Buzadine, Tsvižānañye. The years are named according to the animal cycle and by regnal year of the ruling king.

W. B. Henning, "Neue Materialien zur Geschichte des Manichäismus," *ZDMG* 90, 1936, pp. 1-18 (esp. pp. 11-14).

S. Konow, "Ein neuer Saka-Dialekt," *SPAW*, phil.-hist. Kl., 1935, 20, pp. 772-823.

Idem, "The Oldest Dialect of Khotanese Saka," *NTS* 14, 1947, pp. 156-90.