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TECHNICAL CHRONOLOGY AND ASTROLOGICAL HISTORY IN VARRO, CENSORINUS AND OTHERS

Technical chronology establishes the structure of calendars and the dates of events; it is, as it were, the foundation of history, particularly ancient history. The chronologer must know enough philology to interpret texts and enough astronomy to compute the dates of celestial phenomena, above all eclipses, which alone provide absolute dates. Joseph Scaliger, so we are told, was the first to master and apply this range of technical skills:

> Of the mathematical principles on which the calculation of periods rests, the philologians understood nothing. The astronomers, on their side, had not yet undertaken to apply their data to the records of ancient times. Scaliger was the first of the philologians who made use of the improved astronomy of the sixteenth century to get a scientific basis for historical chronology.[1]

So Mark Pattison.

This verdict can be challenged on a number of grounds. The one relevant at present is simple: Scaliger himself claimed far less. He certainly said that technical chronology had been untouched in modern times – not an entirely fair judgement – but in antiquity it had been practised in exactly the manner he considered proper, or so he believed. In particular he singles out Censorinus, whose *De die natali* drew extensively on Varro's lost *Antiquitates rerum humanarum*, books 14–19, for information on chronology.

Students of Varro have long appreciated the importance of Censorinus. His dry and compact treatise offers Varronian views on etymology, the human life-span, and the course of history itself, all couched in language so jejune as to suggest that he added little or nothing to what he read.[2] Perhaps the most important passage for the study of chronology is chapter 21, in which Censorinus states the year in which he writes, *cuius velut index et titulus quidam est V. C. Pii et Pontiani consulatus*, in a number of different epochs.[3] The list is as follows with the Julian dates of the years to which they apply:

Olympiad 1014 (254, 2)	summer 238–summer 239
A.U.C. 991	21 Apr. 238–20 Apr. 239
Nabonassar 986	25 June 238–24 June 239
Philip (Alexander) 562	25 June 238–24 June 239
Caesar 283	1 Jan. 238–31 Dec. 238
Augustus (Alexandrian) 267	29 Aug. 237–28 Aug. 238
Augustus (Julian) 265	1 Jan. 238–31 Dec. 238.[4]

Censorinus is the principal source for the Varronian era *ab urbe condita*, corresponding to 21 April 753 B.C., a subject to which we shall return, and it is also generally assumed that Varro was his source for the Olympiad, the epoch of which is 776 B.C., in the summer. However, the epochs of the Egyptian calendar, Nabonassar

[1] M. Pattison, *Essays* (1909) 1, 131.

[2] See, e.g., Censorinus, *Le jour natal*, tr. G. Rocca-Serra (1980), v–xi.

[3] Here and elsewhere we use the edition by N. Sallmann (1983).

[4] This list implies that Censorinus drafted at least the chronological sections of his work between 25 June and 28 August 238. The point is not new – see W. Kubitschek in P.-W. s.v. Aera – but deserves repetition, as most recent writers have not fully understood it. Sallmann, for example, infers that the *terminus ante quem* is 21 July 238 (*Hermes*, 111, 1983, 235 n. 9).

and Philip or the Death of Alexander, have not been recognised as being transmitted by Varro. Here is Censorinus' account:

nam ut a nostris ita ab Aegyptiis quidam anni in litteras relati sunt, ut quos *Ναβονναζάρου* nominant, quod a primo imperii eius anno consurgunt, quorum hic nongentesimus octogensimus sextus est; item Philippi, qui ab excessu Alexandri Magni numerantur et ad hunc usque perducti annos DLXII consummant. sed horum initia semper a primo die mensis eius sumuntur, cui apud Aegyptios nomen est Thouth, quique hoc anno fuit ante diem VII kal. Iul., cum abhinc annos centum imperatore Antonino Pio II Bruttio Praesente Romae consulibus idem dies fuerit ante diem XIII (MSS: XII) kal. Aug., quo tempore solet canicula in Aegypto facere exortum (21.9–10).[5]

The years of Era Nabonassar, 26 February 747 B.C., and Era Philip, 12 November 324 B.C., are Egyptian years of 365 days without intercalation, and what is unusual about the appearance of these eras in Censorinus is that they are otherwise known only from astronomical sources beginning with Ptolemy and from Ptolemy's *Royal Canon*, a list of regnal years of kings in Egyptian years that appears to have been compiled in that form specifically for astronomical purposes.[6] Egyptian years, precisely because of their lack of intercalation, are most suitable for astronomical calculation since they provide the equivalent of a direct day count. Ptolemy regularly uses them in the *Almagest*, the *Handy Tables* are arranged for Egyptian years, and earlier astronomical tables on papyri are often computed for Egyptian years, although not using Era Nabonassar or Era Philip. Ptolemy explains in *Almagest* 3.7 that he uses Era Nabonassar because he has observations, of eclipses observed in Babylon, as far back as Nabonassar's reign, and the era seems to have been of significance only in an astronomical context.[7] It is most unlikely that Censorinus ever saw the *Almagest* or the *Handy Tables*, and it is even more unlikely that he could make much sense of them if he did. His introductory sentence, at once vague and abrupt, shows no awareness of the special place of Era Nabonassar and Egyptian years in astronomy. Hence it seems likeliest that he learned of them from an earlier non-astronomical work now lost. Since he gives Egyptian dates for A.D. 238 and for the rising of Sirius in A.D. 139, it has been assumed that this source was more or less recent.[8] But there is evidence that Varro had already reported Egyptian dates, precisely in the course of applying astronomical calculations to chronological problems.

At the beginning of 21 Censorinus expounds Varro's threefold division of history into *ἄδηλον*, *μυθικόν*, and *ἱστορικόν*. He readily admits the fabulous and confused character of the first two periods, and recites the varied opinions of Sosibius, Eratosthenes, and others about the duration of the second. For the third, however, he offers firm chronological information, and he explains how this is possible:

[5] The correction of the text from XII kal. Aug. to XIII was made by Scaliger, *Opus novum de emendatione temporum* (1583), 138 (ed. 1629, 490 CD).

[6] A late, non-astronomical work that uses the era of Nabonassar for chronological purposes is the detailed introduction to Ptolemy's *Royal Canon* in Syncellus, *Chronographia* 388–90 Dindorf. This presumably goes back to Panodorus, who was in turn using Theon's recension of Ptolemy's *Handy Tables*. See H. Gelzer, *Sextus Julius Africanus und die Byzantinische Chronographie* 2.1 (1885), 215–16. The importance – and uniqueness – of its occurrence in Censorinus 21 are well discussed by L. Ideler, *Handbuch der mathematischen und technischen Chronologie* (1825–6), 1, 107–8.

[7] See the recent discussion by G. J. Toomer, *Ptolemy's Almagest* (1984), 10–11.

[8] See, e.g., M. Schanz, 'Suetons Pratum', *Hermes* 30 (1895), 425–6; A. Hahn, *De Censorini fontibus* (1905), 46; Rocca-Serra (n. 2 above), 59. It is not included in Peter's collection of fragments and is not discussed in F. Franceschi, 'Censorino e Varrone', *Aevum* 28 (1954), 393–418.

De tertio autem tempore fuit quidem aliqua inter auctores dissensio in sex septemve tantum modo annis versata. sed hoc quodcumque caliginis Varro discussit, et pro cetera sua sagacitate *nunc diversarum civitatium conferens tempora, nunc defectus eorumque intervalla retro dinumerans* eruit verum lucemque ostendit, per quam numerus certus non annorum modo, sed et dierum perspici possit (21.4–5).

The crucial phrases are printed in italics. Varro obtained his dates for the 'historic' period by collating the *tempora* of different states and computing back through intervals between eclipses; he thus attained an accuracy not merely of years but of days. Censorinus makes clear that he follows Varro's reckoning in his list of concordances.[9] Thus his chief source used astronomical techniques for dating and studied the chronological records of (evidently) more than two states; in the context of 21, Censorinus can only have in mind Greece, Rome and Egypt.[10]

This account is frustratingly concise. But a curious passage in Plutarch, *Romulus* 12, usually considered in discussions of the date of the foundation of Rome, shows exactly how the use of eclipse records and that of the Egyptian calendar were connected in Varro's work. Plutarch explains that by tradition the city was founded on the festival of the Parilia, 21 April.[11] He also reports a further tradition that Rome was founded by Romulus on the thirtieth of the (lunar) month, at a conjunction of the sun and moon in which there was an eclipse, thought to be the one seen by Antimachus the epic poet of Teos in Olympiad 6.3. This would presumably be 21 April 753 B.C., but in fact no solar eclipse was visible in Rome, or in the Mediterranean, within several years of this date. The origin of this tradition is not clear, and it is not strictly Varronian, even though the year of the foundation agrees with Varro.[12]

So far Varro has not been mentioned. Plutarch then relates that Varro asked one Tarutius, L. Tarutius of Firmum, a philosopher and 'mathematician', to determine the day and hour of Romulus' birth, which he did astrologically. In fact, he did a good deal more, determining no fewer than three dates, the conception of Romulus, the birth of Romulus, and the foundation of Rome. For the last, he cast a horoscope, of which Cicero, who claimed Tarutius for a friend, did not think highly:

L. quidem Tarutius Firmanus, familiaris noster, in primis Chaldaicis rationibus eruditus, urbis etiam nostrae natalem diem repetebat ab iis Parilibus, quibus eam a Romulo conditam accepimus, Romamque, in iugo cum esset luna, natam esse dicebat, nec eius fata canere dubitabat. O vim maximam erroris! Etiamne urbis natalis dies ad vim stellarum et lunae pertinebat? (*De Divinatione* 2.98–9)

All three dates are given by Plutarch in the Egyptian calendar, and we shall show that Tarutius arrived at them using astronomical tables of various sorts that must have been arranged for the Egyptian calendar. Cicero's statement that in the horoscope the moon was in Libra is correct, but we shall see that the horoscope was not cast for the Parilia, although it was later adjusted, unsuccessfully, as though it were.

[9] 21.6: 'secundum quam (= Varro's) rationem nisi fallor hic annus...ab olympiade prima millensimus est et quartus decimus...'

[10] The word *diversarum* in 21.5 is too strong to refer merely to the synchronisation of Olympiads with years A.U.C. The *diversae civitates* (so MSS; text *diverse*) of 19.4–6 include the Egyptians, Arcadians, Carians, and Acarnanians; cf. 21.12: 'cum...conditorum voluntates non minus diversae sint quam opiniones philosophorum'. But of the eras that follow the founding of Rome and the beginning of the Olympics, only those of Nabonassar and Philip are likely to come from Varro.

[11] He gives the Roman date XI kal. Mai.

[12] In what follows, we are not concerned with the correct date of the foundation of Rome or the multifarious scholarly traditions about it. For a detailed discussion see O. Leuze, *Die römische Jahrzählung* (1909). The best-known dates are

21 April Ol. 6.3 (753 B.C.) – Varro

21 April Ol. 6.4 (752 B.C.) – Dionysius of Halicarnassus 1.75.

Tarutius first determined that Romulus was conceived on 23 Choiak of Olympiad 2.1 at the third hour of the day during a total solar eclipse. This date corresponds to 24 June 772 B.C., and while it is the date of an ecliptic conjunction (Oppolzer 1022), no eclipse was visible in Rome or anywhere else.[13] Plutarch says that Tarutius arrived at this date by investigating all the events of Romulus' life and the circumstances of his death. Now, it is evident that Tarutius could not have computed the date of a recorded eclipse because no eclipse could have been observed and recorded. What he did was to find the date of a conjunction of the sun and moon about eighteen years before the traditional date of the foundation of Rome at which the moon was fairly close to the node so that an eclipse was possible. He then assumed, mistakenly, that a total eclipse had actually occurred. Tarutius made this mistake because he evidently could not determine the lunar parallax, which is crucial to the computation of a solar eclipse – since the parallax can amount to as much as twice the diameter of the sun[14] – for a computation of the parallax would allow the eclipse to be excluded. None the less, this assumed eclipse was taken as the omen of Romulus' conception, and exactly fixed its date and time.

Tarutius could have determined the date in various ways. One would be to count back by periods of 223 synodic months (6,585⅓ days) from an observed and dated solar eclipse. This would be what Censorinus calls *defectus eorumque intervalla retro dinumerans*, and while it could indeed locate an ecliptic conjunction, it could not show whether an eclipse was visible at a given location. Another possibility is that Tarutius had tables of ecliptic syzygies, conjunctions and oppositions at which the moon was close enough to a node for an eclipse to be possible. Such tabulations of eclipse possibilities are standard in Babylonian ephemerides, and a list of lunar eclipses from 85 B.C. to 74 B.C. is known in a Demotic papyrus doubtless based upon Greek prototypes.[15] Such tables are based upon the principle that solar eclipses are possible at intervals of six, sometimes five or seven, synodic months, and sometimes even one month apart. These one-month pairs will be at most very slight eclipses only visible from widely separated locations on opposite sides of the equator. In fact, the eclipse of 24 June 772 B.C. can be paired with another of 26 May (Oppolzer 1021), equally insignificant and invisible, and, as is characteristic of such pairs, a total lunar eclipse occurs in the middle of the month at the full moon of 10 June (Oppolzer 664). These eclipse intervals are demonstrated by Ptolemy in *Almagest* 6.6, and according to Pliny *N.H.* 2.57 were already shown by Hipparchus.[16] Within the context of discussing eclipses, Pliny 2.53 also mentions that Hipparchus predicted the motion of the sun and moon for 600 years (*utriusque sideris cursum in sexcentos annos praececinit Hipparchus*), and this admittedly vague statement could refer to a list of syzygies at which eclipses were possible. In any case, there is sufficient evidence that by the time of Tarutius methods were available for finding ecliptic syzygies, although not computing the circumstances of solar eclipses in the (essentially modern) method given by Ptolemy.

[13] On the eclipse see F. K. Ginzel, 'Finsterniss-Canon für das Untersuchungsgebiet der römischen Chronologie', *SB Berlin* (1887), 1122–3. Oppolzer numbers for eclipses come from Th. v. Oppolzer, 'Canon der Finsternisse', *Denkschr. Akad. Wien*, Math.-naturwiss. Kl. 52 (1887). The time of the conjunction in Oppolzer is about 9.40 a.m. at Rome, a bit late for the third hour of the day if it begins at sunrise, as is conventional in the Egyptian calendar.

[14] See esp. *Almagest* 4.1, 6.10.

[15] O. Neugebauer, *A History of Ancient Mathematical Astronomy* (1975), 521–8; R. A. Parker and O. Neugebauer, 'A Demotic lunar eclipse text of the First Century B.C.', *Proc. Am. Phil. Soc.* 125 (1981) 312–27.

[16] See Toomer (n. 7 above), 287 ff.; Neugebauer (n. 15 above), 129 ff.

Plutarch then reports that Tarutius placed the birth of Romulus on (the following) 21 Thoth at sunrise, which corresponds to 24 March 771 B.C. This date is also astrologically determined, for the birth on 21 Thoth follows the conception on 23 Choiak by 273 days, less about three hours, and 273 days is the canonical astrological value for the length of a normal nine-month pregnancy. It is derived from taking the pregnancy as lasting for ten *sidereal* months of $27\frac{1}{3}$ days, which are equal to $273\frac{1}{3}$ days and usually rounded to 273 days. The value, in either months or days, is found in a number of ancient sources, including Virgil *Eclogue* 4.61 (*matri longa decem tulerunt fastidia menses*). The rule is usually applied to go from a known date of birth to a presumed date of conception, but Tarutius must have begun with the date of conception, indicated by the solar eclipse, and computed forward to the date of birth. Since the time of birth is given as sunrise, the interval falls about three hours short of 273 days. Perhaps Tarutius was less interested in the precise length of the interval than in the dramatic appropriateness of having Romulus conceived in the darkness caused by an eclipse and born as the sun rose.[17]

Finally, Plutarch reports that Tarutius set the founding of Rome on 9 Pharmouthi, presumably in Olympiad 6.3, between the second and third hour, that is, after sunrise. This corresponds to 4 October 754 B.C., but the date has occasioned much confusion, and has frequently been regarded as an error, since it does not coincide with the Parilia on 21 April. However, it is not an error, and was not intended to coincide with the Parilia, for it is the correct date of the horoscope of Rome cast by Tarutius. This is not given by Plutarch, but exists in two different versions, one in Solinus *Collectanea rerum memorabilium* 1.18 and in the Planudean recension of John Lydus *De mensibus* 1.14, and the other in the Barberini recension of Lydus. In both cases the date is given as the Parilia,[18] but this is simply an error antedating both Solinus and Lydus, for the horoscope fits 4 October 754 B.C. very well indeed, although the position of the sun was crudely adjusted to fit the date in the spring.

Solinus' account is as follows:

ibi Romulus mansitavit, qui auspicato murorum fundamenta iecit duodeviginti natus annos, XI k. Mai., hora post secundam ante tertiam plenam, sicut L. Tarruntius prodidit mathematicorum nobilissimus, Iove in piscibus, Saturno Venere Marte Mercurio in scorpione, Sole in tauro, Luna in libra constitutis. (1.18, ed. Mommsen, 5.21–6.1)

Note that the time of day agrees with Plutarch, and the moon in Libra with Cicero. The following table gives the positions in Solinus and the Planudean recension of Lydus, marked S-P, the Barberini recension, marked B, and a modern computation for 4 October 754 B.C. 8 a.m. at Rome, a fair approximation to 'between the second and third hour'.[19]

Planet	S-P	B	Modern	Planet	S-P	B	Modern
Saturn	♏	♎	♏ 4°	Mercury	♏	♈	♓ 26°
Jupiter	♓	♌	♓ 17°	Sun	♉	♉	♎ 3°
Mars	♏	♎	♎ 17°	Moon	♎	♓	♎ 26°
Venus	♏	♉	♏ 2°				

[17] On the 273-day interval see O. Neugebauer, 'Decem tulerunt fastidia menses', *AJP* 84 (1963), 64–5 = Neugebauer, *Astronomy and History* (1983), 358–9; Neugebauer (n. 15 above), 1036.

[18] Note that Cicero seems to make the same error in *De divinatione*, not long after Tarutius cast Rome's nativity.

[19] Using H. Hunger and R. Dvorak, 'Ephemeriden von Sonne, Mond und hellen Planeten von −1000 bis −601', *Denkschr. Akad. Wien*, Phil.-hist. Kl. 155 (1981), which make the dating of the horoscope a simple matter. The positions according to Lydus are from the edn. by R. Wuensch (1898), 8, 5–14.

The agreement of S-P and the modern computation is excellent for Saturn, Jupiter, Venus, and the moon. Mars is off by about half a sign, and will reach Scorpio about 21 October, Mercury is in error by two signs, reaching Scorpio about 25 October. We have no explanation for these errors except to remark that they are of the order commonly found in early horoscopes. The sun, however, is completely wrong, and it appears plausible that in an early copy of the horoscope, already before Solinus (*c.* A.D. 200), the sun was moved from Libra to Taurus to fit the Parilia in April, and this change was made in ignorance of the fact that Mercury and Venus must be within one or two signs of the sun.

A nice confirmation that the sun should be in Libra comes from Manilius 4.773–7:

> Hesperiam sua Libra tenet, qua condita Roma
> orbis et inperium retinet discrimina rerum
> lancibus et positas gentes tollitque premitque,
> qua genitus Caesar melius nunc condidit urbem
> et propriis frenat pendentem nutibus orbem.

773, explained by Housman and Goold as a reference to the moon's presence in Libra in Tarutius' horoscope of Rome, makes even better sense as a reference to sun and moon together. It is tempting to speculate that two versions of the horoscope were in circulation from a very early date: the accurate one used by Plutarch and Manilius and the one wrongly adjusted to the Parilia used by Solinus and Lydus (and, perhaps, by Cicero before them). Unfortunately, the evidence is too scanty to support clear conclusions, and the mere fact that Cicero had connected Tarutius' horoscope with the Parilia might easily have led later scholars to make the same mistake.

Of course, the separation between the sun and the inferior planets Mercury and Venus shows that something is seriously wrong with the horoscope. Most modern literature innocently accepts the sun in Taurus, since it is about correct for the Parilia, and considers Venus and Mercury to be in error.[20] In fact, however, horoscope and date are basically correct, despite the error for Mercury, since the positions of Saturn, Jupiter, Venus, and the moon can only fit 2, 3, and 4 October 754 B.C., i.e. 9 Pharmouthi as given by Plutarch, and no other dates within hundreds of years. About the version in B we have little to say except that it fits no plausible date for the horoscope, and we suspect that it is a late adjustment in the text of Lydus aimed at bringing Mercury and Venus close to the sun, while the other changes are simply obscure. We can, however, offer a speculation about the choice of 4 October. It fell very near the autumnal equinox (Tarutius could even have thought it was the equinox) – and that could have supplied adequate motivation for his redating.

Tarutius definitely had the means of setting out such a horoscope. It is unlikely that he had tables of mean motions and equations of the kind found in the *Almagest*, for these may well be Ptolemy's own invention and are not found in earlier sources including papyri. The sorts of tables found in papyri are of a more primitive sort, generally giving either month-to-month planetary positions or, more often, the dates of the entries of planets into each sign.[21] The dates are in either the Egyptian or Alexandrian calendar, and since Tarutius lived before the introduction of the Alexandrian calendar – and the dates he gives are centuries earlier still – it is only to be expected that he gives the dates in the Egyptian calendar. Projecting such tables back for hundreds of years is not difficult, although the results will become more and

[20] G. F. Unger, 'Romulusdata', *Jb. f. cl. Phil.* 135 (1887), 409 ff., took the horoscope as fitting October 4, which he took as the date not of the foundation but of the *conception* of Rome. One wonders exactly how Romulus brought that about. Neither this nor any other assessment known to us is based upon a strict dating for the horoscope.

[21] Neugebauer (n. 15 above), 781 ff.

more inaccurate. Each planet approximately repeats its sequence of positions in relatively short cycles, e.g. 59 years for Saturn, 71 years for Jupiter, and may therefore be extended back through a number of cycles, which is what Tarutius may have done. This could explain the errors for Mars and Mercury. Tables of this form are particularly designed for astrological application, in which one wishes to know with the least amount of labour the sign of a planet at a given time. However, they may also be used the other way round, that is, having decided in advance on some astrologically appropriate positions, one can use the tables to find a date at which they occur. This is presumably what Tarutius did, looking for a significant configuration somewhere in the vicinity of the traditional date of the foundation of Rome.[22]

To summarise our analysis, the three dates established by Tarutius were definitely astrological in origin. The conception of Romulus was given the date of an ominous, if non-existent, solar eclipse. His birth followed conception by the canonical ten sidereal months amounting to 273 days. Finally, the date of the foundation of Rome was determined by a horoscope astrologically appropriate to the event and fairly close to the traditional date. All of these Varro gave as Egyptian dates, perhaps with an explanation of the Egyptian calendar.[23] No other Greek or Roman antiquarian before Censorinus is known to have used Egyptian dates or to have synchronised the foundation dates of cities with Era Nabonassar.[24] We infer that Varro was Censorinus' source for Era Nabonassar and Era Philip (or the Era of the Death of Alexander). Censorinus clearly used later sources as well, at least for consular dates; and he might have found in a later source the Julian and consular dates for the (calendrical) rising of Sirius on Thoth 1 (20 July) 139.[25] But the fundamental synchronisation of epochs recorded in Censorinus 21 seems to be Varronian.[26]

At this point it is fair to ask what Varro thought he was doing. Was he practising technical chronology in a modern sense: dating events by the recomputation of observed eclipses, working out conversions of calendars, epochs, and regnal years? Or was he practising astrological history, divining dates by computing ominous eclipses and suitable horoscopes? Probably both – or perhaps it did not occur to him,

[22] A. Bouché-Leclercq gives an astrological analysis of the horoscope in *L'Astrologie grecque* (1899), 369, but he uses the version given by the Barberini recension of Lydus, which is not the correct one.

[23] Cf. Censorinus 18.10 (note that Sallmann's *solidus*, p. 43 line 5, from Cholodniak, is certainly wrong; read *solum* or *solos*), for what could well be a summary of Varro/Tarutius on the Egyptian calendar.

[24] The only scholar known to have mentioned Nabonassar is Berosus, who is quoted as having done so in the Armenian version of the Chronicle of Eusebius (*FGrHist* 680 F 3), and who seems to have thought that Nabonassar made away with the records of earlier kings so that the Chaldean king-list would start with him (so a fragment quoted in Syncellus, loc. cit. n. 6 above = *FGrHist* 680 F 16; Jacoby considered this spurious, but cf. S. M. Burstein, *The Babyloniaca of Berossus* (1978), 22). There is no solid evidence to show that Berosus or his Greek contemporaries used astronomical data for scholarly ends; nor did the era of Nabonassar ever become a bench-mark for the Greek chronographers whose work is attested. See in general B. Croke, 'The origins of the Christian world chronicle', *History and Historians in Late Antiquity* (1983), 116–31; A. A. Mosshammer, *The Chronicle of Eusebius and Greek Chronographic Tradition* (1979).

[25] Traditionally Suetonius has most often been made to do duty as the more recent source; but the evidence about his work is far too scanty to prove anything.

[26] This is not the only passage in Censorinus that has been too hastily declared non-Varronian. His description of the Julian calendar reform (20.8–10) recounts what Caesar did in some detail but omits the colourful story of how the *pontifices* misunderstood and corrupted it (cf. Macr. *Sat.* 1.14). It presumably comes from a source contemporary with the reform, one which could only include Caesar's enactment, not its results. On chronological grounds alone Varro is the likeliest candidate; whether Censorinus or someone else embellished it we cannot tell.

as it did not occur to most other writers on chronology as late as the sixteenth and seventeenth centuries, that there was a difference. Clearly he had a better understanding of calendars and epochs than most ancient scholars; and he had help from Tarutius, who could have recomputed observed eclipses as easily as those that never took place. But he could just as easily have decided that since important events are indicated by celestial omens, a reasonable way to find their exact dates is to compute the nearest interesting omen – a procedure that could be considered more accurate than counting back through uncertain annals and lists of regnal years.

And Varro was certainly interested in *portenta* of all sorts, as shown by a fragment of *De scaenicis originibus* 1 quoted in Censorinus 17.8, as well as from his researches into the doctrines of the Etruscans on the lifespan of states (ibid. 17.5–6), and the related question of the lifespan of individuals (14.6). One fragment is highly pertinent to our subject. After declining to say when Rome will fall, Censorinus writes:

> sed quid apud Varronem legerim, non tacebo. qui libro antiquitatum duodevicensimo ait fuisse Vettium Romae in augurio non ignobilem, ingenio magno, cuivis docto in disceptando parem; eum se audisse dicentem, si ita esset ut traderent historici de Romuli urbis condendae auguriis ac XII vulturis, quoniam CXX annos incolumis praeterisset populus Romanus, ad mille et ducentos perventurum (17.15).

Evidently Varro's historical works included predictions of the future as well as data about the past. His connection of celestial omens and astrology with history was no doubt meant to find yet more *portenta* that the historians had failed to note, and thus to bring to light the hidden, underlying causes of Roman history, past, present, and future.[27] This approach to history bears a close resemblance to the astrological chronology practised in the Islamic world, and in Europe in the later middle ages and Renaissance, and shows that such astrological history has its origin as early as the first century B.C.

And Censorinus? What was he doing? Here at least we have the text of *De die natali*, and it is surely one of the oddest of ancient books. His subject is chronology of sorts, the stages of human life, the divisions of time used by various nations in various ages, but his treatment is neither scientific nor historical despite his efforts to separate the credible from the fabulous.[28] His work is a magpie's nest, grossly inconsistent in quality (at 18.9 he knows Hipparchus' work on the length of the solar year, by 19.2 he has forgotten it) and supinely credulous about Etruscan predictions and the like (17.5–6). Censorinus, in short, was no more able than Varro to distinguish technical chronology from astrological history.[29]

Perhaps the best way to take the measure of this very alien style of scholarship is to see it through the eyes of men better qualified than us to appreciate it: the scholars of the sixteenth century, who set themselves the same task Varro had imposed on Tarutius – applying the methods of classical astronomy to historical ends. They assumed that Varro had produced definitive chronological work: 'Antiquitates M. Varronis perierunt', lamented Vives, 'quae unae si adfuissent Mercuriorum nobis fuissent vicariae'.[30] They saw that Tarutius' procedures had required knowledge of

[27] Cf. H. Peter, 'Die Epochen in Varros Werk de gente populi Romani', *RhM* N.F. 57 (1902), 231–51; Rocca-Serra, loc. cit. (n. 2 above). The approving terms in which Censorinus describes Vettius suggest that Varro esteemed his views highly.

[28] See e.g. 17.3 ('poetae quidem multa incredibilia scripserunt, nec minus historici Graeci, quamvis eo⟨s⟩ a vero par non fuit decedere').

[29] See e.g. 17.4–6, 13–15, 18.2–4, 19 passim, for characteristic mélanges of fact and fancy; admittedly not all modern scholars have taken these at their true worth.

[30] Augustine, *De civitate Dei*, ed. J. L. Vives (1522), 550.

the Egyptian calendar.[31] They singled out the list of eras in Censorinus 21 as the foundation stone on which all technical chronology rested. 'Dignissima haec sunt consideratione', wrote Scaliger's rival Christmann, 'et aureis literis notanda: quae Censorini ingenium vere historicum arguunt, et nobis ad annorum connexionem intelligendam prorsus sunt necessaria.'[32] And one of them even adumbrated part of the argument of the present essay. 'Hactenus Censorinus ex Varrone' – so Theodore Bibliander rounded off his quotation of Censorinus on eras.[33]

Most revealing of all is Scaliger's attitude towards Censorinus. In his chapters on Greek calendars and cycles he used *De die natali* more heavily, and referred to it more respectfully, than any other source. Large parts of *De emendatione temporum*, 1–4 are simply an extended commentary on snippets from Censorinus' *aureolus libellus*. In his chapters on epochs Scaliger went further. He made plain that he saw in Censorinus not only a rich source but a brilliant predecessor.

In 1578 Paulus Crusius' unfinished work *De epochis* was published posthumously in Basel. This competent and original book used both the *Almagest* and modern tables to establish exact dates for many events. Scaliger read Crusius in 1581, while working on *De emendatione temporum*.[34] Though Scaliger did not admit the fact – or even mention Crusius by name – he learned a great deal from him. But he was also provoked by Crusius to define the nature of chronology more precisely – and to exaggerate Censorinus' contribution to the field.

Consider, for example, the way in which the two men established one crucial epoch: that of the Olympic Games. Crusius worked backwards from a series of eclipses for which he had Olympiad dates. We give a sample of his argument:

> Similiter in anno 19. belli Peloponnesiaci Luna defecit, plenilunio *Μεταγειτνιῶνος*, iuxta Plutarchum (*Nic.* 22–3, 28), paucis diebus ante cladem Niciae in Sicilia. Huius Eclipsis meminerunt Diodorus (13.12.6) et Thucydides (7.50), quorum hic annum belli numerat, ille vero etiam Olympiadis 91. annum quartum adiungit, Cleonio Athenarum praefecto. Certum est autem e tabulis Astronomicis, hunc Lunae defectum, congruere ad 27. diem Augusti, in anno 445. ante mortem Christi. Quare si huic annorum numero, pro 90 Olympiadibus perfectis, cum triennio, 363. annos addideris, invenies tertia vice a nobis constitutum principium Olympiadum, in anno ante Christum 808.[35]

In modern terms: the lunar eclipse of 27 August 413 B.C. (Oppolzer 1228) fell in Ol. 91.4. Hence the epoch of the Olympic Games must fall in

$$413 + (4 \times 90) + 3 = 776 \text{ B.C.}$$

This argument, itself a confirmation of earlier ones, finds still more confirmation from Crusius' treatment of the solar eclipse of 3 September 404 B.C. = Ol. 94.1, mentioned in *Hellenica* 2.3.4 (Oppolzer 1936).

Scaliger agreed about the epoch date. But he argued that the chronologer could find the same result already worked out

> non solum ex defectionibus Solis a Thucydide, Xenophonte, et aliis notatis, sed etiam expeditiore ratiocinio ex Censorino, qui anno Iphiti 1014, hoc est Olympiadis 254 secundo scribebat aureolum libellum de Die natali. Is autem annus, eodem teste, erat 986 a Nabonassaro. Cuius Thoth caepit ex a.d. VII Kal. Iul. feria secunda.[36]

[31] J. Temporarius, as quoted by H. J. Erasmus, *The Origins of Rome in Historiography from Petrarch to Perizonius* (1962), 52–3 n. 6.

[32] *Muhamedis Alfragani Arabis Chronologica et astronomica elementa* (1590), 418.

[33] *De ratione temporum...liber unus* (1551) 121 on 21.4–6, 9–10.

[34] J. J. Scaliger, *Lettres françaises inédites*, ed. P. Tamizey de Larroque (1879), 113, 115, 117.

[35] *Liber de epochis seu aeris temporum et imperiorum* (1578), 54–5. For chronological purposes Crusius sets Christ's passion at the arbitrary but convenient date 1 January A.D. 33. To turn his years before the passion into years B.C. one need only subtract 32.

[36] Scaliger, *De emendatione temporum* (n. 5 above), 209.

Censorinus, in short, had already synchronised Olympiads with Julian and Egyptian years. From his equation the modern chronologer could readily determine the *character* of Ol. 254.2 – and thus that of any other Olympiad year. No need, then, to worry about eclipses.

Scaliger's argument had a more general implication. Censorinus had already provided historians with an era that offered the equivalent of a direct day count from a fixed beginning, and synchronised the eras generally used by Greek and Roman historians with it. He had also shown that any year within historical time had an *index* or *titulus* that enabled it to be identified unequivocally. Scaliger's own central innovation in chronology was the Julian Period – a period of 7,980 years, beginning 1 January 4713 B.C., in which every year could be unequivocally identified by what Scaliger called its *character* – namely, its positions in the 19-year luni-solar cycle, the 28-year solar cycle, and the 15-year indiction cycle that he took to run from the beginning of the Julian Period.[37] By laying such stress on Censorinus 21, Scaliger not only did justice to the one unequivocally successful side of Varro's venture into technical chronology, the creation of a list of eras accurate enough to reveal *numerus certus non annorum modo, sed et dierum.* He also provided a fairly convincing ancient pedigree for his own brand of technical chronology. What he did not do – here or elsewhere – was to recognise the crucial importance of eclipses (and the means of dating them). It is ultimately the calculation of eclipses dated in various calendars that verifies Censorinus' concordance of eras. Though Scaliger used a number of dated eclipses in *De emendatione temporum* 5 and elsewhere, his application of astronomical methods was never so extensive or so proficient as Crusius', and from his point of view (if not from ours) that was fair enough. After all, he saw himself as imitating Varro, not Tarutius.

In this context, it is interesting to compare Crusius' and Scaliger's treatment of the eclipse of Romulus, the supposed eclipse of 24 June 772 B.C. that did not occur. Crusius takes Plutarch's date Olympiad 2.1 Choiak 23 and converts it correctly to 24 June, 804 years before the passion of Christ, hence 772 B.C. Using the *Prutenic Tables*, computed by Erasmus Reinhold on the basis of Copernicus' observations, the most up-to-date tables of the time, he finds that on this date at 9.30 a.m. there was an apparent conjunction near the ascending node, but no eclipse. As another possibility, he converts 23 Choiak in the Alexandrian calendar to the equivalent of 19 December 772 B.C., which is correct, when (by coincidence!) there was likewise a conjunction near the descending node at about 8 a.m., but also no eclipse. And he goes on to point out that no year even remotely close will have an ecliptic conjunction on 23 Choiak using either conversion of the calendar. He then concludes:

> Haec cum ita se habeant, suspicor in iis locis Plutarchum aliorum vestigia sequutum esse, qui tempora et motus, a posteriore, ut vocant, conati sunt investigare. Verum exactiore Mathematicarum artium cognitione destituti, certitudinem attingere non potuerunt.[38]

Crusius' conclusion is essentially correct. Scaliger's treatment of the eclipse, which he calls Tarutius' *iocularis coniectura*, is not nearly so thorough. He converts the date to 19 December using only the Alexandrian calendar (the wrong choice), and gives the 'character' of the date in various cycles. He then remarks:

[37] Since the period of 7,980 years is arrived at by multiplying the three constituent cycles – 7,980 is the lowest common multiple of 19, 28, and 15 – every year within it will have a unique combination of positions in the lesser cycles.

[38] Crusius (n. 35 above), 61–2; quotation 62. This analysis anticipates a great deal of what the several German scholars who wrote profusely on this question in the later nineteenth century managed to achieve.

Sed nulla fuit eclipsis solaris eo anno, et frustra quaeritur. Quare ex his potest vere eludi vanitas matheseos Chaldaicae, cum tantus vir in illis Tarrutius tam strenue nugetur.[39]

It seems fair to conclude that Scaliger based his judgement on Crusius' analysis, of course without mentioning Crusius. Hence in these cases – and there are a number of similar ones – Scaliger's achievement was not so much to use 'the improved astronomy of the sixteenth century', except perhaps indirectly, as Varro used Tarutius; rather it was to avoid using it by showing that the information a chronologer required had already been extracted and put into usable form by Censorinus and other ancient writers. Scaliger was always far more a philologian than a mathematician.

However, in one vital respect Scaliger and Crusius alike differed from Censorinus, Varro, and their own contemporaries: both clearly distinguished between astrological history and historical chronology. Crusius did so politely. His account of Rome's founding begins with a reference to Petrus Apianus, who had used Tarutius' horoscope to date the event in his *Astronomicum Caesareum* of 1540. 'Vrbs Rhoma condi caepit', wrote Apianus, 'anno 753 ante Salutem Orbi factam, 11 Kalendas Mayas, si Lutio Tarutio Mathematico credimus, inter secundam et tertiam.'[40] And he went on to recompute the positions of the planets for the Parilia in 753 B.C., to abuse Tarutius for his incompetence in putting Venus and Mercury at the other side of the Zodiac from the sun – and to offer his own horoscopes for the fall of Troy, the birth of Charles V and other notable events.[41] 'Ego', wrote Crusius, 'in numeris annorum ab illo minime dissentiens, aliam formam calculi sequutus sum'[42] – and indeed he did. Crusius' chapter ignores Solinus, horoscopes and planetary positions. It simply assembles a series of solar eclipses for which ancient writers had supplied consular dates or years AVC and for which Crusius could compute Julian dates:

3 Feb. 105 B.C. (Oppolzer 2622)	649 A.U.C. (from Julius Obsequens)
1 Aug. A.D. 45 (Oppolzer 2997)	798 A.U.C. (from Dio)
30 April A.D. 59 (Oppolzer 3033)	812 A.U.C. (from Tacitus and Pliny).

In each case the era of Rome's founding proves to be 753 B.C.; in each case, more to the point, the eclipses serve not as omens but simply as historical evidence.[43]

Scaliger also made a sharp distinction between astrology and chronology. Unlike Crusius he made fun of the former. His account of the horoscope of Rome – in which, *si Dis placet*, Mercury and Venus appear in opposition to the sun – is notably sarcastic.[44] Unlike Crusius, he also studied it in depth, and in one respect at least

[39] Scaliger (n. 5 above), ed. 1629, 396B.

[40] P. Apianus, *Astronomicum Caesareum* (1540) E ii^{v}. His main source, naturally, is Solinus.

[41] Ibid. D^{v}, E ii^{v}, E iv^{v}. We give Apianus' revised figures here:

Planet	Apianus
Saturn	♏ 2, 20°
Jupiter	♓ 14, 30°
Mars	♌ 1, 15°
Venus	♈ 9, 25°
Mercury	♉ 3, 15°
Sun	♈ 22° (approx.).

It is odd that the wide divergence between his results and those of Tarutius provoked Apianus into making sharp comments (Quid igitur Lucium Tarutium fascinavit...?) but did not lead him to abandon faith in the basic importance of the horoscope or even to question its relevance to the Parilia.

[42] Crusius (n. 35 above), 57.

[43] Ibid. 57–60. In fact the first eclipse is not that mentioned by Julius Obsequens, 43 (the correct one is Oppolzer 2625, 19 July 104 B.C.); but the error has no effect on the dating of the foundation.

[44] Scaliger (n. 5 above), 213 = ed. 1629, 388D–389A.

successfully. He did point out, unlike most modern scholars who have dealt with these questions, that Tarutius had made Romulus' birth follow his conception by a precise, canonical interval: 'Recte vero distantia servata est τῆς σπορᾶς καὶ τῆς ἐκτροπῆς, dies 273. Tot enim sunt a XXIII Choiac ad XXI Thoth.'[45] But he did not consider this a contribution to real Roman history, and included it not in the *De emendatione temporum* but in his great inquiry into ancient superstition, the commentary on Manilius.[46]

Neither Scaliger nor Crusius, in other words, saw horoscopes as usable historical sources, or celestial events as omens of terrestrial ones. Both used the ancient sources critically, extracting what was of some value and precision and treating fantasies with circumspection. Nothing like their work had been seen before; and even today their example deserves respect – and imitation.[47]

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[45] *M. Manilii Astronomicon*, ed. Scaliger (1600), *Castigationes et notae* 359. Unger (n. 20 above) also notices the significance of the interval. For Scaliger's final verdict on the whole matter see the *Isagogici chronologiae canones* in his *Thesaurus temporum* (1658²), 289. Here he remarks that Cato set the foundation in Ol. 6.4, Varro in Ol. 6.3 'idque quod nugatorium est, ex apotelesmate L. Tarrutii Firmani'.

[46] It is worth noting that Crusius discussed Vettius' prediction of the length of Roman history. He remarks that Rome fell to Alaric in A.U.C. 1163 and to the Vandals *c.* A.U.C. 1209, both dates close to the 'fatalis terminus' set by Vettius. But the sentence with which Crusius connected the prediction and the events does not suggest credulity on his part: 'Quantum vero hisce divinationibus tribuendum sit, non est huius loci explicare: nos historica prosequemur' (n. 35 above, 143).

[47] Our thanks to the editors of *CQ* and to N. Horsfall, G. Most, O. Neugebauer, D. Pingree, E. Rawson and G. Toomer for information and criticism.