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INDICE

The astronomical foundations of the Romulean calendar, its relationship with the Numan calendar and the slippage of the winter solstice: an hypothesis[1]

Leonardo Magini
e-mail: l.magini@yahoo.it

Riassunto. Le basi astronomiche del calendario romuleo – fondato sulle osservazioni di due fenomeni, il solstizio d'inverno e la levata vespertina di Arturo – e la modalità del passaggio dal calendario romuleo a quello numano, con lo slittamento del solstizio d'inverno: un'ipotesi[1].

The Romulean year is described thus by Macrobius: "There was a time when the Romans, thanks to Romulus, had their own 10-month year, beginning in March and lasting 304 days: six months – i.e. April, June, August, September, November and December – were 30 days long; four months – i.e. March, May, July and October – were 31 days long"[2]. From an astronomical standpoint, a 304-day year makes no sense at all: it is neither solar nor lunar, and it doesn't even last a whole number of lunations. There is also the fact that 31-day months are not compliant with lunations, which last around 29.5 days: it would make far more sense for 30-day months alternating with 29-day months, or 31-day months with 28-day months. In consequence, it is generally believed that the Romulean year was not astronomically-based. And yet in another comment from Macrobius – a further important yet neglected comment, much like the rest

[1] This article is a summary of Chapters 26 and 27 of *Stars, Myths and Rituals in Etruscan Rome*, which has been published by Springer International Publishing AG in 2015. / Questo articolo è un riassunto dei Capitoli 26 e 27 di *Stars, Myths and Rituals in Etruscan Rome*, che è stato poi pubblicato presso Springer International Publishing AG nel 2015.

[2] Macrobius *Saturnalia* 1.12.3: *"Romanos quoque olim auctore Romulo annum suum decem habuisse mensibus ordinatum: qui annus incipiebat a Martio et conficiebatur diebus trecentis quattuor, ut sex quidam menses, id est Aprilis Iunius Sextilis September November December, tricenum essent dierum, quattuor vero, Martius Maius Quintilis October, tricenis et singulis expedirentur".*

of his writings on the Numan cycle[3] – we discover that a link does indeed exist between month and season in the Romulean year: "Given that this number [304 days: author's note] agrees neither with the motion of the Sun nor with the rhythm of the Moon, at times it occurred that the cold part of the year took place in the summer months or, vice versa, the hot part of the year in the winter months. When this happened, a number of days as large as those necessary to return the season of the year to the particular climate of that month was allowed to be lost, without any monthly name"[4].

This comment leaves absolutely no room for doubt: every month in the Romulean calendar is associated with "the particular climate of that month, *caeli habitus instanti mense aptus*" – that is, the appropriate type of weather – which means that the Romulean year is indeed bound up with the motion of the Sun. In consequence, no 304-day year can be followed by a new 304-day year without a break – as is the case today in parts of the world where a purely lunar calendar is still in use. Without such a break, every month would slide backwards through the entire solar year, and could not therefore be associated with a specific "climate" or season: a Year One lasting 10 months from March to December would be followed by a Year Two in which March starts when January had started the previous year; in Year Three, March would be where November had been two years previously, and so on. The obvious consequence is that it would be impossible to associate a season with any given month in any stable form.

Macrobius's observation shows that the Romulean calendar covers 304 days of the solar year, subdivided into ten numbered months, but leaves out 61 days "without any monthly name, *sine ullo mensis nomine*". A similar system existed in a different culture and tradition, coeval with the first kings of Rome. In *Works and Days*, the Greek poet Hesiod writes: "When Zeus [the Sun; author's note] has finished sixty wintry days / after the solstice, then the star / Arcturus leaves the holy stream of Ocean, / and first rises brilliant at dusk; after him / the shrilly wailing daughter of

[3] On the Numan cycle, see Magini *Astronomia etrusco-romana*, "L'Erma" di Bretschneider Roma 2003, pp. 28-31.

[4] Macrobius *Saturnalia* 1.12.39: *"Sed cum is numerus neque solis cursui neque lunae rationibus conveniret, non nunquam usu veniebat ut frigus anni aestivis mensibus et contra calor hiemalibus proveniret; quod ubi contigisset, tantum dierum sine ullo mensis nomine patiebantur absumi quantum ad id anni tempus adduceret quo caeli habitus instanti mensi aptus inveniretur"*.

Pandion, the swallow, / appears to men when spring is just beginning"[5]. The same occurs in Rome with the Numan calendar, in which the winter solstice falls on 21 December. The Praenestine Calendar, regarding the feast of *Divalia* on 21 December, certifies: "There are those who believe that the ceremony for this day is to celebrate the New Year; it is evident, indeed, that (this day) is the start of the New Year"[6]. While, as to the solstice, Varro says: "The time from the *bruma* until the Sun returns to the *bruma*, is called a year"[7]; and Ovid supports: "Midwinter is the beginning of the new Sun and the end of the old one; / Phoebus [the Sun: author's note] and the year take their start from the same point"[8].

In the Numan calendar, "sixty wintry days" from the 21 December solstice take us to 22 February[9], the day that the swallows appear; the day after, Arcturus performs its vespertine rising. This is exactly how Hesiod chronicled events, and how Pliny recounts the process: "Variable weather is expected with the appearance of swallows the eight day before the Calends of March [22 February; author's note], and the day after [23 February] the evening rise of Arcturus"[10]. So, the period of time separating these two significant astronomical phenomena – the winter solstice and Arcturus's vespertine rising[11] – corresponds fairly well to the 61 days

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[5] Hesiod *Erga kaì Emérai* 564-9. Pandion, King of Attica, had his daughter turned into a swallow.

[6] The Praenestine Calendar reads thus: S]UNT TAMEN, [QUI FIERI ID SACRU]M AIUNT OB AN[NUM NOVUM; MANI]FESTUM ESSE [ENIM PRINCIPIU]M [A]NNI NOV[I]. Mommsen's rather freighted addition on the basis of chronicles by Varro, Pliny (following on from Verrius Flaccus) and Macrobius, is universally accepted; indeed, as Warde Fowler (*The Roman Festivals of the Period of the Republic*, 1908, p. 275) noted, "the Praenestine fragments clearly suggests the word '*annus*'."

[7] Varro *De lingua latina* 6.8: "*tempus a bruma ad brumam dum sol redit, vocatur annus"*. *Bruma* is the "very short day", the shortest of the year; Varro also talks of *dies brumales*, the "shortest days", because of the difficulty in working out which one of them is the actual solstice.

[8] Ovid *Fasti* 1.163-4: *"Bruma novi prima est veterisque novissima solis; / principium capiunt Phoebus et annus idem"*.

[9] Counting inclusively: 9 days of December + 29 days of January + 22 days of February = 60 days.

[10] Pliny *Naturalis Historia* 18.237: *"varie et VIII kal. Mar. hirundinis visu et posteriore die Arcturi exortu vespertino"*.

[11] Even using modern-day calculations, at the time of Rome's first kings, around 60 days elapsed between the winter solstice and the evening rising of Arcturus. The day of the solstice – when the Sun sets at 4:46 p.m. with azimuth 238.5 – corresponds to

missing from the Romulean calendar, "without any monthly name". The remaining 304 days, broken down into 10 numbered months, cover the rest of the year, from Arcturus's vespertine rising to the winter solstice.

It is here that the two calendars begin to display their fundamental differences, regardless of their chronological link and similar heritage[12]. The older of these years – the Romulean year – needs to be re-anchored every year through the observation of one or two significant astronomical phenomena if it is to match the movement of celestial bodies; however, Macrobius notes that this alone was not necessarily sufficient. The more modern of the two years – the Numan year – is far more similar to our own year, requiring solely the addition of intercalary days as prescribed by the rules in order to remain in sync with the motion of the Sun, Moon and planets over a long cycle of years[13]. In other words, the Romulean calendar is still a "primitive" calendar, even if the winter solstice and the rising of the brightest star in the northern hemisphere are astronomical phenomena of the first order. The Numan calendar, on the other hand, is not just a "modern" calendar, it is the direct progenitor of our modern-day calendar: the Gregorian calendar was begat by the Julian calendar, and the Julian calendar was begat by the Numan calendar. This Numan calendar – as we know – employs a system of intercalation based on a large quantity of refined knowledge about heavenly bodies. For this calendar, direct and "practical" ongoing observations are required solely to verify what we may call the abstract or "theoretical" results reached through well-known and well-codified calculations.

The vespertine rising of Arcturus marks the end of the Ancient Roman liturgical year, with the feast of *Terminalia* on February 23. Terminus's inflexible and steadfast resolve not to cede his place even to Jupiter Optimus Maximus not only marks, in all likelihood, the point where the two calendars – Romulean and Numan – coincide; it shows the inalterable nature of the relationship between rite and the observation of celestial

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our 22 December 754 B.C., i.e. Julian Day 1446381; the day of Arcturus's vespertine rising – at 6:34 p.m., 49 minutes after sunset – corresponds to our 20 February 753 B.C., i.e. Julian Day 1446441 (Arcturus rises with azimuth 45.3). All data has been sourced from the Cosmos Programme.

[12] According to tradition handed down among others by Censorinus (*De die natali* 20.4), the Romulean year was almost immediately amended by Romulus's successor, Numa Pompilius: "Afterwards, either by Numa... there was instituted a year of twelve months and 355 days.., *Postea sive a Numa… XII facti sunt menses et dies CCCLV...*".

[13] See Magini 2003, pp. 32-6 and 111-5.

bodies. Ovid confirms this in his statement: "From that time, Terminus, thou hast not been free to flit: / abide in that station in which thou hast been placed"[14]. His is, however, a deceptive lack of motion that the slow, imperceptible and inexorable precession of the equinoxes undermines, year after year and century after century, as it alters the time and azimuth of the vespertine – and heliacal! – rising of all heavenly bodies, Arcturus in particular. With the passage of time, it is no longer possible to observe the first appearance of the celestial body in the East soon after sunset on 23 February from the "small hole, *exiguum foramen*" on the Capitoline temple roof above the altar to Terminus[15].

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At this point, it becomes important to attempt to establish how Numa's "reform" made it possible to move from one calendar to the other. We will begin with Censorinus and Macrobius's writings,[16] which state – as we have already seen – that the Romulean year was 10 months long, and consisted of four months of 31 days each, and six of 30 days each. March, May, July and October were 31 days long; April, June, August, September, November and December were 30 days long. In total, the Romulean year lasted 304 days; it began on 1 March and ended on 30 December, which was the last day of the year. It is worth recalling the quotes from Varro and Ovid, cited above. Varro writes: "The time from

[14] Ovid *Fasti* 2.673-4: *"Termine, post illud levitas tibi libera non est: / qua positus fueris in statione, mane"*. "From that time", regarding the god's refusal to move to make way for construction of the new temple.

[15] And yet, as Augustine (*De civitate dei* 7.7: *"...ad eum* (scil. *Ianum*) *dicuntur rerum temporalium initia pertinere, fines vero ad alterum, quem Terminum vocant"*) noted almost a thousand years later, *Terminus* would maintain his privilege of representing the "end of ephemeral things", while *Ianus* represents the "beginning". The two gods remain united: *Terminus* is associated with a specific point in the heavenly vault and a specific time of year; *Janus* is associated with the entire heavenly vault and its ceaseless revolution for all time.

[16] Censorinus (*De die natali* 20.2-3) recalls that the ten-month long Romulean year was "like the year of the Albans, from which the Roman descend, *ut tunc Albanis erat, unde orti Romani*". He continues: "Those ten months had 304 days distributed like this: March 31 days, April 30, May 31, June 30, July 31, August and September 30, October 31, November and December 30, *"Hi decem menses dies CCCIIII hoc modo habebant: Martius XXXI, Aprilis XXX, Maius XXXI, Iunius XXX, Quintilis XXXI, Sextilis et September tricenos, October XXXI, November et December XXX; quorum quattuor maiores pleni, ceteri sex cavi vocabantur"*. Macrobius (*Saturnalia* 1.12.3) writes: "But Numa, his successor… added…, *Sed secutus Numa... addidit*…," and continues as per note no. 2.

the *bruma* until the Sun returns to the *bruma*, is called a year." While Ovid writes: "Midwinter is the beginning of the new Sun and the end of the old one; / Phoebus [the Sun: author's note] and the year take their start from the same point." The only legitimate conclusion we may draw from these writings is that the winter solstice marked the end of the year in the Romulean calendar, and therefore fell on 30 December. It may be objected that in actual fact, neither Varro nor Ovid specify precisely "which" year they are referring to. However, we may be certain about one thing: it is not the Numan year, in which the winter solstice occurs on 21 December[17]. Once we have ruled out the Numan year, the only other year it could be – in Rome – is the old Romulean year.

Plutarch would appear to provide the casting vote for this thesis: "But consider whether Numa may not have adopted as the beginning of the year that which conforms to our conception of the natural beginning. Speaking generally, to be sure, there is not naturally either a last or a first in a cycle; and it is by custom that some adopt one beginning of this period and others another. They do best, however, who adopt the beginning after the winter solstice, when the sun has ceased to advance, and turns about and retraces his course toward us. For this beginning of the year is in a certain way natural to mankind, since it increases the amount of light that we receive and decreases the amount of darkness, and brings nearer to us the lord and leader of all mobile matter"[18]. It could be posited that Plutarch is not talking about the end of the old year and the beginning of the new, but about the changes Numa made to the order of the months, whereby January and February preceded Romulus's first month, i.e. March. This objection, however, does not hold water, as a number of writings demonstrate that this order was not Numa's doing, but came into effect at a later date. In Numa's time, January and February followed December, and February was the last month of the year. This leaves us with two alternatives: either Plutarch ascribes to Numa something that came after him, or he is providing us with that proof that we were looking for all along, namely, that Numa established the beginning of the year "after the winter solstice". Let's look a little more closely at this. Let's imagine that Romulus chose the winter solstice as the last day of his year, i.e. 30 December, and that Numa in his calendar reform, brought it forward to 21

[17] This is confirmed by the Praenestine Calendar; see no. 8.
[18] Plutarch *Romanae Quaestiones* 19.

December, under the Numan year. To recap, according to tradition[19], Numa's reform consisted of the following:
- to begin with, Numa added 51 days to the 304 days of the Romulean year and obtained a 355-day lunar year;
- he then removed one day from the six 30-day months, recouping six days;
- he added these 6 days to the 51 already added to the Romulean year, giving 6 + 51 = 57 days;
- lastly, he split these 57 days into two new months, to create a 29-day January and a 28-day February.

Following this series of changes, the 304-day year divided into 10 months, plus the 60 days "without any monthly name", made up a 355-day year, which was augmented by an average of 10.25 intercalated days; the Romulean calendar became the Numan calendar, and the Numan year applied intercalation on a 24-year cycle[20]. Table 1 summarizes the changes between the Romulean and the Numan years according to this thesis:
- in the Romulean year, the interval between 15 March and 30 December lasts 290 days; in the Numan year, the interval between 1 March and 21 December lasts 290 days[21];
- the Romulean year has 60 days "without a monthly name" between the winter solstice and the vespertine rising of Arcturus; as we saw[22], the same number of days in the Numan year run from 21 December to the 22

[19] Censorinus *de die natali* 20.5: "We may be certain that 51 days were added to the old year; as this did not quite make two months, one day was subtracted from each of the empty months, and these six days were added to the 51 days to make a total of 57 days, which was used to form two months: January with 29 days and February with 28., *Certe ad annum priorem unus et quinquaginta dies accesserunt; qui quia menses duo non explerent, sex illis cavis mensibus dies sunt singuli detracti et ad eos additi, factique dies LVII, et ex his duo menses, Ianuarius undetriginta dierum, Februarius duodetriginta"*. See also Macrobius *Saturnalia* 1.13.2-5.

[20] Macrobius *Saturnalia* 1.13.13: "Every three eight-year cycles were allotted not ninety but sixty-six intercalated days, to offset the twenty-four extra days that accreted over twenty-four years., *Tertio quoque octennio ita intercalandos dispensabant dies, ut non nonaginta sed sexaginta sex intercalarent, compensatis viginti et quattuor diebus pro illis qui per totidem annos supra… numerum creverant"*. See Magini 2003, p. 30.

[21] Always counting inclusively. In the Romulean year: 17 days of March + 273 days of April, May, June, July, August, September, October, November and December = 290 days. In the Numan year: 269 days of March, April, May, June, July, August, September, October and November + 21 days of December = 290 days.

[22] See no. 9.

February: these 60 days consist of the last nine days of December, the 29 days of January and the first 22 days of February;
- in the Romulean year, the first 14 days of March, added to the following 290 days, make up the 304 days of the 10-month year; in the Numan year, the last five days of February, plus the added 10.25 average intercalated days, make a total of 15.25 days.

All in all, the Romulean year lasted 364 fixed days, while the Numan year, on average, lasted 365.25 days.

ROMULEAN YEAR		**NUMAN YEAR**	
interval	*no. of days = d.*	*Interval*	*no. of days = d.*
from 1 to 14 March	14 d.	===	===
15 March → 1 March - KALENDAE MARTIS			
from 15 March to 30 December	290 d. (14 + 290 = 304)	from 1 March to 21 December	290 d.
30 December: last day of the year → solstice → 21 December - DIVALIA			
days "without a monthly name"	60 d.	last 8 days of December + 29 days of January + 23 days of February	60 d.
vespertine rising of Arcturus → 23 February - TERMINALIA			
= = =	= = =	last 5 days of February + 10.25 intercalary days	15.25 d.
total days	14 + 290 + 60 = **364 d**		290 + 60 + 15.25 = **365.25 d**

Table 1. Correspondences between the Romulean and Numan years.

Table 1 also shows correspondences between specific days in both of these years: a) the winter solstice fell on 30 December in the Romulean year and on 21 December in the Numan year; b) the last of the 60 days "without a monthly name" corresponds to the vespertine rising of Arcturus in the Romulean year, and to 23 February, feast of *Terminalia*, in the Numan year; c) 15 March in the Romulean year corresponds to 1 March in the Numan year.