THE SOLAR YEAR OF THE COLIGNY CALENDAR AS AN ANALOGUE OF THE ROMAN SOLAR YEAR

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In this essay, Fotheringham's suspicion that 'the Coligny calendar is, like our Easter calendar, a calendar accommodated to the Julian calendar' (Rhys and Fotheringham 1910, 285) is reassessed with Samon as March, in line with the conclusions of the first in this pair of essays. We find that the resulting relationship between the two calendars is symmetrical and extremely simple, such that converting dates from one calendar to the other becomes straightforward. Days marked IVOS *are shown to cluster with some precision around dates with strong traditional associations. In light of these findings, it is suggested that Fotheringham's suspicion may have been correct but for his alignment of the year.*

Reassessing Fotheringham's idea with Samon as March

With Samon as March, the Gaulish solar months parallel the Roman months in length, as shown in the preceding essay, suggesting that Fotheringham may have been correct in his suspicion that the two calendars existed in a standardised relationship. However, based upon the fact that Samon means 'summer', Rhys placed Samon in June, near the summer solstice (*ibid*., 210; Rhys 1905, 73).

Let us then reassess Fotheringham's idea with Samon as March, and do so in the most straightforward way: by plotting the behaviour of the two calendars against each other. If the correspondence between the lengths of the solar months does indicate a standardised relationship between the calendars, then this exercise should reveal it.

Sequential use of the plate

Some scholars (e.g., Duval and Pinault 1986, 415; Olmsted 1992, 46) believe that the plate was used sequentially, from left to right in repeated iterations. Others (e.g. Rhys and Fotheringham 1911, 350; MacNeill 1926, 33; Lainé-Kerjean 1943, 255-6) have suggested that the years on the plate were employed in a simple but non-sequential pattern. Here, we will examine the behaviour of both patterns of use against the Roman calendar, beginning with sequential use.

Method of sequential use

The solar year on the plate, as shown in the previous essay, contains 366 days, or 367 if Equos is long. If Equos is given 30 days in (Gaulish) years encompassing a Roman bissextile, and 29 days in other years, as Fotheringham suggested (Fotheringham 1910, 285-6), then this solar year will always amount to a Roman year and a day, and will advance on the Roman calendar by one day per year. After 30 years, it will have advanced by 30 days; and at this point, omitting one 30-day intercalary month should cause the pattern to repeat.
To illustrate, let us take a single day in the Gaulish solar year – say, the first day of solar Samon – and determine its Roman equivalents over a 30-year period.

Results of sequential use

As shown in the previous essay, the intercalary months indicate the days on which solar Samon commences in the five 'plate-years':

TABLE 1: Days on which solar Samon begins in the five plate-years

Plate-year	*Start of solar Samon*
I	Samon 1
II	Samon 13
III	Samon 25
IV	Samon 7
V	Samon 19

Now let us arbitrarily call March 1, AD 101 'Samon 1 of cycle-year 1', and observe the behaviour of these five days against the Roman calendar:

TABLE 2: Results of sequential use (cycle-years 1 to 5)

Cycle-year	*Start of solar Samon*	*Roman equivalent*	*Long Equos?*
1	Year I, Samon 1	March 01, 101	
2	Year II, Samon 13	March 02, 102	
3	Year III, Samon 25	March 03, 103	Y
4	Year IV, Samon 7	March 04, 104	
5	Year V, Samon 19	March 05, 105	

As can be seen, these five starting-days of solar Samon occur at intervals of a Roman year and a day, such that the equivalent day of March increments by one day per year. Making Equos long in bissextile years preserves this pattern.

In the second iteration of the plate, the same five days again represent the start of solar Samon, and continue to mark out a Roman year and a day:

TABLE 3: Results of sequential use (cycle-years 6 to 10)

Cycle-year	*Start of solar Samon*	*Roman equivalent*	*Long Equos?*
6	Year I, Samon 1	March 06, 106	
7	Year II, Samon 13	March 07, 107	Y
8	Year III, Samon 25	March 08, 108	
9	Year IV, Samon 7	March 09, 109	
10	Year V, Samon 19	March 10, 110	

The remaining four iterations continue in the same fashion:

TABLE 4: Results of sequential use (cycle-years 11 to 30)

Cycle-year	*Start of solar Samon*	*Roman equivalent*	*Long Equos?*
11	Year I, Samon 1	March 11, 111	Y
12	Year II, Samon 13	March 12, 112	
13	Year III, Samon 25	March 13, 113	
14	Year IV, Samon 7	March 14, 114	
15	Year V, Samon 19	March 15, 115	Y
16	Year I, Samon 1	March 16, 116	
17	Year II, Samon 13	March 17, 117	
18	Year III, Samon 25	March 18, 118	
19	Year IV, Samon 7	March 19, 119	Y
20	Year V, Samon 19	March 20, 120	
21	Year I, Samon 1	March 21, 121	
22	Year II, Samon 13	March 22, 122	
23	Year III, Samon 25	March 23, 123	Y
24	Year IV, Samon 7	March 24, 124	
25	Year V, Samon 19	March 25, 125	
26	Year I, Samon 1	March 26, 126	
27	Year II, Samon 13	March 27, 127	Y
28	Year III, Samon 25	March 28, 128	
29	Year IV, Samon 7	March 29, 129	
30	Year V, Samon 19	March 30, 130	

At this point, omitting ICA at the end of Year 30 will cause the 31st solar Samon to begin not on March 31, AD 131, but thirty days earlier on March 1, and the 30-year pattern repeats:

TABLE 5: Results of sequential use (cycle-years 1 to 5 of next cycle)

Cycle-year	*Start of solar Samon*	*Roman equivalent*	*Long Equos?*
1	Year I, Samon 1	March 01, 131	Y
2	Year II, Samon 13	March 02, 132	
3	Year III, Samon 25	March 03, 133	
4	Year IV, Samon 7	March 04, 134	
5	Year V, Samon 19	March 05, 135	Y

The plate perpetually follows the Roman calendar in this manner, as long as Equos is given a 30th day only in (Gaulish) years that encompass a Roman bissextile.

Evaluation of results

In this system of use, two things are immediately evident: first, that all five instances of Equos on the plate will periodically require a 30th day. This would explain why all surviving ends of Equos show a 30th day: perhaps, as Rhys and Fotheringham suggested (Rhys/Fotheringham 1911, 358), all five instances of the month had a 30th day that was used only when needed, just as today's ecclesiastical calendars always contain an entry for February 29 in the expectation that the user will know when to employ it. In this context, the numeral CCCLXXXV engraved into the centre of Year III does *not* preclude Equos of Year III from containing 29 days, as Orpen felt it did (Orpen 1910, 369): as MacNeill points out, the existence of this numeral 'does not imply that the number was invariable'(MacNeill 1926, 28 n.1).

Second, it is evident that for any start of solar Samon, in any cycle, the equivalent day of March is always given by the cycle-year. This makes finding March 1 simple:

TABLE 6: March 1 is always (cycle-year - 1) days before the start of solar Samon

Cycle-year	*Start of solar Samon*	*Roman equivalent*	*Therefore:*
1	Year I, Samon 1	March 01, 101	March 01, 101 = Year I, Samon 1
2	Year II, Samon 13	March 02, 102	March 01, 102 = Year II, Samon 12
3	Year III, Samon 25	March 03, 103	March 01, 103 = Year III, Samon 23
4	Year IV, Samon 7	March 04, 104	March 01, 104 = Year IV, Samon 4
5	Year V, Samon 19	March 05, 105	March 01, 105 = Year V, Samon 15
6	Year I, Samon 1	March 06, 106	March 01, 106 = Year V, ICA 26
7	Year II, Samon 13	March 07, 107	March 01, 107 = Year II, Samon 7
8	Year III, Samon 25	March 08, 108	March 01, 108 = Year III, Samon 18
9	Year IV, Samon 7	March 09, 109	March 01, 109 = Year III, Cantlos 28
10	Year V, Samon 19	March 10, 110	March 01, 110 = Year V, Samon 10

These five initial days of solar Samon can always be used in this way to locate March 1 on the plate; all that is necessary is to know the cycle-year.

One troubling result

Employing the plate sequentially in this way does create a simple relationship between the calendars, and it affords a quick way of converting dates from one calendar to the other. But one result remains troubling: the range over which the lunar months then wander. Samon, for example, can begin as early as February 7 (in cycle-year 3) and as late as March 26 (in cycle-year 26), a range of no fewer than 48 days – well over a lunar month and a half. Yet the primary purpose of intercalary months is to limit this drift. Why would the calendar include not one but two of them, only to limit it so ineffectively?

Meanwhile, more effective patterns for applying intercalary months had been known in Europe since the fifth century BC, when Meton published his lunisolar calendar in Greece (Neugebauer 1957, 7). In Meton's calendar, the additional months were applied more awarely so as to restrict the drift to a lunar month or less, enabling the solar months to continue to begin within their own lunar months (McCarthy 1993, 207), just as the plate's own solar months are shown to do in the previous essay.

Because it minimised drift so effectively, Meton's calendar was adopted by astronomers, amongst whom it never lost currency. Ptolemy refers to it in the *Almagest* (Samuel 1972, 42-9), and whenever Greek or Roman astronomers of any subsequent period use a Greek calendar in their work, they use Meton's (*ibid.*, 50), such that those who traded ideas with Greek astronomers, or read their writings, could scarcely have remained ignorant of it.

As this had been the case for centuries before the plate, Rhys and Fotheringham suspected that the Gaulish calendar might well have been intercalated according to a pattern like Meton's. Accordingly, they suggested an effective non-sequential pattern for operating the calendar in a 19-year cycle (Rhys and Fotheringham 1911, 349-50). Lainé-Kerjean (1943, 255-6) proposed an equally-effective pattern for a 30-year cycle, in line with Pliny's attestation in *Naturalis Historia* (XVI. 250) that Gaulish druids marked a cycle of this length.

Non-sequential use of the plate

It would help resolve the issue if such a non-sequential intercalation pattern could be shown to arise from the plate itself – and in fact, just such a pattern is naturally created by requiring that March begin within Samon. In generating this pattern, we will again follow Fotheringham's suggestion that Equos be given 30 days in (Gaulish) years encompassing a Roman bissextile, and 29 days in other years (Fotheringham 1910, 285-6). But this time, instead of paying no heed to the relationship between Samon and March, we will require that March 1 remain within Samon. We will find that the intercalation pattern arises directly from this requirement, and that it produces interesting results.

Method

Divide the 30 days of Samon into five equal spans of six days. For the moment, let us call these six-day spans 'hexads':

	← *hexad 1* →						← *hexad 2* →						← *hexad 3* →						← *hexad 4* →						← *hexad 5* →					
SAMON:	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30

Fig. 1. Samon divided into five spans of six days.

As before, we take March 1, AD 101 to be Samon 1 of cycle-year 1:

	← *hexad 1* →						← *hexad 2* →						← *hexad 3* →						← *hexad 4* →						← *hexad 5* →					
SAMON:	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30

↑ *March 1, 101AD (cycle-year 1)*

Fig. 2. Location of March 1 within Samon (cycle-year 1).

There is no bissextile in the coming year, so both Equos and February will be short, and the solar and lunar years will therefore contain 365 days and 354 days, respectively. As the solar year is 11 days longer than the lunar year, March 1, AD 102 will fall 11 days later in Samon, on day 12; and in the same way, March 1, AD 103 will fall on day 23:

	← *hexad 1* →						← *hexad 2* →						← *hexad 3* →						← *hexad 4* →						← *hexad 5* →					
SAMON:	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30

↑ *March 1, 101AD (cycle-year 1)* ↑ *March 1, 102AD (cycle-year 2)* ↑ *March 1, 103AD (cycle-year 3)*

Fig. 3. Location of March 1 within Samon (cycle-years 1 to 3).

Let us tabulate these days against the hexads in which they occur:

TABLE 7: Location of March 1 within Samon (cycle-years 1 to 3)

Cycle-year	*March 1 is…*	*Within…*
1 (101)	Samon 1	hexad 1
2 (102)	Samon 12	hexad 2
3 (103)	Samon 23	hexad 4

The year following March 1, AD 103 contains a bissextile; but because February and Equos will be lengthened in tandem, the pattern will remain undisturbed, and March 1, AD 104 will again fall 11 days later – on ‘day 34’, outside Samon. This, however, is the very situation we expect the intercalary months to prevent; so we note that one of them must intervene somewhere between the Samons of cycle-years 3 and 4, with the result that March 1, AD 104 will actually fall 30 days earlier, on Samon 4:

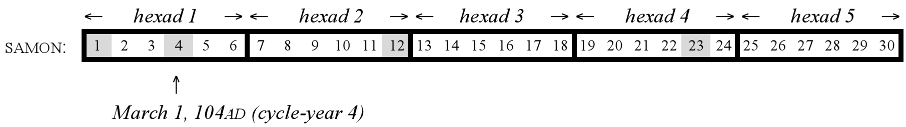

Fig. 4. Location of March 1 within Samon (cycle-year 4).

We will tabulate this fourth entry as follows, so as to show the insertion of an intercalary month between the third and fourth Samons:

TABLE 8: Location of March 1 within Samon (cycle-years 1 to 4)

Cycle-year	*March 1 is...*	*Within...*
1 (101)	Samon 1	hexad 1
2 (102)	Samon 12	hexad 2
3 (103)	Samon 23	hexad 4
	Intercalation	
4 (104)	Samon 4	hexad 1

So then: the signal to intercalate is arising entirely from the requirement that March 1 remain within Samon.
If we continue in this way, adding 11 days each year (then subtracting 30 if the result exceeds 30) so as to ensure that March 1 remains within Samon, we find that the pattern completes after 30 years:

Table 9, see next page.

One step remains: to express 'hexad' as something more meaningful; and in fact, there is a natural correlation between hexads and plate-years. Earlier, Table 1 listed the days on which solar Samon commences in the five plate-years: Samon 1, 13, 25, 7, and 19, respectively. Notice that each of the hexads in Samon is headed by one of these five days:

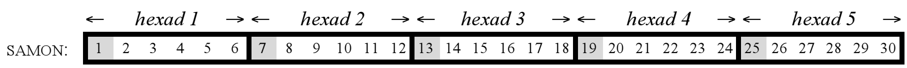

Fig. 5. Each hexad begins with one of the days listed in Table 1.

TABLE 9: Location of March 1 within Samon (cycle-years 1 to 30)

Cycle-year	*March 1 is…*	*Within…*	*Cycle-year*	*March 1 is…*	*Within…*
1 (101)	Samon 1	hexad 1	17 (117)	Samon 27	hexad 5
2 (102)	Samon 12	hexad 2		Intercalation	
3 (103)	Samon 23	hexad 4	18 (118)	Samon 8	hexad 2
	Intercalation		19 (119)	Samon 19	hexad 4
4 (104)	Samon 4	hexad 1	20 (120)	Samon 30	hexad 5
5 (105)	Samon 15	hexad 3		Intercalation	
6 (106)	Samon 26	hexad 5	21 (121)	Samon 11	hexad 2
	Intercalation		22 (122)	Samon 22	hexad 4
7 (107)	Samon 7	hexad 2		Intercalation	
8 (108)	Samon 18	hexad 3	23 (123)	Samon 3	hexad 1
9 (109)	Samon 29	hexad 5	24 (124)	Samon 14	hexad 3
	Intercalation		25 (125)	Samon 25	hexad 5
10 (110)	Samon 10	hexad 2		Intercalation	
11 (111)	Samon 21	hexad 4	26 (126)	Samon 6	hexad 1
	Intercalation		27 (127)	Samon 17	hexad 3
12 (112)	Samon 2	hexad 1	28 (128)	Samon 28	hexad 5
13 (113)	Samon 13	hexad 3		Intercalation	
14 (114)	Samon 24	hexad 4	29 (129)	Samon 9	hexad 2
	Intercalation		30 (130)	Samon 20	hexad 4
15 (115)	Samon 5	hexad 1		Intercalation	
16 (116)	Samon 16	hexad 3	1 (131)	Samon 1	hexad 1

By analogy, let us use the list in Table 1 to associate each hexad with a plate-year:

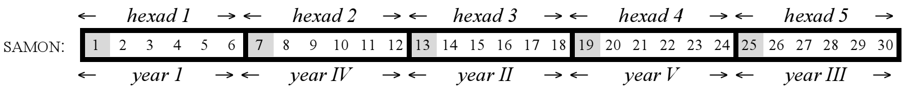

Fig. 6. Hexads associated with plate-years.

We can now substitute ‘plate-years’ for ‘hexads’ in Table 9. The result is Table 10:

Table 10, see opposite page.

TABLE 10: Location of March 1 within Samon (cycle-years 1 to 30), with *plate-year* substituted for *hexad*

Cycle-year	*March 1 is…*	*Within…*	*Cycle-year*	*March 1 is…*	*Within…*
1 (101)	Samon 1	Year I	17 (117)	Samon 27	Year III
2 (102)	Samon 12	Year IV		Intercalation	
3 (103)	Samon 23	Year V	18 (118)	Samon 8	Year IV
	Intercalation		19 (119)	Samon 19	Year V
4 (104)	Samon 4	Year I	20 (120)	Samon 30	Year III
5 (105)	Samon 15	Year II		Intercalation	
6 (106)	Samon 26	Year III	21 (121)	Samon 11	Year IV
	Intercalation		22 (122)	Samon 22	Year V
7 (107)	Samon 7	Year IV		Intercalation	
8 (108)	Samon 18	Year II	23 (123)	Samon 3	Year I
9 (109)	Samon 29	Year III	24 (124)	Samon 14	Year II
	Intercalation		25 (125)	Samon 25	Year III
10 (110)	Samon 10	Year IV		Intercalation	
11 (111)	Samon 21	Year V	26 (126)	Samon 6	Year I
	Intercalation		27 (127)	Samon 17	Year II
12 (112)	Samon 2	Year I	28 (128)	Samon 28	Year III
13 (113)	Samon 13	Year II		Intercalation	
14 (114)	Samon 24	Year V	29 (129)	Samon 9	Year IV
	Intercalation		30 (130)	Samon 20	Year V
15 (115)	Samon 5	Year I		Intercalation	
16 (116)	Samon 16	Year II	1 (131)	Samon 1	Year I

Notice that, without our intending it, the intercalary months are all occuring where they should on the plate – that is, only after the Samons of Years III and V. We can therefore identify the intercalary months:

Table 11, see page 44.

The series of plate-years may appear irregular, but it is not. To illustrate, here again are the 30 years of the cycle, together with the corresponding plate-years from the table above (now shown in Arabic numerals):

Cycle-year:	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30
Plate-year:	1	4	5	1	2	3	4	2	3	4	5	1	2	5	1	2	3	4	5	3	4	5	1	2	3	1	2	3	4	5

Fig. 7. Cycle-years against plate-years.

The sequence of plate-years seems haphazard only until we depict it as shown in Fig. 8:

Table 11: Location of March 1 within Samon (cycle-years 1 to 30), with intercalary months identified

Cycle year	*March 1 is...*	*Within...*
1 (101)	Samon 1	Year I
2 (102)	Samon 12	Year IV
3 (103)	Samon 23	Year V
	ICA	
4 (104)	Samon 4	Year I
5 (105)	Samon 15	Year II
6 (106)	Samon 26	Year III
	ICB	
7 (107)	Samon 7	Year IV
8 (108)	Samon 18	Year II
9 (109)	Samon 29	Year III
	ICB	
10 (110)	Samon 10	Year IV
11 (111)	Samon 21	Year V
	ICA	
12 (112)	Samon 2	Year I
13 (113)	Samon 13	Year II
14 (114)	Samon 24	Year V
	ICA	
15 (115)	Samon 5	Year I
16 (116)	Samon 16	Year II
17 (117)	Samon 27	Year III
	ICB	
18 (118)	Samon 8	Year IV
19 (119)	Samon 19	Year V
20 (120)	Samon 30	Year III
	ICB	
21 (121)	Samon 11	Year IV
22 (122)	Samon 22	Year V
	ICA	
23 (123)	Samon 3	Year I
24 (124)	Samon 14	Year II
25 (125)	Samon 25	Year III
	ICB	
26 (126)	Samon 6	Year I
27 (127)	Samon 17	Year II
28 (128)	Samon 28	Year III
	ICB	
29 (129)	Samon 9	Year IV
30 (130)	Samon 20	Year V
	ICA	
1 (131)	Samon 1	Year I

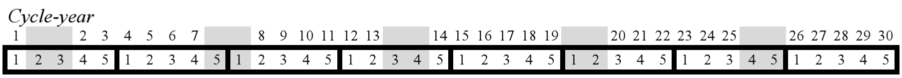

Fig. 8. Cycle-years against plate-years (full pattern).

That is: we are now viewing the 30 years of the cycle as consisting of *eight* sequential iterations of the plate, as shown by the bold borders; but with five pairs of years omitted at regular intervals, as shown by the shading. This creates a simple, invariable pattern of use: the plate is employed sequentially for six years, then two years are passed over, then six years are used, two are passed over, and so on.

This, then, is the intercalation pattern that naturally arises from the sole requirement that March 1 remains within Samon. During these 30 years, March 1 occurs once on each of the 30 days of Samon, but never outside it. Meanwhile, 11 intercalary months are called for at the points shown in Table 11.

Interestingly, Lainé-Kerjean (1943, 255-6) noted that the most astronomically accurate 30-year solution for this calendar would be produced by inserting intercalary months at alternating 2.5- and 3-year intervals, in this fashion:

A (2.5y) **B** (3y) **B** (2.5y) **A** (3y) **A** (2.5y) **B** (3y) **B** (2.5y) **A** (3y) **A** (2.5y) **B** (3y) **B** (2.5y)
↑

Fig. 9. Lainé-Kerjean's 30-year intercalation pattern.

This series is in fact identical to the one we have generated: Table 11 begins at the point indicated by the arrow.

Results for first cycle

Using this new intercalation pattern, let us again plot the behaviour of the two calendars against each other. As before, March 1, AD 101 is taken as Samon 1 of cycle-year 1:

TABLE 12: Results of non-sequential use (cycle-year 1)

Cycle-year	*Start of solar Samon*	*Roman equivalent*	*Roman usage*	*Long Equos?*	*ICM?*	*Lunar year*	*Days to next solar Samon*
1	Year I, Samon 1	Mar 01, 101	k.mar.			354	354+6 = 360

That is: in cycle-year 1, the plate-year is I, and solar Samon begins on Samon 1; the Roman equivalent is March 1, AD 101, which in Roman usage is 'k.mar.' (the kalends of March). The ensuing year does not contain a bissextile, so Equos will contain 29 days; and there is no intercalary month this year, so this plate-year will contain 354 days.

The far-right column shows the number of days until the next start of solar Samon. We know from Table 11 that in cycle-year 2, the plate-year will be IV; and Table 1 shows that in plate-year IV, solar Samon begins on Samon 7; and as Samon 7 is six days later than Samon 1, the far-right column indicates that it will be 354 + 6 = 360 days until the next start of solar Samon. Adding these 360 days to the date produces the next row:

TABLE 13: Results of non-sequential use (cycle-years 1 and 2)

Cycle-year	*Start of solar Samon*	*Roman equivalent*	*Roman usage*	*Long Equos?*	*ICM?*	*Lunar year*	*Days to next solar Samon*
1	Year I, Samon 1	Mar 01, 101	k.mar.			354	354+6 = 360
2	Year IV, Samon 7	Feb 24, 102	vi k.mar.			354	354+12= 366

In the same way, Table 11 indicates that in cycle-year 3, the plate-year will be V; and Table 1 shows that in plate-year V, solar Samon begins on Samon 19;

and as Samon 19 is twelve days later than Samon 7, the far-right column indicates that it will be 354 + 12 = 366 days to the start of the next solar Samon. Adding these 366 days to the date produces the third row:

TABLE 14: Results of non-sequential use (cycle-years 1 to 3)

Cycle-year	*Start of solar Samon*	*Roman equivalent*	*Roman usage*	*Long Equos?*	*ICM?*	*Lunar year*	*Days to next solar Samon*
1	Year I, Samon 1	Mar 01, 101	k.mar.			354	354+6 = 360
2	Year IV, Samon 7	Feb 24, 102	vi k.mar.			354	354+12= 366
3	Year V, Samon 19	Feb 25, 103	v k.mar.	Y	Y	385	385–18= 367

Cycle-year 3 will include a Roman bissextile at its end, in that February 24 of AD 104 will be doubled; and so cycle-year 3 will also include a 30-day Equos. In addition, as the plate-year is V, there will be an instance of ICA at the end of the year; so this calendar year will contain 355 + 30 = 385 days.
For cycle-year 4, however, Tables 11 and 1 show that the plate-year will again be I, and that solar Samon again begins on Samon 1. This is eighteen days earlier than Samon 19; so to produce the fourth row, we add 385 - 18 = 367 days... and so on.

Continuing in this way for the entire cycle produces Table 15 (see p. 47):

In the penultimate column, it is apparent that the calendar years variously contain 354, 355, 384, or 385 days; but these year-lengths are entirely dictated by the structures of the two calendars as they operate against each other.
In the final column, the starting-days of solar Samon mark out rough intervals of a solar year. Were it not for the bissextiles, these intervals would form a repeating pattern consisting of one year of 360 days, followed by five of 366 days, for an average of 365. The four-yearly bissextiles increase this average by 0.25 day to 365.25, the average length of the Roman calendar year.
Meanwhile, in the fourth column, a simple and regular pattern of Roman equivalents has been generated. As shown by the horizontal lines, the 30 years fall into five 'hexads', much as the 30 days of Samon did. In the first year of each hexad, solar Samon begins on k.mar.; in the second year, it begins on vi k.mar.; then, in each subsequent year, solar Samon begins one day later in the Roman calendar, until it again begins on k.mar. in the first year of the next hexad. The only variation occurs in cycle-years 8 and 20, when it happens to begin on vi k.mar. in a bissextile year. This is the day that is doubled to produce the bissextile, and so in these years, solar Samon begins on the *second* 'vi k.mar.'– that is, on 'vi$_2$ k.mar.', the day after the bissextile day.
Notice that solar Samon - and therefore the calendar's solar year as a whole - can never begin *earlier* than vi k.mar. The significance of this date is that it is the first

TABLE 15: Results of non-sequential use (cycle-years 1 to 30)

Cycle-year	*Start of solar Samon*	*Roman equivalent*	*Roman usage*	*Long Equos?*	*ICM?*	*Lunar year*	*Days to next solar Samon*
1	Year I, Samon 1	Mar 01, 101	k.mar.			354	354+6 = 360
2	Year IV, Samon 7	Feb 24, 102	vi k.mar.			354	354+12= 366
3	Year V, Samon 19	Feb 25, 103	v k.mar.	Y	Y	385	385–18= 367
4	Year I, Samon 1	Feb 26, 104	iv k.mar.			354	354+12= 366
5	Year II, Samon 13	Feb 27, 105	iii k.mar.			354	354+12= 366
6	Year III, Samon 25	Feb 28, 106	ii k.mar.		Y	384	384–18= 366
7	Year IV, Samon 7	Mar 01, 107	k.mar.	Y		355	355+6= 361
8	Year II, Samon 13	Feb 24_2, 108	vi_2 k.mar.			354	354+12= 366
9	Year III, Samon 25	Feb 25, 109	v k.mar.		Y	384	384–18= 366
10	Year IV, Samon 7	Feb 26, 110	iv k.mar.			354	354+12= 366
11	Year V, Samon 19	Feb 27, 111	iii k.mar.	Y	Y	385	385–18= 367
12	Year I, Samon 1	Feb 28, 112	ii k.mar.			354	354+12= 366
13	Year II, Samon 13	Mar 01, 113	k.mar.			354	354+6= 360
14	Year V, Samon 19	Feb 24, 114	vi k.mar.		Y	384	384–18= 366
15	Year I, Samon 1	Feb 25, 115	v k.mar.	Y		355	355+12= 367
16	Year II, Samon 13	Feb 26, 116	iv k.mar.			354	354+12= 366
17	Year III, Samon 25	Feb 27, 117	iii k.mar.		Y	384	384–18= 366
18	Year IV, Samon 7	Feb 28, 118	ii k.mar.			354	354+12= 366
19	Year V, Samon 19	Mar 01, 119	k.mar.	Y		355	355+ 6= 361
20	Year III, Samon 25	Feb 24_2, 120	vi_2 k.mar.		Y	384	384–18= 366
21	Year IV, Samon 7	Feb 25, 121	v k.mar.			354	354+12= 366
22	Year V, Samon 19	Feb 26, 122	iv k.mar.		Y	384	384–18= 366
23	Year I, Samon 1	Feb 27, 123	iii k.mar.	Y		355	355+12= 367
24	Year II, Samon 13	Feb 28, 124	ii k.mar.			354	354+12= 366
25	Year III, Samon 25	Mar 01, 125	k.mar.		Y	384	384–24= 360
26	Year I, Samon 1	Feb 24, 126	vi k.mar.			354	354+12= 366
27	Year II, Samon 13	Feb 25, 127	v k.mar.	Y		355	355+12= 367
28	Year III, Samon 25	Feb 26, 128	iv k.mar.		Y	384	384–18= 366
29	Year IV, Samon 7	Feb 27, 129	iii k.mar.			354	354+12= 366
30	Year V, Samon 19	Feb 28, 130	ii k.mar.		Y	384	384–18= 366

day after *Terminalis* (vii k.mar.), the traditional end of the Roman year; and so we can see that the calendar's solar year is being constrained *never to begin earlier than the traditional start of the Roman year.* This seems unlikely to be pure concidence, and tends to support the idea that Samon is indeed the equivalent of Roman March.

Results for subsequent cycles

Because Equos and February are lengthened in tandem, the bissextile never disturbs the relationship between the calendars; and so the initial day of solar Samon produces the same pattern of Roman equivalents no matter where the

TABLE 16: Results of non-sequential use (entire second cycle, and cycle-years 1 to 8 of third cycle)

Cycle-year	*Start of solar Samon*	*Roman equivalent*	*Roman usage*	*Long Equos?*	*ICM?*	*Lunar year*	*Days to next solar Samon*
1	Year I, Samon 1	Mar 01, 131	k.mar.	Y		355	355+6=361
2	Year IV, Samon 7	Feb 24_2, 132	vi$_2$ k.mar.			354	354+12=366
3	Year V, Samon 19	Feb 25, 133	v k.mar.		Y	384	384–18= 366
4	Year I, Samon 1	Feb 26, 134	iv k.mar.			354	354+12= 366
5	Year II, Samon 13	Feb 27, 135	iii k.mar.	Y		355	355+12= 367
6	Year III, Samon 25	Feb 28, 136	ii k.mar.		Y	384	384–18= 366
7	Year IV, Samon 7	Mar 01, 137	k.mar.			354	354+6= 360
8	Year II, Samon 13	Feb 24, 138	vi k.mar.			354	354+12= 366
9	Year III, Samon 25	Feb 25, 139	v k.mar.	Y	Y	385	385–18= 367
10	Year IV, Samon 7	Feb 26, 140	iv k.mar.			354	354+12= 366
11	Year V, Samon 19	Feb 27, 141	iii k.mar.		Y	384	384–18= 366
12	Year I, Samon 1	Feb 28, 142	ii k.mar.			354	354+12= 366
13	Year II, Samon 13	Mar 01, 143	k.mar.	Y		355	355+6= 361
14	Year V, Samon 19	Feb 24_2, 144	vi$_2$ k.mar.		Y	384	384–18= 366
15	Year I, Samon 1	Feb 25, 145	v k.mar.			354	354+12= 366
16	Year II, Samon 13	Feb 26, 146	iv k.mar.			354	354+12= 366
17	Year III, Samon 25	Feb 27, 147	iii k.mar.	Y	Y	385	385–18= 367
18	Year IV, Samon 7	Feb 28, 148	ii k.mar.			354	354+12= 366
19	Year V, Samon 19	Mar 01, 149	k.mar.			354	354+6= 360
20	Year III, Samon 25	Feb 24, 150	vi k.mar.		Y	384	384–18= 366
21	Year IV, Samon 7	Feb 25, 151	v k.mar.	Y		355	355+12= 367
22	Year V, Samon 19	Feb 26, 152	iv k.mar.		Y	384	384–18= 366
23	Year I, Samon 1	Feb 27, 153	iii k.mar.			354	354+12= 366
24	Year II, Samon 13	Feb 28, 154	ii k.mar.			354	354+12= 366
25	Year III, Samon 25	Mar 01, 155	k.mar.	Y	Y	385	385–24= 361
26	Year I, Samon 1	Feb 24_2, 156	vi$_2$ k.mar.			354	354+12= 366
27	Year II, Samon 13	Feb 25, 157	v k.mar.			354	354+12= 366
28	Year III, Samon 25	Feb 26, 158	iv k.mar.		Y	384	384–18= 366
29	Year IV, Samon 7	Feb 27, 159	iii k.mar.	Y		355	355+12= 367
30	Year V, Samon 19	Feb 28, 160	ii k.mar.		Y	384	384–18= 366
1	Year I, Samon 1	Mar 01, 161	k.mar.			354	354+6= 360
2	Year IV, Samon 7	Feb 24, 162	vi k.mar.			354	354+12= 366
3	Year V, Samon 19	Feb 25, 163	v k.mar.	Y	Y	385	385–18= 367
4	Year I, Samon 1	Feb 26, 164	iv k.mar.			354	354+12= 366
5	Year II, Samon 13	Feb 27, 165	iii k.mar.			354	354+12= 366
6	Year III, Samon 25	Feb 28, 166	ii k.mar.		Y	384	384–18= 366
7	Year IV, Samon 7	Mar 01, 167	k.mar.	Y		355	355+6= 361
8	Year II, Samon 13	Feb 24_2, 168	vi$_2$ k.mar.			354	354+12= 366

bissextiles occur. This means that all 30-year cycles produce the same result. To illustrate this, we need only look at the next 30-year cycle (see Table 16 on p. 48):

In the second 30-year cycle, the bissextiles are displaced by two years from their positions in the first cycle, creating a different sequence of year-lengths; yet the pattern of Roman-style equivalents remains unchanged.
The first few years of the third cycle are also shown, to demonstrate that, as 60 is evenly divisible by 4, the bissextiles now occupy the same locations as in the first cycle. So then, the full pattern actually encompasses a *pair* of 30-year cycles; but the pattern of Roman equivalents remains the same throughout.
In fact, as the location of the bissextiles never affects the pattern of Roman equivalents, we could just as well begin the first 30-year cycle in AD 102, or in any other year, rather than in AD 101:

TABLE 17: Results of non-sequential use (cycle-years 1 to 10 of first cycle, if cycle begins in AD 102)

Cycle-year	*Start of solar Samon*	*Roman equivalent*	*Roman usage*	*Long Equos?*	*ICM?*	*Lunar year*	*Days to next solar Samon*
1	Year I, Samon 1	Mar 01, 102	k.mar.			354	354+6= 360
2	Year IV, Samon 7	Feb 24, 103	vi k.mar.	Y		355	355+12= 367
3	Year V, Samon 19	Feb 25, 104	v k.mar.		Y	384	384–18= 366
4	Year I, Samon 1	Feb 26, 105	iv k.mar.			354	354+12= 366
5	Year II, Samon 13	Feb 27, 106	iii k.mar.			354	354+12= 366
6	Year III, Samon 25	Feb 28, 107	ii k.mar.	Y	Y	385	385–18= 367
7	Year IV, Samon 7	Mar 01, 108	k.mar.			354	354+6= 360
8	Year II, Samon 13	Feb 24, 109	vi k.mar.			354	354+12= 366
9	Year III, Samon 25	Feb 25, 110	v k.mar.		Y	384	384–18= 366
10	Year IV, Samon 7	Feb 26, 111	iv k.mar.	Y		355	355+12= 367

Just the first ten years are shown, but it is clear that although the sequence of year-lengths is yet again different, the Roman equivalents remain unchanged. The same is true of the second cycle (see Table 18 on p. 50):

TABLE 18: Results of non-sequential use (cycle-years 1 to 10 of second cycle, if first cycle begins in AD 102)

Cycle-year	*Start of solar Samon*	*Roman equivalent*	*Roman usage*	*Long Equos?*	*ICM?*	*Lunar year*	*Days to next solar Samon*
1	Year I, Samon 1	Mar 01, 132	k.mar.			354	354+6= 360
2	Year IV, Samon 7	Feb 24, 133	vi k.mar.			354	354+12= 366
3	Year V, Samon 19	Feb 25, 134	v k.mar.		Y	384	384–18= 366
4	Year I, Samon 1	Feb 26, 135	iv k.mar.	Y		355	355+12= 367
5	Year II, Samon 13	Feb 27, 136	iii k.mar.			354	354+12= 366
6	Year III, Samon 25	Feb 28, 137	ii k.mar.		Y	384	384–18= 366
7	Year IV, Samon 7	Mar 01, 138	k.mar.			354	354+6= 360
8	Year II, Samon 13	Feb 24, 139	vi k.mar.	Y		355	355+12= 367
9	Year III, Samon 25	Feb 25, 140	v k.mar.		Y	384	384–18= 366
10	Year IV, Samon 7	Feb 26, 141	iv k.mar.			354	354+12= 366

...and the third as well, which (as before) is a duplicate of the first:

TABLE 19: Results of non-sequential use (cycle-years 1 to 10 of third cycle, if first cycle begins in AD 102)

Cycle-year	*Start of solar Samon*	*Roman equivalent*	*Roman usage*	*Long Equos?*	*ICM?*	*Lunar year*	*Days to next solar Samon*
1	Year I, Samon 1	Mar 01, 162	k.mar.			354	354+6= 360
2	Year IV, Samon 7	Feb 24, 163	vi k.mar.	Y		355	355+12= 367
3	Year V, Samon 19	Feb 25, 164	v k.mar.		Y	384	384–18= 366
4	Year I, Samon 1	Feb 26, 165	iv k.mar.			354	354+12= 366
5	Year II, Samon 13	Feb 27, 166	iii k.mar.			354	354+12= 366
6	Year III, Samon 25	Feb 28, 167	ii k.mar.	Y	Y	385	385–18= 367
7	Year IV, Samon 7	Mar 01, 168	k.mar.			354	354+6= 360
8	Year II, Samon 13	Feb 24, 169	vi k.mar.			354	354+12= 366

So then, it is also immaterial which year is designated as the start of the first 30-year cycle: the pattern of Roman equivalents will always be the same, and will remain the same for all subsequent cycles.

Evaluation of results

In this non-sequential method of use, all five instances of Equos on the plate again periodically require a 30th day; and as before, this could explain why all surviving ends of Equos contain a 30th day. Furthermore, the degree of wander is now as small as the calendar's complexity suggests it ought to be. Table 15 shows that Samon can begin as early as February 1 (in cycle-years 9 and 20) and as late as March 1 (in cycle-year 1) – a range of no more than 29 days, a result as good as Meton's.

The consequent relationship between Samon and March is so symmetrical and simple that dates can be converted from one to the other quite easily, even if one knows *only the current cycle-year*. For example: say that the current cycle-year is 16. The calendars can then be coordinated in three simple steps:

Step 1: From the cycle year, locate the current year on the plate:
Add 4 to the cycle-year, divide the result by 6, and discard any remainder. Double the result, add the cycle-year, and subtract 5 until the number is 5 or less. (Formula A)
Example: For cycle-year 16, the result is 2 – that is, plate-year II.

Step 2: From the plate-year, determine the day of Samon on which solar Samon begins:
Subtract 1 from the plate-year, multiply the result by 12, and add 1. If greater than 30, subtract 30. (Formula B)
Example: For Year II, the result is 13 – that is, solar Samon begins on Samon 13.

Step 3: From the day of Samon on which solar Samon begins, determine the equivalent day of the kalends of March:
From 32, subtract the cycle-year, then subtract 6 until the number is 6 or less. (Formula C)
Example: For cycle-year 16, the result is 4 - that is, Samon 13 = iv k.mar.

So then: knowing only that it is cycle-year 16, one can use these three simple formulae to determine that in *this* year, Samon 13 coincides with iv k.mar. in the Roman calendar. As Table 15 shows, these results match the ones derived earlier for cycle-year 16, using the much more cumbersome method of counting days.

Behaviour of other months

Furthermore: as solar Samon and March both contain 31 days, the *same simple relationship* occurs between solar Duman and April:

TABLE 20: Results of non-sequential use (cycle-years 1 to 7): Samon and Duman

Cycle-year	*Plate-year*	*Start of solar Samon*	*Roman equivalent*	*Roman usage*	*Start of solar Duman*	*Roman equivalent*	*Roman usage*
1	I	Samon 1	Mar 01, 101	k.mar.	Duman 2	Apr 01, 101	k.apr.
2	IV	Samon 7	Feb 24, 102	vi k.mar.	Duman 8	Mar 27, 102	vi k.apr.
3	V	Samon 19	Feb 25, 103	v k.mar.	Duman 20	Mar 28, 103	v k.apr.
4	I	Samon 1	Feb 26, 104	iv k.mar.	Duman 2	Mar 29, 104	iv k.apr.
5	II	Samon 13	Feb 27, 105	iii k.mar.	Duman 14	Mar 30, 105	iii k.apr.
6	III	Samon 25	Feb 28, 106	ii k.mar.	Duman 26	Mar 31, 106	ii k.apr.
7	IV	Samon 7	Mar 01, 107	k.mar.	Duman 8	Apr 01, 107	k.apr.

TABLE 21: Results of non-sequential use (cycle-years 1 to 7): Samon, Duman and Rivros

Cycle-year	*Plate-year*	*Start of solar Samon*	*Roman equivalent*	*Roman usage*	*Start of solar Duman*	*Roman equivalent*	*Roman usage*	*Start of solar Rivros*	*Roman equivalent*	*Roman usage*
1	I	Samon 1	Mar 01, 101	k.mar.	Duman 2	Apr 01, 101	k.apr.	Rivros 3	May 01, 101	k.mai.
2	IV	Samon 7	Feb 24, 102	vi k.mar.	Duman 8	Mar 27, 102	vi k.apr.	Rivros 9	Apr 26, 102	vi k.mai.
3	V	Samon 19	Feb 25, 103	v k.mar.	Duman 20	Mar 28, 103	v k.apr.	Rivros 21	Apr 27, 103	v k.mai.
4	I	Samon 1	Feb 26, 104	iv k.mar.	Duman 2	Mar 29, 104	iv k.apr.	Rivros 3	Apr 28, 104	iv k.mai.
5	II	Samon 13	Feb 27, 105	iii k.mar.	Duman 14	Mar 30, 105	iii k.apr.	Rivros 15	Apr 29, 105	iii k.mai.
6	III	Samon 25	Feb 28, 106	ii k.mar.	Duman 26	Mar 31, 106	ii k.apr.	Rivros 27	Apr 30, 106	ii k.mai.
7	IV	Samon 7	Mar 01, 107	k.mar.	Duman 8	Apr 01, 107	k.apr.	Rivros 9	May 01, 107	k.mai.

TABLE 22: Results of non-sequential use (cycle-years 1 to 7): Anagant, Ogron and Cutios

Cycle-year	*Plate-year*	*Start of solar Anagant*	*Roman equivalent*	*Roman usage*	*Start of solar Ogron*	*Roman equivalent*	*Roman usage*	*Start of solar Cutius*	*Roman equivalent*	*Roman usage*
1	I	Anagant 4	Jun 01, 101	k.iun.	Ogron 5	Jul 01, 101	k.iul.	Cutios 6	Aug 01, 101	k.aug.
2	IV	Anagant 10	May 27, 102	vi k.iun.	Ogron 11	Jun 26, 102	vi k.iul.	Cutios 12	Jul 27, 102	vi k.aug.
3	V	Anagant 22	May 28, 103	v k.iun.	Ogron 23	Jun 27, 103	v k.iul.	Cutios 24	Jul 28, 103	v k.aug.
4	I	Anagant 4	May 29, 104	iv k.iun.	Ogron 5	Jun 28, 104	iv k.iul.	Cutios 6	Jul 29, 104	iv k.aug.
5	II	Anagant 16	May 30, 105	iii k.iun.	Ogron 17	Jun 29, 105	iii k.iul.	Cutios 18	Jul 30, 105	iii k.aug.
6	III	Anagant 28	May 31, 106	ii k.iun.	Ogron 29	Jun 30, 106	ii k.iul.	Cutios 30	Jul 31, 106	ii k.aug.
7	IV	Anagant 10	Jun 01, 107	k.iun.	Ogron 11	Jul 01, 107	k.iul.	Cutios 12	Aug 01, 107	k.aug.

Just the first seven years of the cycle are shown, but the point is clear: solar Duman and April produce the same pattern of equivalents in Roman usage as do solar Samon and March.

In the same way, solar Duman is the same length as April, so the same pattern is also reproduced between solar Rivros and May:

TABLE 21: Results of non-sequential use (cycle-years 1 to 7): Samon, Duman and Rivros, see opposite page.

Clearly, each subsequent Gaulish solar month will form this same pattern against its Roman counterpart as long as they both contain the same number of days, which we find is the case for the next six months of the year:

TABLE 22: Results of non-sequential use (cycle-years 1 to 7): Anagant, Ogron and Cutios, see opposite page.

TABLE 23: Results of non-sequential use (cycle-years 1 to 7): Giamon, Simivi and Equos, see next page.

The pattern has now remained the same through the first nine months of the year. The final three months contain a difference:

TABLE 24: Results of non-sequential use (cycle-years 1 to 7): Elembiu, Edrin and Cantlos, see next page.

Here we see the regular perturbation caused by the inequality between Equos and November – namely: with respect to the Roman calendar, (a) solar *Elembiu* always begins one day *late* in years containing a *long* Equos, whereas (b) solar *Edrin* and *Cantlos* always begin one day *early* in years containing a *short* Equos. The inequality between February and Cantlos, however, does not cause a further perturbation, but rather corrects the first one, such that the relationship between March and Samon remains constant.

Universal 'conversion formulae'

So then, the same pattern of Roman equivalents is reproduced in all but the final three months; and in these final three months, the pattern is perturbed in a simple and regular way. This means that the three-step conversion process can be recast as a *universal* one, useful for any month, in any year of any cycle.

Suppose, for example, that it is now cycle-year 28, and that we want to coordinate the month of Giamon against the Roman calendar. We already know that Giamon roughly corresponds to September:

TABLE 23: Results of non-sequential use (cycle-years 1 to 7): Giamon, Simivi and Equos

Cycle-year	*Plate-year*	*Start of solar Giamon*	*Roman equivalent*	*Roman usage*	*Start of solar Simivi*	*Roman equivalent*	*Roman usage*	*Start of solar Equos*	*Roman equivalent*	*Roman usage*
1	I	Giamon 7	Sep 01, 101	k.sep.	Simivi 8	Oct 01, 101	i k.oct.	Equos 9	Nov 01, 101	k.nov.
2	IV	Giamon 13	Aug 27, 102	vi k.sep.	Simivi 14	Sep 26, 102	vi k.oct.	Equos 15	Oct 27, 102	vi k.nov.
3	V	Giamon 25	Aug 28, 103	v k.sep.	Simivi 26	Sep 27, 103	v k.oct.	Equos 27	Oct 28, 103	v k.nov.
4	I	Giamon 7	Aug 29, 104	iv k.sep.	Simivi 8	Sep 28, 104	iv k.oct.	Equos 9	Oct 29, 104	iv k.nov.
5	II	Giamon 19	Aug 30, 105	iii k.sep.	Simivi 20	Sep 29, 105	iii k.oct.	Equos 21	Oct 30, 105	iii k.nov.
6	III	Giamon 1	Aug 31, 106	ii k.sep.	Simivi 2	Sep 30, 106	ii k.oct.	Equos 3	Oct 31, 106	ii k.nov.
7	IV	Giamon 13	Sep 01, 107	k.sep.	Simivi 14	Oct 01, 107	i k.oct.	Equos 15	Nov 01, 107	k.nov.

TABLE 24: Results of non-sequential use (cycle-years 1 to 7): Elembiu, Edrin and Cantlos

Cycle-year	*Plate-year*	*Start of solar* Elembiu	*Roman equivalent*	*Roman usage*	*Start of solar Edrin*	*Roman equivalent*	*Roman usage*	*Start of solar Cantlos*	*Roman equivalent*	*Roman usage*
1	I	Elembiu 10	Dec 01, 101	k.dec.	Edrin 11	Dec 31, 101	ii k.ian.	Cantlos 12	Jan 31, 102	ii k.feb.
2	IV	Elembiu 16	Nov 26, 102	vi k.dec.	Edrin 17	Dec 26, 102	vii k.ian.	Cantlos 18	Jan 26, 103	vii k.feb.
3	V	Elembiu 28	Nov 28, 103	iv k.dec.	Edrin 29	Dec 28, 103	v k.ian.	ICA 1	Jan 28, 104	v k.feb.
4	I	Elembiu 10	Nov 28, 104	iv k.dec.	Edrin 11	Dec 28, 104	v k.ian.	Cantlos 12	Jan 28, 105	v k.feb.
5	II	Elembiu 22	Nov 29, 105	iii k.dec.	Edrin 23	Dec 29, 105	iv k.ian.	Cantlos 24	Jan 29, 106	iv k.feb.
6	III	Elembiu 4	Nov 30, 106	ii k.dec.	Edrin 5	Dec 30, 106	iii k.ian.	Cantlos 6	Jan 30, 107	iii k.feb.
7	IV	Elembiu 16	Dec 02, 107	iv non. dec.	Edrin 17	Jan 01, 108	k.ian.	Cantlos 18	Feb 01, 108	k.feb.

TABLE 25: Basic correspondence between Gaulish and Roman months

Gaulish	*Roman*	*Gaulish*	*Roman*
Samon	March	Giamon	September
Duman	April	Simivi	October
Rivros	May	Equos	November
Anagant	June	Elembiu	December
Ogron	July	Edrin	January
Cutios	August	Cantlos	February

... but how *exactly* does Giamon correspond to September in cycle-year 28?

In the following solution, Formula A has remained the same; but Formulae B and C have been altered so that they will work for any month:

Step 1: From the cycle year, locate the current year on the plate:
Add 4 to the cycle-year, divide the result by 6, and discard any remainder. Double the result, add the cycle-year, and subtract 5 until the number is 5 or less. (Formula A)
Example: For cycle-year 28, the result is 3 – that is, plate-year III.

Step 2: From the plate-year, determine the day of Giamon on which solar Giamon begins:
Subtract 1 from the plate-year, multiply the result by 12, and add the month number.
If greater than 30, subtract 30. (Formula B)
Example: Giamon is the 7th month, so its month-number is 7; and so for Year III, the result is 1 - that is, solar Giamon begins on Giamon 1.

Step 3: From the day of Giamon on which solar Giamon begins, determine the equivalent day of the kalends of September:
From 32, subtract the cycle-year, then subtract 6 until the number is 6 or less.
If the month is after Elembiu, add 1; and if it is after long Equos, subtract 1. (Formula C)
Example: For cycle-year 28, the result is 4 - that is, Giamon 1 = iv k.sep.

The existence of such simple (yet perpetual) rules for conversion demonstrates the simplicity of the relationship between the calendars that results from equating Samon with March. As has been demonstrated, this simplicity is due largely to the one-to-one correspondence between the Gaulish and Roman month-lengths, *if* Samon is equated with March; and so not surprisingly, equating Samon with any other Roman month produces conversion-rules that are markedly more complex. If the calendar was at all used in Gallo-Roman administration, then, the equating of Samon with March recommends itself as producing by far the *simplest* system to administer.

TABLE 26: Nine sets of IVOS days in each plate-year

Set	*Year I*	*Year II*	*Year III*	*Year IV*	*Year V*
1	ICA 26 - Sam 4	Sam 26 - Dum 4	Sam 26 - Dum 4	Can 26 - Sam 4	Sam 26 - Dum 4
2	Dum 13 - 20	Riv 13 - 20	Riv 13 - 20	Dum 13 - 20	Riv 13 - 20
3	Dum 26 - Riv 3	Riv 26 - Ana 3	Riv 26 - Ana 3	Dum 26 - Riv 3	Riv 26 - Ana 3
4	Ogr 28 - Cut 3	Cut 28 - Gia 9	Cut 28 - ICB 3	Ogr 28 - 30; Cut 28 - Gia 3	Cut 28 - Gia 3
5	Gia 9	Sim 9	Gia 9	Sim 9	Sim 9
6	Sim 27 - Equ 4	Equ 26 - Ele 5	Sim 27 - Equ 4	Equ 26 - Ele 5	Equ 26 - Ele 5
7	Ele 1 - 3	Edr 1 - 3	Ele 1 - 3	Edr 1 - 3	Edr 1 - 3
8	Ele 25	Edr 25	Ele 25	Edr 25	Edr 25
9	Edr 28 -30; Can 28 - Sam 3	Can 28 - Sam 3	Edr 28 - Can 3	Can 28 - Sam 3	Can 28 - ICA 3

TABLE 27: Lunar phases marked by sets of IVOS days

Set	*Days* *Gaulish month*	*Age of moon of* *(day 1 = new moon)*	*The set then marks:*
1	day 26 - day 4	days 1 (or 2) - 9	The waxing moon, from early crescent to just after first quarter
2	days 13 - 20	days 18 - 25	The waning moon, from just after full to just after last quarter
3	day 26 - day 3	days 1 (or 2) - 8	The waxing moon, from early crescent to just after first quarter
4 (normal)	day 28 - day 3	days 3 - 8	The waxing moon, from early crescent to just after first quarter
4 (interrupted)	days 28-30, then	days 3 - 5, then	The early crescent of one waxing moon, then
	day 28-day 3	days 3 - 8	the next waxing moon, from early crescent to just after first quarter
5	day 9	day 14	The full moon
6	day 26 (or 27) - day 4 (or 5)	days 2 - 9 (or 10)	The waxing moon, from early crescent to just after first quarter
7	day 1 - 3	days 6 - 8	The first-quarter moon, and the day before and after it
8	day 25	day 30	The new moon
9 (normal)	day 28 - day 3	days 3 (or 4) - 8	The waxing moon, from early crescent to just after first quarter
9 (interrupted)	day 28 -30, then	days 3 - 5, then	The early crescent of one waxing moon, then
	day 28 - day 3	days 3 (or 4) - 8	the next waxing moon, from early crescent to just after first quarter

Resulting placement of sets of days marked ivos

In attempting to demonstrate some of the patterns produced by equating Samon with March, I have so far concentrated on the larger structures of the calendar (years and months); little has been said about individual days and groups of days, apart from the notations within the intercalary months. Space does not permit a thorough analysis of the host of smaller elements contained in the calendar. But having developed this hypothesis, it would be interesting to examine at least one of these smaller structures in detail, simply to see whether the hypothesis and the structure illuminate each other. To this end, one of the best-known of these structures will be examined: the sets of days bearing the notation IVOS.

Pattern of ivos days on the plate

Each plate-year can be said to contain nine sets of days marked IVOS (the meaning of which is unknown). Table 26 shows the pattern in which they occur across the plate (see p. 56).

The lacunae (marked by shading) require that a certain portion of this pattern be reconstructed by conflation; but because IVOS days occur mostly in blocks, portions of most blocks have survived, and so this pattern is actually one of the best-attested and least-controverted in the calendar. Of the sets in Table 26, all but the shaded ones are wholly or partially extant, such that no set is entirely missing from more than two of the five years, and all are wholly or partially extant in both an ordinary and an intercalated year.

Set 2 is perhaps in the poorest condition, with some attendant uncertainty as to whether all eight of its days were marked IVOS (Duval and Pinault 1986, 342; Olmsted 1992, 87-88). But this uncertainty does not extend to the first and last days of the set; and as we are interested in the placement of the sets as a whole, not of their individual days, let us include set 2 on the basis of its bounds, and defer the issue of its contiguity.

As Table 26 shows, these sets occur in a regular pattern across the plate. Each set is shifted to the previous month during the year following an intercalation – that is, throughout Year I, and during the latter half of Year III and the first half of Year IV. The sets are then returned to their normal positions by means of a simple device. The final set in each shifted period — set 9 of Year I, and set 4 of Year IV – begin in shifted position, but are interrupted after three days, and then resume on the 28th day of the following month, as in ordinary years. All subsequent sets then fall in their normal positions, until the next intercalation shifts them again.

Pliny's sexta luna

In *Naturalis Historia* (XVI. 250), Pliny states that for Gaulish druids, lunar months began on 'the sixth day of the moon, which marks for them the beginning of the months, the years, and the century of thirty years'. There has often been debate about whether this refers to the sixth sunset after first crescent, or the sixth sunset after new moon; but for an observer, the former option is excluded by Pliny's next phrase: 'as by this time it has considerable strength, though not yet at its halfway point.' The sixth sunset after first crescent often produces a moon past first-quarter, whereas the sixth sunset after new moon *never* does. To illustrate, the following figure shows the average appearance of the moon at the sixth sunset after new moon to a viewer at the latitude of Coligny, when that average is taken over a full Metonic cycle of 235 lunar months:

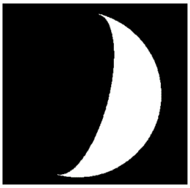

Fig. 10: Average appearance of moon at Pliny's *sexta luna:* 31.5% illumination

This shape fits Pliny's description, and so in this essay, *sexta luna* is taken to mean the sixth sunset after new moon. Beginning months at new moon rather than at first crescent is not as modern an idea as it is often made out to be: in Meton's own calendar, months began at the first sunset after new moon (Samuel 1972, 53), and both Ptolemy's *Almagest* (Neugebauer 1957, 191-4; 1975, 98-9) and the astronomical tablets of the Seleucid era (*ibid*. 1957, 106-9; 1975, 534) clearly demonstrate an ability to determine the time of new moon with some precision.

Lunar phases marked by the sets

If lunar months begin at the sixth sunset after new moon, then new moons must occur on the 25th day or 26th day of the preceding month, depending on whether that month contains 29 or 30 days. As Table 26 shows, IVOS sets 1, 3, 4, 6 and 9 all begin on or after the 26th day of the month, and end on or before the 5th day of the following month - that is, they begin on or just after a new moon, then proceed to mark the waxing moon, from early crescent to just after first quarter.

Using the same method, we can deduce the lunar phases marked by each set:

TABLE 27: Lunar phases marked by sets of IVOS days, see page 56.

In short: the nine sets of IVOS days mark five waxing moons, one first-quarter moon, one full moon, one waning moon, and one new moon.

Properties of the new moons that precede the sets
Let us look more closely at the new moons preceding each set. The new moons preceding the five instances of set 1 listed in Table 26, for example, must occur on the following days:

TABLE 28: New moons preceding IVOS set 1

	Year I	*Year II*	*Year III*	*Year IV*	*Year V*
New moon:	ICA 26	Sam 26	Sam 26	Can 25	Sam 26
IVOS set 1:	ICA 26 - Sam 4	Sam 26 - Dum 4	Sam 26 - Dum 4	Can 26 - Sam 4	Sam 26 - Dum 4

These new-moon dates fall close to the dates on which solar Samon begins in each plate year, as shown earlier in Table 1:

TABLE 29: New moons preceding IVOS set 1, and dates on which solar Samon begins

	Year I	*Year II*	*Year III*	*Year IV*	*Year V*
New moon preceding set 1:	ICA 26	Sam 26	Sam 26	Can 25	Sam 26
Start of solar Samon:	Sam 1	Sam 13	Sam 25	Sam 7	Sam 19
Difference:	5 days	13 days	1 day	11 days	7 days

As can be seen, the new moon preceding set 1 never falls more than 13 days from the start of solar Samon. In nature, new moons occur no less than 29.5 days apart – and as 13 days is less than half this amount, it is clear that the new moon leading into set 1 will always be the new moon closest to the start of solar Samon.
In the same way, the other eight sets are associated with new moons occurring closest to the start of other solar months:

TABLE 30: New moons preceding IVOS sets, and their proximity to solar-month boundaries, see next page.

In set 8 of Year I, the new moon on Elembiu 25 is shown as 15 days from the start of solar Edrin – but this is not really an exception, for the start of solar Elembiu (on Elembiu 10) is also 15 days away. This is the only case in which a new moon falls equidistant between two solar-month boundaries.
But the two interrupted sets – IV set 4, and I set 9 – do contain exceptions. Because both sets encompass two adjacent waxing moons, Table 30 lists two new-moon dates for each, and shows that in both sets, the second new moon falls closest to the expected solar-month boundary, while the first does not. As a result, IV Ogron 26 and I Edrin 26 become the two exceptions to the pattern.

Table 30: New moons preceding IVOS sets, and their proximity to solar-month boundaries

	Year I	*Year II*	*Year III*	*Year IV*	*Year V*
New moon preceding set 1:	ICA 26	Sam 26	Sam 26	Can 25	Sam 26
Start of solar Samon:	Sam 1	Sam 13	Sam 25	Sam 7	Sam 19
Difference:	5 days	13 days	1 day	11 days	7 days
New moon preceding set 2:	Sam 26	Dum 25	Dum 25	Sam 26	Dum 25
Start of solar Duman:	Dum 2	Dum 14	Dum 26	Dum 8	Dum 20
Difference:	6 days	11 days	1 day	12 days	5 days
New moon preceding set 3:	Dum 25	Riv 26	Riv 26	Dum 25	Riv 26
Start of solar Rivros:	Riv 3	Riv 15	Riv 27	Riv 9	Riv 21
Difference:	7 days	11 days	1 day	13 days	5 days
New moon preceding set 4:	Ogr 26	Cut 26	Cut 26	Ogr 26; Cut 26	Cut 26
Start of solar Cutios:	Cut 6	Cut 18	Cut 30	Cut 12	Cut 24
Difference:	10 days	8 days	4 days	16 days; 14 days	5 days
New moon preceding set 5:	Cut 26	Gia 25	ICB 26	Gia 25	Gia 25
Start of solar Giamon:	Gia 7	Gia 19	Gia 1	Gia 13	Gia 25
Difference:	11 days	6 days	5 days	12 days	0 days
New moon preceding set 6:	Sim 26	Equ 25 or 26	Sim 26	Equ 25 or 26	Equ 25 or 26
Start of solar Equos:	Equ 9	Equ 21	Equ 3	Equ 15	Equ 27
Difference:	13 days	4 or 5 days	7 days	10 or 11 days	1 or 2 days
New moon preceding set 7:	Equ 25 or 26	Ele 25	Equ 25 or 26	Ele 25	Ele 25
Start of solar Elembiu:	Ele 10	Ele 22	Ele 4	Ele 16	Ele 28
Difference	14 days	3 days	8 days	9 days	3 days
New moon closest to set 8:	Ele 25	Edr 26	Ele 25	Edr 26	Edr 26
Start of solar Edrin:	Edr 11	Edr 23	Edr 5	Edr 17	Edr 29
Difference:	15 days	3 days	9 days	9 days	3 days
New moon preceding set 9:	Edr 26; Can 25	Can 25	Edr 26	Can 25	Can 25
Start of solar Cantlos:	Can 12	Can 24	Can 6	Can 18	ICA 1
Difference:	16 days; 13 days	1 day	10 days	7 days	5 days

These results are summarised in Table 31:

TABLE 31: A summary of Table 30

New moon : preceding	*Year I*	*Year II*	*Year III*	*Year IV*	*Year V*	*Always the new moon closest to the start of:*
IVOS set 1	ICA 26	Sam 26	Sam 26	Can 25	Sam 26	solar Samon
IVOS set 2	Sam 26	Dum 25	Dum 25	Sam 26	Dum 25	solar Duman
IVOS set 3	Dum 25	Riv 26	Riv 26	Dum 25	Riv 26	solar Rivros
IVOS set 4				Ogr 26		
	Ogr 26	Cut 26	Cut 26	Cut 26	Cut 26	solar Cutios
IVOS set 5	Cut 26	Gia 25	ICB 26	Gia 25	Gia 25	solar Giamon
IVOS set 6	Sim 26	Equ 25/26	Sim 26	Equ 25/26	Equ 25/26	solar Equos
IVOS set 7	Equ 25/26	Ele 25	Equ 25/26	Ele 25	Ele 25	solar Elembiu
IVOS set 8	Ele 25	Edr 26	Ele 25	Edr 26	Edr 26	solar Edrin
IVOS set 9	Edr 26					
	Can 25	Can 25	Edr 26	Can 25	Can 25	solar Cantlos

Again, we can see that only IV Ogron 26 and I Edrin 26 fail to meet the condition shown in the far-right column. However, we find that these two exceptions are part of a second pattern, which becomes apparent if we expand Table 31 to include all 62 new-moon dates on the plate:

TABLE 32: The 62 new moons on the plate, and their proximity to solar-month boundaries, see next page

The horizontal line divides the solar year into two halves at solar Samon and solar Giamon. The new-moon dates preceding the IVOS sets remain aligned as before, while the new moons that do not precede IVOS sets are shaded. Notice that each row contains only those new moons occupying a particular sequential position within the solar year:

TABLE 33: The 62 new moons on the plate, and their sequential positions in the solar year, see page 63.

The penultimate column implies a second set of conditions for the sets – that the five sets marking the waxing moon, for example, must mark the waxing of the 1st, 3rd and 6th new moons of the summer half of the solar year, and the 3rd and 6th new moons of the winter half. In this second pattern, the exceptions are now IV Cutios 26 and I Cantlos 25 – the *second* new moon of each interrupted set: both these new moons are not the sixth of the season, but an exceptional seventh.

TABLE 32: The 62 new moons on the plate, and their proximity to solar-month boundaries

New moon: preceding:	*Year I*	*Year II*	*Year III*	*Year IV*	*Year V*	*Always the new moon closest to the start of:*
IVOS set 1	ICA 26	Sam 26	Sam 26	Can 25	Sam 26	solar Samon
IVOS set 2	Sam 26	Dum 25	Dum 25	Sam 26	Dum 25	solar Duman
IVOS set 3	Dum 25	Riv 26	Riv 26	Dum 25	Riv 26	solar Rivros
	Riv 26	Ana 25	Ana 25	Riv 26	Ana 25	
	Ana 25	Ogr 26	Ogr 26	Ana 25	Ogr 26	
IVOS set 4				Ogr 26		
	Ogr 26	Cut 26	Cut 26	Cut 26	Cut 26	solar Cutios
IVOS set 5	Cut 26	Gia 25	ICB 26	Gia 25	Gia 25	solar Giamon
	Gia 25	Sim 26	Gia 25	Sim 26	Sim 26	
IVOS set 6	Sim 26	Equ 25/26	Sim 26	Equ 25/26	Equ 25/26	solar Equos
IVOS set 7	Equ 25/26	Ele 25	Equ 25/26	Ele 25	Ele 25	solar Elembiu
IVOS set 8	Ele 25	Edr 26	Ele 25	Edr 26	Edr 26	solar Edrin
IVOS set 9	Edr 26					
	Can 25	Can 25	Edr 26	Can 25	Can 25	solar Cantlos

TABLE 33: The 62 new moons on the plate, and their sequential positions in the solar year

New moon preceding:	*Year I*	*Year II*	*Year III*	*Year IV*	*Year V*	*Position of new moon in solar year:*	*Phase of moon marked by set:*
IVOS set 1	ICA 26	Sam 26	Sam 26	Can 25	Sam 26	1st of solar summer	Waxing
IVOS set 2	Sam 26	Dum 25	Dum 25	Sam 26	Dum 25	2nd	Waning
IVOS set 3	Dum 25	Riv 26	Riv 26	Dum 25	Riv 26	3rd	Waxing
	Riv 26	Ana 25	Ana 25	Riv 26	Ana 25	4th	
	Ana 25	Ogr 26	Ogr 26	Ana 25	Ogr 26	5th	
IVOS set 4	Ogr 26	Cut 26	Cut 26	Ogr 26	Cut 26	6th	Waxing
				Cut 26			
IVOS set 5	Cut 26	Gia 25	ICB 26	Gia 25	Gia 25	1st of solar winter	Full
	Gia 25	Sim 26	Gia 25	Sim 26	Sim 26	2nd	
IVOS set 6	Sim 26	Equ 25-26	Sim 26	Equ 25-26	Equ 25-26	3rd	Waxing
IVOS set 7	Equ 25-26	Ele 25	Equ 25-26	Ele 25	Ele 25	4th	1st Qtr
IVOS set 8	Ele 25	Edr 26	Ele 25	Edr 26	Edr 26	5th	New
IVOS set 9	Edr 26	Can 25	Edr 26	Can 25	Can 25	6th	Waxing
	Can 25						

From Tables 32 and 33, we can now formulate practical definitions that entirely account for the sets:

TABLE 34: Practical definitions of IVOS sets

Set....	*must mark the:*	*... of the new moon which is:*	*... and:*
1	waxing	1st of the summer half	...nearest the start of solar Samon
2	waning	2nd of the summer half	...nearest the start of solar Duman
3	waxing	3rd of the summer half	...nearest the start of solar Rivros
4	waxing	6th of the summer half	...nearest the start of solar Cutios
5	fullness	1st of the winter half	...nearest the start of solar Giamon
6	waxing	3rd of the winter half	...nearest the start of solar Equos
7	first quarter	4th of the winter half	...nearest the start of solar Elembiu
8	day	5th of the winter half	...nearest the start of solar Edrin
9	waxing	6th of the winter half	...nearest the start of solar Cantlos

For each set, then, we have posited a pair of conditions, with the implication that both conditions must always be met. As Tables 32 and 33 show, a single new moon satisfies both conditions for each set except the two interrupted ones, where the two conditions are satisfied separately by adjacent new moons. This suggests a rationale for the existence of the interrupted sets, which then proceed to mark *both* waxing moons with IVOS days.

Finally, an observation about set 2. Table 26 shows that this waning moon is always followed in six days by the waxing moon of set 3; while Table 34 shows that set 3 marks the waxing of the closest new moon to the start of solar Rivros; and so it follows that sets 2 and 3 will always *frame* this new moon. The implication is that a particularly important new moon is being doubly-marked, with commemmoration of both the waning moon leading into it, and the waxing moon leading out of it.

Average Roman dates of the sets

In determining average Roman dates for the sets, the earlier parameters were retained: March 1, AD 101 was taken as Samon 1 of cycle-year 1; Equos was given a 30th day only in (Gaulish) years that encompass a Roman bissextile; and the calendar was intercalated according to the pattern shown in Table 11. The resulting Roman dates of the sets were then tabulated for two consecutive 30-year periods, from AD 101 to AD 161, so as to include the full pattern of bissextiles. The resulting tables are ponderous, but they are summarised in Table 35:

Set 1, for example, has its earliest occurrence in AD 102, when it falls on February 14-21; and it has its latest occurrence in AD 113 and AD 143, when it falls on March 14-22. Taken over the 60 years, the average start- and end-dates for the set are February 28 and March 7; and the average median is March 4 –

TABLE 35: Roman dates of IVOS sets over a 60-year period (AD 101 to AD 161)

Set	*Dates and year(s) of earliest occurrence*	*Dates and year(s) of latest occurrence*	*60-year average start & end*	*60-yr avg median median*
1	Feb 14-21, 102	Mar 14-22, 113 & 143	Feb 28 - Mar 7	Mar 4
2	Apr 1-8, 102 & 132	Apr 29-May 6, 113 & 143	Apr 15 - Apr 22	Apr 18
3	Apr 14-20, 102 & 132	May 12-19, 113 & 143	Apr 28 - May 4	May 1
4 (all but Year IV)	Jul 19-24, 126 & 156	Aug 11-16, 113 & 143	Jul 30 - Aug 4	
4 (Year IV only)	Jul 13-15 + Aug 12-17, 102 & 132	Jul 18-20 + Aug 17-22, 107 & 137	Jul 15 - Aug 19	Aug 2
5	Aug 29, 126 & 156	Sep 26, 107 & 137	Sep 12	Sep 12
6	Oct 15-22, 126 & 156	Nov 12-21, 107	Oct 29 - Nov 6	Nov 2
7	Nov 17-19, 126 & 156	Dec 16-18, 107	Dec 1 - 3	Dec 2
8	Dec 11, 126 & 156	Jan 9, 107	Dec 25	Dec 25
9 (all but Year I)	Jan 18-23, 120 & 150	Feb 11-15, 107	Jan 30 - Feb 3	
9 (Year I only)	Jan 12-14 + Feb 11-15, 126 & 156	Jan 18-20 + Feb 17-21, 131	Jan 15 - Feb 18	Feb 1

that is, March 4 is the day around which this set is centred, when its dates are averaged over the entire 60-year period.
For sets 4 and 9, two entries are given – one for the four normal instances of the set, and one for the interrupted instance. As can be seen, both normal and interrupted varieties produce the same average median in both cases.

Sets 2, 3, 4, 6, and 9, and the Insular quarter-days
As Table 35 shows, the average medians of sets 3, 4, 6 and 9 coincide with the four quarter-days of the traditional Insular Celtic year (Hutton 1991, 176), which is divided into equal halves at May 1 and November 1:

Gaulish solar months:	Sam	Dum	Riv	Ana	Ogr	Cut	Gia	Sim	Equ	Ele	Edr	Can
TRADITIONAL INSULAR YEAR:	WINTER		SUMMER						WINTER			
Roman months:	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Jan	Feb

↑↑ *Sets 2 & 3* BELTINE
↑ *Set 4* LUGHNASADH
↑ *Set 6* SAMHAIN
↑ *Set 9* IMBOLC

Fig. 11. Average median dates of IVOS sets 2, 3, 4, 6 and 9, and the Insular Celtic quarter-days

This was certainly an unexpected result, given that this is a *Gaulish* calendar. Nevertheless, Figure 11 clearly indicates the four quarter-days, and further suggests that they were once movable lunisolar feasts, like Easter, and that after Christianisation, they were simply fixed at their median dates in the Roman calendar.
Set 2 has been included to show that it and set 3 *frame* the new moon associated with Beltine – or more precisely, they mark the waning moon leading into, and the waxing moon leading out of, the new moon closest to the start of solar Rivros, with the result that set 3 is centred on May 1 (the traditional date of Beltine). The configuration of this double-set – a waning moon followed by a waxing moon – seems an appropriate symbol of Beltine's status as the end of civil winter and the start of summer. Intriguingly, this configuration also evokes the Insular custom of extinguishing all fires at Beltine, and rekindling them from a consecrated flame (*ibid.*, 178-9), one of the few Celtic customs that can confidently be dated to pre-Christian times (*ibid.,* 327).
Muirchú's seventh-century *Life of Patrick* describes how the saint defied this custom by kindling an Easter-Eve fire of his own (*ibid.,* 178), and Dr Hutton questions the account, pointing out that Easter and Beltine can never coincide. This is certainly true with Beltine fixed at May 1; but with Beltine as the movable feast represented by sets 2 and 3 in Figure 11, the situation is very different. Table 27 shows that set 2 always begins just after a full moon; and in fact, in 23 out of every 30 years, this full moon is the next after the equinox – that

is, it is the *paschal* full moon. As a result, Easter very often occurs *within* set 2, the waning-moon or ‘extinguishment’ set of IVOS days; and this would make Muirchú’s account plausible.

Meanwhile, Table 35 shows that the average median of set 2 is April 18; and so if sets 2 and 3 are considered together, the average median for the pair becomes the midpoint between April 18 and May 1 – that is, April 24/25, now known as St George’s Day. This association of May Day with St George’s Day seems significant: festivals celebrating the return of greenery were ‘known across the whole Continent and British Isles and held variously on May Day or St George’s Day since records begin’ (*ibid.,* 272).

Finally, Table 26 shows that the two intercalary months always begin within sets 4 and 9; and so Figure 11 implies that the intercalary months must always begin near what we call Imbolc and Lughnasadh. The data show that this is so:

TABLE 36: Roman dates on which the intercalary months begin (AD 101 - AD 161)

ICA begins:	*ICB begins:*
Jan 28, 104	Aug 1, 106
Jan 30, 112	Jul 29, 109
Jan 26, 115	Jul 31, 117
Jan 28, 123	Jul 28, 120
Jan 30, 131	Aug 2, 125
Jan 27, 134	Jul 30, 128
Jan 29, 142	Aug 1, 136
Jan 26, 145	Jul 29, 139
Jan 28, 153	Jul 31, 147
Jan 30, 161	Jul 28, 150
	Aug 2, 155
	Jul 30, 158

It is interesting enough to find the Insular quarter-days appearing in a Gaulish calendar; but Figure 11 and Table 36 hint that these days may actually have played an important role in the organisation of the plate itself. This becomes clearer if we depict the entire arrangement of quarter-days on the plate, as is done in Figure 12. For lack of Gaulish terms, abbreviations of the Irish ones have been used; and for contrast, the locations of the solstices and equinoxes have also been indicated in brackets:

Figure 12, see page 68.

Notice that the double-allotment of vertical space to each intercalary month has forced the quarter-days into adjacent pairs at the start of each half of the plate – Imbolc with Beltine on the left, Lughnasadh with Samhain on the right, such that all four are brought into alignment along the top edge of the plate. In the

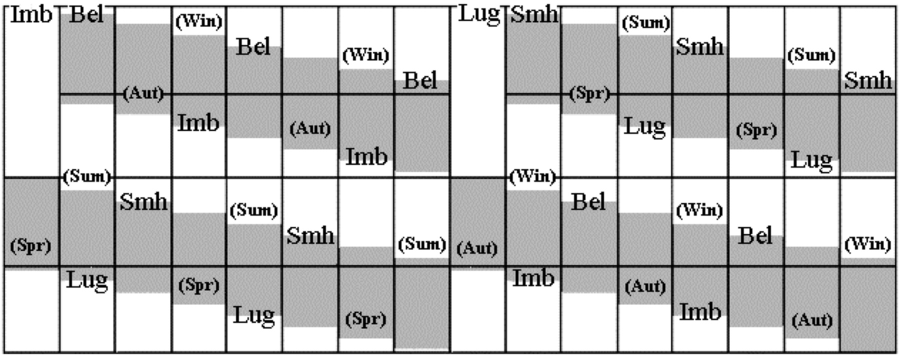

Fig.12. Locations of quarter-days, solstices, and equinoxes on the plate. Boxes = Gaulish lunar months; shading = Gaulish solar months

left half, all instances of Imbolc, Beltine, the autumn equinox, and the winter solstice are thereby confined to the upper quadrant, within the vertical compass of ICA; and Beltine itself occurs exclusively along the top row.

With Imbolc as the centre of the Irish civil winter, and Beltine signifying winter's end, the upper-left and lower-right quadrants then contain nothing but wintertime markers; and in the same way, the upper-right and lower-left quadrants contain nothing but markers of summertime. If the plate has a 'winter half' and a 'summer half', as has so long been suspected, then perhaps the left half is the winter one. Importantly, this effect has been produced entirely by the double-length of the intercalary months – an aspect of the calendar's layout for which no practical purpose has ever been suggested.

Finally, Lughnasadh is situated prominently at top-centre, which seems appropriate for a calendar with a provenance so near Lugdunum. By the second century, August 1 was being celebrated in Gaul as the birthday of Augustus, the occasion of rites at the Altar of the Three Gauls at Lugdunum. Romanised Gaulish tribal leaders actually held office as priests of Rome and Augustus; and so attendance at the Altar on this day became an important symbol of loyalty to Rome (Cornell/Matthews 1982, 83).

Sets 1 and 7, and the Gaulish solar year

Set 1 simply marks the waxing moon that begins the entire year. Set 7, on the other hand, marks a first-quarter moon – half dark, half light, a symbol of midpoints; and in fact, this first-quarter moon is always the closest to the start of solar Elembiu, the midpoint of the winter half of the solar year:

Gaulish solar months:	Sam	Dum	Riv	Ana	Ogr	Cut	Gia	Sim	Equ	Ele	Edr	Can
GAULISH SOLAR YEAR:	S U M M E R						W I N T E R					
Roman months:	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Jan	Feb
	↑ *Set 1*								↑ *Set 7*			

Fig. 13. Average median dates of IVOS sets 1 and 7, and the Gaulish solar year

In terms of the Gaulish solar year, then, these two sets mark the start of summer, and the midpoint of winter.

Set 5, and the sun in Virgo

Around AD 200, the sun was entering the constellation of Virgo on August 24 or 25 each year, and leaving it at the equinox on September 24. Table 35 shows that set 5, a single IVOS day, marks the full moon between August 29 and September 26; and so this IVOS day will nearly always mark the full moon whose light *originates* from the sun in Virgo. In AD 200 exceptions would have occurred when this day fell on September 25 or 26; but in 44 BC, when the Julian calendar was introduced, September 26 *was* the usual date of the equinox, and so at that time, this IVOS day would *always* have marked the full moon reflecting the sun in Virgo. Such an association does make some sense, given Virgo's ancient associations with harvest and fertility, and the full moon's congruent associations with abundance and fertility.

Set 8, and the winter solstice

Table 35 shows that set 8, also a single IVOS day, marks the new moon closest to December 25. For the Romans, this day was the Imperial Feast of the Birth of the Unconquered Sun (Hutton 1991, 285), the traditional date of the winter solstice, and very nearly its *actual* date in Caesar's time, when it was occurring on December 23 or 24. Interestingly, the winter solstice appears to be the only solstice or equinox associated with any day marked IVOS.

Conclusions

Constraining March 1 within Samon naturally produces a 30-year non-sequential intercalation sequence which, when implemented, causes the Gaulish calendar to create a simple, repeating pattern against the Roman calendar. As a result, conversion between the calendars becomes straightforward, and sets of days marked IVOS cluster around meaningful dates, including the four Insular quarter-days, marking the important boundary between April and May with a double-set. On the plate, the double-length of the intercalary months brings the four quarter-days into prominent alignment along the upper edge, constrains all wintertime and summertime markers into diagonally-opposite quadrants, and leaves Lughnasadh at top-centre, creating an impression that the quarter-days were being catered for in the layout of the plate.

All these findings arise solely from the requirement that March begin within Samon, in line with the conclusions of the previous essay; and this strongly suggests that the calendar inscribed on the Coligny artifact represents a native Gaulish calendar in a standardised relationship to the Julian calendar, a relationship of the type found in surviving *hemerologia*. This is a sensible result for a calendar from second-century Gaul; and it implies that Rhys and Fotheringham's initial suspicion was in fact correct but for their alignment of the year.

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