

A Rationale for the Initial Date of the Temple of the Cross at Palenque

FLOYD G. LOUNSBURY

YALE UNIVERSITY

A *raison d'être* for the Initial Series date, 12.19.13.4.0, 8 Ahau 18 Zec, of the Temple of the Cross, will be proposed here. Thompson has posited an analogy between this date and the dates determined by 'ring numbers' in the Dresden Codex (1972: 21b). This analogy, in its most substantial part, consists in the fact that the initial date of the Temple of the Cross, like the ring-number dates of the codex, falls at a relatively short distance before 4 Ahau 8 Cumhu, 13.0.0.0.0, the zero date for the current Maya chronological era. A more tenuous part of the analogy, as posited by him, was that yet another date was thought to be related in some way to this one and to be counted forward from it instead of from the usual 4 Ahau 8 Cumhu.

The ring-number dates of the Dresden Codex, however, have some characteristics and associations of types that are not immediately in evidence in the case of the initial date of the Temple of the Cross. The first and most obvious difference, of course, is that there is no ring number as such to determine the date of the Temple of the Cross. But this may be a trivial difference, without consequence, and as Thompson suggested, merely another manner of expression — "two rather similar systems perhaps flourishing together during the Classic period." If there were a ring number here, it would have to be the Maya number 6.14.0, represented with a band of cloth looped around its last digit and tied with a knot at the top; and this would stand over a statement of the calendar-round day 4 Ahau 8 Cumhu. The Temple of the Cross, on the other hand, simply gives the longcount

position of the date in the previous era, instead of leaving it for the reader to compute. We may think of it as a positive number counted forward from the zero day of the *previous* chronological era, instead of as a negative number counted (backwards) from the zero day of the *current* era — without intending to imply, however, that the Maya necessarily conceived of ring numbers as 'negatives.'¹

A second difference strikes one as of possibly more consequence. A ring number of the type with which we are here concerned² is regularly accompanied by a second number, of much greater magnitude, that leads from the ring-number date to a far later date with eight, nine, or ten baktuns in its count. Satterthwaite (1964) has called these associated numbers 'companion numbers' (abbreviated CN). Thompson (1972) called them 'long reckonings' (abbreviated LR). Now in the case of the Temple of the Cross, the companion or long-reckoning number that Thompson cited as a parallel to those of the Dresden Codex is, as he acknowledged, a notably "short" long reckoning: just 8.5.2. And instead of leading to a date with some eight to ten baktuns in the longcount, it leads to one that is just 542 days (1.9.2) after 4 Ahau 8 Cumhu 13.0.0.0.0. If this is a proper parallel, it would seem to be a rather special and unusual one. But there are grounds for questioning it as a proper parallel. In the first place, it required emendation of the text to get it. The text (TC: D1-C2) is unambiguous; it has 8.5.0; not 8.5.2. Moreover, the structure and the content of the passage that contains it (D1-C5) and of the

¹ See Satterthwaite 1964 (esp. pp. 51-53) and Thompson 1972 (p.21) concerning this latter point.

² We are concerned only with ring numbers that are accompanied by companion numbers, such as those described here, and which serve as special bases for long reckonings. The 'ring' device has other uses also. On pages 71-73a of the Dresden Codex they mark numbers designating days in the trecena, i.e., the implied coefficients of (unwritten) day signs. See Thompson 1972, pp. 85c-86a (in correction of Thompson 1950, p. 253), and Satterthwaite 1964, p. 53. In the Grolier Codex they mark the kin or units digit of the distance numbers which correspond to the subdivisions of the Venus synodic year. See Coe 1973, pp. 150-154.

next passage (D5-D9...) impose serious impediments in the way of that interpretation.³

There is yet a third difference. The companion numbers that go with ring numbers in the Dresden Codex have arithmetic properties that betray, in at least some cases, their motivation and function. Thompson noted: "Very frequently the LR is a multiple of the 260-day count, or it may be a multiple of the 364-day year, or both" (1972: 21b; cf. also 24a). Elsewhere he noted that certain of them are divisible by the triple almanac, 780 days (*ibid.*: e.g. 107b). Except for these brief mentions, however, it seems that not much attention has been given to the properties of the companion numbers, at least not in print. The predominating interests in previous studies of these sets of numbers have been rather in the question of how they are to be read (this was badly misunderstood in the earlier works⁴) and in the terminal longcount dates to which they lead (with whatever significance may be imputed to them). In any case, neither the amended 8.5.2 nor the inscribed 8.5.0 contain any of the factors cited by Thompson as frequent in the 'long reckoning' (companion) numbers. Nor is it certain whether any particular significance can be ascribed to the relation between the initial date of the Temple of the Cross and the supposed terminal date 1.9.2 (TC: D5-C6) to which it was thought that this "short" long reckoning was to lead.

RING-NUMBER PASSAGES

A ring-number passage in the Dresden Codex normally involves two distance numbers and three calendar-round days. Together these determine three dates: one a before-zero date (the 'ring-number date', RND); one the zero date of the current era (ZD: 13.0.0.0.0, 4 Ahau 8 Cumhu); and one a date long after zero in what we may call Maya 'historical' times (the 'terminal date', TD). The relations between the three dates and the two distance numbers may be expressed as follows:

- (1) Ring-Number Date + Companion Number = Terminal Date;
- (2) Ring-Number Date + Ring Number = Zero Date (13.0.0.0.0).

Obviously these imply also the following relation:

- (3) Companion Number - Ring Number = Terminal Day Number; or
- (4) Companion Number = Ring Number + Terminal Day Number.

The display of these in the codex is in vertical array,

usually in one but sometimes in two columns, most typically in this arrangement:

- RND (calendar-round day only; sometimes only tzolkin day; sometimes omitted)
- CN (with digits in vertical array)
- TD (calendar-round day only; sometimes only tzolkin day; sometimes omitted)
- RN (with digits in vertical array, with 'ring' usually around last digit)
- ZD (calendar-round day only: 4 Ahau 8 Cumhu).

But for one exception, longcount positions of the three dates are not written. Anything omitted is of course recoverable by simple computations.

There are eighteen ring-number statements of this type in the Dresden Codex. It is noteworthy that each of them, or each set of them, is accompanied by a table of multiples (and multiples of multiples) of some basic interval. One may suppose that these tables were used in the computations involved, or that they were supplied to enable a user of the codex to make other similar computations for similar or related purposes. (Cf. Thompson, 1972: 22-23).

THE COMPANION NUMBERS

As already mentioned, Thompson has pointed out that the companion numbers (his LR, Satterthwaite's CN) are often, though not always, divisible by 260 or by 364 or by both (i.e., by 1820, the lowest common multiple of these) or by 780. Occasionally they are divisible by yet other 'Maya' factors. This matter is worth pursuing somewhat further.

The best known case, surely, is the one on page 24 of the Dresden Codex, where the subject matter is the approximate Venus cycle and its correction device. I believe it is the only case where the high factorability of the companion number has been given suitable notice (e.g., Thompson 1950: 226b). Here we find the ring number 6.2.0, the companion number 9.9.16.0.0, and the terminal day number (the only instance where a terminal day number is written out) 9.9.9.16.0, together with the zero day 4 Ahau 8 Cumhu, and the terminal day 1 Ahau 18 Kayab, which latter is also the ring-number day. These relate to each other in the various manners specified in equations 1 to 4 above.

The characteristic of the companion number 9.9.16.0.0 is its divisibility, without remainder, by the following significant Maya calendrical numbers: (a) the tzolkin of 260 days; (b) the triple tzolkin and approximate synodic Mars year of 780 days; (c) the Maya calendrical

³ These passages deal with the birth, at 8.5.0 before the beginning of the current era, and a second event, at 1.9.2 after the beginning of the era, involving the mythological personage named at C8-D8, who is the first of the three gods of what Berlin (1963) has called 'the Palenque triad.' The TC initial date on the other hand, 6.14.0 before the beginning of the era, is named as the birth date of a different deity, apparently an ancestral 'mother,' who is named at B17-C1, and who will concern us later on in this paper. Since the discovery of the meaning of the 'birth' glyph by Proskouriakoff (1960) there is no longer any motivation to suppose that the number 8.5.0 was intended to mediate between -6.14.0 and +1.9.2, or for amending it so that it might qualify for such office.

⁴ See Satterthwaite 1964 (esp. pp. 47, 51-52) and Thompson 1972 (p.21) concerning the misunderstanding of these numbers by Förstemann and Morley, and the determination of their proper manner of reading by Willson.

year or haab of 365 days; (d) the approximate synodic Venus year of 584 days; (e) a 2340-day period, with a variety of applications, that is presented in the Dresden Codex;⁵ (f) the Venus-haab cycle of 2920 days; (g) the calendar round of 18,980 days; and (h) the Venus grand cycle of 37,960 days. Thus:

(a)	9.9.16.0.0 = 1,366,560 = 5,265 (260)
(b)	= 1,752 (780)
(c)	= 3,744 (365)
(d)	= 2,340 (584)
(e)	= 584 (2,340)
(f)	= 468 (2,920)
(g)	= 72 (18,980)
(h)	= 36 (37,960)

However, it fails with several other important Maya numbers, by which it is not evenly divisible; for example: (i) the 'computing year' of 364 days; (j) the seven-tzolkin or five-computing-year cycle of 1820 days that is the object of a number of tables in the Dresden and Paris codices; (k) the 819-day cycle that is recognized in several inscriptions at Palenque, Yaxchilan, and Quirigua; (l) the 81-moon unit of 2392 days that was the basis for lunar computations both at Palenque and in the Dresden Codex, and (m) the Dresden eclipse cycle of 11,960 days. Thus:

(i)	9.9.16.0.0 = 1,366,560 = 3,754 (364) + 104
(j)	= 750 (1,820) + 1,560
(k)	= 1,668 (819) + 468
(l)	= 571 (2,392) + 728
(m)	= 114 (11,960) + 3,120

For any companion number, both its factors and its non-factors are of interest. The former suggest subject matter with which the given number and the passage or section that contains it may be concerned,⁶ and the latter suggest subjects with which it is not likely to be concerned — though this cannot be taken as an infallible guide: in some cases the remainders may have meaning in their own right and may have been intentional.

A useful index to the possible significance of a companion number is provided by its decomposition into prime factors. In the present case (page 24 of the Dresden Codex (Fig. 1) these are $2^3 \cdot 3^2 \cdot 5 \cdot 13 \cdot 73$. To be an integral multiple of the tzolkin requires factors $2^2 \cdot 5 \cdot 13$; the haab, $5 \cdot 73$; the Venus year, $2^3 \cdot 73$; the 2340-day period, $2^2 \cdot 3^2 \cdot 5 \cdot 13$; etc. It may be noted in passing that this is the only CN containing the factor 73 in the Dresden Codex; which suggests that it is probably the only one concerned (in any simple way) with the haab or with

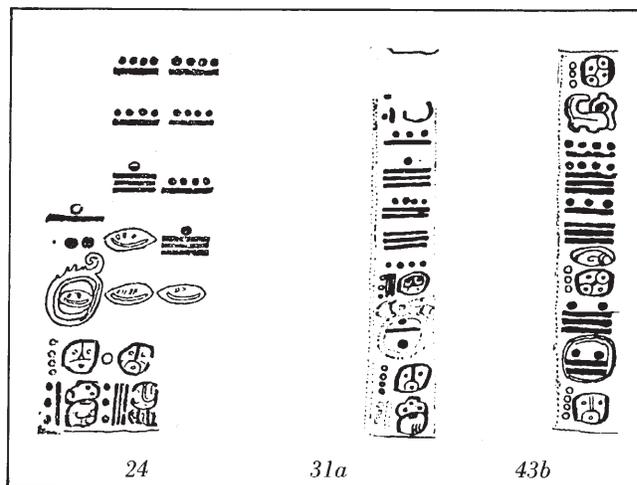


Fig. 1 Ring and companion numbers from the Dresden Codex, with terminal day number in one instance (24).

the synodic year of Venus. This is without doubt the 'super-number' of the codex. In some ways it is unique. In a more general way, however, it is not unique; for, as will be shown, decomposability into a relatively large number of relatively low prime factors (in this case there were ten) is a typical — though not quite universal — characteristic of companion numbers. This is appreciably less characteristic of the terminal day numbers, which decompose generally into fewer primes, at least one of which usually turns out to be a high prime (running into the thousands, tens of thousands, or even hundreds of thousands). In the present case the contrast is manifest as follows:

$$\begin{aligned} \text{CN: } 9.9.16.0.0 &= 1,366,560 = 2^5 \cdot 3^2 \cdot 5 \cdot 13 \cdot 73; \\ \text{TDN: } 9.9.9.16.0 &= 1,364,360 = 2^3 \cdot 5 \cdot 23 \cdot 1483. \end{aligned}$$

We turn to another example. In two locations in the Dresden Codex, pages 31a[A] and 62[F], there is the companion number 8.16.14.15.4 paired with the ring number 6.1, leading to a terminal day which is named on page 31a as 13 Akbal, and on page 62 as 13 Akbal 16 Pop.⁷ The relations among these items may again be expressed in the manner of the previously cited equations. The pair of equations 1 and 2 would no doubt be closer to the Maya manner of expression, but equation 3 suits our present purpose better; thus:

$$\begin{aligned} \text{CN: } & 8.16.14.15.4 \\ -\text{RN: } & \quad \quad \quad -6.1 & \quad \quad \quad [\text{RND: } 13 \text{ Cauac } 7 \text{ Ceh}] \\ =\text{TDN: } & \underline{\quad \quad \quad} \quad \quad \quad 8.16.14.9.3 & \quad \quad \quad [\text{TD: } 13 \text{ Akbal } 16 \text{ Pop}], \end{aligned}$$

⁵ The number 2340, or 6.9.0 in Maya is (1) the period that harmonizes the cycle of the nine lords of the night with that of the tzolkin, and (2) the magnitude of the corrective foreshortening of the Venus grand-cycle. See Thompson 1950, pp. 208-211 and 224-227.

⁶ Somewhat strangely, although the CN just discussed occurs on the page of the codex that is devoted to the correction device for the Venus table, this CN appears to be concerned only with canonical whole-day approximations to the lengths of the synodic year of Venus and of the solar year, apparently ignoring the accumulation of error which the fourth tier of numbers on this page was designed to correct.

⁷ Dresden 62F has 13 Akbal 15 Pop. In the correlation of day names with positions in the months which prevailed during the Classic Maya period and which is otherwise observed in the Dresden Codex, this is an improper calendar-round day. All students of the codex correct this to 13 Akbal 16 Pop. The "15" is assumed to be due to a copyist's omission of the additional dot for a "16."

or in our numerals:

$$1,272,544 \text{ [CN]} - 121 \text{ [RN]} = 1,272,423 \text{ [TDN]}.$$

Unlike many of the CN, the one in this instance is not evenly divisible by 260 or 780; but it is by 364. Besides this; however, it is divisible also by 2392, the key to lunar computations according to the so-called Palenque moon formula (2392 days = 81 moons) which is followed also in the eclipse table of the Dresden Codex. Although the moon age at the terminal date is not an inherently interesting one in its own right (Satterthwaite computed it at 22.18 days), the terminal date itself must have held some particular interest for the compilers of the codex; and it is obvious that they would have imputed the same moon age to the ring-number date as they did to the terminal date.⁸ The interesting properties of this CN then are simply these:

$$\begin{aligned} 8.16.114.15.4 &= 1,272,544 = 3,496 (364) \\ &= 532 (2,392) \end{aligned}$$

And of divisions with remainder, the following may also have some interest:

$$\begin{aligned} &= 4,893 (260) + 364 \\ &= 1,631 (780) + 364 \\ &= 699 (1,820) + 364 \end{aligned}$$

The characteristic difference between the componential properties of a companion number and those of a terminal day number is again to be seen. The CN is highly composite, of low primes; the TDN is less so, and of higher primes:

$$\begin{aligned} \text{CN: } 8.16.14.15.4 &= 1,272,544 = 2 \cdot 7 \cdot 13 \cdot 9 \cdot 23; \\ \text{TDN: } 8.16.14. 9.3 &= 1,272,423 = 3 \cdot 197 \cdot 2153. \end{aligned}$$

We may look at yet another example. On 43b[C] of the Dresden Codex we find a companion number 9.19.8.15.0 paired with a ring number 17.12, with a ring-number day named as 3 Lamat, and leading to a terminal day also named as 3 Lamat. We have then the following:

$$\begin{array}{rcl} \text{CN:} & 9.19. 8.15. 0 & \\ -\text{RN:} & \underline{-17.12} & \text{[RND: 3 Lamat 1 Uayeb]} \\ =\text{TDN} & 9.19. 7.15. 8 & \text{[TD: 3 Lamat 6 Zotz],} \end{array}$$

or in our numerals:

$$1,435,980 \text{ [CN]} - 352 \text{ [RN]} = 1,435,628 \text{ [TDN]}.$$

The interesting properties of the CN are:

$$\begin{aligned} 9.19.8.15.0 &= 1,435,980 = 5,523 (260) \\ &= 1,841 (780) \\ &= 3,945 (364) \\ &= 789 (1,820) \end{aligned}$$

and perhaps also these:

$$\begin{aligned} &= 600 (2,392) + 780 \\ &= 120 (11,960) + 780. \end{aligned}$$

Again there is a difference between the componential properties of the companion number and those of the terminal day number. Reduced to prime factors, they are:

$$\begin{aligned} \text{CN: } 9.19.8.15.0 &= 1,435,980 = 2^2 \cdot 3 \cdot 5 \cdot 7 \cdot 13 \cdot 263; \\ \text{TDN: } 9.19.7.15.8 &= 1,435,628 = 2^2 \cdot 358907. \end{aligned}$$

The citation of examples could continue. Each could be discussed in respect to the Maya calendrical and astronomical constants by which it is divisible without remainder, or by which it is divisible with a remainder that in itself is of potential significance. But this is not the place for that exercise, which is a long one, and which would lead to topics that are far removed from the subject of this communication, namely, the initial date of the Temple of the Cross. For present purposes the relevant point is simply to note the highly composite character of the companion numbers (most of them) as contrasted with the generally lesser composition of the terminal day numbers to which they lead when counted from their ring-number bases. To bring out this single point, the above illustrations, together with the assemblage of data presented in Table 1 of the Appendix, will suffice.

The inference that one is led to draw from this contrast is that the companion numbers are *contrived numbers*. The terminal day numbers, on the other hand, give the appearance of being uncontrived or 'accidental.' These are representative (insofar as such a small sample can be called 'representative') of what one may expect from a random drawing of numbers in the one-million to two-million bracket.⁹ In other words, the terminal day numbers look like dates on which the events commemorated by them *just happened* to occur, while the companion numbers look like numbers fabricated *to have particular properties*.

One may ask for what purpose the companion numbers, and with them their ring-number bases, were contrived. A reliable answer to that question must await more detailed study of the companion numbers, not only as objects in and of themselves, but also in relation to their associated terminal dates, in relation to each other, and of the terminal dates in relation to each other. Preliminary results at hand, but not presented here, suggest the following tentative and somewhat speculative answer: It looks as though the calendar priests were trying to project some significant combination of attributes of a Maya 'historical' date backwards to an earlier date that would *share those same attributes* and that would be *the last possible one to do so* before the beginning of the current chronological era. These are the ring-number

⁸ That they would have been in error by an amount of 12 days might either have been unknown to them, or have been a matter of only secondary concern in comparison with the canonical relations.

⁹ See Lehmer 1909, 1914.

dates. The Maya 'historical' dates commemorated in this special fashion were then to be reckoned from bases that were *their like-in-kind* just preceding the start of the current era, rather than from the otherwise normal base, the zero day of the era, 4 Ahau 8 Cumhu, 13.0.0.0.0. The attributes chosen to project back in determining such alternative bases might be various; there were many to choose from and the choice may have been governed in each case by the nature of the event that occurred on, or was ascribed to, the 'historical' date. It would be reasonable to expect that the dates for which these prehistoric like-in-kind antecedents were sought must have had some considerable importance, whether in the history of human or of celestial events.

Before leaving the subject of the dates in the Dresden Codex, it should be remarked that not all of the terminal dates, whose day numbers have the character of uncontrived or randomly chosen numbers in that bracket, are indeed such; because the intervals between some of them, though nowhere recorded in the codex, are also patently contrived intervals. (If you add a contrived number to an uncontrived one, the sum usually has the appearance of an uncontrived one.) The problem remains of ferreting out which of the terminal dates may represent 'empirical' dates, records of actual events, and which are 'predictions,' i.e. computed projections backward or forward at closer range.

THE INITIAL DATE OF THE TEMPLE OF THE CROSS

We took note at the outset of Thompson's suggestion that the initial date of the Temple of the Cross may have been the same kind of thing as the ring-number dates in the Dresden Codex. But there were grounds for doubting that his suggested analogs to a 'long-reckoning' companion number and to a terminal date were the proper ones. Now we must ask: If not Thompson's 8.5.2 and 1.9.2, for CN and TDN respectively, then what?

In seeking an answer we may take a clue from his observation that, "Very frequently the LR is a multiple of the 260-day count, or it may be a multiple of the 364-day year, or both" (Thompson 1972: 21b). We might begin, then, by pursuing the first of these possibilities as a hypothesis. Since the initial date of the Temple of the Cross falls on a tzolkin day 8 Ahau, we should ask whether there is any other 8 Ahau registered in the inscriptions of Palenque. As everyone knows, there indeed is. It is 8 Ahau 13 Pop, 9.8.9.13.0, the date of the birth of Palenque's magnificent ruler, Lord 'Shield' Pacal. It is recorded as an initial series on the inscribed stairs of House C of the Palace; again in the west panel of the Temple of the Inscriptions, with a secondary series that places it on the same date in the longcount; and again as the first date of the inscription on the edge of the sarcophagus lid that covers his remains.¹⁰

So we are led to ask whether this date, taken together with the initial date of the Temple of the Cross, would

form a pair of dates related to each other in the way in which terminal dates and ring-number dates are related to each other in the Dresden Codex. Such a relationship consists in being separated by an interval that has the kind of arithmetic properties that a 'long-reckoning' companion number has in the codex, i.e., in *being separated by a contrived number*. We can test this.

The initial date of the Temple of the Cross is 12.19.13.14.0, 8 Ahau 18 Zec, a day slightly prior to the end of the previous chronological era. As related to the zero day of the current era, this is equivalent to a ring number of 6.14.0. The interval between this date and Pacal's birth date is given by the addition:

$$\begin{array}{r} 9.8. 9.13.0, \text{ date of Pacal's birth} \\ +6.14.0, \text{ RN equivalent of TC initial date} \\ \hline 9.8.16. 9.0, \text{ interval between dates, implied CN.} \end{array}$$

We know to begin with that this number will be an integral multiple of 260 because we looked for another 8 Ahau. If this should be its only good 'Maya' factor, our hypothesis would still be plausible, but its support would be weak. (It would be an instance like those of Dresden 58F-lower, 63A, and 70B-upper, i.e., at best minimally contrived, or possibly fortuitous. See Table 1 of the Appendix.) However, if there are other Maya factors in this number, the case for the hypothesis will be strengthened. This is what we find:

$$\begin{array}{r} 9.18.16.9.0 = 1,359,540 = 5,229 (26) \\ = 3,735 (364) \\ = 1,734 (780) \\ = 1,660 (819) \\ = 747 (1,820) \\ = 581 (2,340) \\ = 415 (3,276) \end{array}$$

and, rather curiously,

$$= 71 (18,980) - 11,960.$$

Thus our hypothetic CN is an integral multiple of seven different important Maya periods. Particularly interesting is its divisibility by 819, and even better, by 4 times 819, or 3,276. Thus the initial date of the Temple of the Cross, with the adjoining specification of its position 20 days after a *south* station in the 4x819-day cycle, duplicates exactly the position of Pacal's birth date in that same cycle.

Reduced to prime factors, this hypothetic companion number and its terminal day number are as follows:

$$\begin{array}{l} \text{CN: } 9.8.16. 9.0 = 1,359,540 = 2^2 \cdot 3^2 \cdot 5 \cdot 7 \cdot 13 \cdot 83; \\ \text{TDN: } 9.8. 9.13.0 = 1,357,100 = 2^2 \cdot 5^2 \cdot 41 \cdot 331. \end{array}$$

Their relationship in regard to prime factors is of the sort with which we have become familiar. The CN is more highly composite, its prime factors are low, and they include all possible significant 'Maya' factors except 23 and 73. Only the 83 is without significance in its own right. The TDN — the longcount date of Pacal's birth —

¹⁰ Mathews and Schele 1974; Lounsbury 1974.

happens to be divisible by 100, which accounts for the $2^2 \cdot 5^2$ among its components; but 100 is not a Maya unit or interval of any consequence, and the other two factors, 41 and 331, are without significance in Maya calendars. Thus the hypothetic CN shows every sign of being, like the Dresden CN's, a contrived number, while the TDN looks like a fortuitous one. The initial date of the Temple of the Cross, then, is the end-result of this contrivance; and the date of Pacal's birth is the empirical datum from which it was projected, and must have been its motivation.

In line with our hypothesis about the significance of ring-number bases, we are led to suspect now that the attempt here at Palenque, in the initial date of the Temple of the Cross, was to project a significant combination of attributes of Pacal's birth date back to the last possible date before 4 Ahau 8 Cumhu, 13.0.0.0.0, that would share those same attributes.

We may raise a question now as to how many of the Maya periods enumerated above, of which the hypothetic CN is an integral multiple, would have to have been involved in the reckoning, and how many of them are merely inevitable artifacts of the manipulations of the primary ones. And we may speculate on how the Palenque 'number theorists' might have carried out their computations so as to arrive at the TC initial date.

From many sources we know that the tzolkin day on which one was born, or on which any event happened, or on which something of consequence was to be undertaken, was an especially significant attribute of the date, and of the event in question, and of the person affected by that event. In some parts of the Maya highlands, as well as in some of the other regions of Middle America, the name of the day of one's birth was taken as an essential part of one's personal name. There is no evidence for its use as a personal name in the Maya lowlands, but its importance in other ways is amply attested. We are fairly safe in supposing not only that "8 Ahau" was the most important part of the specification of the date of Pacal's birth, but that it was seen also as an inherent part of the character or destiny of the man himself. To find an appropriate 'ring-number' date to go with Pacal's birth date, then, we may begin (or the Palenque calendar priests might have begun) with the specification that it be an "8 Ahau." There are any number of possibilities at relatively short times before the beginning of the current era, e.g.: -5.0, -1.0.0, -1.13.0, -2.8.0, -3.3.0, -3.16.0, -4.11.0, -5.6.0, -6.1.0, -6.14.0, -7.9.0, -8.4.0, -8.17.0, etc. (Of course, to know this we have to have — and the Maya calendar specialists would have to have had — either suitable tables of multiples of 13.0, or workable algorithms for converting 'days' to 'dates', and vice versa.

There is ample reason to believe that they had both.)

With some "8 Ahau" possibilities before us, we are able to satisfy what was probably Condition No. 1 for a suitable 'ring base,' i.e., for a pre-zero like-in-kind to be associated with Pacal's birth date. And we are assured that, whichever one of these is chosen, the interval between it and the date of Pacal's birth will be divisible by 260; i.e., the CN will have factors 2^2 , 5, and 13.

Condition No. 2 may well have involved one of the other reckoning periods, say 364 or 117;¹¹ which means that the next higher interval of manipulation would be either 1820 (the lowest common multiple of 260 and 364; in Maya 5.1.0) or 2340 (the lowest common multiple of 260 and 117; in Maya 6.9.0). The Maya calendar priests must have been well aware of the factorial properties of these numbers, viz., that the former is 7 tzolkins (as well as 5×364) and that the latter is 9 tzolkins (as well as 20×117), because the tables in the Dresden and Paris Codices that build up to these numbers display that awareness. So it is a matter now of introducing an additional factor of either 7 or 9.

Thompson has suggested that the purpose, or a purpose, of the 2340-day table in the Dresden Codex (pp. 30-33c) may have been to unite the cycle of the nine lords of the night with the 260-day cycle into a higher-order cycle.¹² Since the most usual order of presentation of data in an inscribed initial series has Glyph "G" immediately after the specification of the tzolkin position of the date, we may suppose that the reigning lord of the night may, at least for some purposes, have been the second most important attribute of a date. So we may as well take that attribute (or the Maya calendar priest might well have taken it) as Condition No. 2 for the determination of an appropriate 'ring-number' base to match with Pacal's birth date. This introduces the factor 9 and moves the reckoning onto a 2340-day cycle. Choosing a "G8" (eighth lord of the night), to agree with that of the day of Pacal's birth, thus imposes a further limitation. Of the possibilities enumerated above, it selects -5.0 and -6.14.0 as the only surviving eligible ones when Condition No. 2 is imposed in addition to Condition No. 1. With either of these two candidates for a ring base, the CN will now have prime factors of 2^2 , 3^2 , 5, and 13.

If, as has now been suggested, Condition No. 1 was that the 'ring-number' base have the same tzolkin day as the 'terminal date,' and Condition No. 2 was that it be under the same lord of the night, we may surmise now that Condition No. 3 was either that it have the same position in the 364-day cycle (the so-called computing year), or else that it have the same position in the 819-day cycle (a cycle of apparent importance at Palenque — see Thompson 1943, and Berlin and Kelley 1961).

¹¹ 117, which is 9 times 13, is the base of the 2340-day table of Dresden 30c. Its fifth multiple, which is one day more than the mean synodic year of Venus, was apparently another such reckoning number. Its sixth multiple, 702, presented as 54×13 on Dresden pp. 71-73a, is the base of a table of higher multiples on pp. 70-71a. Its seventh multiple is the base of the 819-day cycle.

¹² This must surely, as Thompson suggested (see references in note 5), have been one of the functions of the 2340-day cycle. But in the passage of Dresden 30-33c it can hardly be seen as exemplifying that function. Rather, it relates a cycle of nine stations in the wanderings of the rain god, or of nine localized rain gods, to the 260-day cycle of the tzolkin.

Whether the 364-day cycle (the so-called computing year) or the 1820-day cycle (uniting the computing year with the tzolkin) were ends in themselves, or only reckoning devices to serve other ends, cannot be said with certainty. In either case, there is ample evidence that these were much used in the computation of what we have been calling 'companion numbers' in the Dresden Codex, and now also here at Palenque. And whether Condition No. 3 for finding a pre-zero match for Pacal's birth date was this, or was instead that it should share the same position in the 819-day cycle, cannot be known with any certainty. But it makes no material difference. The prime factors of 364 are 2², 7, and 13. Those of 819 are 3², 7, and 13. Since under the first two conditions we have already accumulated factors 2², 3², 5, and 13, the sole effect of either of these choices for Condition No. 3 will be to throw in one more factor, viz. 7. Thus we move to a yet higher-order cycle, that of 2²·3²·5·7·13, or 16,380 days, or 2.5.9.0 in Maya. And it narrows the choice of 'ring' base down now to -6.14.0.

Is this the way the Palenque calendrists did it? I would think that something like this was part of the process. There is surely sufficient evidence in the construction of tables in the Dresden and Paris Codices to show that Maya arithmeticians were aware of composition by factors. The 2340-day table of Dresden 30-33c is built up, starting with thirteens, as 13·9·5·4; and elsewhere it is presented as 78·10·3 (Dresden 59, and 43-44bc). The 1820-day period is presented variously as 28·13·5 (Paris 23-23b), as 91·4·5 (Dresden 31-32a), as 91·20 (Dresden 63-64), and as 65·28 (Dresden 71-72bc), with higher multiples introducing yet other factors. And similarly with the periods of other tables. And if we grant the Maya the degree of intellectual curiosity and ability that we ought, in view of what can still be seen of their early achievements, it would be absurd to deny of them an understanding of their important numbers as products of factors.

This number that we have reached, 2.5.9.0, must have been a familiar one to them. They would have known that it was 7 times 2340, or 9 times 1820. (We can obtain it easily by a single addition of two numbers from any one of five different tables in the Dresden Codex.) Its principal properties are:

$$\begin{aligned}
 2.5.9.0 &= 16,380 = 140 (117) \\
 &= 63 (260) \\
 &= 45 (780) \\
 &= 20 (819) \\
 &= 9 (1,820) \\
 &= 7 (2,340) \\
 &= 2^2 \cdot 3^2 \cdot 5 \cdot 7 \cdot 13
 \end{aligned}$$

There are two further properties which would have facilitated reckoning with it: it is *one calendar-round minus ten tzolkins* (18,980 - 2,600); and it is *forty-five and one-half tuns*.

This last property is a felicitous one. If we double this unit, we have

$$2 (2.5.9.0) = 4.11.0.0.$$

Note the zeros in the last two positions of the resulting product. Once we are rid of the *uinal* and *kin* digits, Maya arithmetic is easy. We may multiply this last number by 20 (which is Maya 1.0) simply by adding another zero, thus:

$$40 (2.5.9.0) = 4.11.0.0.$$

The task in finding the 'ring' base to match Pacal's birth date is simply to find that CN which will be the lowest possible multiple of 2.5.9.0 that will just exceed 9.8.9.13.0, the day-number of his birth. So we may double the above:

$$\begin{array}{r}
 80 (2.5.9.0) = 9.2. 0. 0.0, \\
 \text{and then add two more,} \quad 4.11. 0.0, \\
 \text{and one more,} \quad 2. 5. 9.0, \\
 \text{arriving at} \quad 9.8.16. 9.0, \text{ the desired CN,} \\
 \text{which is in excess of} \quad 9.8. 9.13.0, \text{ the given TDN,} \\
 \text{by the amount of} \quad 6.14.0,
 \end{array}$$

which is the minimum possible excess for a multiple of 2.5.9.0, and which therefore is the desired RN.

Now if we are to express this ring-number base as a positive day number counted in the preceding chronological era rather than simply as a ring number, we must subtract it from the final day number of the old era (the zero of the new):

$$\begin{array}{r}
 13. 0. 0. 0.0 \\
 \quad \quad \quad -6.14.0, \\
 \hline
 \text{yielding} \quad 6.12.19.13. 4.0,
 \end{array}$$

which is the initial date of the Temple of the Cross.

THE 'RING' EVENT, AND ITS SUBJECT

Having accounted for the date that is inscribed in the initial series of the Temple of the Cross, which is a ring-type match for the date of Lord Pacal's birth, we will want to ask what kind of an event the inscription predicates as having happened on that date. The answer is given in the three glyphs, A17-C1 (Fig. 2).

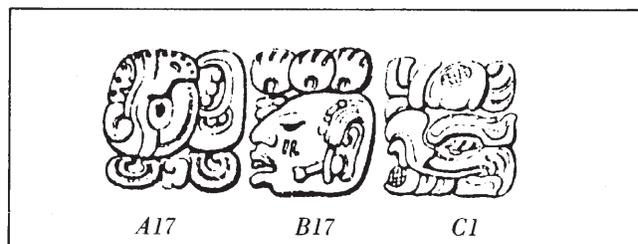


Fig. 2 Event phrase associated with the initial date of the Temple of the Cross.

These declare it to have been the "brith" (A17) of the personage whose appellation here consists of the second and third of these glyphs (B17-C1) and, elsewhere of variants of this phrase, in one case of just the third glyph. The date of this birth is in what would be Maya

mythological time. (In the Goodman-Martinez-Thompson correlation it would be placed in the year 3120 B.C.) Since the date is contrived to be an ancient like-in-kind to the date 9.8.9.13.0, we may assume that the persons whose births are ascribed to these two dates were intended to be seen in a similar relationship of likeness. In other words, the person named at B17-C1 was in some sense a posited like-in-kind to Pacal. Or vice versa, Pacal was being identified as one in kind with an ancient ancestral figure or deity.

It seems pretty clear what we are dealing with here. Surely it is a matter of mythic genealogical and numerological charter for the position of a king,¹³ and through him perhaps for his successor and the dynasty that he founded. If the mythical ancestor himself (or herself?) was not a fabrication for the purpose, then at least the ascription of his or her birth date was a bit of numerological manipulation for just that purpose — possibly tampering with an earlier tradition as to the day on which that mythical being came into existence.¹⁴

The above parenthetic query about the sex of the mythical ancestor is occasioned by the glyph of B17. The head that is the mainsign of that glyph (T1000a) is almost surely the same as the one that is used in inscriptions of this and other sites as a determinative or title to go with the name-glyphs of female persons (see Berlin 1959, and Proskouriakoff 1960). But this seems also to be the same as the head-form glyph for the numeral 'one.' Berlin (1959) has already commented on the potential ambiguity of this sign. In many instances its intended sense can be inferred from the context. But the present case is one that may leave some uncertainty. Its superfix (T69) is of no help in resolving the question, for its value is unknown. The context here would be hospitable to the notion of 'ancestor.' Thus, the combination of superfix and mainsign might reasonably be construed either as 'ancestress' or as 'first ancestor.' However, a later passage, to be noted below, seems to attribute maternity to this personage. So we tentatively take the mainsign of the glyph of B17 as designating femininity and the entire glyph as meaning something like 'ancestress' or 'ancestral mother.' It should be understood that this is put down with something less than full confidence, and with a view more toward posing the apparent alternatives than affirming a final choice.

The glyph of C1 (T793b) is the principal part, and in one instance the sole part, of this mythical ancestor's name. The entire appellative phrase appears in several variants. These are assembled in Figure 3, together with notation of their loci in the inscriptions of the Temples of the Cross, the Foliated Cross, and the Sun, and of Temple XVIII. The name is also found four times in the East Panel of the Temple of Inscriptions, where it is applied to a historical person, again apparently female. Two of these instances are also included in Figure 3.

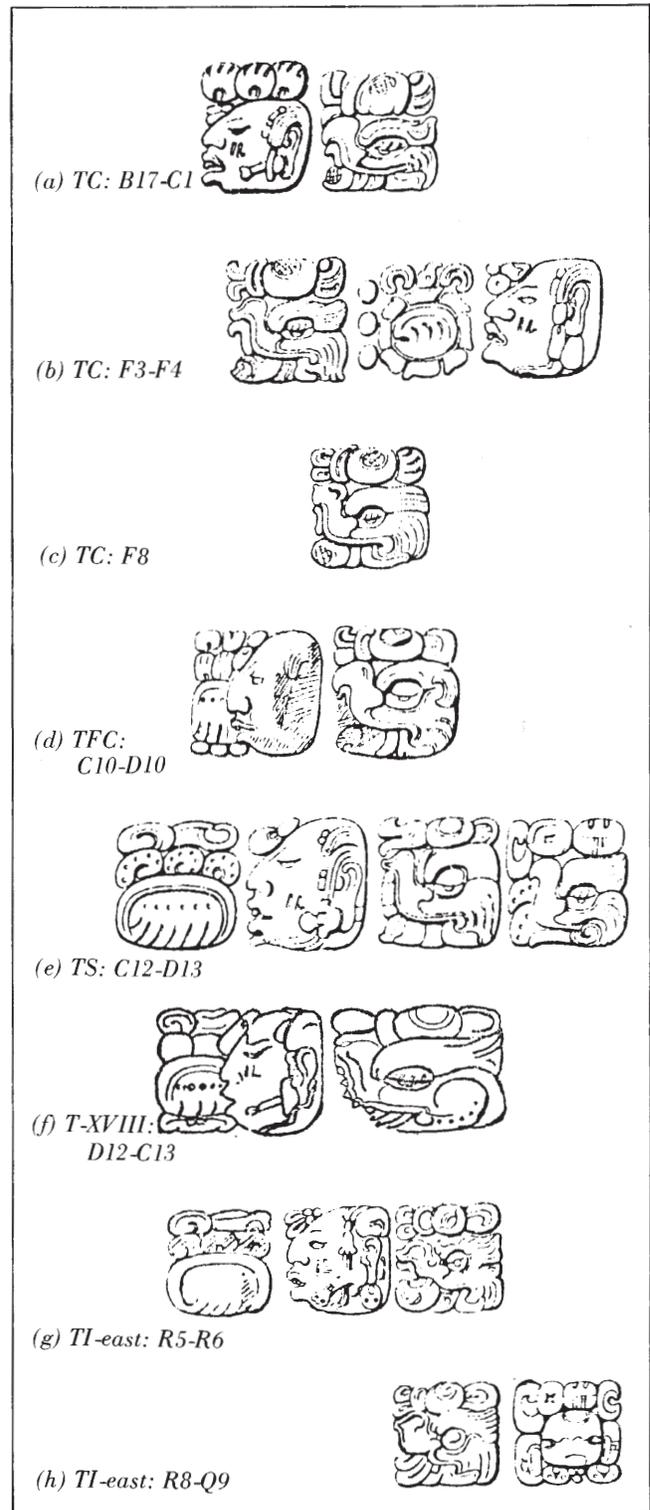


Fig. 3 Variants of the appellative phrase of the mythological ancestress (a-f) and her historical namesake (g-h).

¹³ "Numerology, *n.* the study of numbers (as one's birth year, etc.), supposedly to determine their influence on one's life and future" (*The American College Dictionary*, 1947).

¹⁴ That there are inconsistencies in the inscribed record of the Temple of the Cross, such as might have been due to conflicting traditions or, as suggested here, to deliberate tampering with the record, is well known to those who have puzzled over it. See Berlin 1965.

The fanciful head which is the mainsign of the name glyph is similar to another which is the mainsign of one of the three forms of the Palenque emblem glyph (see Berlin 1958). Thompson grouped these together as “Upturned Snout 3” and listed them under one number, 793, in his glyph catalog; but he noted their consistent differences both in form and in the affixes that join them. In the phrase from the Temple of the Sun the two may be seen side by side with their respective affixes (Fig. 3, e: C13-D13).

Beasts with upturned snouts are a genus of many species in Maya iconography. Some are portrayed as reptilian, some as cervine, or as combined reptilian-cervine, and some with bodies in human form. Some are at one of the two ends of two-headed serpents or two-headed saurian monsters. All, of whatever form, are clearly celestial. Maya mythological beings are composite products of features abstracted from various species of diverse orders. Identification of their component features is sometimes fairly obvious, more often difficult, and sometimes impossible; and in most cases we can do little more than guess at their symbolic significance. For the present it will suffice to suppose that we are dealing with a celestial being, a deity of sorts, most likely an apotheosized legendary ancestor (or ancestress), possibly with a stellar or planetary identity (among others), about whom there was current an explanatory myth of which we are ignorant.

Whatever else was her nature, Lady Beast-with-the-Upturned-Snout was a kind of Lady Methuselah. The passage TC:E5-F9 unambiguously states that:

“It was 2 baktuns, 1 katun, 7 tuns, 11 uinals and 2 days from her ‘birth’ [as recorded in the initial series] to her ‘accession’ on 9 Ik 0 Zac,”¹⁵

employing here the same glyphic phrase (at F7-E8) for ‘accession’ at an age of over 800 years as is used in other birth-to-accession statements, for eight other rulers (at least six of whom were in Maya historical times), for recording accessions that took place at normal and expectable ages for human beings. And in the difficult passage that just precedes this (TC:D13-F4), as best I can make it out, I think that the Lady is named in the role

of mother to the ‘successor’ or ‘scion’ of the first of the gods, ‘G-I’, of the Palenque Triad.¹⁶ I cannot attempt to give my reasons for this interpretation here (the argument would be a long one and had better wait); but in any case, whatever the nature of her role in that passage, it was in connection with an event that is stated to have taken place on a date at which she would have been some 760 years of age.

Considering the prominence given to the role of women in the bestowal of the emblems of rulership — as portrayed, for example, in the Palace Tablet and in the Slaves Tablet (see Ruz 1952a: 57, 1952b: 35) — there should be no difficulty in accepting the idea that the ancient or divine ancestor with whom the ruler identifies himself, and from whom he claims sanction for his position, should have been female. Nor is this ancestor’s sex incompatible with an ‘accession’ statement naming her as the subject. Not only were women involved in the bestowal of royal title at Palenque; they could hold it in their own name. By the time of this inscription, Palenque had already had at least two women as titular rulers. One of these, whose accession is recorded in TI-east:K2-L2, and whose death is recorded among those on the edge of the sarcophagus lid, held title as ruler for over twenty years.¹⁷ There is little room for doubt about the sex of this ruler (see Berlin 1959: 5-6), for the diagnostics of sex can be seen in the portraiture as well as in the glyphs of this person on the sides of the sarcophagus. The other female ruler, interestingly, is one who assumed the name glyph of the ancestress whom we have been discussing. Her accession is recorded in TI-east:N11-P3, with additional details continuing to Q9. (For the occurrences of her name phrase in this inscription, see Figure 3, g-h.) Apparently she served only as a temporary regent, until the boy Pacal was of an age to be installed in the position which he had inherited. Very likely she was his mother.

Thus there are reasons for supposing that the mythological personage, whose birth date is recorded in the initial series of the Temple of the Cross, may have been a female figure. This looks sufficiently probably at present perhaps to warrant the tentative use of feminine

¹⁵ There is a difficult problem, familiar to students of Palenque, inhering in this passage. The recorded distance number 2.1.7.11.2, if applied to the ‘birth’ date of the named personage (as the passage directs), and if that ‘birth’ date is identified as the initial date of the inscription (as the normal manner of reading requires), then the day reached is 3 Ik 0 Zac (2.1.0.15.2), and not 9 Ik 0 Zac, which would require a distance number 1.12.8.0 greater, or 1.0.5.0 less, than the recorded one. On the other hand, the following passages in the inscription require that the day here be 9 Ik 0 Yax, which would require either a distance number 1.0 less than the recorded one, or the application of the recorded one to the 819-day date rather than to the initial date (see Berlin 1965). These are the “inconsistencies” alluded to in note 14, which motivated the suggestion of possible “tampering” by the Palenque numerologists. In any case, the magnitudes of the inconsistencies are insufficient to alter the Methuselah-like characteristic referred to here.

¹⁶ On the ‘Palenque Triad’ see Berlin 1963. In the inscriptions of the Temple of the Foliated Cross and the Temple of the Sun this ancestress is implicated in a similar role in relation to the other two of that brood, who are ‘G-II’ and ‘G-III.’ And from the alfardas of the Temple of the Cross it becomes clear that the first of this group of progeny — unnamed in the main TC inscription except with a relationship glyph — was a second-generation ‘G-I’, having the same name glyph as the first ‘G-I’, but with a birth date 1.18.5.3.2 as opposed to the –8.5.0 date of the former. These interpretations will be argued in detail on another occasion.

¹⁷ This is the one to whom I have referred previously (1974: 6-11) as “Lady Ik.” A fuller, but still less than complete, rendering of her name glyphs would have been “Lady Kanal-Ik.” Her accession, recorded in the east panel of the Temple of Inscriptions at K2-L6, is described as 9.14.12 before the 5 Ahau 3 Chen katun-ending (9.8.0.0.0), which places it on 9 Lamat 1 Muan 9.7.10.3.8. The date of her death, or more likely of her interment rite, is recorded on the edge of the TI sarcophagus lid, in glyph 28, as 2 Eb 20 Ceh (i.e., 0 Mac), which is placed at 9.8.11.6.12. It was thus 1.1.3.4 from her accession to her death, or interment, indicating a period of something over twenty years for her incumbency in royal office.

nouns and pronouns in reference to 'her' — but with the proviso that this is with something less than certainty. For the principal thesis of this communication, however, the correct identification of the sex of the personage is not crucial. The relevant points are rather (a) that the personage was presented as an ancestral figure, (b) that a manner of 'identification' of at least one Palenque ruler with that personage was attained through numerological means, (c) that a 'birth' date for that personage was fabricated in the manner of a ring-number base to that end, and (d) that this is what lies behind the initial date of the Temple of the Cross. Evidence has been offered which led to these hypotheses in the first place, and which I think lends them strong support. And I know of no credible alternative hypothesis to account for the initial date of this temple.¹⁸

This is not the last that is heard of Lady 'Beast-with-Upturned-Snout' in the Palenque inscriptions. As already noted, there is reference to her in the inscription of the jambs of Temple XVIII.

THE LONG DISTANCE-NUMBER OF TEMPLE XVIII

The jambs of Temple XVIII memorialize a later ruler of Palenque, whose rule was brief, and whose accession is recorded not only here but also — with others — in the Slaves Tablet and in the Tablet of the 96 Glyphs. He has been referred to previously as "Subject C," of the subjects named in the 96 Glyphs, by Berlin (1968); as "Feathered Skull" by Kubler (1974), after one of the glyphs that recurs in his appellative phrase in the Temple XVIII jambs; and as "Lord Chaac" by Mathews and Schele (1974), after the glyph in his appellative phrase that carries the prefix of royal rank in Temple XVIII and in the 96 Glyphs, employing the Chol cognate for the name of that glyph, which is otherwise known by its Yucatec name, Cauac.

The content of the Temple XVIII inscription is as follows. (Illustrations of the inscription can be found in Ruz, 1958: 157, and in Saenz, 1956.) The passage A3-A15 records the event of this ruler's birth on the initial-series date of 9.12.6.5.8, 3 Lamat 6 Zac, together with inserted lunar data and placement in the 819-day cycle. B15-B18 records an event that occurred when he was nearly 14 years old, possibly a rite of heir-designation, on 9.13.0.7.0, 5 Ahau 8 Ch'en. A19-C5

recorded another event in his life, taking place when he was almost 16 years of age, on 9.13.2.9.0, 11 Ahau 18 Yax, the nature of which event cannot be determined because of damage to the top portion of the south jamb. D5-D7 records his accession to rule, and C8-C13 gives a further characterization of the date of his accession, concerning both of which see the paragraphs below. D13-C18 records his death, only a year after his accession, and D18-D20 is a concluding phrase, the sense of which is not understood.

The accession of this ruler is described in the passage D5-D7 as having been 2.3.16.14 after his birth. In other words, he was approximately 43 years and 4 months of age when he succeeded to rule. Since the date of his birth is given in the initial series as 9.12.6.5.8, 3 Lamat 6 Zac, the date of his accession is fixed then at 9.14.10.4.2, 9 Ik 5 Kayab. This is confirmed again in the inscriptions of the Slaves Tablet (A4-C1) and the 96 Glyphs (E1-F6)¹⁹ — see Mathews and Schele, 1974, and Berlin, 1968.

Following this, the accession is further characterized in C8-C13 as having been 7.14.9.12.0 after the 'accession' or 'inauguration' of the mythological lady of our acquaintance above, whose role in the Temple of the Cross inscription has occupied our attention. Her accession is given here as having been on a day 9 Ik 0 Zac, precisely the day that is recorded for that event in the Tablet of the Cross;²⁰ and the distance number given here, subtracted from the present ruler's accession date of 9.14.10.4.2, fixes that day at 2.0.0.10.2.

Now one must wonder what could have been the purpose in the second characterization of the accession date of this ruler, relating it to an ancient and necessarily legendary one said to be over three thousand years earlier. The fact that both of these were 9 Ik days makes one suspect that the selection of the latter's accession day was not a chance matter. From it one knows in advance that the distance number of this passage will be divisible by 260, which makes one wonder what else may be contained in it. This is what one finds:

$$\begin{aligned} 7.14.9.12.0 &= 1,112,280 = 4,278 (260) \\ &= 2,139 (520) \\ &= 1,426 (780) \\ &= 465 (2,392) \\ &= 93 (11,960) \end{aligned}$$

¹⁸ An earlier hypothesis was that the TC initial date was a 'determinant' of the date 13 Ahau 18 Kankin (9.10.10.0.0), which is recorded at K9 in the TC inscription (see Teeple 1931: 76-77, and Thompson 1936). But that date is merely a period-ending marker serving as a reference point for securing the longcount position of the important date 9 Akbal 6 Xul, which is that of the preceding passage, C1-K6. That was the date of an important event in the early life of Chan-Bahlum (at age 6.2.17), possibly the ritual of heir-designation, naming him as the legitimate or chosen successor to Pacal. The passage K7-K10 says that it was 1.8.17 from the date of that event to the lahuntun-ending 13 Ahau 18 Kankin. Thus this latter day is of only secondary importance, hardly meriting a 'determinant' in so prominent a position as in the initial series of the inscription.

¹⁹ In the 96 Glyphs (E1-F6) his accession day is named as 9 Ik 5 Kayab and is related by a distance number to the accession day of his predecessor. In the Slaves Tablet (A4-C1) it is named again as 9 Ik 5 Kayab, and is related by a distance number (an approximate or round-number DN) to a birth date; but it is to that of his more fortunate and longer-lived successor and replacement. These inscriptions are both lists, in which this ruler is merely one in a sequence. The Temple XVIII inscription, which is devoted exclusively to him, gives fuller information.

²⁰ Compare note 15. The Temple XVIII inscription repeats the calendar-round day as 9 Ik 0 Zac, as recorded in the TC inscription, accepting it perhaps as 'written history' and not getting involved with the competing calendar-round positions implied in that inscription. The longcount position implied for it in Temple XVIII is one of the possibilities mentioned in note 15, namely the one that is 1.0.5.0 less than that implied by the distance number of the TC recorded.

It does indeed contain more than the tzolkin; it is an integral multiple also of the double tzolkin (three lunar nodes), the triple tzolkin (the Mars period), the Palenque 81-moon constant, and the Dresden eclipse cycle. Again, it should be of interest to compare the decomposition of the distance number into its prime factors with the similar decomposition of the terminal day number to which it leads when added to its base; and since the base in this case (unlike the ring bases) is a positive number of sizeable magnitude, it should be of interest to include that also in the comparison. We find the following:

DN: 7.14. 9.12.0 = 1,112,280 = $2^3 \cdot 3 \cdot 5 \cdot 13 \cdot 23 \cdot 31$;
 Base: 2. 0. 0.10.2 = 288,202 = $2 \cdot 29 \cdot 4969$;
 TDN: 9.14.10. 4.2 = 1,400,482 = $2 \cdot 700241$.

The prime factors of the distance number (the analog here to the companion number to a ring base) make evident its contrived character, while those of the base and of the terminal day number give them the appearance of accidental numbers.

It was noted earlier, however, that not every number that has the appearance of an accidental number is necessarily such, inasmuch as the addition of a contrived number to an uncontrived one generally yields a new number that has the appearance of an uncontrived one, in spite of its being mediated by a contrivance. This is the situation in the present case. The terminal day number — the longcount date of Lord Chaac's accession to rule — is clearly contrived, since it was obviously chosen so that it would be a like-in-kind in respect to certain of its attributes (its tzolkin position, its position in the lunar month, its distance from the lunar nodes, its position in the Mars year, and its position in the eclipse cycle) when compared to the 'accession' date of the great ancestress. Nor is this earlier date free from the suspicion of contrivance either, since that was in mythological time and can hardly be accidental in the manner of a date that records a chance happening in historical time. Yet it has the appearance of an accidental one; which only means that 13.0.0.0.0 is not the relevant base.

Kubler, after a review (1974) of the Classic Maya inscriptions which contain ancient dates and long distance-numbers, was able to conclude, from the remoteness of the dates and the magnitude of the numbers, that "some principal figures of Maya dynastic history boasted of mythological ancestries. ... Their ancestors are cited as flourishing in the most remote times, and as occupying another cosmological stage." Now we have seen some additional properties of two such numbers. These further support that conclusion, and they offer insights into a technical aspect of Maya thinking about numbers, time, and destiny.

The reading of destiny from the properties of numbers, especially of the numbers that are used to specify birth dates, is the business of the occult 'science' of numerology. It need not require a wholly passive submission to the numbers. One could take destiny into one's own hands; and a king could have his numerologists manipulate the numbers, even change

them or invent suitable ones, or fabricate appropriate significance for them. It appears that Pacal must have had his numerologists at work to invent a birth date for the ancestral divinity from whom he claimed descent and derived authority, in order to establish or to reinforce his identification with that figure. Another part of the business of numerology is the determination of auspicious days for undertakings of consequence. Surely a prince's elevation to rulership was an occasion meriting whatever benefits the practice of that science might be able to bestow. The inscription from Temple XVIII gives witness to its employment for this purpose, as well as to the continued appeal to the same mythical ancestress; for the numerologists of the ruler memorialized in that temple appear to have sought a propitious day for his inauguration and to have found what they must have thought was one, within a reasonable length of time after his predecessor's death, in a day bearing a likeness to that on which the mythic ancestral being was said to have ascended to power. Unfortunately, though their arithmetic was good, their prognostication was less so. The ruler was dead within a year, and his successor, a somewhat senior age-mate, succeeded to power in less than a year and a half (1.8.2) after he had.

APPENDIX: TABULATION OF COMPANION NUMBERS AND TERMINAL DAY NUMBERS ASSOCIATED WITH RING NUMBERS IN THE DRESDEN CODEX

There are eighteen pairs of ring and companion numbers in the Dresden Codex, from which corresponding terminal day numbers (longcount dates) may be derived. Of the eighteen, three are duplicates, leaving fifteen distinct pairs. Three of these were chosen as examples in the first portion of this paper to illustrate a frequent characteristic of the companion numbers and to contrast them in this respect with their corresponding terminal day numbers. That feature of the companion numbers (qualified, when previously mentioned, as characterizing "most of them") was their highly composite character and their divisibility by several, or by many, of the basic Maya calendrical primes. In this respect they are noticeably different, as a set, from the terminal day numbers.

In the following table each companion number (CN) and its corresponding terminal day number (TDN) are listed in pairs, in Maya and in Arabic numerals, and then in prime-factor notation. The latter is in separate columns for CN and TDN in order to facilitate comparison of the two categories. One additional pair (from page 52 of the codex) is also included, in which the base is not properly a ring-number base (a before-zero date) but one just eight days after the zero day of the longcount. It is included because this pair also exhibits the relationship discussed. Thus there are sixteen different pairs in the table. The ring numbers are omitted from the table partly for lack of space, but also because they are of a wholly different order of magnitude and would distract

from the comparison for which the table has been compiled. (They are in every case equal to the difference between the respective companion number and terminal day number.)

The purpose in presenting this tabulation is to add further supporting evidence and to avoid sweeping any of the possibly negative evidence under the rug. It has been implied, in the above-mentioned qualification, that not all of the companion numbers exhibit the property that has been described as characteristic of them, or exhibit it to the same degree. Of the sixteen cases at hand, it can be seen from the prime-factor reductions in the table that *eight* are 'good' manifestations of the posited CN property, as well as of the contrast between CN and TDN in this respect; that *five* cases are 'fair' manifestations, at least to the extent of divisibility of the CN by the tzolkin ($2^2 \cdot 5 \cdot 13$); and that *three* cases (62E, 63C-black, and 63C-red/31aC) are apparent exceptions or possibly 'negative' instances. I do not consider that these latter carry sufficient weight, however, to invalidate the generalization about the nature of the companion numbers as numerological contrivances or the hypothesis about the purpose of ring-number bases. One of the possibly negative instances (62E) is of dubious validity because of unresolvable discrepancies between the RN and CN on the one hand and the RND and TD, as registered in the codex, on the other hand. Another of them (63C-red/31aC), an apparent anomaly because of the high prime factor 59167 in the CN, may actually be in keeping with the hypothesis about the

purpose and manner of determination of ring-number bases; for only if a cycle of such magnitude (permissably though not necessarily prime) were basic to the CN, could the hypothesis accommodate a ring number of the unusual magnitude of the one in this case, namely 7.2.14.19, or 51419 (necessarily less, but not necessarily much less, than that factor). And now to the eight 'good' manifestations of the principle I think we may go beyond the Dresden Codex and add *two* more: the one inherent in the initial date of the Temple of the Cross, and the one exemplified in the long distance number of Temple XVIII.

The reader is advised to consult Thompson 1950 (p. 257, and fig. 46: 11), Thompson 1972 (esp. pp. 20-24, 80, and 115-116), and Satterthwaite 1964, in connection with reference to the Dresden Codex. The numbers registered in the codex contain a few copyists' errors. Satterthwaite, Thompson, and earlier scholars, utilizing internal evidence in the codex together with checks of mathematical consistency, have been able to correct most of these with certainty. A pertinent example is that of 31aC. The codex here has the CN as 10.13.3.13.2, with metathesis of the tun and the uinal digits. It also has the RN with the uinal and the kin digits conflated, using red to derive the kin number from the black uinal number. It is the recurrence of this set in 63C-red, without metathesis or conflation, that offers proof of its restoration. The numbers as presented here in the Table follow the readings of Satterthwaite and Thompson.

TABLE 1: Prime Factors of Companion Numbers and Terminal Day Numbers associated with bases before, or in one case just after, 4 Ahau 8 Cumhu 13.0.0.0 in the Dresden Codex.

Page and Location	CN and TDN: Maya Numbers	Arabic Equivalents	Prime Factors of CN	Prime Factors of TDN
24	CN: 9. 9.16. 0. 0 TDN: 9. 9. 9.16. 0	1,366,560 1,364,360	$2^5 \cdot 3^2 \cdot 5 \cdot 13 \cdot 73$	$2^3 \cdot 5 \cdot 23 \cdot 1483$
31aA	CN: 8.16.14.15. 4 TDN: 8.16.14. 9. 3	1,272,544 1,272,423	$2^5 \cdot 7 \cdot 13 \cdot 19 \cdot 23$	$3 \cdot 197 \cdot 2153$
31aB	CN: 8.16. 3.13. 0 TDN: 8.16. 3.12. 3	1,268,540 1,268,523	$2^2 \cdot 5 \cdot 7 \cdot 13 \cdot 17 \cdot 41$	$3^2 \cdot 17 \cdot 8291$
31aC	CN: 10.13.13. 3. 2 TDN: 10. 6.10. 6. 3	1,538,342 1,486,923	$2 \cdot 13 \cdot 59167$	$3 \cdot 89 \cdot 5569$
43b	CN: 9.19. 8.15. 0 TDN: 9.19. 7.15. 8	1,435,980 1,435,628	$2^2 \cdot 3 \cdot 5 \cdot 7 \cdot 13 \cdot 263$	$2^2 \cdot 358907$
45a	CN: 8.17.11. 3. 0 TDN: 8.17.11. 1.10	1,278,420 1,278,390	$2^2 \cdot 3 \cdot 5 \cdot 11 \cdot 13 \cdot 149$	$2 \cdot 3 \cdot 5 \cdot 43 \cdot 991$
51a(black)	CN: 9.16. 4.10. 0 TDN: 9.16. 4.10. 8	1,412,840 1,412,848	$2^3 \cdot 5 \cdot 11 \cdot 13^2 \cdot 19$	$2^4 \cdot 227 \cdot 389$
58F(upper)	CN: 9.18. 2. 2. 0 TDN: 9.18. 0.12. 9	1,426,360 1,425,849	$2^3 \cdot 5 \cdot 13^2 \cdot 211$	$3 \cdot 475283$
58F(lower)	CN: 9.12.11.11. 0 TDN: 9.12.10.16. 9	1,386,580 1,386,329	$2^2 \cdot 5 \cdot 13 \cdot 5333$	$7 \cdot 198047$
62E	CN: 8.16.15.16. 1 TDN: 8.16.14.11. 5	1,272,921 1,272,465	$3 \cdot 13 \cdot 127 \cdot 257$	$3^2 \cdot 5 \cdot 28277$
62F	[Same as 31aA]			
63A	CN: 8.11. 8. 7. 0 TDN: 8.11. 7.13. 5	1,234,220 1,233,985	$2^2 \cdot 5 \cdot 13 \cdot 47 \cdot 101$	$5 \cdot 47 \cdot 59 \cdot 89$
63B	[Same as 31aB]			
63C(black)	CN: 10.13. 3.16. 4 TDN: 10. 6. 1. 1. 5	1,535,004 1,483,585	$2^2 \cdot 3^3 \cdot 61 \cdot 233$	$5 \cdot 41 \cdot 7237$
63C(red)	[Same as 31aC]			
70A(upper)	CN: 9.13.12.10. 0 TDN: 9.13.10.15.14	1,394,120 1,393,514	$2^3 \cdot 5 \cdot 7 \cdot 13 \cdot 383$	$2 \cdot 696757$
70A(lower)	CN: 8. 6.16.12. 0 TDN: 8. 6.16. 7.14	1,201,200 1,201,114	$2^4 \cdot 3 \cdot 5^2 \cdot 7 \cdot 11 \cdot 13$	$2 \cdot 600557$
70B(upper)	CN: 9.19.11.13. 0 TDN: 9.19. 7. 2.14	1,437,020 1,435,374	$2^2 \cdot 5 \cdot 13 \cdot 5527$	$2 \cdot 3^3 \cdot 19 \cdot 1399$
70B(lower)	CN: 8.16.19.11. 0 TDN: 8.16.19. 0.12	1,274,260 1,274,052	$2^2 \cdot 5 \cdot 13^3 \cdot 29$	$2^2 \cdot 3 \cdot 13 \cdot 8167$

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