Alternative Functions of Distance Numbers in Maya Calendrical Texts: Codices vs. Monuments

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Introduction

In the context of Classic Maya monumental inscriptions, the function of distance numbers is well known and understood. They refer to intervals linking important events in the lives of Maya rulers and members of their families. Less well known, and often misunderstood, is the function of intervals in the Postclassic Maya codices. The purpose of the present study is to explain the different functions of intervals in monumental and codical texts and what this means for understanding the structure of codical texts.

Intervals in Codices

The three principal surviving Maya codices, the ones conserved in the cities of Dresden, Madrid, and Paris, are concerned with a variety of topics (ritual, astronomy, meteorology, and agriculture), but not human biography. In fact, the anthropomorphic figures that populate their pages are deities, not people. Another characteristic that distinguishes codical from monumental inscriptions is their treatment of distance numbers, represented almost universally in the former with bar-and-dot numbers alone, without accompanying period glyphs. The codical treatment of *tzolkin* dates is similarly abbreviated: in many cases, only the coefficient is represented and the day sign must be inferred from context. The bar-and-dot coefficients of *tzolkin* dates are painted red to distinguish them from distance numbers, their bars and dots being painted black. Another difference between intervals in monumental and codical texts is that the ones in the codices are often numerologically driven (cf. Aveni 2006) and occur in highly repetitive sequences, such as 13-13-13-13-13, 16-16-16-17, or 6-7-6-7-6-7-6-7, whereas those on the monuments are not numerologically driven, but reflect the variation that is characteristic of human life histories. In the repetitive series of the codices, the only function of the dates that begin and end an interval is to anchor a span, within which the date(s) of interest may fall. This stands in contrast with intervals bounded by dates on the monuments, where the historical dates connected by distance numbers, not dates that happen to fall inside the intervals, are significant. In the codical model, the boundaries of an interval can be adjusted to fit a numerological imperative, as long as it includes the date of an iconographically targeted event. If that date falls in or near the center of an interval, then its beginning or end can be moved forward or backward (or both) by a few days to accommodate the desired numerological pattern.

In securely dated contexts it is possible to show that codical intervals can serve as the source of dates of recurrent events of interest to users of the Maya codices, such as solstices and equinoxes or stations of the Maya *haab* (New Year and Half Year). To take an example, the seasonal tables on pages 61 to 69 of the Dresden Codex provide such a context. The introduction or preface to the tables on pages D.61-D.64 contains multiple dates in ring-number or serpent-number formats that can be tied into the Maya long count and from there into our Western, Gregorian calendar (Figure 1). It also contains a table of multiples, indicating that the seasonal tables were intended to be recycled.

The tables themselves occupy the upper and lower registers of pages D.65-D.69 (Figure 2). Each table is composed of 13 pictures and the captions above them and has two rows of distance numbers and *tzolkin* coefficients, one row above the captions and one below them, indicating that the user should go through each table twice. The intervals in each row sum to 91 days. Thus, the full length of each table is 182 days.

The upper row of black distance numbers and red coefficients above the upper seasonal table is heavily damaged; some of them are completely effaced. Enough remains, however, that what is missing can be inferred from what is still legible and from the fact that the intervals in that row form a highly patterned sequence that mirrors the intervals in the row of distance numbers below the captions in the lower seasonal table. The four rows of intervals in the two tables are arranged in an a-b-b-a numerological pattern as follows (reconstructed numbers are italicized):

9-5-1-10-6-*2-11-7-3-12-8-4*-13

11-13-11-1-8-6-4-2-13-6-6-8-2

11-13-11-1-8-6-4-2-13-6-6-8-2

9-5-1-10-6-2-11-7-3-12-8-4-13

The intervals in the last row exhibit an internal patterning such that each value is exactly four less than its predecessor. Enough remains of the intervals in the first row to suggest the same internal patterning, thus validating the inferred values for the effaced numerals.

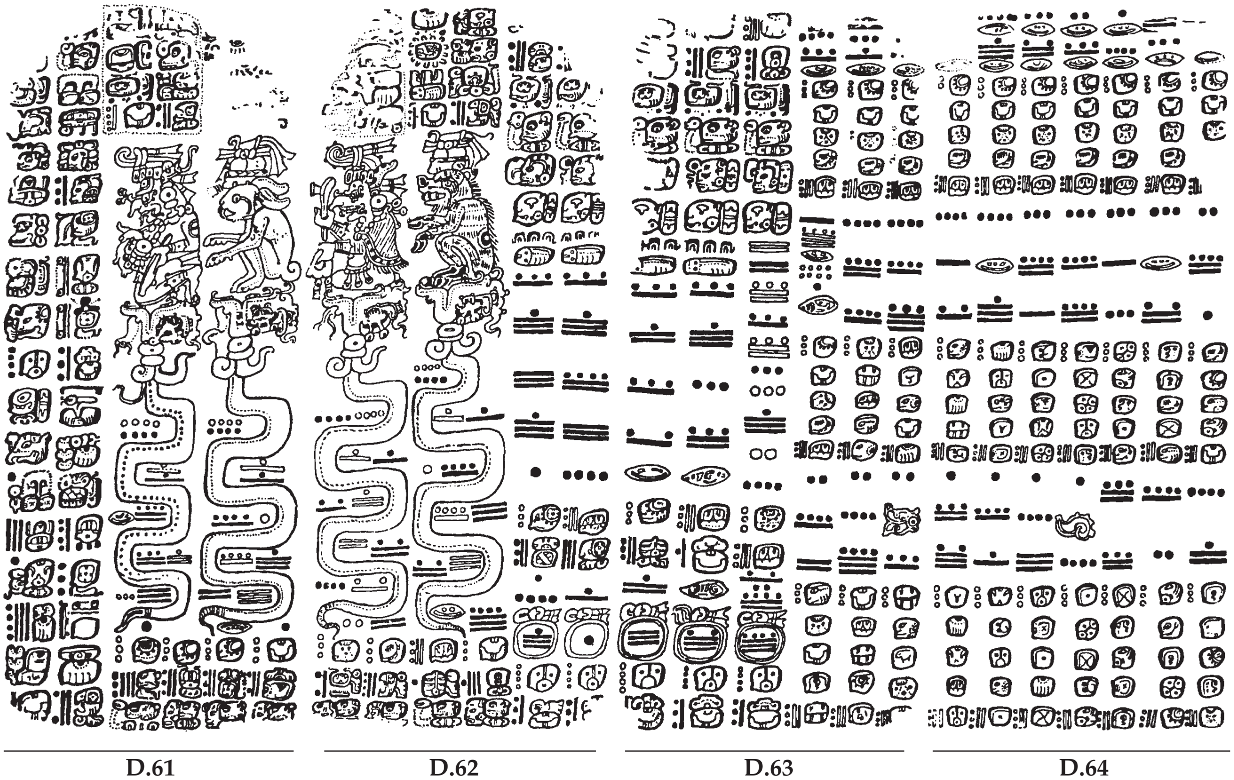

Figure 1. The left half of the seasonal tables on pages 61 to 64 of the Dresden Codex. After Villacorta C. and Villacorta (1976:132, 134, 136, 138).

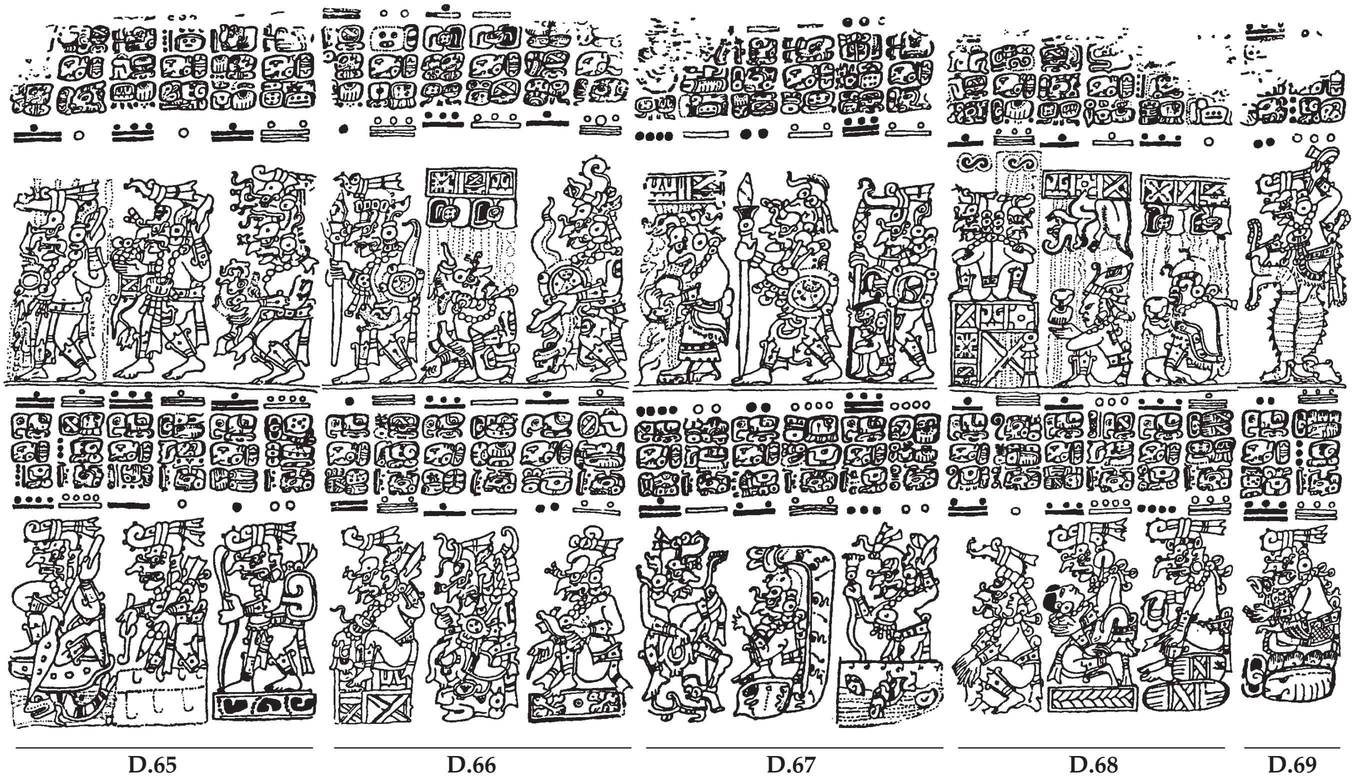

Figure 2. The right half of the seasonal tables on pages 65 to 69 of the Dresden Codex. After Villacorta C. and Villacorta (1976:140, 142, 144, 146, 148).

Elsewhere, Bricker and Bricker (2011:527-545) have shown that some of the pictures and their captions in the seasonal tables pertain to the two intertwined ring-number base dates that immediately precede the table of multiples. From one of those base dates, the long-count equivalent of which is 10.6.1.1.5 3 Chicchan 8 Zac (= 12 July AD 949), an entry date of 10.6.1.5.16 3 Cib 19 Muan can be derived for the upper seasonal table, which corresponds to 11 October AD 949. It leads to the date of the vernal equinox on 20 March AD 950 (= 10.6.1.13.14 7 Cib 14 Tzec in the Maya calendar) in the second row of the table, which is associated with the first picture and caption on page D.68a (Figure 3). The picture consists of a bent skyband on which two images of the rain god Chac are seated back-to-back. Above them are two clouds. Rain falls from the one on the right onto the Chac directly below it.

A six-day interval is associated with the bent-skyband picture, and the vernal equinox in AD 950 fell on the first day of the interval. In the second multiple of the table, 182 days later, the picture is associated with the autumnal equinox on 23 September AD 950 (= 10.6.2.5.3 12 Akbal 1 Muan in the Maya calendar), which fell on the *sixth* (and last) day of the interval. The third multiple returns the bent-skyband picture on D.68a to the vernal equinox on 20 March AD 951 (= 10.6.2.14.1 8 Imix 14 Tzec), this time on the *second* day of the six-day interval. The even multiples of the table no longer link this picture with autumnal equinoxes, but the odd multiples continue to associate it with vernal equinoxes, on the *fourth, fifth,* and *sixth* days of the interval in AD 952, 953, and 954, respectively, after which the relationship ends (Table 1). Because two runs through the table equal only 364 days (2 x 182), they fall short of the 365.2422-day length of the tropical year by 1.2422 days. Between AD 950 and 954, this error accumulates until it has used up the six days of the interval, after which the table is no longer effective for targeting vernal equinoxes. The greater emphasis on vernal equinoxes is consistent with the scene in the picture, which places the dry season (represented by the cloud without rain on the left) before the rainy season (represented by rain falling from the cloud on the right), not vice versa. In this example, the dates connected by the interval are less important than the equinoctial dates that fall on different days within it in five sequential years.

The intervals are equally useful for locating dates of ritual significance in sequential years or *haabs.* For example, the first day of the eight-day interval associated with the second picture on page D.68a happens to coincide with Maya New Year on 4 Ik 0 Pop (= 16 December AD 949) in the first row of the table (Table 2). The maize god (God E) served as the yearbearer for Ik years, and he is depicted sitting with the glyphs for food and water balanced on his right hand. No event is associated with that picture in the second multiple of the table, but Maya New Year on 5 Manik 0 Pop falls on the *second* day of the interval in AD 950. The odd multiples of the table continue to link this picture with Maya New Year's days on the *third, fourth, fifth, sixth, seventh,* and *eighth* days of the interval in AD 951, 952, 953, 954, 955, and 956, respectively. Only in AD 949 and 953 was the maize god appropriately represented by the picture. In this case, the discrepancy between the length of the *haab* (365 days) and the length of two runs through the table (364 days) is only one day, and the interval itself is two days longer than the interval associated with the equinoctial picture (eight days, instead of only six days). For these reasons, the table is efficacious for targeting Maya New Year's day for seven years, instead of only five years.

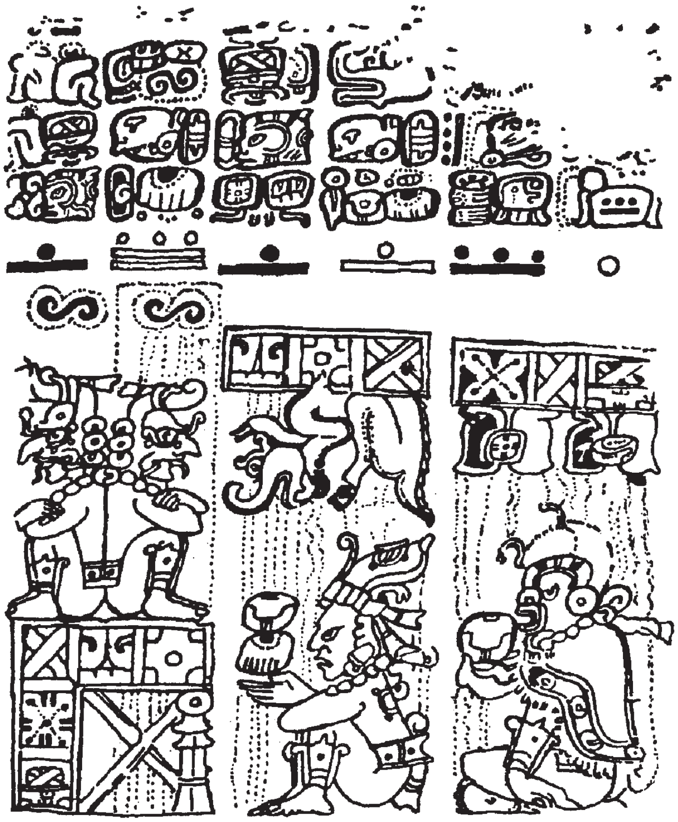

Figure 3. Page 68a of the upper seasonal table in the Dresden Codex. After Villacorta C. and Villacorta (1976:146).

Table 2 also shows that, beginning in AD 952, the upper seasonal table begins to target the 180th day of the year—on 0 Yax—as well as the first day of the year—on 0 Pop—and this relationship continues through AD 959, three years after it ceases to be effective for tracking the New Year. Because this relationship does not materialize until four years after the beginning of the table, we consider it to be an artifact of the structure of the table, rather than an objective of the person who designed it. We regard it as more likely that interest in the ritual significance of 0 Yax was expressed in the third picture

Mult.	Year (AD)	Vernal	Autumnal	Day in Interval
Orig.	950	20 March		1
2nd	950		23 September	6
3rd	951	20 March		2
4th	951		--	--
5th	952	20 March		4
6th	952		--	--
7th	953	20 March		5
8th	953		--	--
9th	954	20 March		6
10th	954		--	--
11th	955	--		--

Table 1. Dates of equinoxes falling in the 6-day interval associated with the first picture on page 68a of the Dresden Codex.

in the *lower* seasonal table on page D.65b, which depicts the rain god (God B) on a road (Figure 4). The lower seasonal table begins 218 days after the upper seasonal table, after which they overlap each other in time. The interval associated with the third picture is eleven days, and what we call the Half Year, 2 Ik 0 Yax (= 14 June AD 950), falls on the fifth day of the interval. Table 3 shows that the odd multiples of the lower seasonal table link the third picture of the lower seasonal table to the *sixth, seventh, eighth, ninth, tenth,* and *eleventh* days in the interval in AD 951, 952, 953, 954, 955, and 956, respectively. These are the same years during which the second picture on page 68a of the upper table is linked to Maya New Year. And because of the structure of the lower seasonal table, the even multiples of it link the third picture to 0 Pop in AD 950, 951, 952, and 953. In this sense, the dates associated with the two pictures concerning stations of the *haab* mirror each other, even though the picture in the upper table is not positioned directly above the corresponding picture in the lower table on pages D.65-69. Other examples of the relationship between the upper and lower seasonal tables appear in Bricker and Bricker (2011:540-541, Table 11-9).

The foregoing example of D.61-69 was discussed in detail in order to reveal motives for contriving intervals in order to accommodate seasonal events in succeeding runs of codical almanacs. In a separate study, Aveni (2011) established the existence of patterns in intervallic day sequences in a large number of almanacs and dealt with a variety of motives for contriving such patterns. These include the desire to *avoid* or *arrive at* a particular day or date (e.g., an interval of 20 returns an almanac

Figure 4. Page 65b of the lower seasonal table in the Dresden Codex. After Villacorta C. and Villacorta (1976:140).

Mult.	New Year	Half Year	Day in interval
Orig.	4 Ik 0 Pop 16 Dec 949		1
2nd		--	--
3rd	5 Manik 0 Pop 16 Dec 950		2
4th		--	--
5th	6 Eb 0 Pop 16 Dec 951		3
6th		4 Eb 0 Yax 13 Jun 952	1
7th	7 Caban 0 Pop 15 Dec 952		4
8th		5 Caban 0 Yax 13 Jun 953	2
9th	8 Ik 0 Pop 15 Dec 953		5
10th		6 Ik 0 Yax 13 Jun 954	3
11th	9 Manik 0 Pop 15 Dec 954		6
12th		7 Manik 0 Yax 13 Jun 955	4
13th	10 Eb 0 Pop 15 Dec 955		7
14th		8 Eb 0 Yax 12 Jun 956	5
15th	11 Caban 0 Pop 14 Dec 956		8
16th		9 Caban 0 Yax 12 Jun 957	6
17th	--		--
18th		10 Ik 0 Yax 12 Jun 958	7
19th	--		--
20th		11 Manik 0 Yax 12 Jun 959	8
21st	--		--
22nd		--	--

Table 2. Dates of New Year and Half Year falling in the 8-day interval associated with the second picture on page 68a of the Dresden Codex.

Mult.	New Year	Half Year	Day in interval
Orig.		2 Ik 0 Yax 14 Jun 950	5
2nd	5 Manik 0 Pop 16 Dec 950		8
3rd		3 Manik 0 Yax 14 Jun 951	6
4th	6 Eb 0 Pop 16 Dec 951		9
5th		4 Eb 0 Yax 13 Jun 952	7
6th	7 Caban 0 Pop 15 Dec 952		10
7th		5 Caban 0 Yax 13 Jun 953	8
8th	8 Ik 0 Pop 15 Dec 953		11
9th		6 Ik 0 Yax 13 Jun 954	9
10th	--		--
11th		7 Manik 0 Yax 13 Jun 955	10
12th	--		--
13th		8 Eb 0 Yax 12 Jun 956	11
14th	--		--
15th		--	--

Table 3. Dates of New Year and Half Year falling in the 11-day interval associated with the third picture on page 65b of the Dresden Codex.

user to a given day *name*, an interval of 13 to the same coefficient) or a lucky or unlucky day for planting, burning milpa, fishing, hunting, etc. If almanacs have been altered to record lucky and unlucky days for religious, civic, and other subsistence activities, as indeed the postconquest and ethnographic sources attest (Thompson 1950:93-96), then we might expect certain days in the 260-day count either to surface or to be suppressed more than others in the almanacs. It turns out that the distribution of day names for all dates in the *tzolkin* arrived at via the intervals in each of the almanacs in the Dresden and Madrid codices are relatively uniform. On the other hand the distribution of the day names associated with entry dates is decidedly non-uniform.

Another motive for intervallic alteration, perhaps so practical as to escape attention, likely derives from the basic need to save space in a manuscript. Such a consideration might involve reducing the number of intervals and stations by combining two or more of the latter. In the U.S., the conflation of Washington's and Lincoln's birthdays into a single President's Day offers an example. Conversely, an almanac can be expanded by subdividing an interval and consequently adding a station. Examples from the Western calendar include tacking on Boxing Day to Christmas in Britain or 'Pascuetta' (little Easter) to Easter Sunday in Italy. The need to save space is clearly evident in the cognate pair D.21b and M.90d-92d. In the former, three of the four pictures are absent, though the intervallic sequence 7-7-7-5 persists. But there are instances in which pairs of pictures and their content (a single picture/interval) are subdivided. Compare the following sequences:

11 – 7 – 6 -16 – 8 – 4 .. (D.17b-18b) (Figure 5)

5 – 5 – 7 – 6 – 8 – 8 – 8 – 4 (M.94c-95c)

and

15 – 33 – 4 (D.17c-18c) (Figure 6)

7 – 8 – 8 –13–12 – 4 (M.93d-94d)

Finally, there exist purely esoteric reasons for contriving intervals. Among these are examples of intervallic mirror symmetry, e.g.,

12-8-12-8-12	(D.10a-12a)
13-26-13	(D.12b)
1-1-3-3-6-6-10-10-6-[6]	(M.85a)
20-[12]-20	(M.83b)
13-[39]-13	(M.84b)
(1-2)-5-3-2-11-2	(M.49c: symmetric about 11);

and the slightly aberrant sequence centered on the sixth interval in D.4b-5b:

4-4-4-3-4-3-4-3-6-3-4-4-3-3

To summarize, codical intervals express time spans within which rituals might be conducted. Many of these numbers follow particular numerological rules. Having dealt with what we know of such numbers, we turn next to an inquiry into the properties of intervals, called distance numbers (hereinafter DN), in the monumental inscriptions.

Intervals on Monuments

All dates and DNs discussed in this section were acquired with the kind permission of Martha Macri from the Maya Hieroglyphic Data Base (1991-2012). We begin with a few examples illustrating the general properties of distance numbers in monumental biographical

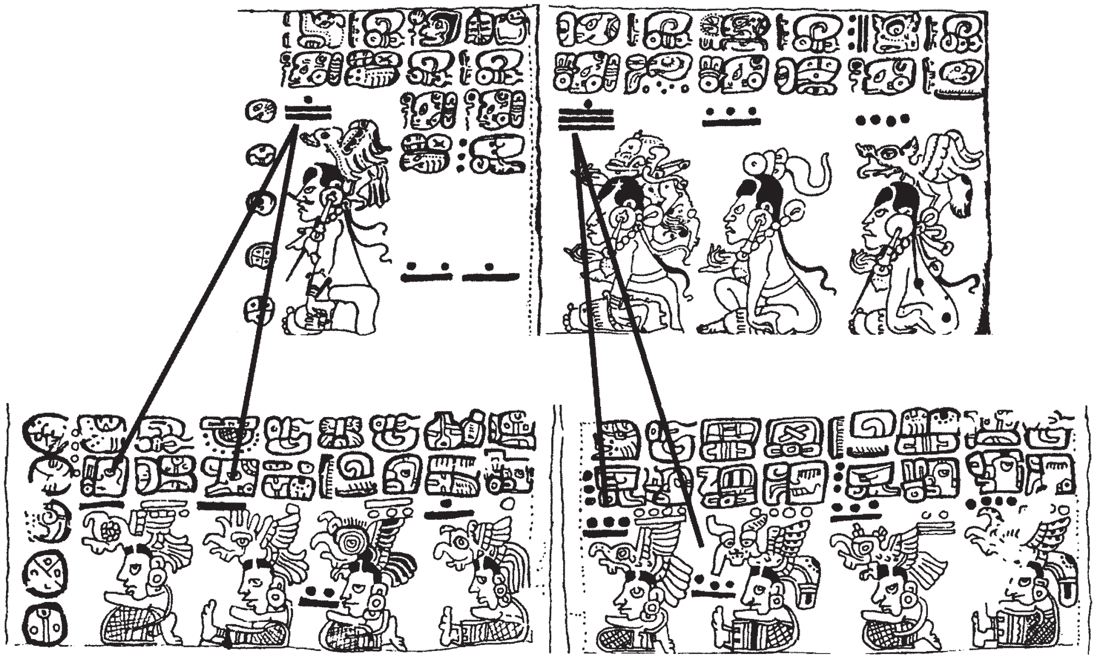

Figure 5. Cognate almanacs: Dresden Codex, pages 17b-18b (top), and Madrid Codex, pages 94c-95c (bottom), showing intervallic changes (black lines).

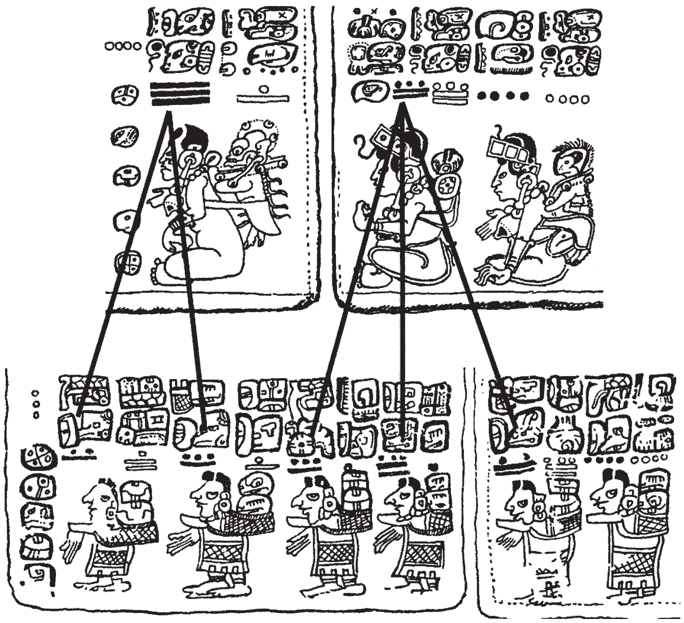

Figure 6. Cognate almanacs: Dresden Codex, pages 17c-18c (top) and Madrid Codex, pages 93d-94d (bottom), showing intervallic changes (black lines).

texts by referring to the life of a woman named Lady Katun (now known as Lady Winikhab Ajaw), known from the inscriptions of Piedras Negras, Guatemala. Her birth is prominently recorded on the back of two monuments, Stela 1 and Stela 3 (both from the terrace of Structure J-4), as well as on the first of a set of four engraved shells recovered from Burial 5 of Structure J-5 (Stuart 1985). Lady Katun was born on 9.12.2.0.16 5 Cib 14 Yaxkin. On Stela 3 (Figure 7), the reference to her birth (at A1-A10) is immediately followed by the distance number, 12.10.0 (at C1-D1), leading to the calendar round of her marriage to Ruler 3 (now known as K'inich Yo'nal Ahk II), 1 Cib 14 Kankin (9.12.14.10.16) (at C2b-C4). In this case, the distance number has two functions: (1) to link the date of her birth to the date of her marriage, and (2) to indicate her age at the time of her marriage as being between twelve and thirteen years old.

The text on the back of Stela 1 (Figure 8) also begins with Lady Katun's birthday (at A1-H1), but the distance number that follows it (at H2-I2) refers to a smaller interval: 12.9.15 versus 12.10.0. This leads to a different event, her betrothal to Ruler 3 on 9 Chuen 9 Kankin (9.12.14.10.11) (at J1-K2). A second distance number of only five days (at J3) (not present on Stela 3) leads from her betrothal to her marriage on 1 Cib 14 Kankin (9.12.14.10.16) (at K3-K4 in Figure 8), the same date that is recorded on Stela 3.

The same three events—the birth, betrothal, and marriage of Lady Katun—are mentioned on a sequence of three incised shells discovered in Burial 5 of Structure J-5 (Figure 9), perhaps the tomb of a male ruler of Piedras Negras (see Stuart 1985). This inscription begins with the calendar round of Lady Katun's birth, 5 Cib 14 Yaxkin (at A1-A2). It continues with the distance number 12.9.15 (at C2-D1) which links it to the date of her betrothal on 9 Chuen 9 Kankin (at E2-D3). By analogy with Stela 1, we would expect the next distance number to be five days and the date following it to be 1 Cib 14 Kankin, but neither expectation is realized. Instead, the next distance number is *six* days (at H1) and the calendar round reached by the addition of six days to 9 Chuen 9 Kankin is *2 Caban 15* Kankin (at I1-H2), *one day later* than the marriage date inscribed on Stela 3 and Stela 1.

The one-day discrepancy in these dates suggests that the wedding took place over a two-day period. Lady Katun's marriage is also attributed to 2 Caban 15 Kankin on the front of Stela 8, suggesting that the choice of that date on the shells was no accident. The epigraphic record contains two references to 1 Cib 14 Kankin (on Stelae 1 and 3) and two references to 2 Caban 15 Kankin (on the Burial 5 shells and Stela 8) as the dates of the wedding.

We have considered the records of Lady Katun's birth, betrothal, and marriage in some detail in order to make the point that the length of intervals between events apparently had no symbolic significance. The interval between Lady Katun's birth and marriage on Stela 3 was easily split into two smaller intervals to accommodate her betrothal on Stela 1, and the distance between her betrothal and her marriage could be either five or six days. Neither five nor six seems to have been a sacred number. The length of intervals was easily adjusted to fit the historical circumstances.

The inscriptions on Stelae 1, 3, and 8 have a repeating calendrical structure, beginning with an initial series date and a calendar round permutation, followed by distance numbers leading to the next calendar round permutation in the chronological sequence, followed by another distance number, another calendar round permutation, and so on until the completion of a *katun* or quarter-*katun* (or *hotun*) at the end of the text:

$$\mathrm{IS} - \mathrm{CR}_1 - \mathrm{Event}_1 - \mathrm{DN}_1 - \mathrm{CR}_2 - \mathrm{Event}_2 - \mathrm{DN}_2 - \mathrm{CR}_3 - \mathrm{Event}_3 \ldots \mathrm{DN}_{n-1} - \mathrm{CR}_n - \mathrm{PE}$$

In this structure, every calendar round permutation is linked to the next calendar round permutation by a distance number representing the interval between them. This is the same structure that one finds in the codices, except that there the dates flanking the distance numbers are expressed in terms of the *tzolkin* alone, without mentioning the *haab* portion of the calendar round.

Not all monuments at Piedras Negras have such a consistent structure. On Stela 36, for example, there are three dates, but only one distance number (Figure 10). The order of elements is as follows:

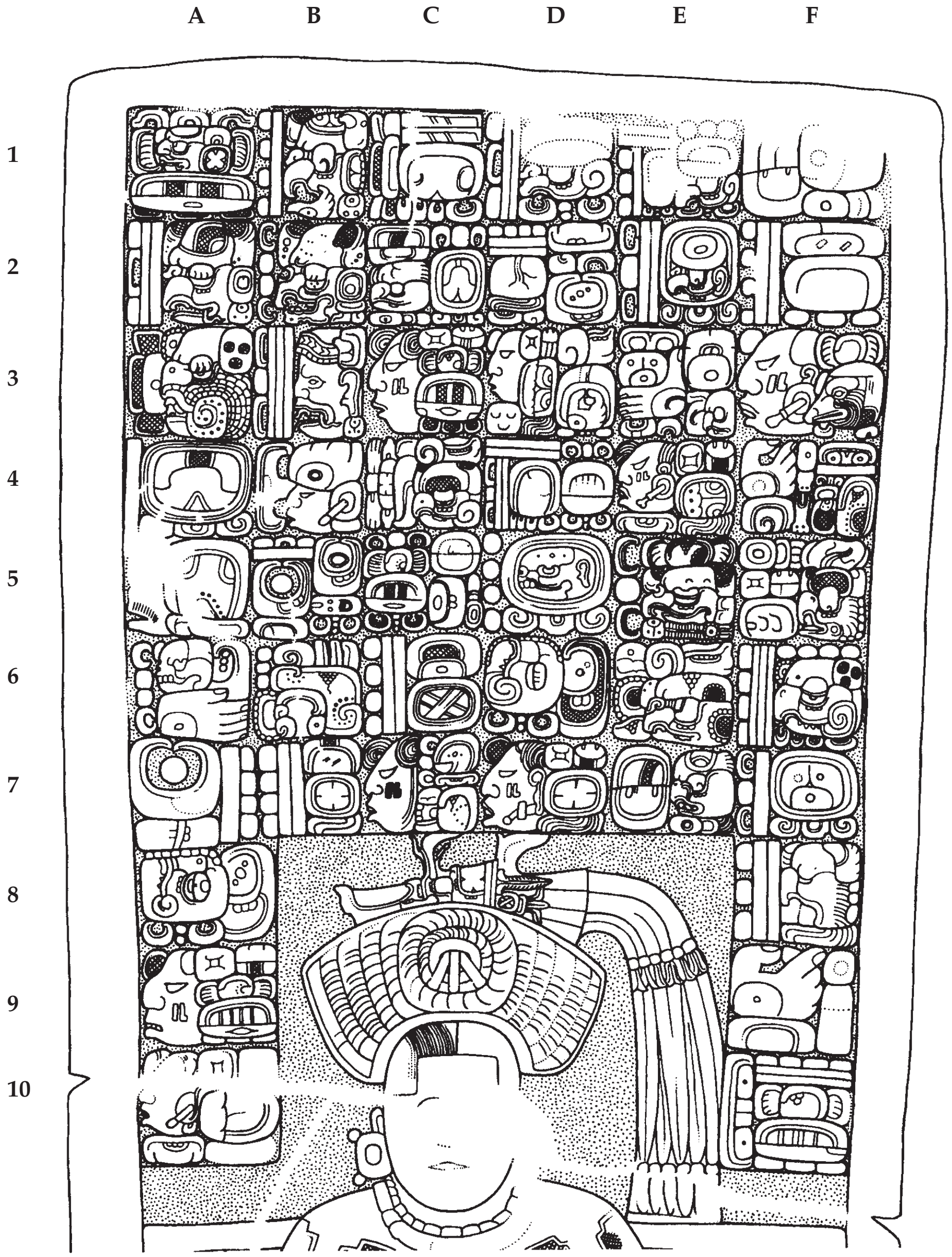

Figure 7. The text on the back of Stela 3, Piedras Negras. Drawing by David Stuart (after Stuart and Graham 2003:26).

$IS – CR_1 – Event_1 - DN_1 – CR_2 – Event_2 – CR_3 – PE$

The initial series date and its calendar round permutation are 9.10.6.5.9 8 Muluc 2 Zip (at A1-B4 and A8). The distance number is 2.1.13.19 (at C3-D3). It is followed by the calendar round permutation, 6 Imix 19 Zodz (at C4-D4) that refers to the birth of Ruler 2 on 9.9.13.4.1, a date that preceded his accession by thirteen *tuns*, one *uinal*, and eight *kins*, an interval that is not mentioned on Stela 36. The stated distance number links the date of Ruler 2's birth to the calendar round, 4 Ahau 13 Mol (at D7-C8 in Figure 10), which corresponds to the *hotun* ending on 9.11.15.0.0. In other words, the distance number *precedes* both of the dates that it links, rather than lying between them. This is quite different from the temporal structure of Stelae 1, 3, and 8, where all dates are linked by distance numbers, and the distance numbers lie between the dates that they link. Another difference is that the second date precedes the initial series date in

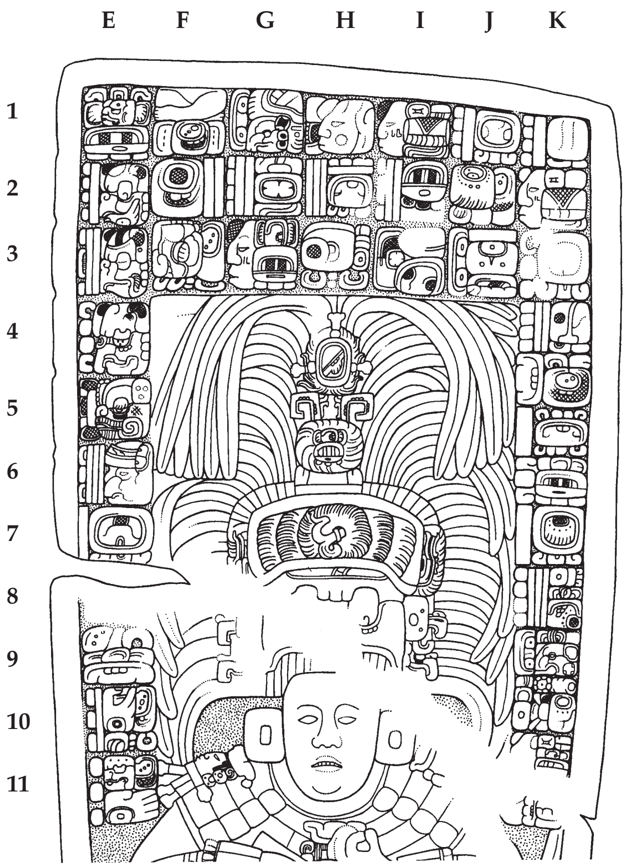

Figure 8. The text on the back of Stela 1, Piedras Negras. Drawing by David Stuart (after Stuart and Graham 2003:18).

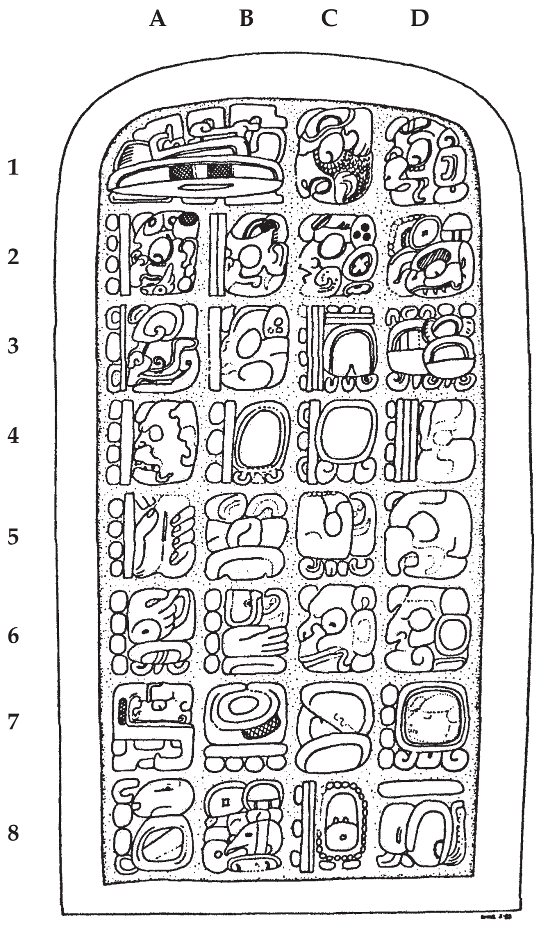

Figure 10. The text on Stela 36, Piedras Negras. Drawing by William Ringle.

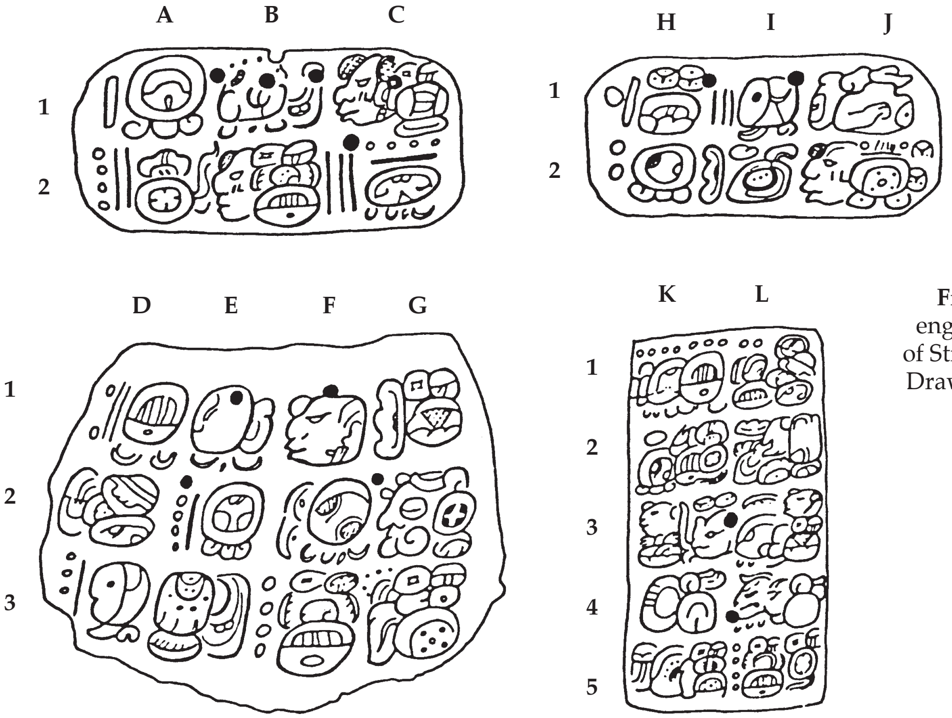

Figure 9. The text on four engraved shells from Burial 5 of Structure J-5, Piedras Negras. Drawing by Linda Schele (after Stuart 1985:Figure 1).

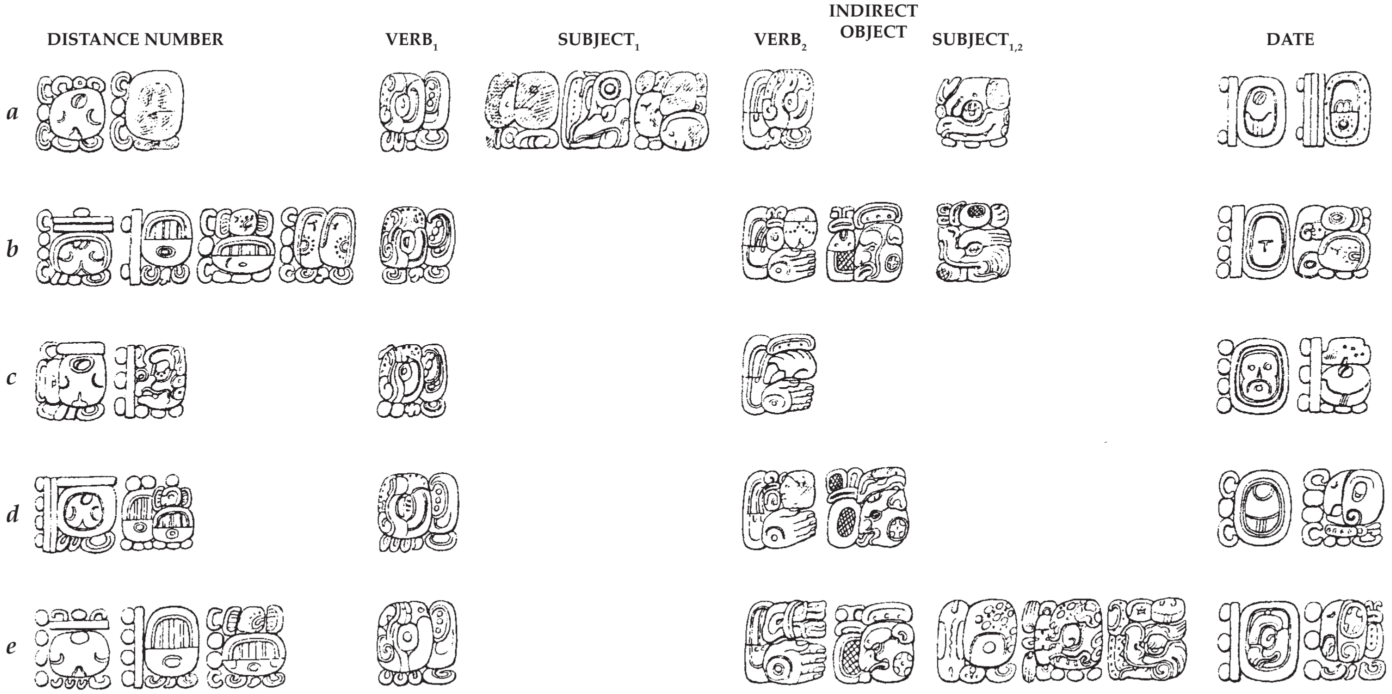

Figure 11. Context of distance numbers on the Cross Tablets at Palenque: a) Pal. Cross, U6-T11; b) Pal. Cross, E5-F9; c) Pal. Cross, D1-C4; d) Pal. Cross, P6-P9; e) Pal. Fol, M17-O5. After V. Bricker (1986:174, fig. 207).

time, instead of following it. Such "flashbacks" are rare in monumental inscriptions and do not occur at all in codical texts, but they are common in Maya oral narratives today.

Yaxchilan has relatively few distance numbers because, on many monuments, the hieroglyphic texts mention a single event. The texts that refer to multiple events and the intervals that separate them have the same calendrical structure as Stelae 1, 3, and 8 at Piedras Negras, with the distance numbers lying *between* the dates linked by them, and this is the dominant pattern in monumental texts throughout the Maya area. At Palenque, however, a variant of the pattern we have documented for Stela 36 at Piedras Negras, where the distance number *precedes* the two dates and events linked by them, is common on the large wall panels in the Temples of the Cross and Foliated Cross, except that only the second of the two events is accompanied by a calendar round permutation, which *follows* the reference to the second event, instead of immediately preceding it (Figure 11).

$$\text{DN} - \text{Event}_1 - \text{Event}_2 - \text{CR}_2$$

These examples suggest that scribal traditions varied from site to site (and probably also from epoch to epoch within a site), and it is not possible to identify a structure for the placement of distance numbers relative to the dates and events to which they refer that would accurately characterize the texts in the entire region. What we have established is that there is more variation in the relationship between dates and distance numbers on the monuments than there is in the codices. The only constant seems to be that the dates that were connected by the distance numbers were of greater significance than the intervals represented by the distance numbers, which is consistent with the historical nature of the texts where they were found.

We turn next to the question of whether some DNs on monuments might have been contrived for reasons not related to historical events. This question was addressed only briefly by Lounsbury (1978:807). Lounsbury notes that the *tzolkin* entry in the initial date of Palenque's Tablet of the Cross, 12.19.13.4.0 8 Ahau 18 Tzec, distant by 6.14.0 prior to the end of the previous 13.0.0.0.0 4 Ahau 8 Cumku, is also found in the recorded date, on several other monuments, of the birth of K'inich Janab Pakal I on 9.8.9.13.0 8 Ahau 13 Pop. Now the interval from a day 6.14.0 before 13.0.0.0.0 4 Ahau 8 Cumku is 9.8.16.9.0, or 1,359,540 days. This is decomposable into prime factors $2^2 x 3^2 x 5 x 7 x 13 x 83$, and is a whole multiple of a number of well-known calendrical cycles. Lounsbury believed it to be a contrived number. Additionally the old era 12.19.13.4.0 date is declared the birth date of an ancestral deity to K'inich Janab Pakal I. It bears a likeness-in-kind to the king's 9.8.9.13.0 birth date. Since one's destiny is determined by the birth date the contrivance of the synchronic 8 Ahau days suggests that the initial date of the temple "provides a calendrical and numerological charter attesting to the legitimacy of the position of the ruler and of the dynasty that he founded" (Lounsbury 1978:807).

We propose to test the hypothesis that at least some monumental DNs might have been contrived. Our data base consists of inscriptions from three sites for which relatively complete and abundant chronological data bases are extant: Palenque, Yaxchilan, and Piedras Negras. For each of these we looked at DNs between rituals and DNs reckoned from katun-ending dates.

Important events that are not controllable include births and deaths (though it is conceivable that dates applied to them may have been contrived). Those dates that are controllable might include accessions, x-tun anniversaries of events, betrothals, captures, etc. We listed DNs separating rituals and DNs reckoned from katun-entry dates, paying special attention to DNs less than 360 days as well as larger DNs, excluding even multiples of *tuns* and *katuns* as well as period endings and birth/death anniversaries. Our basic goal was to learn how one might have adjusted DNs dictated by historical circumstances to accommodate numerological patterns.

We tested the Piedras Negras and Yaxchilan DNs for commensuration with periodic astronomical and non-astronomical cycles by dividing each of them by significant Maya calendrical cycles: 365 (the vague year), 13, 20, 29.53059 (the lunar synodic period), 177 (the six lunar synodic month period), 365.2422 (the tropical year), 584 (the Venus cycle), 780 (the Mars cycle), 117 (the approximate Mercury synodic period, also 9 x 13), and 18980 (the Calendar Round). A single number, 13429, in a biographical text of Yaxchilan ruler Shield Jaguar I (now known as Itzamnaaj Bahlam III), connecting two death events, turned out to be commensurate with the Venus cycle, thus:

Yaxchilan Lintel 27, E1-F1: $13429 = 23 \times 584^{d} - 3^{d} = 23 \times 583.92^{d} - 1^{d}$

Because no other dates in the sample of 55 yielded a positive result, this result may be coincidental.

Palenque offers a substantial record of monumental inscriptions that can be used to test the hypothesis of contrivance, though, unlike the Piedras Negras inscriptions, many of the DNs are disconnected from chronological dates. While it would be a monumental task, fraught with uncertainties, to undertake an analysis of the precise role of intervallic sequences in the expression of dynastic history at all Maya sites, as we have attempted for the modest, chronologically well organized data bases from Piedras Negras and Yaxchilan, the data from Palenque, a much larger corpus, does offer some possibility for exploring the nature of monumental DNs.

To begin with it is interesting to note (cf. Table 4) that nearly half the DNs are less than 1000 days (about 2.7 years) and that the percentages drop off significantly after one Calendar Round. Palenque seems to exhibit a penchant for ultra-long DNs, which may imply a more significant effort on the part of the dynasts to embed their roots in deep or "mythic" time. We isolated 120 of 138 DNs in the Macri data base. Of these, 27 are longer than two *katuns*, which begins to approach the length of a lifetime of a typical ruler (Proskouriakoff 1960:461); ten DNs exceed five *katuns* (about a century). The longest is 1.25 million years (TIW F9-E12), and the second longest, which follows it at G4-H5, is 4172 years. The longest number, 7.18.2.9.2.12.1, may have been contrived to be commensurate with the Palenque lunar count of 6.11.12 = 2392 days = 81 lunar synodic months - 0.222 days. Thus, treating bundles of 81 moons canonically, one could fit 190,382 of them into 7.18.2.9.2.12.1 with .0071 of a bundle (17 days) left over.

DN Duration	% of DNs (YAX, PN)	% of DNs (PAL)
0-1000	48	48
1000-10,000	32	22
10,000-20,000 (50 years = 18250d) (1 CR = 18980)	13	13
20,000-40,000 (100 years = 36520d)	3	7
40,000-400,000 (1000 yrs = 365200d)	5	7
>400,000	0	4

Table 4. Distribution in duration of Yaxchilan, Piedras Negras, and Palenque Distance Numbers.

Location	Earlier Event	Later Event	DN	DAYS
B13	Mythic Event (819 dc)	Birth Muwan Mat	20	20
P15	PE	Birth 'Casper'	6.3	123
U6-7	Birth Ahkal Mo' Nahb II	Birth Kan Bahlam I	1.1.1	381
K7-8	Birth K'inich Janab Pakal I	Fall of (?)	1.8.17	537
D5-C6	PE	GI Descent (mythic)	1.9.2	542
O2-3	-----	Accession of (?)	6.11.6	2386
D1-C2	Birth HSNB (mythic)	PE	8.5.0	2980
P12-Q12	Birth 'Casper'	PE	13.3.9	4749
P6-Q6	Birth K'uk' Bahlam I	Acc. K'uk' Bahlam I	1.2.5.14	8034
F15-16	Birth 'Uk'ix Chan'	Acc. 'Uk'ix Chan'	1.6.7.13	9513
R3-4	Birth Butz'aj Sak Chik	Acc. Butz'aj Sak Chik	1.8.1.18	10118
R8-9	Acc. Butz'aj Sak Chik	Birth Ahkal Mo' Nahb I	1.16.7.17	13117
S13-14	Birth K'an Joy Chitam I	Acc. K'an Joy Chitam I	1.19.6.16	14176
T1-2	Birth Ahkal Mo' Nahb II	Acc. Ahkal Mo' Nahb II	2.2.4.17	15217
U11-12	Birth Kan Bahlam I	Acc. Kan Bahlam I	2.8.4.7	17367
D13-C15	Sky Hearth Event (myth)	GI arrives (myth)	1.18.3.12.0	274920
E5-F6	----	Birth Muwan Mat (myth)	2.1.7.11.2	297942
E10-F11	Acc. of Sak (mythic)	Birth 'Uk'ix Chan' (myth)	3.6.10.12.2	479042

Table 5. Distance Numbers in the text of the Tablet of the Cross, Palenque. (PE = period ending.)

The relatively complete text from the Tablet of the Cross (hereinafter TC) (Table 5) offers a closer look at the general nature of Palenque distance numbers. The TC text breaks down into two Long Count segments:

a) 12.19.0.0.0 (of the previous epoch) to 5.7.0.0.0 (the "mythic time" framework), which consists of seven DNs, of which four are extremely large.

b) 8.18.0.0.0 to 9.12.0.0.0 is a "real time" set, consisting of eleven DNs ranging in length from a little over one year to 47 years, with an additional 123-year interval (rounded off); that is, almost all the TC DNs lie within the range of a human lifetime, as one would anticipate in a historical document.

Applying the aforementioned test we found, once again, that few of the TC DNs could be broken down into whole multiples of cycles of known significance. This even includes the DN on the Museo Amparo Censer Stand (D9-D10) 5.3.6 = 1866[d], which is associated with an inscription that purports to link a historical event to the "count of the Venus/star year."

Given the sheer number of DNs we have considered it is difficult to reach any conclusion other than that the DNs on the monuments, except for the possibility of a rare exception or two, are *not* contrived, or at least if they are, the means of contrivance are not known to us. The extra-historical numbers, unless totally made up, may have been fabricated to arrive at anniversaries of dates of historical significance of which we are not aware. Four exceptions are worth noting:

K'an Tok Tablet, pJ12: 17.15 = 355^d – 12 x $29^d.53059$ – $0^d.6$; (lunar)

Palace Tablet, M6-N6: 18.6.15 = 6615^d = 224 x $29^d.53059$ + 0.1 days (this is one month in excess of the saros eclipse cycle)

Temple 18 stucco glyph #499: 8.17 = 177^d = 6 x 29.53059 + 0.2 days (one lunar semester)

Tablet of the Cross Incensario 2, A1-A2: 2.16.14.9 = 20449^d = 35 x 584^d + 9^d (one Venus synodic cycle)

The small DNs, because they are closer in magnitude to the intervals one finds in the codices, are worth analyzing separately. Because there is a break in the distribution of monumental DNs between 425 and 500 days, and because the frequency of occurrence of DN values thins out as they increase in magnitude (35% of the sample are less than 425 days while only 13% range between 425 days and 1000 days), we decided to examine for contrivance all the numbers below 425 in the sample. This includes 33 DNs in the Palenque sample (15 from the Temple of the Inscriptions), 11 from Piedras Negras, and three from Yaxchilan. Among the Palenque numbers are 177 (T18, S499) and 355 (K'an Tok Tablet, pJ12), one and two lunar semesters respectively. Interestingly the lowest DN is 28 (Tablet of the Inscriptions, S4), which is one day shy of a lunar synodic month; so the moon cycle may have been a significant factor. Also represented are 365 (Palace Tablet, B18-B19) and 260 (Temple 17, Tablet I1). The number 273, which is 3x91 = 13x3x7, appears twice (Palace North Gallery jamb panel fragment #54 and Temple 18 stucco glyph #412). Whole number division of the Palenque DNs by 13 and 30 does not rise above the level of what one would anticipate due to chance in the sample. Odd and even DNs are equally represented. There is nothing of perceived significance to report on the relatively small samples from Piedras Negras (11) and Yaxchilan (3), which are incomplete. Additionally, we found a scattering of multiples of 260 and 365 days.

To summarize, while there may be some monumental DNs that were contrived to conform to calendrical/astronomical cycles, none of them reflect the sort of patterned contrivance exhibited by codical intervals. Thus, we reach the conclusion that at least on a statistical basis, the intervals that appear in the codices and those that occur in the monumental inscriptions (so-called distance numbers) serve entirely different purposes.

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