THE NATURE OF THE MAYA CHRONOLOGICAL COUNT

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Most investigators of Maya chronology consider that the Maya measured time intervals by a modified vigesimal count of days or, alternatively, by a tun count in which the uinal and the kin were fractions of the tun. The claim is made that neither of these interpretations is satisfactory and that the Maya perceived their time count to be a composite count comprised of three distinct counts whose respective units are the tun, the uinal and the kin. Support for this contention is found in the early post-Conquest writings as well as in the representations of time counts in the inscriptions and codices. Adoption of this interpretation leads to a clearer understanding of the Maya use of positional notation and also serves to explain some peculiar epigraphic features present in several chronological counts.

THE MOST COMMONLY USED TIME PERIODS in Maya chronology are the *kin* (= 1 day), the *uinal* (= 20 days), the *tun* (= 18 uinals), the *katun* (= 20 tuns), and the *baktun* (= 400 tuns). Longer time periods equivalent to 8,000 tuns, 160,000 tuns, and 3,200,000 tuns also occur but much less frequently. A given time interval can be decomposed into a sum of these time periods in such a way that the number of uinals is less than 18 and the number of kins, tuns, katuns, etc., are each less than 20. Maya inscriptions often indicate the time interval between two calendar dates by a record of the count of the various time periods in a decomposition of this type. Such chronological counts will be referred to here as standard time counts. Standard time counts include Initial Series, briefly IS, which measure the distance of a given date from a fixed base date. The system of chronologic reckoning from this fixed base date is known as the Long Count. Standard time counts linking two calendar dates, neither of which is the base date of the Long Count, are referred to as Secondary Series, briefly SS.

In most Maya inscriptions, standard time counts are represented by a sequence of glyphs bearing numerical prefixes. The glyphs, called period glyphs, correspond to the Maya time periods defined above and the numerical prefixes indicate the count of the respective time periods in the decomposition of the given count. In the Maya codices, standard time counts are usually represented by a positional notation. This positional notation comprises a vertical arrangement of numbers in which the lowest position is used to represent the number of kins and the successively higher positions are used to represent the number of each of the successively larger periods constituting the count.

CONCEPTIONS OF THE STANDARD TIME COUNT

The Long Count has been described by Sylvanus G. Morley (1920:48) in the following words:

> The basic unit of the Maya Calendar then was the day, and Maya dates were recorded by stating how many days, expressed as so many cycles of 144,000 days each, so many katuns of 7,200 days each, so many tuns of 360 days each, so many uinals of 20 days each, and so many kins (odd number of days under 20) had elapsed since the starting-point of their chronology to reach the date recorded.
>
> This method of dating is identical with the use of the Julian day by modern astronomers and chronologists, the corresponding Julian day of any date giving the total number of days which have elapsed from the starting-point of the Julian Period, 4713 B.C., to the given date.

In his later writings, Morley maintained these notions as to the nature of the Maya chronological count (Morley 1956:243).

Herbert J. Spinden (1924:22-23) has interpreted the positional notation used for standard time counts as a place-value system in which the first five place-values, from bottom to top, are 1, 20, 360, 7,200, and 144,000. This sequence of place-values can be extended, if required, by vigesimal multiplication. Spinden has called this place-value system the modified vigesimal system of Maya chronology.

Morley's interpretation of the standard time count as a count of days implies that the positional notation used for these counts is a modified vigesimal place-value system. Conversely, Spinden's interpretation of the positional notation implies that it represents a count of days. Thus, the conceptions of Morley and Spinden are equivalent.

A different conception of the standard time count was put forth by John E. Teeple (1931:34-35), who credited William E. Gates with first bringing it to his attention. Teeple wrote:

> In using the year chronologically we add the months and days as separate items. . . . we have three separate units, the year, the month and the day, none of which has a true decimal relation to the other two, but it is essentially a year count, and a month and day are used only for fractions of a year. In the same way the Maya used their main unit, the tun, and expressed portions of a tun in two separate units, the uinal and the kin.

Teeple's assertion that the year, the month, and the day are separate units in our Gregorian count is certainly correct. However, his claim that this is essentially a year count is misleading. The Gregorian count is a composite count of years, months, and days. While it is true that the month and day counts are used for fractions of a year, they are not perceived as fractions. Rather, they are seen as counts of distinct units. Now, Teeple's assertion that the tun, the uinal, and the kin are separate units implies that the Maya count is a composite count of tuns, uinals, and kins. But, this is a conclusion he did not reach. Instead, Teeple considered the standard time count to be a tun count as is made clear by his later statement: "I feel sure we have to do here with a tun count, not a kin count." Teeple went on to say that "the Maya system of counting time as well as other units is purely vigesimal."

J. Eric S. Thompson (1971:141) considered the standard time count to be a tun count, in which the uinals and the kins are fractions of the tun. For him, the uinal and the kin were not units but merely "fractions of the lowest unit" which was the tun. In this sense, Thompson retreated from Teeple's conception of a time count using three separate units and, consequently, he was further removed from the notion of a composite count.

Linton Satterthwaite (1947:9) accepted Teeple's contention that the tun is a special unit. However, with respect to Teeple's purely vigesimal time count, he rightly noted that: "From the third place up this is undoubtedly true. But the first and second places cannot be ignored." Satterthwaite expressed his interpretation of the standard time count as follows: "It would be closer to the fact, it seems to me, to hold to the old view that the Initial Series numbers give a modified vigesimal count of days, or else—and better—to say that we have a tun and day count." In these words, Satterthwaite had formed the concept which had narrowly eluded Teeple; namely, that the chronological count is a composite count. It was a point he did not pursue, for in describing the standard time count at a later date, he wrote:

> But the tun itself is formed of only 18 uinals. It appears to be a "calculator's year," of which the kins and uinals are divisions. However, in adding or subtracting numbers formed on this plan all distance numbers may be regarded as giving a modified vigesimal count of single days, analogous to our chronologist's decimally expressed Julian Day Count" [Satterthwaite 1965:613].

It should be pointed out that if the uinal and the kin are fractions of the tun, then one still has a modified vigesimal system. The only difference with Morley's system is that a hypothetical "modified vigesimal point" would be placed after the tun rather than after the kin. Here one should not confuse the idea that the uinal and the kin are fractions of the tun with the idea that they are divisions of the tun. The Maya, of course, realized the latter but it is very doubtful that they realized the former. To do so, the Maya would have to visualize the uinal as 1/18 of a tun and the kin as 1/360 of a tun. Since there is very little evidence of fractional conceptions among the Maya such an expectation is unrealistic.

The notion that the standard time count is a composite count, comprised of three separate counts, whose units are the tun, the uinal, and the kin, should be examined. With this interpretation, an IS of 9.10.3.12.15, for example, would be perceived as 9.10.3 tuns, 12 uinals, and 15 kins, that is, as a vigesimal count of tuns followed by separate counts of uinals and kins. This is one of the ways in which Teeple transcribed such an IS and illustrates that the composite count is a logical extension of his remarks.

In making such a chronological count, the Maya would count the kins, reducing the kin count, when appropriate, by using the rule that 20 kins = 1 uinal. This reduction to a second unit would be accomplished without any real effort, since linguistically the Maya grouped their numbers vigesimally. They would continue the counts of uinals and kins, reducing the uinal count, when appropriate, by using the rule that 18 uinals = 1 tun, a reduction which would not be automatic. This third unit would be allowed to accumulate in a strictly vigesimal manner. The resulting count would then consist of a vigesimal tun count plus a reduced count of uinals (less than 18) and a reduced count of kins (less than 20) and hence would be a standard time count. It may be noted here that the addition of two composite counts, using reduction of units, is arithmetically equivalent to the addition of two modified vigesimal counts, using the modified vigesimal rule of addition. In fact, the procedures are mechanistically the same even though the concepts are different.

THE HISTORICAL EVIDENCE

One can find support in the early post-Conquest sources for the hypothesis of a composite chronological count consisting of three separate counts analogous to the year, month, and day counts of the Europeans. Bishop Diego de Landa (1941:27) states that among the sciences which were taught by the high priest and his confreres were "the computation of the years, months and days." This distinction Landa makes among the three counts is reinforced by other writers. In the *Relaciones de Yucatan* (Landa 1941:28, footnote 154) one reads that Tutul Xiu "taught the natives the letters and the reckoning of the months and years which the lords of Mani were using." Again, Avendano (Landa 1941:28, footnote 156) writes: "I wished to speak to them of the old manner of reckoning which they use, both of days, months and years and of the ages." The latter has long been recognized as a separate count under the name of the Short Count. The former is a composite count of days, months, and years.

Information on the nature of Maya counts is presented by Landa (1941:98), who remarks that the Maya counted

> by fives up to twenty, and by twenties up to one hundred and by hundreds up to four hundred, and by four hundreds up to eight thousand; and they used this method of counting very often in the cacao trading. They have other very long counts and they extend them in infinitum, counting the number 8000 twenty times, which makes 160,000, then again this 160,000 by twenty, and so on multiplying by 20, until they reach a number which cannot be counted.

While one must take the last comment with a grain of salt, the basic vigesimal groupings of 20, 400, and 8,000 in the cacao count and the strict vigesimal nature of the "other very long counts" is evident. Now, aside from the trade count the only other very long counts for which we have data are time counts. Thus, it seems likely that these other counts are time counts and, if so, they must be strictly vigesimal. Such a situation can be easily accommodated in the vigesimal tun count contained in the composite chronological count but would be inconsistent with the notion of a modified vigesimal day count. The alternative to this explanation is that the Maya had very long counts about which we do not know and that the important Maya time count was not mentioned by Landa.

Thompson (1971:141) provides evidence from the books of Chilam Balam that "the lapse of time is invariably expressed in tuns or haabs (another name for the period of 360 days used under certain conditions) and is never expressed in days unless the interval is less than a tun in length." As a typical example, he cites a passage from the Mani Chronicle which says "eighty-one *haab* had passed since their departure." Thompson further points out that: "The only name of a period higher than the tun which is beyond question is that of the katun. This is probably an elided form of *kaltun* (20 tuns), and makes no reference to the kin." Thompson's arguments demonstrate that the Maya did perceive of the tun as a unit of time. However, they still allow room for the notion that the uinal and the kin were also perceived as units of time.

Perhaps the most dramatic assertion of the uinal as a unit is found in the book of Chilam Balam of Chumayel (Roys 1967:116-19). Here we read: "This is a song of how the *uinal* came to be created before the creation of the world" and: "The uinal was created, the day, as it was called, was created, heaven and earth were created." Concerning the momentous occasion itself, we read:

> Then they went to consider [what they were], and [the voice] spoke as follows:/"Thirteen entities, seven entities, one." So it spoke when the word came forth, at the time when there was no word. Then the reason was sought by the first ruling day (the first day Ahau) why the meaning of the word to them was not revealed so that they could declare themselves. Then they went to the center of heaven and joined hands.

From the thirteen entities and the seven entities, the Maya emphasize the creation of "one," that is, a new unity, called the uinal. There is no question but that this uinal is a unit. However, as Thompson (1971:97, 122, 143) notes there is some uncertainty as to whether the word uinal is to be applied to the 20-day division of the Sacred Round running from Imix to Ahau (that is, to the uinals of the Long Count), to the 20-day months of the Vague Year of 365 days, or to an arbitrary sequence of 20 days. In determining the sense of the text, in this regard, the reference to the first ruling day Ahau is very significant. It is known that Ahau is the last in the sequence of day names and appears as the last day in any uinal, tun, katun, or baktun of the Long Count. In addition, the day Ahau cannot occupy the first day of a month in the Calendar Round. Yet, Ahau can still be the first ruling day, provided the first day of the Long Count is a day Ahau. This criterion is satisfied; the base date of the Long Count, as recorded by the Maya, is 13.0.0.0.0 4 Ahau 8 Cumku. The association of the first ruling day Ahau with the Long Count places the creation of the uinal in the same context.

It may also be significant that the earliest Long Counts do not record Vague Year dates but only Sacred Round dates. This suggests that the Vague Year and its combination with the Sacred Round to form the Calendar Round may be later accretions to a simpler pre-existing Sacred Round/Long Count calendric structure. In such a case, the creation of the uinal before the creation of the world would imply that it is a uinal of the Long Count.

That the Maya should single out the uinal as such an important unit in their conception of the Long Count may be explained by the composite count hypothesis. To create the composite count, the first step is to create the uinal and the next to create the tun. Thus, the Maya may have thought of the creation of the Long Count as being inherent in the creation of the uinal. From this point of view, the tun, which has been explained as the best approximation of the solar year compatible with the vigesimal system, may have been perceived by the Maya as the best "uinal approximation."

The prominence of the uinal in Maya thought and its formation from thirteen and seven may be reflected in the Chumayel account of the creation of the world. Here we find: "During the creation thirteen infinite series [added] to seven was the count of the creation of the world. Then a new world dawned for them" (Roys 1967:101-02). This same combination of thirteen entities and seven entities may lie behind the interesting pattern followed in the construction of the head variant numerals. Again, the same pair of numbers arises if the Long Count, whose base date is at 13.0.0.0.0, has an inaugural date at the archaeologically realistic position 7.0.0.0.0.

THE EVIDENCE IN THE INSCRIPTIONS

The Initial Series on the monuments are generally represented within a very stable format. This includes an IS Introductory Glyph, briefly ISIG, followed by the five main period glyphs, arranged in descending order, and their numerical prefixes. Thompson (1971:141) has remarked that the symbolic forms of the period glyphs for all periods above the tun have as their principal element or elements, one of the two main signs for the 360-day period and that the kin is a component of none of them. He also presents the fact that the ISIG proclaims a count of tuns, with no suggestion of a count of days. This evidence supports the contention that the tun is a unit, but does not exclude the possibility that the uinal and the kin are also units in the framework of a composite count.

To Thompson's discussion we may add the remark that the symbolic form of the uinal glyph is unlike that of the kin as well as of the higher periods. The pattern of relationships among the symbolic forms of the period glyphs is duplicated when the major head variants are considered. The tun, katun, and baktun glyphs are all represented by bird heads whereas the uinal and kin glyphs are represented by a frog and a sun god head, respectively. As with the symbolic forms, the forms of the two smaller periods are unrelated to each other and to the clearly connected forms of the higher periods. This pattern of relationships is admirably suited to reflect a vigesimal count of tuns and separate counts of uinals and kins as espoused by the composite count hypothesis.

The notion that the ISIG only proclaims a count of tuns can be reconciled to a composite count by limiting its introductory capacity to include only the vigesimal tun count of the IS. Evidence to justify such a limitation will be presented shortly.

The above evidence is of a general nature and applies to most IS. In an examination of some 300 inscriptions, I have found about 20 IS which have epigraphic peculiarities providing supplemental evidence supporting the hypothesis of a composite count. These specific examples will now be considered.

The Altar of Zoomorph O at Quirigua (Fig. 1) has a unique arrangement for its IS. It begins with four large glyph blocks, (1-4 in Fig. 1), recording the ISIG, the baktuns, the katuns, and the tuns, respectively. These four glyph blocks are separated from the remainder of the text by an ornamental frame. The uinals, the kins and the Sacred Round date (5-7 in Fig. 1), are outside the frame in glyph blocks only one-quarter the size of the first four. The distinctive treatment of the vigesimal tun count is not only a matter of size, for the first four glyphs are expressed by rare full-figure variants while the uinal and the kin are expressed by head variants. The singular manner in which the Maya depicted this IS reveals that they perceived the tun count to be separate from the counts of the uinals and the kins.

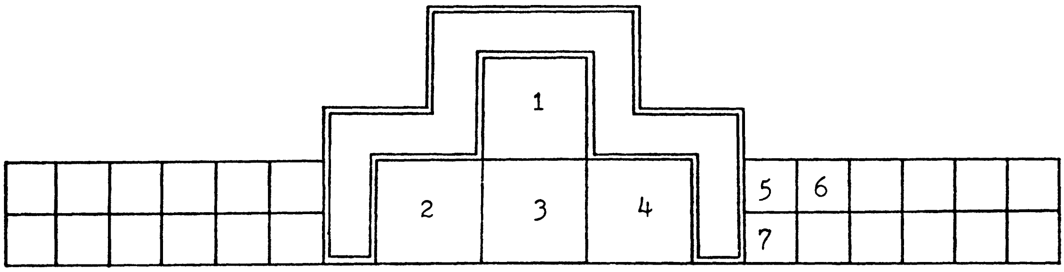

Fig. 1. The arrangement of the Initial Series on the Altar of Zoomorph O at Quirigua.

Zoomorph B at Quirigua (Fig. 2) also has a most unusual arrangement for its IS. In this case, the ISIG and the tun count occupy four neighboring glyph blocks (1-4 in Fig. 2), the uinal count occupies an isolated glyph block (5 in Fig. 2) and the kin count and Sacred Round date occupy a pair of glyph blocks in a third position (6-7 in Fig. 2). The representation suggests that the IS consists of three separate counts corresponding to the three separate positions of the tun, uinal, and kin counts.

These two examples from Quirigua provide evidence to justify that the ISIG's proclamation of a count of tuns is technically limited to the vigesimal tun count. In the first example this is seen in the association of the ISIG with the tun count within an ornamental frame excluding the uinal and kin counts. Moreover, these first four glyphs are given a homogeneous treatment unlike that granted to the uinal and kin glyphs. In the second example there is a similar association of the ISIG with the tun count, the separation from the uinal and kin counts being determined by both position and intervening ornamentation.

Satterthwaite (1961:191-92) has described Stela 9 at Xutilha as an incomplete IS which records only the ISIG followed by the baktuns, katuns, and tuns. This inscription gives additional support to the idea of a separate tun count and to the limitation of the introductory capacity of the ISIG to that count.

The IS on Stela 11 at Machaquila (Fig. 3) is exceptional in several ways. Its baktun, katun, and tun components are inscribed in individual glyph blocks while the uinal and kin components

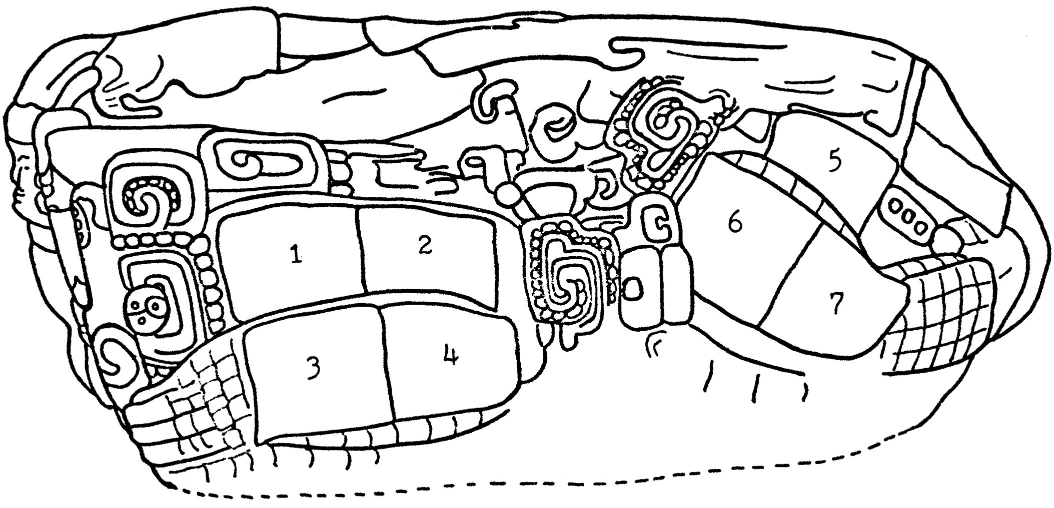

Fig. 2. The arrangement of the Initial Series on Zoomorph B at Quirigua.

occupy little more than one-third of similar sized glyph blocks which they share with other tenants. A further peculiarity is that the uinal and kin counts are separated by the Calendar Round date of the IS. Thus, this inscription not only exhibits a distinction in the treatment of the vigesimal multiples of the tun but also demonstrates the distinct nature of the uinal and kin counts by an actual epigraphic separation. These features all find an explanation in the proposed nature of the standard time count.

It may be noted that Machaquila 11 has a postfix attached to the uinal sign. I do not know of other cases with this particular affix, but Thompson (1971:144) has observed that another postfix, the so-called bundle affix, is sometimes attached to the uinal sign. An example of this can be seen on the cylindrical stela recently on loan to the St. Louis Art Museum (Liman and Durbin 1975). Moreover, and unusually, this last stela also has a postfix attached to the tun glyph of its IS. The IS on Chinkultic 7 also has a postfix attached to its tun sign. In addition, the IS on the west side of Quirigua C has the SS postfix attached to its tun sign. Thompson (1971:178-79) looked on these last two examples as literary curiosities. It may be significant that these affixes are attached to units of the hypothetical composite count. I do not know of any examples of IS in which the katun or baktun glyphs carry a postfix. This feature should not be confused with the presence of affixes, probably numerical classifiers, between the coefficients and period glyphs of some IS (Thompson 1971:56). In these cases, the affixes are linked to the numerical coefficients and not to the period glyphs.

On Machaquila 11 and the Altar of Zoomorph O at Quirigua I have stated that the uinal and kin components of the IS are reduced in size relative to the tun and higher components. I have noted this practice elsewhere, namely, on Quirigua K, Altar de Sacrificios 18 (back), Xultun 3, and Copan P. The IS on Altar de Sacrificios 8 contains a reduced kin component. Once again, these variations from the usual representation are all compatible with the idea of a composite count.

In some inscriptions different variants of zero are used in the same IS. In the instances which I have noted, these distinct variants are used in what are being advocated as distinct counts, an event I consider favorable to the composite count hypothesis. For example, Copan 6 has the head variant zero as kin coefficient but the Maltese cross zero as uinal coefficient. Altar de Sacrificios 9 has rare and unusual zeros attached to the tun and uinal glyphs but the usual Maltese cross zero attached to the kin glyph. Quirigua C has an IS of 13.0.0.0.0 with the uinal zero different from the others and also an IS 9.1.0.0.0 with the kin zero different from the others.

In a somewhat similar vein, the IS from the Temple of the Initial Series at Chichen Itza has as kin coefficient a (non-zero) head variant numeral whereas the coefficients of the other periods are bar and dot numerals.

I also think it favorable to the hypothesis that Copan 15, 24, 12, and 2 all have IS which use full-figure variants for the uinal glyph while all other period glyphs are represented by head

A B

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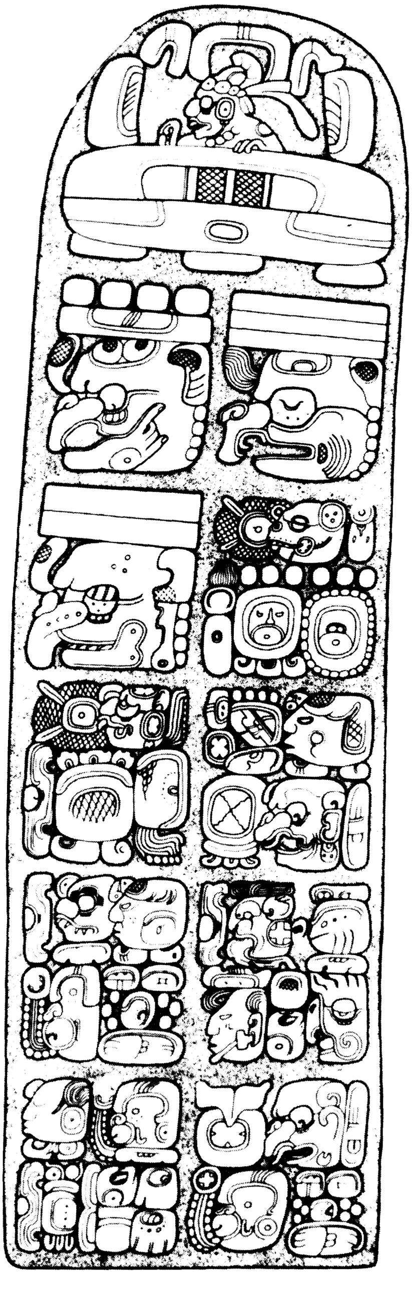

Fig. 3. Stela 11 at Machaquila. A drawing of Ian Graham (1967:84); courtesy of the Middle American Research Institute.

variants. The special treatment accorded the uinal glyph recalls the importance placed on this unit in the book of Chilam Balam of Chumayel.

It should not be thought from the foregoing that all epigraphic peculiarities in the IS of the inscriptions are amenable to the notion of a composite count. In fact, there are oddities which remain as puzzling from this viewpoint as from the viewpoint of a modified vigesimal count. Briefly, the oddities I have noticed occur in the IS on Quirigua I (enlarged baktun glyph), Copan Altar S (enlarged baktun glyph), Copan 6 (reduced tun, uinal, and kin glyphs), Coba 1 (reduced tun and uinal components in one of its IS), Lacanha 7 (lacks a tun sign and coefficient in one of its IS), and Caracol 8 (no tun, uinal, or kin components).

A notable epigraphic feature in most Secondary Series is the suppression of the kin glyph and the attachment of its coefficient to the uinal glyph. By way of contrast, the uinal, the tun and the higher periods are very rarely suppressed. This special treatment accorded the kin count suggests that it was perceived as separate from the rest of the chronological count.

Logically, the suppression of period glyphs and their coefficients when they are zero is quite acceptable. Yet, the Maya entered into this practice with extreme reluctance. Thompson (1971:159) observes that on Yaxchilan 12 a SS of 10.0.6 is recorded in which the tun sign is presented with a coefficient of 10 above and 6 to the left; the uinal sign and its coefficient of 0 have been omitted and the kin coefficient has been attached to the left of the tun sign. In addition, he notes that on Copan J there is a SS of 13.10.0.0 in which the 13 katuns occupy a separate glyph block and the preceding glyph block is shared by 0 kins and 10 tuns, the uinal sign and its coefficient of 0 being suppressed. The idea of a composite count in which the uinal count is distinct from the kin count and the tun count may be sufficient to explain how, in these two cases, the Maya overcame their reluctance to suppress period glyphs with zero coefficients. The only other instance known to Thompson of the suppression of an intermediate period and its zero coefficient is a SS on the Stone of Chiapa. This SS cannot be restored completely but it appears that a tun with a zero coefficient has been suppressed.

Thompson says that in all other cases of suppression of periods and their zero coefficients, those thus treated are the lowest periods in the series. He refers to a SS of 1.10.0.0 on Copan U and Seibal 7 in which the uinal and the kin signs are omitted together with their zero coefficients. Again, the notion of a composite count in which the uinal and kin counts are distinct from the count of tuns would explain these rare features. In fact, it suggests that the Maya may have looked on these examples not so much as a suppression of period glyphs but rather as an omission of a zero count of kins and a zero count of uinals.

The remaining cases of suppression of period glyphs occur on the Tablet of the 96 Glyphs from Palenque which has a SS consisting of merely a katun sign with a coefficient of 1 and on Tila B which has a SS consisting of a baktun sign with a coefficient of 10. The Palenque example is in a passage where it is followed by the date reached and immediately afterward by a declaration of the completion of a first katun. Thus, the passage has the specific purpose of advancing from a given date to its katun anniversary. Similarly, the Tila example links the date at 10.0.0.0.0 to the base date of the Long Count and is surely declaring a baktun anniversary of that date. Hence, neither of these cases is an example of the simple suppression of period glyphs in a SS. Instead, they are both special instances of SS related to katun and baktun anniversaries.

THE EVIDENCE IN THE CODICES

There is some interesting evidence which comes from the Dresden Codex. In the Venus Table, at the bottom of each page, an 8-day division of the Venus period is recorded in positional notation as 0.8. While the representation is technically correct in a place-value system and may have been used for reasons of symmetry, it caused Richard C. E. Long (1948:222) to suggest that the Maya did not really grasp the principle of positional notation. However, if the positional notation reflects a composite count this method of writing 8 kins simply means that the uinal count is zero and the kin count is 8, a perfectly sensible thing to write, especially when one notes that in the other divisions of the Venus period at the bottom of these pages the uinal count is not zero.

The above usage is not unique to the Venus Table for on Dresden 63 a Ring Number of 17 kins is written in positional notation as 0.17.

On Dresden 72b, column G, one finds a SS of 1.1.10 expressed in the form 19.10. Such a representation should not appear if the positional notation reflects a place-value system. But, if it reflects a composite count such a SS is acceptable because it is the singular case in which a time count, not in reduced form, cannot be misinterpreted.

On Dresden 45a there is a standard count of 8.17.11.3.0 in which the kin position is displaced and appears in the previous column. On Dresden 71d, column C, two time counts are crowded together and due to a lack of space their kin positions (with value zero) have been omitted. On Dresden 31a-32a there are other time counts in which the kin positions (with value zero in all cases but one) are also omitted. This last group of examples appears in a section of Dresden showing overcrowding, incomplete delineation of zeros, and absence of day coefficients. Because these counts are all represented by positional notation, the displacement or omission of the kin positions must be regarded as errors. If the time counts are composite the errors can be explained to some extent by noting that a separate count of kins, especially if zero, might become detached or omitted through carelessness. However, if the positional notation reflects a place-value system then we are dealing with the displacment or omission of the lowest places and in this case the errors are more difficult to understand.

Probably the clearest evidence in the Dresden Codex arises from the Maya use of color in writing numbers. Generally, day coefficients are red and month coefficients are black. In many of the almanacs an abbreviated system of linking dates is used wherein day coefficients are red and SS are black. In the Serpent Numbers, time counts are interwritten in pairs, one member of each pair being red and the other black. The practice of interwriting a pair of time counts, one red and the other black, is a space saving device which allowed the Maya to record two time counts in a space which would ordinarily accommodate one. It is frequently used in the Dresden Codex in a variety of contexts. In all these situations two distinct colors, red and black, are used to represent and to distinguish two distinct (calendrical or chronological) counts. It is therefore significant that in the Lunar Tables on Dresden 51-57, the groups of lunations of 8.17, 7.8, and 8.18 are written with red uinals and black kins. This surely indicates that the Maya viewed the uinal and kin counts as distinct.

Similar evidence appears in the Grolier Codex (Coe 1973:152-53). This codex depicts a Venus Table in which subdivisions of the Venus period are recorded with black kins and red uinals. Moreover, the time counts themselves are not written in positional notation but use Maya numerals for the kins and Mexican numerals for the uinals. Thus, the Grolier Codex gives further testimony to the distinct nature of the uinal and kin counts.

CONCLUSIONS

In order to determine the nature of the Maya chronological count we can only weigh the evidence available. An examination of that evidence supports the notion of a composite count consisting of a vigesimal tun count and separate counts of uinals and kins. In a mechanistic sense, the standard time count can be regarded as a modified vigesimal day count but it is inappropriate to do so since this will obscure our understanding of Maya numeration and chronology.

The concept that the standard time count is composed of three distinct counts has an important consequence regarding the Maya use of positional notation. It implies that the Maya used position to distinguish among the distinct counts of the standard count as well as to distinguish among the place-values of the tun count. Hence, Maya positional notation is not a place-value notation but it does include a place-value notation from the third position up.

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