

6

The Long Count

. . . and the days of eternity, who shall number? The height of the heaven, and the breadth of the earth, and the deep, and wisdom, who shall search them out?

—ECCLESIASTICUS, 1:2-3

IN THE MAYA SCHEME the road over which time had marched stretched into a past so distant that the mind of man cannot comprehend its remoteness. Yet the Maya undauntedly retrod that road, seeking its starting point. A fresh view, leading farther backward, unfolded at the end of each stage; the mellowed centuries blended into millennia, and they into tens of thousands of years as those tireless inquirers pushed deeper and still deeper into the eternity of the past. For them time receded in endless vistas of hundreds of thousands of years; the resting places, those annual stages of the bearers of time, mounted to millions and even scores of millions. Theirs was an appraisal of the ages which would have been utterly inconceivable to us, had not our minds been gradually conditioned to that vastness by the writings of astronomers and geologists during the past century.

Time, in the Maya concept, leads into the future, too, with the endlessness of the straight roads of France. When Alfred sat in exile by the rude hearth of tradition, Maya astronomers at Palenque were recording calculations which sweep more than 1,250,000 years into the past, and then forward to dates over four millennia in the future. At about the same time, in another Maya city, there was recorded a computation which in all probability spans over 400,000,000 years. The brain reels at such astronomical figures, yet these calculations were of sufficient frequency and importance to require special glyphs for their transcription, and they were made some 10 centuries before Archbishop Ussher had placed the creation of the world at 4004 B.C.

THE TUN AS BASIS OF MAYA CALCULATIONS

For the manipulation of these calculations into past and future the Maya used the tun (approximate year of 360 days) and its multiples in the vigesimal system, just as we use the year and its multiples in the decimal system. Fractions of a tun were expressed in terms of uinals (20-day periods) and kins (single days).

Students of Maya epigraphy have been divided on the question of what is the Maya chronological unit. Some writers (e.g. Spinden, 1924, pp. 8-9; Morley, 1915, p. 37, and 1937-38, 5:274) consider that the unit of Maya time

was the day; others (Goodman, Gates, Teeple, and Thompson) have expressed the view that the unit was the tun, and that the uinals and kins are merely fractions of the lowest unit, just as our periods are reckoned in multiples of years with the months and days as fractions thereof.

Evidence in support of the second view is, I think, overwhelming:

1. In the various books of Chilam Balam 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. Thus we find constantly statements such as: "during threescore and fifteen katuns (they [the mounds] were constructed)," *oxkal katun . . . catac holhupiz katun* (Chumayel, p. 15); "eighty-one haab had passed since their departure," *cankal haab catac hun[p]pel haab* (Mani Chronicle); "six hundred and seventy-five haab after Chichen Itza was depopulated," *lahu ca bak haab catac holhu cankal haab* (Chumayel, p. 85).

2. The symbolic forms of the 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, either the tun sign or the cauac symbol; the kin (day) glyph is a component of none of them.

3. The main element of the IS introductory glyph is the tun sign, a pair of duplicate affixes being symbols for counting. Thus these two elements mean a count of the tuns, with no suggestion of a count of days.

4. The sentences which precede the chronological tables in various books of Chilam Balam are: *u tzolan katun*, "the order of the katuns," or *u kahlay u xocan katunob*, "the record of the count of the katuns," or *u kahlay katunob*, "the record of the katuns." These sentences appear to correspond in part to the IS introductory glyph. There is no mention of a reckoning by days.

5. 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 *kalun* (20 tuns), and makes no reference to the kin.

6. Were the Maya count to have been based on the single day, it would be logical to expect a straightforward

vigesimal system with a year of 400 days, such as was used by the Cakchiquel.

GLYPHS AND NAMES OF PERIODS

KIN

This word means day or sun, and also time in a general sense, e.g. *u kin oczah*, "sowing time." The symbolic form of its glyph is the main element of the glyph of the sun god (fig. 26,49-57). It also appears frequently as an identifying attribute on the forehead, the earplug, or the headdress of that deity, and it is also the principal element of the month sign Yaxkin (fig. 17,1-13).

The glyph resembles, and in all probability represents, a four-petaled flower. It seems very probable that this is a conventionalized picture of some species of plumeria. The plumeria is a symbol of procreation (Roys, 1933, pp. 104, 121; Thompson, 1939, pp. 138-40), and there are some grounds for believing that it may have been a name for the sun. At any rate the sun and moon are closely connected with the plumeria, presumably because they were the first people to cohabit. The five petals of the plumeria were probably reduced to four because four is the number over which the sun god rules. In Chumayel there is an account of the wooing of the moon by the sun couched in esoteric language. The moon is described as the five-petaled flower; the sun is said to have been set in the center of a flower—"Four-fold [or four-branched] was the plate of the flower, and Ah Kin Xocbiltun [i.e. the sun god] was set in the center." In support of this identification, it should be noted that the Mexican equivalent of Ahau, the day of the sun god, is Xochitl, which both means and represents "flower." Furthermore, in the list of interpretations of Quiche day names recorded by Ximenez, the Quiche equivalent of Ahau is given the meaning of "flower." The value of this as independent evidence, however, is reduced by the strong possibility that such an identification may have resulted from Mexican influences in late times, perhaps even at the start of the colonial period.

This kin element has a postfix a streamerlike arrangement, which it has been suggested is the beard of the sun god and which is sometimes called the tail. The Motul dictionary gives two expressions for the sun's ray: *mex kin*, "the sun's beard," and *u tab kin*, "the cords of the sun." In Chol we find *u halal cin (kin)*, "the arrowshafts of the sun." Since these streamers do not usually issue from the god's chin, it would seem more probable that they represent the sun's cords. The word *kin* with mutations (e.g. highland *kih*) means sun in most Maya languages and dialects save Tzeltal, Tzotzil, and Chicomiceltec, where the word *kaçal* (fiery?) replaces it, and

kin is used as the equivalent of festival. *Hun kaak* (one fire) is a Lacandon name for the sun, although kin is in common use.

In the IS there are no less than three head forms for the kin, and there are others (pp. 167-75) which are used only in distance numbers and which will not be discussed here.

The most easily recognized and perhaps the commonest variant of the head form is that of the sun god himself (figs. 27,58-63,65,66; 29,5,7,9). The characteristic features of the sun god are: a squarish eye with squarish pupil in the top inner corner and with a loop, often with two or three circlets attached, which encloses the eye on the sides and bottom; a prominent Roman nose; the central incisors of the upper jaw filed to the shape of a squat tau; often a fang projecting from the corner of the mouth; and a hollow on the top of the head. In the glyphs the kin tail is usually present beside or below the head.

The second variant of the head is that of an animal (figs. 27,55-57; 29,6). The nose becomes a snout, often with a small scroll on it. The eye is still squarish, but the pupil moves to the center of the eye and becomes a short crescent, the ends of which are sometimes joined across the top by a straight line. A shell pendant hangs from the earplug, and on the cheek there is frequently an irregular crescent, the horns of which point toward the ears (Bowditch, 1910, pl. 14,9,10,21,22). A banded headdress is often shown. On the temple or the side of the face there are visible on most well-preserved examples two circles within an oval, although for lack of space they are frequently reduced to semicircles.

The presence of these two circlets within an oval is of prime importance, since there can be little doubt that they are the symbol for black. In the codices the symbol for black is distinguished from that for white usually by a black circular edging around the two (or more) circlets which constitute the main element of the sign (fig. 20, 1-5). However, in the sculptured texts (and occasionally in the codices; fig. 20,6,7) the black is omitted. In sculpture black is generally shown by hachuring (fig. 20,8,9). When the area involved is quite small and the text no longer retains its full clarity of detail, the crosshatched lines may no longer be visible. This weathering doubtlessly accounts for the absence of the symbol for black in some cases, but in others it is quite plain that the symbol never was present. Beyer (1925 and 1929) has discussed this matter at length and concludes that the surrounding black paint or hachure was often omitted when there was no doubt as to the meaning of the glyph.

The symbol for black is used in two ways: to denote that color, if one may so term it, and to represent the night, the interior of the earth, and death. Thus we find

the symbol for black attached to a glyph of a skull, perhaps that of Multun-Tzek, presumably because the skull has a natural association with the dark underworld (fig. 20,4-6).

I hesitate in making a definite identification of this animal with the black infix which serves as a kin sign. It is most probably either a dog or a jaguar. Note the resemblances on the one hand to heads for Oc and Xul, which are definitely pictures of dogs; on the other hand, to the head in the introductory glyph of Copan P, which is that of the jaguar god (fig. 22,2,3). Both animals may wear the symbol of black, and both animals can wear it because they have much black in their natural coloring (dogs in the Maya codices are almost always painted black and white) and because both are connected with the underworld. Furthermore, both animals are intimately associated with the sun, particularly in connection with his nocturnal journey to the underworld and his passage through its shadowed recesses (pp. 78, 114). I slightly favor the identification of this creature as a dog since we shall later encounter yet another variant which is probably a jaguar (p. 173).

Sometimes a monkey serves as the symbol of the sun (fig. 27,53); a particularly fine example is to be seen in the full-figure variant on Yaxchilan L 48 (fig. 29,10). For a connection between monkey and sun we must turn to Mexico. In Mexico the sun god as patron of the arts of singing, music, and entertainment was Xochipilli ("Flower Prince"), and one of his guises was that of the monkey. Furthermore, the day Ozomatli, "Monkey," is under his rule. In the Maya area the sun god was also patron of poetry and music, and was likewise connected with flowers (the plumeria, symbol of procreation). The monkey also symbolized the arts and crafts as well as licentiousness and the act of procreation, but the sun god was the first person to cohabit. With these various threads forming a definite warp and woof, it is entirely appropriate that the monkey should substitute for the more usual representations of the sun.

Thus kin might be represented by the flower symbol, by the portrait of the sun god himself, by the monkey, or by another animal, probably the dog or the jaguar. These variant forms well illustrate how deeply the hieroglyphs are rooted in mythology.

UINAL

The derivation of the Yucatec name for the period of 20 days is uncertain. As already noted (p. 51) a fairly general term for 20 in many Maya languages and dialects is man (*uinic* and *uinac* respectively in lowland and highland stocks), the assumption being that this derives from the count of fingers and toes. Yucatec and Chol,

however, usually employ the word *kal* for 20 and its multiples, whereas Jacalteca, Chuh, Pokomchi, Uspanteca, Quiche, etc. use both terms, one for 20, the other for some multiple thereof. *Uinic*, the Yucatec word for man, in some cases can have the meaning of 20 in that language, for it is the term used for 20 *kaan* (a cord-length used in measuring milpas), but it should be noted that because of confusion in the various dictionaries, it is uncertain whether *uinic* and *uinac* were used for counts of days or for listing such items as bales of cotton or pods of cacao, or for both categories. We do know, at least, that *uinac* meant 20 days in Cakchiquel and Pokoman. The problem is to decide whether *uinal* derives from *uinic*, "man."

We shall see (p. 167) that a period of 20 days was often expressed by means of the moon glyph. In that connection it may be significant that the Motul dictionary lists the word *uen* with the meaning of a matter of a month or months, with examples given as *hun uen ual*, "my [her] child is one month old," *ho uen in paalil*, "my child is five months old." The word *uen* appears to be connected with the moon, for *uen uinic* is an albino, and albinos are associated with eclipses. Nonetheless, as Gates has pointed out, it is impossible to derive *uinal* directly from *u*, moon. Gates (1931, p. 90) seems to suggest that *uinal* is a contraction of *uinicil* or *uinalic*, "manhood," but the trouble there is that *uinal* is a Yucatec word, whereas *uinalic* is highland. Furthermore, as we have seen, *uinic* survives in Yucatec for a count of 20 cords. That being the case, it is most improbable that it would be changed to *uinal* to denote 20 days. It seems much more probable, therefore, that *uinal* is the Yucatec word for month (of 20 days?) with the termination *al*, which functions very vaguely to show an association, in many cases not apparent (e.g. *eb* and *ebal*, both meaning staircase; *cayom* and *ah cayomal*, both meaning fisherman but perhaps the former, a casual fisher, the latter a professional).

There is evidence that in some parts of the Maya area the 20-day period is named for the moon, for among the Jacalteca it is called *xahau*, "Lady," that is to say, the moon, but that term is applied by the uninitiated to the month of 30 days (La Farge and Byers, 1931, p. 157).

Finally, to terminate this tiresome subject, the fact that man is in no way connected with the glyphs for 20 days, whereas the moon glyph has that function, is fair evidence for accepting a derivation of *uinal* from *uen*, "month," and assuming that the word formerly referred to the period of 20 days, not to the month of 29 or 30 days.

The symbolic form of the *uinal* is too simple to give any good clue as to what it represents (fig. 26,41-48). The

resemblance to the day sign Chuen has been remarked, but this may be fortuitous. The uinal sign not infrequently takes the bundle postfix, like the months Uo and Zip, and the glyphs of certain deities. The meaning of this postfix is uncertain (figs. 26,47,48; 27,46).

The personified form of the uinal is that of a frog, very clearly represented in several full-figure glyphs (figs. 27, 40-52; 29,1-4). There seems little reason to doubt that this is the *uo*, a small black frog with a yellow stripe down its back, which has burrowing habits. The *uo* is the musician of the Chacs, the gods of rain, in Maya legend and folklore (Thompson, 1941, p. 104). The reason why the picture of the *uo* may have been used to designate the period of 20 days has already been set forth (p. 47). The evidence is not beyond question but does suggest an example of rebus writing. The scroll emerging from the corner of the mouth, the serrated teeth, the peculiar form of the snout, the forehead ornament with its circle of beads, the eyelid covering half the eye, and finally the shield with its three circles, are characteristics which together clearly differentiate this head from those of other period glyphs. None is essential, but most are usually present. The three circles on the shield (Maudslay's drawing of the uinal head with four circles, on Copan B, appears to be incorrect) might conceivably represent warts, or might possibly be the symbol for fire, the three hearthstones (Thompson, 1930, pp. 93, 111), although a connection between the *uo* frog and fire is not apparent. However, in all probability these three dots refer to the god of number 3, who is a rain deity (pp. 132, 277), for the frog is closely associated with the rains and their patrons.

TUN

The name for the approximate year of 360 days means in Yucatec "precious stone." It is almost certain that the word was primarily used for jades and various green stones. According to the *Relación* of Campocolche and Chochola, the Maya made offerings in time of hunger of "green stones which they call *tun*." The Yucatec word for stone in general is *tunich*, which becomes *tun* in compounds. In the Manche Chol dictionary of Moran *tun* is given as stone and *yax tun* as blue beads, although *yax* means both green and blue. Precious stone is listed as *sitzil ton* and *ghayalton* in the large Tzotzil dictionary. The first term suggests a meaning of cold stone, one of the properties of jade being its coldness to the touch. *Ton*, *tun*, and *tuun* have the general meaning of stone in Tzeltal, Yocotan, and western Chol respectively. It is therefore apparent that *tun* meant stone in general and precious stone in particular, although in Yucatec it had lost its general meaning except in compounds.

The symbolic form of the *tun* as used in IS almost surely contains the sign for jade, which, as already noted, is either a circle set on a larger disk or the same with the addition of two beads on the perimeter. As such it is the main element of the glyphs for Muluc and Mol (figs. 8, 1-16; 17,14-22), where it signifies not jade as such, but water, the ritualistic name for which was "precious stone, jade." It will be noted that the lower part of the *tun* sign contains the circle set on a larger disk. The upper part of the glyph is rounded, as in the extension of the jade sign, but differs from the latter in the presence of two vertical bars which are usually filled with crosshatching in the sculptured examples (to represent black) and with black paint in the codices (fig. 26,33-40). Beyer (1927) considers the two bars to represent the number 10 and to be a symbol of fire, but I do not regard his arguments as acceptable, since several of the examples he cites are late forms from the codices. These are clearly simplified versions of more complex originals, which have become pairs of straight lines because they could be painted that way with greater rapidity. Furthermore, the number 10 is associated with death, not with fire.

It seems possible that the two vertical bars might represent the element yax. In the forms of Yax and Yaxkin in the codices the principal feature of the prefix comprises two vertical bars painted black (fig. 17,11,12,45,46). In the corresponding elements in representations of Yax and Yaxkin in sculpture the two bars are usually set diagonally in the center of the prefix but two vertical bars or pairs of vertical lines often appear in its upper part (fig. 17,2-4,6,9,38,40). Yax signifies green or blue, and also is associated with the Chicchan deities, the celestial snakes who guard the rain (p. 135). If this identification is correct—and it must be admitted that a plausible case could be made for a quite different interpretation—the whole glyph would read "green precious stone," or "precious water of the celestial Chicchans."

The reasons for believing that this identification is correct are that the cauc glyph, which under certain conditions replaces the regular *tun* glyphs, undoubtedly means rainstorm (p. 87); and the word *haab*, which also signifies a period of 360 days, is almost certainly connected with *ha*, "water." Thus if our identification is correct, both the two glyph forms and the two names signify rain.

The original of the commonest personified form of the *tun* glyph will not be found in any picture book of Central American fauna, but is the product of a vivid imagination. Its most outstanding feature, and the one by which it can be most surely identified, is the bared jawbone which replaces the lower jaw (fig. 27,34,36-39). The beak is generally rather sharp. In nearly all cases

there is a projection in front of the forehead, and a corresponding area at the back of the head. These are usually represented as partly black by the addition of areas of crosshatching; the absence of hachure is probably due to weathering. I think that these two projections can be identified with some assurance as the tufted horns of the Yucatecan screech owl. These tufts are always prominently displayed in representations of owls in the codices, and always have black markings (fig. 20,13,14,19,20,23).

We have already seen that there are excellent reasons for identifying the Yucatecan screech owl with the Moan bird (p. 114). The Moan bird, when it serves as the glyph of the month *Muan* and when it appears in sculpture, lacks a lower jaw. The absence of the lower jaw and its replacement by the bared jawbone have apparently the same symbolic value. Accordingly, the fact that the tun bird has a bared jawbone, whereas the Moan bird has no lower jaw at all in its glyphic form, is not an argument against the identification of both birds as screech owls.

It has been pointed out that the Moan bird is connected with rain, and that the word *muán* itself means shower. The identification of this head form of the tun glyph as the rain bird brings the head variant, too, into agreement with the other variants and the names of the period, all of which, as we have seen, have a pluvial connotation.

There is another personified form of the tun, the head of a long-nosed being, of either ophidian or saurian origin, which lacks a lower jaw, indicating a connection with the earth. Often this creature wears the tun headdress, although in early texts the headdress is of the voluted form much favored in the first half of Cycle 9 (fig. 27, 28,30-33,35). In two full-figure representations of the tun this head, with tun headdress, is attached to the body of a snake (fig. 28,16,17), and the same is true of the example on the Leiden plaque (fig. 27,28). This snake is also the deity of number 13, god of the day *Muluc*, "water," and as such is intimately associated with water (p. 135; fig. 28,15). The absence of the lower jaw and the presence of the tun headdress, which is often decked with vegetation, also worn by the *Mam*, god of the interior of the earth (p. 133) greatly increase the possibility that this is the snake or crocodile monster which supports the earth. In any case, as god of the number 13, this creature represents rain, and so once again the tun is portrayed by the glyph of a being connected with rain.

In three full-figure representations of the tun at Quirigua a creature which one can tentatively identify as a crab is substituted for the Moan bird or the snake (fig. 28,12,13,15). The identification of this as a crustacean rests on the portrayal, on the murals of Bonampak, of an impersonator of a crab god, who is a member of the

group of impersonators of terrestrial gods, including the *Mam*, all of whom are decked with water lilies to emphasize their connection with the earth. At El Baul there was a strong cult of the crab god, from whose body vegetation grows (Thompson, 1948, p. 20). The crab god, therefore, is a god of the earth and of fertility; his aquatic environment is obvious. Here, too, is another aquatic personification of the tun.

The glyphs for the 360-day year therefore stand, respectively, for jade, that is to say, precious water; rain-storm (cauac variant); the Moan bird (rains and showers); god of number 13 and the day *Muluc*; a serpent god of water; and, probably, the crab god, a deity with vegetal and aquatic associations. All have pluvial or aquatic associations, as do *haab* and *tun*, the names for the period. It is interesting to note that *xiuil*, the Mexican name for the year, also meant turquoise and, by extension, rain, both because of its color, which is that of the *Tlalocs*, and because both turquoise and rain were precious things. Furthermore, the trapezoidal ornament usually worn by the *Tlalocs* is the sign for year in Mexican texts, and there are good reasons for identifying the head of *Cocijo*, the Zapotec rain god, as the year symbol in the glyphic writings of that people (Caso, 1928, pp. 45-64). The symbolic form is the kan cross which was an aquatic symbol for both the Maya and the Mexicans (p. 275). Thus the same association of the year with water, "the precious substance," holds good for Maya, Zapotec, and Mexicans.

KATUN (20 TUNS)

It has been rather generally supposed that *katun* is a contraction of *kal*, "twenty," and *tun*. The name is found constantly in the various books of Chilam Balam; an entry in the San Francisco dictionary reads: "It is said that the Indians counted their years in pairs, and when one reached twenty years, there they said *hun p'el katun* [one katun]."

In discussing the possibility that *katun* is derived from *kaltun* (20 tuns), Roys writes:

A good, but not incontrovertible, case can be made out for the contraction. The principal argument is the weakness of the *l* in Yucatec. Sometimes this is lost at the end of a syllable. An example of this is the numerical classifier *p'el*, which has become *p'e*, e.g. *hump'el*, *cap'el* or *hump'e*, *cap'e*. A village elder at Yaxuna chided me for speaking of *Cetelac* instead of *Ceteac*. The first is the Chumayel form; the second the present-day pronunciation, and presumably the spelling, for my brother Lawrence had *Cetelac* typed in a list of sites, and his spelling was pronounced wrong by his informants at Yaxuna, only 2 km. from the site. Thus it is apparently not a case of an *l* which is so lightly pronounced that we do not recognize it, but it has actually been lost in modern times. The only case I recall in which the Motul dictionary im-

plies that an *l* has been lost, occurs with *bal*, *balx*, and *bax*, which are assigned the same meaning. However, those early lexicographers always had in mind the derivations of words, and I suspect they may have sometimes inserted an unpronounced *l* when they believed that it belonged there. An example of a contraction of *lt* to *t* is supplied by *beeltah*, as written in the Motul and San Francisco dictionaries, and *betah*, which we find in the Ticul dictionary. Another example is *cioltzil*, listed in the Motul dictionary with the meaning of a happy or delectable thing; on Chumayel, p. 103, it is twice given as *ciotzil*, and I have seen that same contraction elsewhere. Similarly, the Motul dictionary gives *talzah*, whereas Pio Perez lists that word both as *talzah* and as *tazah*; the latter is the way it is pronounced at the present time.

Another example of the disappearance of *l* before *t* is supplied by *cutal* as in *u cutal Pop*, "the seating of Pop," which derives from the stem *cul* as in the verb *cultah*, "to be seated." All things considered, it is probable that katun is a contraction of *kaltun*.

Terms employed for the period of 20 years have not been preserved in most Maya languages and dialects. According to Friar Pedro Moran, that period was called *may* in Pokoman. *Mai* means tobacco or powdered tobacco, among other things, in some Maya languages. It has the meaning of 20 also in Kekchi, because, it is said, tobacco leaves are tied in bundles of 20.

The symbolic variant of the katun sign consists of the tun sign with a small cauc glyph, flanked by combs, as a prefix. The cauc sign has the same value as the tun glyph; the flanking combs usually denote "count." It has been suggested that the cauc here is to be taken as an example of rebus writing, *ca*, the first syllable representing the *ka* of katun, but Long (1935, p. 27) has called attention to the fact that *c* and *k* are two entirely different sounds in Maya, and it is therefore extremely improbable that the Maya would use a *ca* element to represent the glottalized *ka*. Apart from that, it seems unlikely that the Maya would take one syllable of a word in that way were it not the root of the word. Actually there appears to be no such root. That interpretation must, therefore, be discarded. Similarly, the comb element, to which Landa assigns the sound *ca*, presumably because that is the first syllable of *cai*, "fish," cannot stand for *ka*.

It will be noticed that all symbolic glyphs for multiples of the tun sign are composed of two glyphs for the 360-day period plus additional affixes. In the case of the katun sign the cauc glyph is combined with the tun sign; in all others the cauc glyph is doubled. In a rare variant of the baktun sign two cauc's appear above a tun sign (fig. 26,19,22). There is also a glyph, which may have the value of baktun, composed of three cauc signs arranged

as a pyramid (fig. 33,57-60). It is tempting to assign the added meaning of 20 to the cauc sign; attached to the katun sign it would mean 20 tuns, doubled it would signify 400 tuns, one baktun. The hand, as we shall see, also stands for the baktun (400 tuns) and the hand over the doubled cauc represents the calabtun (400 × 400 tuns), and, with another affix, the kinchiltun (400 × 8000 tuns). It must be admitted, however, that no evidence in support of this possibility has been uncovered in other passages.

The head variant for the katun is a birdlike creature (fig. 27,15-27). In most cases it resembles rather closely the head form for the tun save that the lower jaw does not show the bone; there is, in addition, a hollow area in the top of the head, such as occurs in the heads of several deities, and is most familiar to us in representations of the long-nosed god of the sculptured monuments.

In the full-figure text of Copan D and Quirigua Alt O the creature has a head which with its rapacious jaws suggests a bird of prey, perhaps a hawk, an eagle, or a vulture. Black markings on the wings rule out parrots and macaws (fig. 28,8,10). Sometimes the fore and aft ornaments of the tun sign which seem to represent the horns of the screech owl are present. In other texts there is on the top of the head a peculiar ornament, which looks like a tight-fitting cap, but also resembles closely the Imix sign (cf. fig. 55,1, Gl B2). Identification of this design, either as an attempt to show some feature of the bird's head or as a glyphic element with symbolic value, would doubtlessly solve the identity of this bird.

In a few cases the prefix of the symbolic form of the katun appears over a head which in most cases seems to be the usual katun head, but in one text (Copan 1) it is definitely the tun head with bared jawbone. This last is what one would expect, for if the prefix raises the value of the tun 20 times, one would suppose that the head beneath would correspond to the tun, not to the katun.

In view of the impossibility of identifying the katun bird, any attempt to find the meaning of the glyph is futile. It may be worth noting, however, that the Moan is not the only bird associated with celestial bands and, what is perhaps more probable, that there were four Moan birds, one for each world direction. On the front of Naranjo 32 a personage, now almost entirely obliterated, appears (seated?) above a mass composed of three, perhaps four, planetary bands. One must assume that the scene represents some deity in his celestial abode. The ends of each of three planetary bands in the lower parts terminate in heads which are clearly those of birds with prominent beaks (fig. 20,15). On the top of each head is the same element, vaguely resembling Imix, to

which attention has already been directed. There can be little doubt, I think, that these heads represent the same bird as does the head variant of the katun.

It is well known that birds were associated with world directions. Although these fowl of the air are individually named in Chumayel, it is possible that they were known collectively as the Moan birds, although each had its characteristics. Hence, one type may have been used to illustrate the tun, another the katun, and a third the baktun. Naturally, since they were mythical creatures, primarily birds but with a dash of alligator and a strain of snake in their ancestry, their characteristics were no more constant than were those of the celestial dragons or the terrestrial alligator. They had this in common, however: all were associated with the celestial dragons, the rain-sending Itzamnas, and therefore could symbolize the haab or tun, "the rain," with complete propriety.

BAKTUN (400 TUNS)

The Maya terms for this and all higher periods are not surely known. They have been formed by modern investigators by prefixing the Yucatec terms for 400, 800, 160,000, and 3,200,000 to the tun, on the logical assumption that katun is a contraction of kaltun and that its multiples are formed in the same manner. There is some support for the term baktun since the expression *bakhaab*, "400 haab," occurs in Chumayel. Haab and tun are synonymous, although their use depends on the texts. Previously, the terms cycle, great cycle, and great-great cycle were employed. Pseudo-Maya terms are to be eschewed, but in these cases I have retained them because cycle is an overworked word.

The symbolic variant of the baktun consists of two cauc signs to which is often added, as a postfix, a knotted piece of textile or similar material. A rare and apparently late variant has the double cauc over the normal tun sign. Should the cauc element have the value of 20, as is possible although hardly probable (p. 146), the one would multiply the other to produce the required 400. Against this should be set the established fact that the doubling of an affix makes no difference as to the meaning (p. 41; fig. 26, 15-23).

The head variant is again a bird (figs. 27, 3-14; 28, 1-5). Tozzer and Allen (1910, p. 334) tentatively accept the full-figure variant of this on Copan D as the zopilote, the black vulture. The heads do not differ greatly from those of the katun, except for a hand covering the lower jaw, as in the head for completion (or zero?). I think there is in this symbol, and in the repetition of the main element of the baktun in higher periods, a little evidence that the Maya considered the baktun somewhat in the light of a basic unit, and that the pictun (8000 tuns) was

also regarded as 20 baktuns. This would roughly parallel our own custom of saying either one thousand nine hundred or nineteen hundred. The Maya did the same thing, for in Chumayel occurs the expression 8000 katuns, whereas one might have expected this number to have been expressed as one calabtun, or, perhaps, 400 baktuns.

PICTUN (8000 TUNS)

The symbolic variant of this sign is the baktun element, the doubled cauc, rarely with the postfix (fig. 3, 12), but with an essential prefix, which consists of an oval outlined with dots and containing a double flare (fig. 26, 8-14). This double-flare element is a matter of some confusion, since it closely resembles the conventionalized symbol for maize as worn by a number of terrestrial deities. The maize symbol is usually distinguished by the addition of circles (grains of maize?), but these are not infrequently omitted. In the codices, however, these two designs are more clearly distinguished. A cauc sign with the *te* (1) affix and with the flare (definitely not the maize element) as prefix occurs 13 times in the codices. Twice it appears with the dog who carries flaming torches and who has been generally accepted as a symbol of lightning; twice with God B, on one occasion when he carries a lighted torch, on the other when he lacks the torch. On six occasions the glyph follows that of the sun god, and in three of these the pair stands above the picture of the sun god. Once it is above the goddess who is probably the moon and who has the fire symbol on the load on her back. Once it is associated with the so-called Mars beast. The thirteenth appearance of this glyph is on a page in which picture and context are obliterated (fig. 43, 65-67).

The cauc symbol is without doubt the sign for rain and storm. When, therefore, we find it with the flare prefix above a god of the rain and storms who carries a lighted torch, we can feel fairly certain that the picture represents a lightning storm. The dog was recognized many years ago by Seler as the lightning beast, and Gates (1931b, p. 33) has pointed out that there is linguistic evidence in Pokomchi for associating the dog with lightning or thunderbolts. The reason for linking this cauc glyph with its flame prefix to the sun god is not clear unless one turns to the language. The name for the rain god of the modern Maya who causes the lightning is Ah Lelem-Caan-Chaac, "the Chac who makes brilliant the sky" (Redfield and Villa, 1934, p. 115). *Lelem* means not only lightning but also brilliant light; *lelem caanil* denotes thunderhead, the storms of much cloud but little rain, and the term is used, as well, to describe the brilliant light of the sun, as *lelemac kin*, "the brilliant sun." The cauc sign, as already noted, is derived from a sec-

tion of the body of one of the celestial dragons which form one of the layers of the sky and send the rains to earth. The glyph, therefore, has the general meaning of rain, but it could presumably be used to indicate the layer of heaven. The combination of this glyph and that of the sun god must mean "Kinich Ahau [the sun god] who fills the heavens with his brilliance" or words to that effect. In that sense it is also applicable to the moon goddess. In the section of the so-called Mars beast of Dresden (fig. 64,2-4), glyphs of light and darkness, of darkened skies, and of drought are prominent, and therefore the cauac with flames symbolizing an electric storm is not out of place. Indeed, this almanac probably indicates days when rain, drought, and storms might be expected (p. 258).

As used in the pictun glyph, the flames are enclosed in an oval of small circles or dots, similar to that which surrounds the glyph for Mol. The latter, it has been shown (p. 110), symbolizes the rain clouds, and the circles or dots probably represent raindrops. The prefix of the pictun, therefore, in all probability is yet another symbol for storm—the lightning flash and rain.

The head variant is the bird with hand across lower jaw which is the sign for the baktun. Above this stands the same prefix as found with the symbolic form of this glyph (fig. 27,1,2).

CALABTUN (160,000 TUNS)

The term *calab* with the meaning of 160,000 appears in the Yucatec list of Beltran and also in Kaua (Berendt edition, p. 79). As *calab*, it is given by Burkitt (1902) as the Kekchi term for the same number.

The symbolic variant of the glyph has again as its main element the doubled cauac (fig. 26,1-3). The prefix is an outstretched hand, which often holds a rod or has some other minor embellishment. It will be recalled that the head variant of the baktun of 400 tuns has as its main characteristic a hand; now we find the hand with this period, which is 400 baktuns.

The head variant is some indeterminate species of bird with the same hand superfix, but in the best-preserved examples (Copan C) the hand is visible on the lower jaw converting the head into that of the baktun (fig. 26,4-6).

KINCHILTUN (3,200,000 TUNS)

Only three examples of this period glyph occur in IS or distance numbers, where its numerical value can be demonstrated by its position in the sequence. Two are symbolic variants (Tikal 10, Coba 1); the other is a personified form, on the stone of Chiapa. In all three cases the main element is either the symbolic or personified

form found in the baktun, pictun, and calabtun. Clearly, then, the kinchiltun is differentiated from the other higher period glyphs by its affixes, which, unfortunately, are not well preserved in any of these three cases. Luckily, there are two examples, at Quirigua, in near mint condition, of what calculations show to have been the symbolic form of the kinchiltun (App. IV; figs. 26,7; 33,48,49). In each case the glyph is similar to the calabtun except for the addition of a prefix, which resembles somewhat the number 8, but with the greater part of each *o* filled with a crosshatched circle. The left edge of the prefix of the Tikal example of the kinchiltun is broken, but one can see a circle, and, on the right edge of that, an interior circle with crosshatching is plainly visible in the photograph (Maler, 1911, pl. 21), although only one *o* of the 8, together with a looping element, is present. The hand affix is placed above the glyph. So far as one can make out, this same 8-shaped prefix is attached to the kinchiltun glyphs on Coba 1 and on the Chiapa stone, but it is highly doubtful that the hand prefix is also present. We can, therefore, make the tentative deduction that the essential determinant of this glyph is this 8-shaped affix, and that the hand may, perhaps, be omitted. To the best of my knowledge, no one has previously attempted to distinguish this glyph from those of the other high periods.

ALAUTUN (64,000,000 TUNS) AND HIGHER PERIODS

Only one example of the alautun and yet higher periods may exist. On Coba 1 there are a number of glyphs preceding the record of 13 kinchiltuns, and each of these has a coefficient of 13. It is possible that one or more of these represents higher periods in the vigesimal system. The glyph preceding 13 kinchiltuns appears to have the tun sign as its main element, and this is surmounted by an effaced prefix. It may well represent 13 alautuns. In passages dealing with reckonings of millions of years into the past at Quirigua there are a couple of glyphs which have the tun as their main element, and which may represent the alautun or even higher periods, but their identification must remain unsolved for the present.

These, then, are the periods of Maya time: the tun (1 unit of 360 days), the katun (20 tuns), the baktun (400 tuns), the pictun (8000 tuns), the calabtun (160,000 tuns), the kinchiltun (3,200,000 tuns), and the alautun (64,000,000 tuns). Perhaps even higher multiples existed. The manipulation of these highest periods is discussed in Appendix IV. This was the count of the tuns, as the IS introductory glyph records; the uinals, 18 of which made a tun, and the kins, 20 of which made a uinal, were fractions of the tun. The system is a strictly vigesimal count of tuns.

STARTING POINTS OF THE LONG COUNT

The reckoning of the tuns and the multiples of the tun in the vigesimal system was usually made from a date which was nearly 4000 years in the past at the height of the Initial Series Period. Almost all IS contemporaneous with the monuments on which they are carved fall in Baktun 9, although a few of the earliest belong to the last third of Baktun 8, and the group of latest IS fall in the first three katuns of Baktun 10. It should be remembered that when we speak of a date, such as 9.15.10.0.0, belonging to, or falling in, Baktun 9, we are, almost without doubt, committing an error, for Baktun 9 had been completed over 300 years before that date, and the count was already more than three-quarters of the way through Baktun 10. However, as the Maya did not record a baktun or any other period before it was completed, it has become customary among specialists on the Maya to speak of a date belonging to the baktun which had expired. It is as though one referred to 1920, 1948, and 1965 as dates in the nineteenth century. Nevertheless, the custom of referring to such dates as 9.15.10.0.0 as falling in Baktun 9 is so firmly established, not only among epigraphers, but among students of all branches of Maya archaeology, that to start speaking of such dates as falling in Baktun 10 would cause inextricable confusion; the correction of the error would cause more harm than its perpetuation.

The base from which 9.15.10.0.0 and almost all other Maya dates are reckoned is 13.0.0.0.0 4 Ahau 8 Cumku. This was not the true starting point of the calendar, since 13 baktuns had already elapsed, for this position of 4 Ahau 8 Cumku is written as the completion of 13 baktuns (fig. 32,1). Moreover, some calculations deal with dates before 13.0.0.0.0 4 Ahau 8 Cumku. For example, the Tablet of the Cross, Palenque, has an IS 12.19.13.4.0 8 Ahau 18 Zec, which precedes 13.0.0.0.0 4 Ahau 8 Cumku and is linked with it (fig. 53,1). This is reckoned from a base 13 baktuns before 13.0.0.0.0 4 Ahau 8 Cumku, but there is no valid reason for supposing that this, either, was the true starting point of the Maya calendar. In fact, I feel confident that there was no such thing as an initial point of departure for the Maya calendar, but, rather, time was conceived of as without beginning or end, and therefore one could project one's calculations farther and farther into the past without ever reaching a starting point. Apart from that concept, it is to be doubted that zero as nothing could be expressed in glyphs.

For the sake of convenience, the Maya chose the point 4 Ahau 8 Cumku, completion of 13 baktuns, from which ordinarily to reckon the LC. Our typical date, 9.15.10.0.0, therefore was 9 baktuns, 15 katuns, and 10 tuns after this

point of departure for the reckoning. It is not improbable, although the matter is not susceptible of proof, that 13.0.0.0.0 4 Ahau 8 Cumku was regarded as the date on which the world was recreated, perhaps for the fifth and last time. The LC was presumably invented in Baktun 7 or 8 of the current count, and an interval of that number of baktuns, and perhaps some katuns as well, was set aside to mark the time which was imagined to have elapsed since an event, which, if my supposition is correct, was regarded as the last creation of the world. Groups of 13 baktuns preceding that base would, perhaps, have been allowed for the earlier "suns" (p. 10).

When the LC was born, the highest period seems to have been the baktun. Baktuns were grouped in re-entering cycles of 13, after which a baktun would end with the same day Ahau; these cycles probably had no starting point, a Baktun 1 following a Baktun 13 in endless succession. Later, with progress in astronomy and growing skill in computation, the Maya priests burst the bounds of the baktun, and roamed farther into the past: they probed with their calculations outermost time, as modern astronomers with giant telescopes penetrate to the recesses of the universe. The re-entering cycles of 13 baktuns were unsuitable for such calculations, for they could be distinguished from one another only by a cumbersome system of nomenclature. The remedy was simple: baktuns were grouped in 20's to form a higher unit in the vigesimal count, the pictun; and the Baktun 13 of 4 Ahau 8 Cumku became Baktun 0 for purposes of calculation, although the old designation of Baktun 13 was retained for everyday usage.

Perhaps at the same time, perhaps later, periods higher than the pictun were invented, and the calabtun, kinchiltun, and alautun came into existence, each with its distinguishing glyphs. The date when the count was extended backward is not known; the earliest record of it is on Tikal 10, erected some time before 9.10.0.0.0. Around 9.13.0.0.0 the Maya priests were much interested in the backward projection of time, and not a few calculations millions of years into the past were made. These are discussed at length in Appendix IV. Suffice it here to say that there are good grounds for believing that in the extended LC our typical date, 9.15.10.0.0, held the position 1.13.0.9.15.10.0.0 3 Ahau 3 Mol. That is to say, there had elapsed 1 kinchiltun, 13 calabtuns, 0 pictuns, 9 baktuns, 15 katuns, 10 tuns, and no extra uinals or kins from the extended point of reckoning. This, however, was not the true zero date, for calculations at Quirigua carry the count very much farther into the past, and, to reiterate, there almost certainly was no such thing as a zero date.

Such calculations were, so to speak, for the senior

wranglers among the Maya priest-astronomers; for all practical purposes they can be ignored, and we can concentrate on the regular LC reckoned from the base 13.0.0.0.0 4 Ahau 8 Cumku. There is, of course, complete arithmetical evidence that all run-of-the-mill IS are computed from that base, and there are many ways of proving the sum. The most obvious, but not the quickest, method is to reduce all the orders of an IS to days and divide the total by 260 and 365, respectively, to obtain the number of days and position in the year of 365 days to be added to 4 Ahau 8 Cumku. Thus Piedras Negras 3 has the IS 9.12.2.0.16 5 Cib 14 Yaxkin (fig. 50,1). In terms of days the interval which has elapsed is:

9 ×	144000	1296000	(baktuns)
12 ×	7200	86400	(katuns)
2 ×	360	720	(tuns)
0 ×	20	0	(uinals)
16 ×	1	16	(kins)
Total of days		1383136	

1383136 ÷ 260, remainder 196; 4 Ahau + 196 = 5 Cib.
 1383136 ÷ 365, remainder 151; 8 Cumku + 151 = 14 Yaxkin.

Various methods for calculating Maya dates have been evolved by modern students, but as there is little evidence that any of them was used by the Maya priests, I shall not discuss them here; we are interested in Maya ingenuity, not that of the modern student. One may presume that the Maya priest-astronomer knew by heart the dates on which the various katuns and half-katuns of Baktun 9 ended, and merely checked his calculations from those points. Thus in the case of the date just discussed, the Maya priest must have known that 9.12.0.0.0 ended on 10 Ahau 8 Yaxkin. He could calculate in his head that 9.12.2.0.0 fell on 2 Ahau 18 Xul (p. 247) and an addition of 16 days would lead to 5 Cib 14 Yaxkin.

All sculptured IS were carved between the second half of Baktun 8 and the first quarter of Baktun 10 (the extremes contemporaneous with the carvings on which they occur are: 8.14.3.1.12 1 Eb 0 Yaxkin [Leiden plaque] and 10.3.0.0.0 1 Ahau 3 Yaxkin [Xultun 10 and La Muñeca 1]), and every legible IS on the monuments which carries a baktun coefficient of 8, 9, or 10 is calculated from 13.0.0.0.0 4 Ahau 8 Cumku. All the IS in Dresden which do not involve orders higher than the baktun are calculated from 4 Ahau 8 Cumku or bases very close thereto, and all record dates in Baktuns 8, 9, and 10. Altogether some 445 IS have been reported from the Maya area, all of which, with the exceptions noted above, have 4 Ahau 8 Cumku as their point of departure. The various dates and distance numbers which extend into pictuns and higher orders are discussed in Appendix IV.

THE INAUGURATION OF THE LONG COUNT

The date of the inauguration of the LC, and the reasons which led to the choice of the starting point have given rise to much speculation. In the absence of any authentic facts on that distant matter, one must regard the subject as ideal for the exercise of that joyous pastime, the building of theoretical castles on sand.

Conjectures as to the length of time necessary for the construction of the calendar vary from the adult life of one man (Spinden, 1924, pp. 157-58) to a span of 500 years for gathering only the data which enabled the length of the year to be calculated as approximately 365 days (Morley, 1937-38, 4: 271). I cannot believe that the whole Maya calendar was the work of one man, or that about half a millennium of research was necessary to fix the year as 365 days. Observation extending over many years surely would not have been necessary for a people as intelligent as the members of the Maya hierarchy. Merrill (1945), who made a series of experiments, reports that the length of the solar year to the nearest day is easily determined at the equinoxes and at the passage of the sun across the zenith. Once the idea of a line of sight is developed or it is decided to mark the shadows cast through the year by an upright pole, the approximate length of the year will soon be established. Merrill notes that observations at sunset are better than those at sunrise, and the equinoxes more sharply defined than the solstices.

I should regard the cycle of 260 days as being of considerably greater age than the completed calendar. It is very widely distributed in Central America, and in most areas it has more mythological and ritualistic association than the year of 365 days. Extent of diffusion and aggregation of mythological and ritualistic associations are not by themselves certain indications of antiquity, but taken together they tend to substantiate it. The year of 365 days also would seem to be of very considerable age. I should suppose that those two elements of the calendar functioned side by side for a long time before the evolution of the LC, and probably for some time before the CR came into existence.

There is no direct evidence for this last supposition, but this is one line of reasoning which leads to it: it would have been natural to make the vague year of 365 days start with Imix, so that every fourth vague year would be an Imix year (as 365 divided by 20 has a remainder of 5, the first days of the vague years would be Imix, Cimi, Chuen, Cib, Imix, etc.). Inasmuch as Imix is the starting point of the 20-day period, it would be logical, and in keeping with their constant desire to bring into harmony the various cycles of time, for the Maya to have

arranged the contact in such a way that Imix fell on the first day of the vague year; it is reasonable to assume that they once did that. If, however, the relationship was at the beginning somewhat indefinite, it could well be that the starting point of the vague year was shifted by the intercalation of days to keep associations with stations of the solar year. Had such intercalation taken place at a time when the CR date was not firmly fixed, Imix would have lost its contact with the start of the year. Intercalation of days was absolutely against the Maya philosophy of time because the addition of leap days would have thrown the whole delicate system of the calendar awry, but shifts could easily have occurred before the CR system was firmly established without interfering with the mechanism of the calendar because that mechanism had not then been evolved. From this very indirect evidence of the noncoincidence of Imix with the start of the year I think one may tentatively assume that after the invention of the 260-day cycle and the recognition of the vague year of 365 days there was an interval of some duration before the two were engaged to form the CR.

The construction of the LC would appear to be a still later stage in the building of the complex calendar. Much speculation has centered on the reason for the choice of an approximate year of 360 days: it has been suggested that the round of 360 days represents an early attempt to guess the length of the solar year, but from what has been said above, I consider that extremely unlikely. Observation of only two succeeding spring or fall equinoxes or of northward or southward passages of the sun across the zenith would show the Maya that the year was of longer duration than 360 days.

I am inclined to think that the period of 360 days was chosen because the Maya desired a formal year which would invariably start with Imix and end with Ahau. To fulfill that condition, 360 days was the logical choice, for 380 days (it had to be a number divisible by 20) are nearly 15 days beyond the true length of the year. Furthermore, with an approximate year of 360 days the same lord of the night always governs the same nights in each tun. Moreover, at the moment the sum of tuns reaches the sacred figure of 13, 18 (twice the important number 9) sacred almanacs are completed, 4680 being the lowest common multiple of 360 and 260 (13×360 or $18 \times 260 = 4680$).

The only good alternative to a year of 360 days is one of 400, such as was used by the Cakchiquel and possibly, too, by the people of La Venta (Thompson, 1941a, pp. 15-16; 1943, pp. 108-09). Such an arrangement has the advantage of conforming to the vigesimal count, and making the 400-day and 260-day cycles coincide after 13 "years" of 400 days, but with that system each "year"

does not start with the same lord of the night, nor is there a reasonably close relationship with the true year.

In seeking the date when the LC was inaugurated one must assume that the choice of the starting point was governed by ritualistic or astronomical considerations, or perhaps a combination of both. From what we know of the Maya we can, perhaps, suppose that the start of the year of 365 days would have coincided with some significant point in the tropical year, but I doubt that that was the case at the time the LC was inaugurated, for even should the assumption be correct that the length of the vague year was corrected with occasional additions of days while it was still unrelated to any other count, intercalation would hardly have been permissible once the CR came into being. Intercalation would have upset the relationship between the two counts or broken the unending succession of the days and their bearers. Thus, if the further assumption that there was an interval of some duration between the development of the CR and the inauguration of the LC be justified—and I feel strongly that it is—then there would be no grounds for supposing that the start of the year was at some significant point when the LC came into being. It would have slipped, the gap depending on the length of the period between the invention of the CR and the inception of the LC.

Accordingly, it is logical to suppose that in the choice of a starting point for the LC the placement of first of Pop at some significant point in the solar year was not a factor. That matter would have been beyond control, since, on the assumption made above, the vague year was already in being and could not be changed. Had first of Pop coincided with, for example, the autumnal equinox at the time the year of 365 days was launched, it might have fallen in mid-June by the time the IS was devised, the distance from the autumnal equinox depending, of course, on the number of years that elapsed between the inception of the CR and the birth of the LC. Only if one assumes with Spinden that the whole Maya calendar emerged fully developed from the womb of time can one expect first of Pop then to have coincided with a significant station in the tropical year.

On the other hand, the start of the count of the tuns might have been arranged in such a way that the first day of the tun fell on that same point of the tropical year, although by then the position in the Maya vague year might have been 18 Uo or 13 Zec or somewhere else, depending on the interval that had elapsed between the inception of the CR and the inauguration of the LC. It would also be natural to assume that the first day of the LC would fall on 1 Imix. In seeking the starting point of the LC, therefore, one would expect to find 13 Ahau coinciding with an important point in the tropical year.

More complications ensue. Can one be certain that the correlation of the Maya and European calendars used in this book is correct? What point in the tropical year would have had most significance for the Maya? There are sundry possibilities: vernal and autumnal equinoxes, the winter solstice, the northward and southward passages of the sun across the zenith, the start or end of the rainy season, and the start of the agricultural year. This last in turn could be reckoned as either when clearance of the land starts or when the seed is sown, and the dates for those two activities vary from one part of the Maya area to another. There are too many possibilities.

The earliest object with a contemporaneous date yet found in the Maya area is the Leiden plaque which has the IS 8.14.3.1.12 1 Eb 0 Yaxkin. By that time the IS was fully developed; the inscription gives the name of the current lord of the night, and may have a rudimentary record of the lunar count (Nottebohm, 1944). It is possible that there has survived a calculation of still earlier date, for it is highly probable that most of the IS in Dresden are records of actual observations of celestial phenomena, the earlier ones having been copied from previous editions of Dresden. Seven of these IS fall in Cycle 8, occupying positions slightly later than the IS of the Leiden plaque; two of them are earlier. These last record respectively the dates 8.6.16.7.14 9 Ix 7 Mac and 8.11.7.13.5 3 Chicchan 8 Kankin. It is, I think, a fair assumption that these dates represent ancient records handed down from the times when they were current observations. In that case the LC was established before 8.6.16.7.14.

At one time and another 7.1.13.15.12 8 Eb 0 Pop (Spinden, 1924, pp. 152-55), 7.6.0.0.0 (Teplee quoted in Thompson, 1932, p. 370), and 7.13.0.0.0 (Thompson, 1927, p. 12) have been advanced as dates for the inauguration of the LC. I now think that the reasoning which led to these several choices is in each case defective.

On the assumption that the Maya, between the inception of the CR system and that of the LC, kept a record of the number of CR's and odd years that had passed, it is logical to suppose that they would fix the date of the inception of the CR as the end of a baktun or of a katun, and from that point allow so many baktuns or katuns for the period prior to the inception of the CR and add to that the number of years that had elapsed since that event (bringing the figure perhaps to an even katun) so as to obtain a LC position in the following way:

A	13.0.0.0.0	Base. Last creation of world?
B	7.0.0.0.0	Theoretical passage of time.
C	7.0.0.0.0	Inauguration of CR.
D	5.0.0.0.0	Time elapsed between inauguration of CR and IS.
E	7.5.0.0.0	Inauguration of LC.

Since there is no evidence at present for the lengths of B and D, it is impossible to make a fair guess as to the true position in the LC of C and E. The date given above is, I think, the very earliest at which the LC could have been inaugurated; 8.5.0.0.0 is probably about the latest. I would rather expect the figure to be closer to the latter position than to the former. In the hieroglyphic texts as now deciphered there is no definite evidence that the Maya paid attention to the date when the LC was inaugurated. There are a handful of references to dates in Baktun 7 and the first half of Baktun 8, but not one is repeated elsewhere. According to the various assumptions already set forth, Date E should fall on 13 Ahau but would no longer have any significance in the solar year. Theoretically at Date C the start of the vague year should occupy a position of significance in the solar year, but if Interval D is a poor approximation to that which actually elapsed between the inauguration of the CR and the birth of the IS, the relationship of first of Pop with the solar year would be in error according to how far Date E, the reconstructed date, is distant from the actual date of the inauguration of the CR. At Date C minus an unknown quantity 1 Imix probably fell on first of Pop.

Whether 13.0.0.0.0 4 Ahau 8 Cumku has any solar associations depends on the accuracy of the Maya calculations as to the length of the solar year at the time of the inauguration of the LC; I doubt that they were then capable of estimating it much better than as 365.25 days. According to the correlation followed in this book, 13.0.0.0.0 4 Ahau 8 Cumku fell on August 10, on which date the sun crosses the zenith somewhat north of Quirigua and Copan. This, however, I believe is merely coincidence because of the probable inaccuracy of Maya computations at the time the LC was launched, and because there is no valid reason for assuming that any part of the calendar originated in that latitude.

According to the Spinden correlation of Maya and Christian dates, a lunar eclipse occurred on 13.0.0.0.0 4 Ahau 8 Cumku, and, moreover, several planetary events of note took place on and around that date. This has been cited as evidence for the correctness of the correlation in question. However, when Maya astronomy was at its peak of perfection, the priests were unable to calculate lunations over thousands of years without an error of several days, and so it is certain that at the time of the inauguration of the calendar they could not have correctly deduced a lunar eclipse some 3000 years in the past. Indeed, according to their best lunar calculations, the moon age at 13.0.0.0.0 4 Ahau 8 Cumku was 22-24 days, not a full moon. Such evidence merely serves as a warning that the path to the secrets of Maya astronomy is liberally sown with pitfalls of coincidence.

After much argument we go out by that same door through which we entered, still empty-handed but with the satisfaction of knowing that some possible solutions have been eliminated, and some conditions which the true solution must meet have been outlined.

The LC presumably came into being to meet two needs: with the general development of the concept of the eternity of time which was to become the supreme mystery of Maya religion, some greater and handier unit than the CR was a necessity; with an awakening interest in astronomy and a desire, withal, to reduce all time counts to cycles in harmonious relationship with one another, a count by CR alone did not suffice. For example, it is possible that the relationship between the CR and the synodical revolutions of Venus had been solved at a somewhat early date (65×584 , 104×365 , 146×260). The Maya priest may have desired to bring the moon into harmony with the other factors. Multiples of CR's would have been necessary, but there was no way of distinguishing one CR from another. All started and ended with the same day and month positions. A LC was practically essential for computations of that nature.

INITIAL SERIES INTRODUCTORY GLYPH

An integral part of the IS on the monuments is the IS introductory glyph which stands at the head of the inscription. The variable element in the center of the prefix is the glyph of the deity who rules or is closely associated with the month in which the IS falls (p. 105; figs. 22; 23). One of the IS on Coba 1 lacks this introductory glyph, and the glyph very rarely (Copan 4) stands above a distance number. In a few texts at Copan, notably those of Stelae P and 7, the IS introductory glyph which is above the IS on one side of the monument, is repeated on other sides, although the glyphs which it heads do not comprise an IS. Here the repetitions probably respond to aesthetic considerations.

Copan C has an IS introductory glyph on each face, but these are not followed by IS. Instead there are in each case declarations of 11, 12, or 13 calabtuns followed by dates but without any record of the intervening periods (p. 315). Similarly Copan F has an IS introductory glyph followed by a declaration of "5 Ahau 3 Mac, half period," without the requisite IS, 9.14.10.0.0. The inscription on the lower step of Mound 2, Copan, also has an IS introductory glyph but lacks an IS. Such presentation is highly irregular. For long it has been believed on stylistic grounds that Stelae F, C, and 4, which do not carry IS but have IS introductory glyphs, form with Stela H a group of monuments erected at almost the same time (circa 9.15.0.0.0?).

The constant elements of the IS introductory glyph are the tun sign, the upper prefix, and the pair of lateral elements of the lower prefix. These last are formed of the so-called comb symbol, which in a few inscriptions is replaced by pairs of fishes (fig. 23,37,39). It has been suggested (Thompson, 1944) that since the fish and comb signs represent the word "count," the whole glyph, less the variable element and the first prefix, has the meaning of "the count of the tuns" (*u xocan* [or *xocol*] *tunob*), and is comparable to the words "the record of the count of the katuns" (*u kahlay u xocan katunob*) which stand at the head of the first chronicle of Chumayel. In Tizimin and Mani the equivalent expression is *u tzolan katun*, "the arrangement in order of the katuns." Allowing for the fact that in the hieroglyphic texts the count is of tuns, whereas in the books of Chilam Balam it is of katuns, the correspondence is close. In the various chronicles there is no mention of the deity of the month, but that is natural since there follows a sequence of katuns, not a specific date.

An IS which we write 9.15.0.0.0 4 Ahau 13 Yax actually reads, so far as we can now tell: "The count of the tuns. The planet Venus [is the patron]. Nine baktuns, fifteen katuns, the tuns complete, the uinals complete, the kins complete [since 13.0.0.0.0 4 Ahau 8 Cumku]. 4 Ahau [the day on] 13th of Yax." Matter in brackets is understood.

A full-figure IS which we would write 9.15.5.0.0 10 Ahau 8 Ch'en, the Maya would interpret with the aid of the pictorial grouping of the signs somewhat as follows: "The count of the tuns. The moon goddess [is the patroness]. The Chicchan god bears the burden of the baktun. The earth god of the realm of the dead bears the katun. The earth god carries the weight of the tun. The deity who symbolizes completion doffs the burden of the uinal, and has run his course with the kin. The god of the dead rests from carrying the day Ahau, and our divine youth of the maize likewise has reached the end of his stage with Ch'en upon his back" (fig. 60 and frontispiece).

INITIAL SERIES OF CODEX DRESDEN

The IS of Dresden (figs. 46,17; 64,2) differ in three respects from the kind usually inscribed on the stone monuments. (1) They lack period glyphs, being formed of bars and dots arranged in vertical columns, true positional notation. (2) They lack IS introductory glyphs. Morley (1937-38, 4:315) claims that five have this glyph, but it is the common "Men variant" with an unusual prefix. (3) A number of them depart from bases shortly anterior to 13.0.0.0.0 4 Ahau 8 Cumku. In such cases the interval between the bases and 4 Ahau 8 Cumku is ex-

pressed by means of a distance number the kin coefficient of which is enclosed within a ring. Thus on page 70 of the codex there are no less than six IS. The first two read 9.13.12.10.0 9 Ix and 9.19.11.13.0 9 Ix. Under them are the numbers 1.12.6 and 4.10.6, the six kins in both cases being enclosed within a ring which has a knot at the top. Beneath each ringed number is the date 4 Ahau 8 Cumku. If these two IS are counted from 4 Ahau 8 Cumku they will not reach 9 Ix. That is obvious because the coefficient of the kin in each case is 0, and 0 kins added to Ahau reaches Ahau. If the ringed numbers are first subtracted from 4 Ahau 8 Cumku and the IS then added, the required day position is reached:

(13. 0. 0. 0. 0)	4 Ahau 8 Cumku
1.12. 6	<i>subtract</i>
(12.19.18. 5.14)	9 Ix 7 Xul)
9.13.12.10. 0	<i>add</i>
(9.13.10.15.14)	9 Ix (12 Muan)
13. 0. 0. 0. 0	4 Ahau 8 Cumku
4.10. 6	<i>subtract</i>
(12.19.15. 7.14)	9 Ix 2 Ch'en)
9.19.11.13. 0	<i>add</i>
(9.19. 7. 2.14)	9 Ix (17 Ch'en)

It is clear that in these two examples, bases before 4 Ahau 8 Cumku were chosen so that the IS might be multiples of 260 days. Matter in parentheses does not appear in Dresden. Other IS with ring numbers are shown in figure 46,17 and translated in the caption.

It is often difficult when treating of Dresden to draw the line between IS and distance numbers, since both are arranged in descending order and both lack IS introductory glyphs. Period glyphs, however, do occur in Dresden (p. 140; figs. 26,13,14,32,40,48,57; 42,43-53).

IS without period glyphs are not confined to Dresden, for one IS of this type is sculptured in stone (Pestac 1) and records the date 9.11.12.9.0 1 Ahau 8 Cumku. Why this single example of an IS without period glyphs should have been sculptured it is difficult to say. Pestac is an outlying part of the important site of Tonina, the other surviving IS of which are of normal type. Unfortunately a number of the IS at Tonina have been destroyed, for they were on the backs of the heads of statues since decapitated. Their former existence is assured by the pattern of glyphs which remain. Tonina is not far from the western boundary of the Maya area, and it is possible that foreign contacts may have led to this unusual presentation, so far as stone sculpture is concerned. On the other hand it is probable that the original from which Dresden derives also employed positional notation for the presentation of IS, and therefore the idea was not unknown to the Maya of that earlier period.

IS or inscriptions resembling IS, also without period glyphs, are found in sites of La Venta culture, generally attributed to the Olmec, and also occur on the Pacific slope of the Guatemalan highlands. To the culture of La Venta can certainly be attributed the famous Tuxtla statuette, for many years regarded as bearing the earliest known Maya inscription. A discussion of La Venta hieroglyphs and the calendar of that people is outside the scope of this book. Suffice it to say that there is no conclusive evidence that these bar-and-dot inscriptions served as IS, and still less grounds for assuming that they should be reckoned from 4 Ahau 8 Cumku (Thompson, 1941a).

POSITION AND FUNCTION OF THE INITIAL SERIES

The Initial Series was thus named by Maudslay because it stands, with very rare exceptions, at the start of a text (i.e. the top left corner). Usually there is only one IS on each monument, but in some cases there are two. There are two monuments with three IS (Uxul Alt 2, Lacanha 7) and one with four (Coba 1). Commonly, the second IS, if present, occurs on a different face of the monument. An IS is a LC plus required CR date.

The IS usually serves one of two purposes: it may declare the date which the monument was erected to commemorate, usually either the end of a katun, the completion of a half-katun, or the end of one quarter (5 tuns) or three quarters (15 tuns) of a katun (figs. 47,3; 48,1; 53,2); alternatively it records a date not ending on a tun, which, almost without exception, is prior to the dedicatory date (figs. 50,1,2; 53,1,3). There are good grounds for believing that an IS which does not fall at the close of a period was in almost all cases chosen because the date it carries was connected with the dedicatory date of the monument or the end of the current katun, usually declaring the correct position in the solar year of the date in question or recording a position of lunar importance. The latter may or may not be directly related to the dedicatory date. There is not at present evidence that all IS which do not declare the end of a period fall into this category, but I believe that future research will reveal a relationship of some kind between nearly all IS and the dedicatory date of the monument or the katun current at the time of its erection.

On the other hand, there are a few IS (e.g. Quirigua F, Copan T 11) which repeat dates recorded on earlier monuments, or give their anniversaries in the LC, as in the case of Piedras Negras L 3 (fig. 57,1). Such dates, being of outstanding importance for sundry reasons, were repeated on more than one occasion. Somewhat rarely a date was recorded as an IS apparently because of its ritualistic importance. Thus, we find some emphasis

placed on the date 9.4.0.0.0 13 Ahau 18 Yax as a starting point for calculations in the past, presumably because 13 Ahau ends the round of 13 katuns, as noted above; the IS 9.9.9.18 9 Etz'nab 16 Zac (Uxul Alt 2) was probably chosen because of the profusion of "lucky" nines.

When the IS is not the dedicatory date of the monument, one or more distance numbers carry the reckoning forward to the PE which the monument commemorates. There are some texts, however, notably at Yaxchilan, which, so far as they can be deciphered, do not record a PE, but I am not sure that these are exceptions to the rule, for the information may be given in a way we do not understand (the "Ben-Ich" katuns?), or the count may have been carried forward to altars or lintels no longer existing.

It has been held by some that Maya dates recorded on stelae may refer to historical events or even recount the deeds of individuals; to me such a possibility is well-nigh inconceivable. The dates on stelae surely narrate the stages of the journey of time with a reverence befitting such a solemn theme. I conceive the endless progress of time as the supreme mystery of Maya religion, a subject which pervaded Maya thought to an extent without parallel in the history of mankind. In such a setting there was no place for personal records, for, in relation to the vastness of time, man and his doings shrink to insignificance. To add details of war or peace, of marriage or giving in marriage, to the solemn roll call of the periods of time is as though a tourist were to carve his initials on Donatello's David. Stelae and other monuments chimed the passing hours; they were dedicated to mark the passage of time, that is to say, its arrival at the major *lub* of the katun, or those wayside halts which are the half- and quarter-katuns. Cities which had a highly developed stela cult erected a monument every quarter-katun; those less religiously inclined or less wealthy consecrated a monument every katun.

Some writers have compared the IS to a counting machine of boundless accuracy. Tosh! Accuracy does not enter when it is a question of counting years and days one by one: the IS was a sublime poetic concept; to regard it as a machine is on a par with discussing fan vaulting only as a problem in engineering.

Of the sculptured legible IS, approximating 340, some 230 record the ends of baktuns, katuns, half-katuns, or quarter-katuns. None of the IS of Dresden fall into this category.

DEDICATORY DATES OF MONUMENTS

There are no foolproof rules for determining the commemorative date of a monument, but one is fairly safe in assuming that the latest period ending recorded is that

of the monument's dedication, particularly if that is given at the close of the text, although there are exceptions. For instance, Copan S has an IS 9.15.0.0.0, which is followed by a period ending 10.0.0.0.0, but there is good evidence that the latter was not the dedicatory date of the altar but was probably inserted because 9.15.0.0.0 marked the completion of three-quarters of Baktun 9 (more correctly 10). The glyphs lack late features (the tun with horizontal lines, and the St. Andrew's cross as a numerical filler are absent; the Ahau with its crescentic eyes is a type in use around 9.16.0.0.0, but not two katuns later). Furthermore, Copan had abandoned the use of IS by 9.18.0.0.0, and without much doubt had ceased to erect hieroglyphic monuments before 10.0.0.0.0.

Style of the glyphs, detailed treatment of elements of costume and attributes of personages (Proskouriakoff, MS.), location of the monument (not infrequently monuments which follow in a sequence of erection are grouped in a single court), methods of recording lunar data, and length of text and its subject matter (late monuments tend to have abbreviated texts which ignore problems to the fore in earlier times) are all helpful in deciding on the dedicatory date of a monument, if that is in doubt.

Generally speaking, the dedicatory date of a monument is posterior to any non-tun ending date recorded in the text, but, here again, there are exceptions which prove the rule: Los Higos 1 has an IS 9.17.10.7.0 9 Ahau 3 Zec, but a distance number of 7 uinals followed by the anterior date indicator leads back to 9.17.10.0.0 12 Ahau 8 Pax. This is probably the dedicatory date, although on the opposite side there is what may be the start of a distance number (0 kins, 0 uinals), which might have been 10.0.0, and, therefore, carried the count forward to 9.18.0.0.0.

THE GRANDEUR OF THE INITIAL SERIES

As will be set forth in Chapter 7, dates were recorded by other methods which to all intents and purposes are just as good as the IS. For example, a statement "1 Ahau 8 Kayab, end of a katun" fixes the position of a date in a period of 949 katuns. Only after that interval of over 18,000 years will 1 Ahau 8 Kayab again mark the end of a katun, and it will be 18,980 katuns, over of a third of a million years, before 1 Ahau 8 Kayab can once more be the closing day of a Katun 10. Such accuracy should have satisfied the Maya. That statement requires three glyphs; the IS, eight.

There is little doubt in my mind that the IS was carved because its majesty and rhythm did justice to the honor in which time was held. The roll call of the periods has a grand cadence when spoken, and is a panorama of

harmonious glyphs when written; an IS is in itself a prayer and a noble offering to the divine powers. Because it embodied a living creed and a philosophy which was the core of Maya character, it was carved with the same faith, humility, and loving patience as guided the hands that embroidered the magnificent vestments of mediaeval Christendom; the bewildering intricacies of the full-figure IS, veritable pageants in stone, have a deep religious emotionalism comparable to that which inspired the best carving in Gothic—not only of reredos but also of hidden misericord.

Dull pages of dull discussion about the identity of this god or of that, or why jade is an element in one glyph,

or why the Moan bird is the form of another, have led us into the swamps of minutiae. If we lift our eyes thence to the heights we may perceive dimly the sublime poetry of time into which the tools of the graver and the legends and myths of the storyteller have transmuted its periods. It is not given to us to see it in the whole clarity of its beauty nor fully to share the exhilaration of its poetry, for differences in mentality and in outlook on life, as well as unperfected knowledge, are veils before our eyes. Yet what we can perceive fills us with reverent wonder at this sublime achievement of the Maya. In truth, the Initial Series, that opening movement of the symphony of time, is a shining nobility, a treasure in history's store of beauty.