11

Soulless Mechanisms and Magical Formulae

Amiddes
His Magick bookes and arts of sundry kindes,
He seekes out mighty charmes, to trouble sleepy mindes.
—EDMUND SPENSER, *Faerie Queene*

NOT A FEW PEOPLE are content to draw inspiration from the outward appearance of some work of beauty without overly concerning themselves with mechanical problems, such as stress in buildings or application of pigments in a painting. I must confess to being among that number. I consider the lily of the field, but pay scant attention to its stamens and pistil. Nonetheless, it is meet and very right that we inspect, albeit briefly, the structural elements in the Maya fabric of time, and tour the quarries and kilns whence come its stone and brick.

SHORT CUTS IN COMPUTATIONS

Computations in the Maya calendar are involved, and, unless short cuts are taken, they can be both long and tedious. Modern students of the subject have evolved various systems of shortening the labor of computation. Some are along lines that might have been followed by the Maya; others involve special charts or slide rules. It is not my intention to discuss these, for each student will choose the system which best agrees with his bent of mind.

Numerical sequences hold the key to the quickest ways of making calculations in the Maya calendar. For example, the coefficients of Ahau have different sequences according to the period of time in question. This, of course, is so because the number of days involved has a different remainder in each case when divided by 13. The uinal sequence rises by 7: 13, 7, 1, 8, 2, 9, etc. The tun sequence falls by 4: 13, 9, 5, 1, 10, 6, etc. The katun sequence falls by 2: 13, 11, 9, 7, 5, 3, etc. The baktun sequence falls by 1: 13, 12, 11, 10, 9, 8, etc. For ready reckoning it is extremely useful to remember these quick cuts, for with a few dates firmly fixed in one's mind, one can quickly calculate from them the coefficient of Ahau for any other date. Thus, if one knows that 9.15.0.0.0 fell on 4 Ahau 13 Yax, one can calculate immediately that katun 9.18.0.0.0, for example, has an Ahau coefficient 6 less, that is to say, 11 Ahau.

In Kaua (pp. 275–76) there are notations which give the correct sequence of Ahau coefficients for uinals, tuns, and katuns, although the tun series is labeled uinals.

Vinales 1, 8, 2, 9, 3, 10, 4, 11, 5, 12, 6, 13, 7.
Vinales (tuns) 13, 9, 5, 1, 10, 6, 2, 11, 7, 3, 12, 8, 4.
Katunes 13, 11, 9, 7, 5, 3, 1, 12, 10, 8, 6, 4, 2.

The accompanying explanation is given in bad Spanish and involves the year bearers for the last years of the eighteenth century. In Perez (pp. 100–01) the same arrangement is repeated, the second line representing the tuns, being wrongly labeled *Katunes*. The passage is copied from Mani.

A somewhat similar arrangement of the sequence of coefficients of the year bearer day for the uinals of a year, but written in Maya, occurs in Ixil (Perez, p. 174; probably p. 2 of original). The series runs 1, 8, 2, 9, 3, 10, 4, 11, etc., concluding with "10 to 4 Muluc on first of Pop." There is something wrong with the table, for no note is made of the five nameless days, which would lead not to 4 Muluc on first of Pop, but to 2 Muluc. Perhaps the copyist erred, writing *can* (4) instead of *ca* (2).

WHEELS

I think these sequences of coefficients must have been illustrated by wheels, of which a few colonial examples have survived, the best known of which are those in Chumayel and in Landa. Both wheels give the order of the katuns starting with 11 Ahau and proceeding clockwise 9 Ahau, 7 Ahau, 5 Ahau, etc. In Ixil (Perez, p. 172; probably p. 1 of original) is a wheel of year bearers, which, however, is to be read anticlockwise, starting with 1 Kan. I do not purpose to describe these wheels in detail, for the subject has been thoroughly discussed by Bowditch (1910, pp. 324–34). One might note, however, that it is probable that wheels giving the sequence of coefficients for tuns and uinals, and perhaps baktuns, once existed. There is a wheel of the days in the Quiche calendar of 1722. Similar wheels were also used in Mexico proper, and have been reproduced by Sahagun, Duran, and Veytia. It is possible that the circle was a development from an earlier design, an elaborated Maltese cross, representing the completion sign, such as forms the framework of the 260-day cycle which occupies Madrid 75 and 76 (Thompson in Caso, Stirling, et al., 1946). There again the arrangement is anticlockwise. The count starts with 1 Imix, to the east, at the left upper edge of the bottom section. Twelve dots (erroneously written as 11) lead down to 13 Ben, next to which is 1 Ix. Twelve dots (erroneously written as 13) lead across the bottom of the page to 13 Cimi, next to which is 1 Manik.

Thereby the days continue the circuit, each of 20 lines that form the pattern of four petals and four loops being assigned to each 13-day "week" starting with 1 Imix 13 Ben, and ending with 1 Lamat 13 Ahau. Each petal has three lines; each loop has two. A petal and the contiguous leaf in the anticlockwise direction are assigned to a world direction, thereby dividing the cycle into four divisions, each of 65 days.

The center of the picture is surrounded by the 20 day signs, without coefficients, but there are almost certainly errors in this arrangement. It is probably meant to run sinistrally:

Right:	Kan	Lamat	Eb[1]	Cib[1]	Ahau[1]
Top:	Imix	Chicchan	Muluc	Ben	Caban[1]
Left:	Ik[2]	Cimi[2]	Oc	Ix	Etz'nab
Bottom:	Akbal	Manik	Chuen	Men	Cauac

[1]Transposed pairs.
[2]Partly obliterated, and perhaps transposed.

This elaborate design, accompanied as it is by portraits of gods associated with the world directions, must have been decorative rather than useful. As a ready reckoner, it can have functioned only to give the sequence of the "weeks" and their association with world directions. It closely resembles the design in Fejervary-Mayer.

THE FOOTSTEPS OF THE YEAR

La Farge and Byers (1931, p. 158) note that among the Jacalteca the only subdivision of the year which is recognized is that of 40 days (two uinals). The recurrence of the year bearer with a coefficient one higher is called "one foot of the year." This, of course, happens after 40 days because the sequence by uinals runs 13, 7, 1, 8, 2, etc. Forty days later is two feet of the year and so on until eight feet of the year is reached at the end of 16 uinals, where the count is terminated. The completion of the last couple of uinals is not regarded as adding another (ninth) foot to the year. Nevertheless, one may presume that there once was some term to denote that the footsteps of the year carried to the three hundred and sixtieth day, although that term may have made no reference to the feet. The foot of the year is termed *yoc habil.* The word *oc* in Yucatec means not only foot, but also footprint or track, and the same is possibly true of Jacalteca. Roys (1933, p. 116), in a somewhat parallel passage next to be considered, translates the word as both footprint and footstep.

This text, in Chumayel, recounts in recondite language the creation of the uinal before the sun first rose. It forms one of the mysteries of Maya religion:

> These were their words as they marched along, when there was [as yet] no man. Then they arrived there in the east and began to speak, "who has passed here? Here are footprints. Measure it off with your foot." So spoke the mistress of the world. Then our Lord God the father measured his footstep. This was the reason of his ordaining the count of the whole world by footsteps on 12 Oc. This was the setting in order, after it had been given life by the action of 13 Oc, after his feet were joined evenly, after they had departed there in the East.

The above translation is based on that of Roys, but with certain amendments which have been approved by him. There follows a description of the birth of the uinal in the era before the first dawn, and then the 20 days which follow 13 Oc are listed in order with some detail of the creation assigned to each day. The fact that the interval from 12 Oc to 13 Oc is 40 days, taken in conjunction with the fact that *oc* means foot or footstep and the whole text is full of the word *oc,* is surely significant. One footstep or pacing off was taken before the uinal was created. The simile, of course, is in keeping with the Maya concept of time being carried on the backs of gods. Apparently the same imagery of measuring by paces was applied in some way to the katun. In the series of prophecies for the tuns of a Katun 5 Ahau in Tizimin (p. 13) there is a statement in the text dealing with the twentieth tun of the katun: "13 Oc would be the day when the katun is measured by paces" (*u chek oc katun*). This is 70 days before the end of the katun, and I see no way to reconcile this with a 40-day arrangement, which would lead to a day 5 Ahau, but it may not be coincidence that 13 Oc marks the termination of the measuring before the birth of the uinal.

Roys, who translates the above, calls my attention to a confused passage on Perez 151–52, where the colonial fallacy of a katun starting on the day after a Cauac year bearer is rehashed. The table which follows this indicates that the katun was paced off from the day Oc immediately preceding the day on which it begins (for these 24-year katuns are named for the days on which they start). I do not believe that either of these arrangements is correct, but they are evidence that in some way the katun was paced off, just as the years were divided into periods of 40 days. The present-day Maya of British Honduras use *oc* in the sense of "last chance"; *oc pak* is the last chance to sow before the rains. I do not know if there is any connection with the calendarial use of *oc.*

OTHER SHORT CUTS IN RECKONING

There must have been a number of other "rules" of the calendar, of which the Maya priest was cognizant; many of them would probably have been of more value to the priests of the Initial Series Period than to those of the period before the Spanish conquest. For example:

1. The coefficient of a half-katun is one less than the preceding katun, e.g. 9.15.0.0.0 4 Ahau, 9.15.10.0.0 3 Ahau.
2. The coefficient of a 5-tun date is seven less than that of the preceding katun, and that of a 15-tun date is eight less, e.g. 9.15.0.0.0 4 Ahau, 9.15.5.0.0 10 Ahau, 9.15.15.0.0 9 Ahau.
3. Any Ahau date repeats as the end of a 5-tun division after 3.5.0.0, e.g. 9.15.0.0.0 4 Ahau, 9.18.5.0.0 4 Ahau.
4. At the end of each tun the month position is five days less than at the preceding tun, e.g. 9.15.0.0.0 4 Ahau 13 Yax, 9.15.1.0.0 13 Ahau 8 Yax.
5. With the passage of a half-katun the month position drops 50 places, and at the end of a katun it has receded 100 places (five months less), e.g. 9.15.0.0.0 4 Ahau 13 Yax, 9.15.10.0.0 3 Ahau 3 Mol, 9.16.0.0.0 2 Ahau 13 Zec.

Formulae for reckoning the age of the moon and the position of the planet Venus over long periods have been indicated in the chapters dealing with those subjects. There is a good body of evidence that the Maya purposely recorded the glyph of the current lord of the night to denote the LC position of a CR date within the span of slightly over 23 katuns (p. 211).

WORLD DIRECTIONS AND COLORS

The great attention paid to the four quarters of the world, and the association with them of colors, is typical of all the high cultures of Mexico and Middle America, and not improbably represents a local development of Old World cosmology.

It is very definitely established that at the time of the Spanish conquest the associations in Yucatan of year bearers, colors, and world directions were as follows:

Year bearer	*Direction*	*Color*
Kan	East (*Likin*)	Red (*Chac*)
Muluc	North (*Xaman*)	White (*Zac*)
Ix	West (*Chikin*)	Black (*Ek*)
Cauac	South (*Nohol*)	Yellow (*Kan*)

The directional names in parentheses are those most commonly used in Yucatan. *Likin* means sunrise; *chikin* may perhaps be a contraction of *chinkin*, "lowering of the sun"; the derivation of *xaman* is unknown; that of *nohol* is almost as elusive. *Nohol* means the greater or greatest and is a superlative form derived from *noh*, "great." From what we know of Maya cosmology we can be reasonably sure that the south was not the most important direction. However, *noh* also means the right hand or on the right hand, and in several languages the right hand is the "big" or important hand; the left, the less important (cf. Kekchi: *chi tze*, "left"; *chi nim*, "right"). I am inclined to think the south originally was called "on the right hand," and this it would be when one faces the east, which to the Maya is the most important direction. Indeed, east is at the top of the two native maps accompanying the land treaty of Mani (Roys, 1943, p. 184). I am aware that this interpretation is opposed to Seler's, based on the Palmo vocabulary of Nahuatl which assigns the left hand to the south, but I offer it as a matter worth investigating. Another possibility is offered by the Moran vocabulary of Chol. South is listed as *nool*, to which the meanings "very bad" and "headache" are also given. Father Moran frequently omits light aspirates (e.g., *no*, "great"), and it is accordingly evident that *nool* and *nohol* are the same words, and may indicate "very evil." As the south was ruled by the god of death and as Cauac years were calamitous, there was every reason for regarding the south as evil. I prefer the meaning of right for *nohol*, but that does not necessarily preclude the Manche Chol analogy.

Andrade (1946) gives the Lacandon term for south as *yaram k'in*, the Yucatec equivalent of which would be *yalam k'in*, "below the sun"; Blom and La Farge (1926–27, p. 477) list as a Tzeltal term for that direction *nitaa lan*, "here below." Wirsing (1930) gives the Kekchi for south as *sacque*, the name for the sun. Such descriptive terms presumably refer to where the sun is at midday except for the time when it is north of the zenith in midsummer.

In some Maya languages north also bears a descriptive name, such as "from here the water," in reference to the cold northers which make life so unpleasant in the winter, but in the Moran vocabulary of Manche Chol north is given as *no ec*, which is probably meant for *noh ek*, "great star," presumably a reference to the pole star or perhaps the great bear.

Maya names for east and west generally mean sunrise and sunset, but Moran gives the Manche Chol word for east as *tzatzibcin*, and that may indicate something like "where the sun gets strength," and perhaps refers to the clothing of the sun with flesh on its departure from the underworld (p. 173).

Charency (1899) has collected linguistic material on this subject, and a great deal more is available. Unfortunately, these linguistic terms are of little help in interpreting the directional glyphs. The associations of gods and year bearers with directions have been discussed by various writers, and as I have covered that ground at some length

(Thompson, 1934), I shall not enter into detail. There are, however, a number of points still unsettled, notably:

1. Seler and I have supposed that the directions north and south and their corresponding colors have been transposed on Dresden 26 and 28, corresponding to Caban-Etz'nab and Manik-Lamat. However, it is possible that the Dresden scheme is clockwise, and represents a regional variation from the counterclockwise arrangement recorded by Landa.

2. Is Kan always associated with the east, or only when it functions as a year bearer, or only when it is a year bearer in the years starting with 1 Kan?

3. In the round of 20 days, does the world direction change with each day, or only at each fifth day?

4. At the time Akbal was the year bearer, was it, as the first of the year bearers, associated with the east, or with the south, or did it rotate?

5. Madrid 75–76, as previously noted, assign the weekly divisions of the 260-day cycle to world directions. In the rectified arrangement of the center, Akbal is set to the east, together with days at intervals of four days therefrom. Can this double page have been copied without alteration from some other codex which conformed to the Akbal set of year bearers? Whether that be the case or not, the arrangement does suggest that to each sequent day was reserved a different world direction. On the other hand, in the late and degenerate Kaua, Kan to Lamat are set to the east, Muluc to Ben are to the north, and so with the other divisions of the 20 days. I believe this wheel, made toward the close of the eighteenth century, does not mirror true usage. Indeed, it assigns Katuns 2 Ahau, 13 Ahau, and 11 Ahau to the east, contradicting in that respect also the views of its elders and betters.

The year bearers on Paris 19–20 run Lamat, Ben, Etz'nab, Akbal. Although the glyphs of the first and third are now completely obliterated, there seems small reason to doubt that the series begins with 1 Lamat. There are no directional glyphs or colors, but the picture corresponding to Ben has the background blackened, which suggests assignment to the west.

6. It is possible that the directions of year bearers changed every 13 years. Thus when a year bearer entered with a coefficient of 1, he may have been set to the east. In that case, for 13 years Kan would be set to the east, then Muluc would enter as chief year bearer for 13 years, and would be moved to the east, Kan passing to the south. Thirteen years later, Ix would enter with 1 Ix, and would be set to the east, sending Muluc back to the south. The latter, in turn, would cause Kan to pass to the west. Finally, 1 Cauac would be supreme for 13 years in the east, thereby completing the cycle of 52 years.

Such an arrangement might account for the year bearers of Dresden starting with Ben; those of Paris with Lamat, and those of Madrid with Cauac. (But why 10 Cauac in the top line? Did the scribe start with 1 Cauac, and then, finding there was no room at the bottom of the page, add the last row of four year bearers at the top of the column on each page?) Each scribe would have started with the year bearer which had ushered in the 13-year period current when each codex was painted. That theory might also take care of the apparent mistakes in Dresden, for this could be the result of converting one sequence of year bearers to another when the new edition was prepared.

There is a passage in the account of the Ixil calendar which may supply a parallel. Lincoln (1942, p. 115) says that the Ixil recognize these four divisions of the round of 52 year bearers. The year bearer with coefficient of 1, which starts each period of 13 years, is known as *Présidente* or *Ij lenal'ki*, and "it dominates the whole period [of thirteen years] over and above the year bearer of the current year." In Yucatecan terms that would mean, for example, that in a year 11 Muluc the influence of 1 Cauac would still make itself felt, as the *"Presidente"* of the 13-year period then current. Perhaps such an arrangement accounts for the dextral circuit of the year bearers in the wheel of Ixil, for the year bearers would rotate clockwise if, at the start of each period of 13 years, the incoming year bearer replaced its predecessor at the east, for, of course, 1 Muluc as *"Presidente"* succeeds 1 Kan, which would move clockwise to the south, and is in turn replaced by 1 Ix which then would move down from north to east. Note that I am speaking of the wheel in rotation; if it is stationary, the eyes of the reader move sinistrally.

Landa's account of the year bearers is so confused that various interpretations are possible. I have given one explanation (Thompson, 1934) but the text can be read to make Muluc the year bearer to the east, which, of course, it would have been in 1553, if the suggested theory is correct, for 1 Muluc entered as *"Presidente"* in 1542. The statement in various books of Chilam Balam that the year bearer 4 Kan was set to the east in 1536 contradicts the above assumption, but that statement is itself at fault since 4 Kan was not the year bearer for that year. I am by no means convinced that there was a shift of year bearer in relation to world directions every 13 years, but I believe the possibility should be borne in mind.

I think that we can assume that during the Initial Series Period the year bearers were generally Akbal, Lamat, Ben, and Etz'nab, but that in the region (principally Campeche), where the shift of one place in month positions almost certainly took place as early as 9.12.0.0.0 (Proskouriakoff and Thompson, 1947), the Kan-Muluc-Ix-Cauac year bearers came into use at the time the shift was made. It is, accordingly, highly probable that the two sets of year bearers existed side by side for a very long period. By the time of the Spanish conquest, Yucatan had switched to the Kan set, but not improbably peoples living in much of the Central Area retained the Akbal set until the arrival of the white man. A weak explanation of why the Quiche and the Ixil may have come to use the equivalents of Ik, Manik, Eb, and Caban as their year bearers has been offered (p. 127).

I have discussed at some length (Thompson, 1934) other problems involved, and, with no better guidance than I had then, I do not now propose to venture further on those shifting sands.

The ceiba glyph and what I call the double-sky element once follow the world directions and trees (fig. 62,*4*); the latter may represent center above.

In the codices the sign for east consists of an inverted Ahau above a winged kin; the inscriptional form comprises a kin or a kin cut in half above a winged kin. Sometimes a yax, "new," prefix may be added and in such cases the kin may be infixed in the yax prefix (fig. 41,*1–9,32*). The inverted Ahau, either through carelessness or because the change did not affect the meaning, is sometimes right side up in Madrid, and it may be placed beneath the kin. It will be recalled that the inverted Ahau is one of the elements in a compound, perhaps with the meaning of sunrise, which can be substituted for the kin sign in distance numbers (p. 172). We shall probably not be far in error if we read these two forms as signifying "sun at sunrise" and "new sun," respectively. The locative *ti,* "to the east," etc., can be prefixed to all directional glyphs (fig. 41,*2*).

The glyph for west both on the monuments and in the codices is a hand over the winged kin, presumably to be read as "completion of sun or daylight" (fig. 41,*14–22,33*). One apparent glyph for west (fig. 41,*22*) seems to represent the sun with death markings, which would have a parallel meaning of end. The hand takes the form on the monuments of an upright clenched fist with kin infix, and this, when slightly eroded, is hardly distinguishable from the yax prefix of east.

The head of a god with *u* bracket before his face represents north in the codices (fig. 41,*10–13*). It is open to question whether this is really God C, as Schellhas (1904) supposed; more than one deity is probably present in the figures he grouped under the name of God C. If that is so, the god of the north may not be connected with the one with monkey features. To complicate matters further, this same head, without *u* bracket, can be assigned to all world directions and colors (fig. 41,*40,49,58,67*). In the inscriptions the glyph for north is not surely identifiable, although it would appear that a glyph on Copan A represents that direction because it follows those for east, west, and south (fig. 41,*35*). It consists of a yax prefixed to a crosshatched triangle, reminiscent of snake markings and definitely identifiable with an element sometimes occupying one of the segments of a celestial band or celestial serpent. The glyph may represent a snake, and perhaps be that of some constellation in the northern sky; our constellation Draco would qualify as such.

The glyph for south in the codices is the yax symbol with "down-balls" prefix and usually two or three little *u*'s on each side; the inscriptional form has the same affixes, but the main element is a section of shell, and small inverted Ahaus may be postfixed (fig. 41,*23–31,34,36*). The shell is the same as that used as a kin variant except that it is inverted (fig. 31,*1–8*). South was anciently associated with the god of death by both the Maya and Mexicans (Thompson, 1934), although Wisdom (1940) reports that the present-day Chorti connect death with the west. The shell, as a symbol of the underworld, fits this assignment nicely. A possible connection between yax and south has been discussed (p. 112).

Glyphs for world directions are of considerable antiquity, for they appear to be inscribed on Piedras Negras L 12 (c. 9.4.0.0.0) and, perhaps, on Tikal 18 (c. 9.4.13.0.0).

Often world-direction signs are followed by a glyph which consists of the muluc and cauac elements conjoined and surmounted with the "down-balls" prefix, (fig. 41,*6,8,20,22,29*). The muluc element here must be read as *xoc,* "count"; the cauac element represents haab "year." Taken in conjunction with the world-direction glyph, it reads "To the east (north, west, or south) the count of the year," and corresponds to the expression "The count of the year to the east" (*u xocol hab ti lakin*), which occurs in Tizimin. I have been unable to discover what governs the appearance of these glyphs. It is possible that more than one sequence is involved.

On the murals at Santa Rita there is a sequence of tuns represented as gods roped together. Beside each god is the day Ahau on which each ends; the tun ending on 13 Ahau is accompanied by the glyph for west (Gann, 1900, pl. 29, no. 5). It may be significant that the personification of that tun wears a black mark, for black is associated with the west.

Glyphs which might represent the world colors, other than color elements affixed to main elements (fig. 41,*42, 45,51,71,72,81,83–90*), have not as yet been recognized on the monuments, although they are frequent in the codices (fig. 41,*38,46,47,55,56,64,65,73,74*). That the association of colors with directions as given on page 249 holds good also for the codices is beyond question, for colors and world directional glyphs are constantly linked (fig. 62, *1,2*), but there is a possibility that yellow may have replaced green as the color for south, perhaps a regional shift or perhaps a general time change. The evidence for this is far from satisfactory, but it may be significant that the prefixes of the four months, Ch'en, Yax, Zac, and Ceh, which have the cauac sign as their main element, are those of the colors black, green, white, and red. Indeed, those color names survive in the names of the months in some languages (p. 111). Moreover, as we have just seen, yax (green) is one of the elements in the glyph for south. In the Popol Vuh (1927, pp. 219, 259) the four colors of Yucatan and the codices are given in one passage, but in another, green is substituted for yellow. In neither case are the associated directions given, but the fact that both passages treat of the four roads makes it evident that these sets of colors were assigned to world directions. It is possible that either green or yellow may have been once assigned to the center, a region almost ignored in Yucatecan sources of the sixteenth and later centuries.

Research subsequent to the writing of the above reveals that the kan cross, identified above as a symbol for both yellow and water, represents turquoise in the glyphic writing of Monte Alban, for it is prominent on the front of the *xiuhuitzolli* (the turquoise headband), which is the Zapotec symbol for the year. Moreover, an interpretation of turquoise would fit its constant use with representations of Tlaloc in the art of Teotihuacan. Turquoise was unknown or extremely rare in the region and period which witnessed the development of Maya glyphs, but I think one should give serious consideration to the possibility, suggested above, that the assignment of the south to yellow was a recent, and perhaps local, innovation. It is not impossible that when or where the surviving codices were compiled or copied, blue or green (one word covers both in Maya) was the color of the south. In that case the kan cross would represent blue or blue-green, and the symbol for yellow would be unidentified. Should that be so, the presence of the kan cross in sky bands, often beside the sign for darkness, presumably would indicate the blue sky of day; combined with the yax sign, it might indicate jade and turquoise (fig. 45,*13,14*). A symbol for blue or turquoise would naturally stand also for water.

Color names have secondary meanings in Yucatec, and probably other Maya languages, and such extended usages may be expected to occur in the glyphs. *Zac* signifies not only white, but also artificial or not what a thing seems; *zacmul* is an artificial mound, whereas *mul* may be either natural or man-made; *zacyuum* is stepfather, whereas *yuum* is father; *zacyaom* is applied to a woman who gives the appearance of being pregnant but is not so; *yaom hal* is pregnancy. There is a glyph for great fainting, *chac zac cimil* (fig. 41,*54*). Barrera Vasquez (1944) also points out that *zac* can mean pure, and is thus used in describing a sacrificial victim who had to be uncontaminated. Red and white are frequently paired in the Ritual of the Bacabs, and Roys is under the impression that the two are contrasted, red for strength and white for weakness. In a legend of the Guatemalan highlands (Redfield, 1946, p. 134) the red rain god pours from his large gourd heavy rains and storms, but the white god sprinkles from his small gourd only drizzling rain. The white prefix usually appears with the glyph of the young moon goddess (fig. 41,*50*), probably to indicate white goddess but perhaps with one of the secondary meanings of *zac,* although that of purity could scarcely be applied to that vivacious lady; red is usually prefixed to the glyph of the old clawed goddess, whom I take to be the aged moon goddess (p. 83).

The red prefix is usually found with the Venus glyph (fig. 42,*31,33*), but rarely on the monuments (fig. 54,*5*). One is reminded that one of the names for Venus was *chac ek,* "red star" or "giant star." *Yax,* in addition to meaning green or blue in nearly all Maya languages (shift to *rax* in the Guatemalan highlands), signifies new or strong, and these secondary meanings appear in the glyphs, as for instance in Yaxkin and *yaxil haab* (figs. 32,*25;* 43,*62*), and other glyphs (fig. 33,*57–60*). It is also the symbol of the Chicchan god of number 9, and the two are interchangeable (figs. 13,*17,18;* 24,*50–52,54,55;* 25,*32,34,35,46,49;* 41,*90*). The glyph for yellow also serves as a symbol for water, probably because *kan* means both yellow and precious (p. 275). Much remains to be done in elucidating the uses of color affixes in the glyphic writing.

This elaborate structure of years, katuns, and probably other periods, as well as colors, associated in rotation with world directions is in keeping with Maya mentality, which forever sought an orderly arrangement of the spiritual and material world. The periods of time and the gods who rule them change positions in ordained succession and, completing their rounds, return to their original places like participants in a square dance or a set of lancers.

TABLES OF MULTIPLES OF THIRTEEN

In the second half of Dresden are given the 4, 5, 6, and 7 × 13 tables, and another table lists multiples of 54. The tables are constructed to reach 260 days or one of its multiples, and usually continue with multiples of that figure in the vigesimal system; the exception to this rule, multiples of 19 × 780, is perhaps due to an error in computation. At first glance the tables appear to have been constructed by simple addition, that is to say the scribe would have obtained, for example, 1.9.6. (546) as the total for 7 × 78 by adding 3.18 (78) to 1.5.8 (468), the total for 6 × 78 given in the adjacent column. That, however, cannot have been the case, for in that event errors, which are not unusual, would have been repeated through the higher entries in the table. Occasionally, a dot is dropped or added, and that might be due to the carelessness of the copyist who prepared the present edition of the codex, but the omission or addition of 260 days in one total is not repeated in higher multiples. The possibility that such additions or omissions were intentional must not be overlooked, but I think that if the explanation I shall offer for the use of these tables is correct, omissions or additions would throw everything out of gear.

Most of the tables are preceded by one or more IS, which are counted from bases short distances before 13.0.0.0 4 Ahau 8 Cumku. At the base or to the side of each IS is a short distance number, the kins (exceptionally the uinals too) of which are enclosed in a circle with a knot at the top, apparently to indicate subtraction. Robert Willson coined the term "ring number" to designate distance numbers of this type. For instance, there is a ring number on page 43b (fig. 64,2). The whole, with the IS, can be transcribed as follows:

13. 0. 0. 0. 0	4 Ahau (8 Cumku)
17.12	Ring number. *Subtract*
(12.19.19. 0. 8)	3 Lamat (1 Uayeb)
9.19. 8.15. 0	*Add*
(9.19. 7.15. 8)	3 Lamat (6 Zotz')

Data in parentheses do not appear in the codex. The dates reached by the IS are those which form the bases of the adjacent tables. Thus the table which follows the IS given above has 3 Lamat as its base. Month positions are not given in the tables, presumably because the latter could be used at different places in the LC and they are also generally absent in the IS.

Each table has its particular day or days for its *lub* just as we found that 1 Ahau was the *lub* of the Venus table. The tables with their days and the pages on which they occur are as follows:

4 × 13	13 Chicchan (?)	pp. 71a–73a
5 × 13	4 Eb	73b–70c
6 × 13	3 Lamat	44b–43b
6 × 13	13 Muluc	59
7 × 13	13 Akbal etc.	32a–31a
7 × 13	13 Oc	45a
7 × 13	13 Akbal, 3 Chicchan	64c–63a
6 × 9	9 Ix	71a–73a, 71b–70a

The 4 × 13 table is presented in a most unusual manner, for it is grafted on the first part of the 6 × 9 table. This was a fairly simple matter to arrange because 52 (4 × 13) is only two less than 54 (6 × 9). It was achieved by placing a ring number under each multiple of 54, each ring number being two greater than the preceding one. As, however, the basal date of the 54-day table was 9 Ix, and the desired basal date of the 4 × 13 table was 13 Chicchan, the ring number of the first entry is 11. The first five entries of the table are reached as follows:

9 Ix + 54 = 11 Lamat.	Subtract ring number 11 = 13 Caban
11 Lamat + 54 = 13 Ik.	Subtract ring number 13 = 13 Muluc
13 Ik + 54 = 2 Cib.	Subtract 13 + ring number 2 = 13 Imix
2 Cib + 54 = 4 Oc.	Subtract 13 + ring number 4 = 13 Ben
4 Oc + 54 = 6 Kan.	Subtract 13 + ring number 6 = 13 Chicchan

The entries continue thus until 12 × 52 is reached, at which point the 4 × 13 table ends. The entries can be transcribed as:

1 × 52 = 52
2 × 52 = 104
3 × 52 = 156
4 × 52 = 208
5 × 52 = 260
6 × 52 = 312
7 × 52 = 364
8 × 52 = 416
9 × 52 = 468
10 × 52 = 520 (2 × 260)
11 × 52 = 572
12 × 52 = 624

The 5 × 13 table on pages 73b–70c is longer and more complicated. The multiples are in sequence as far as 28 × 65, which is the same as 7 × 260 or 5 × 364. Then follow 14 × 260 and 21 × 260. The next step, 28 × 260, which is the same as 20 × 364 (20 computing years, p. 256), is missing, but the following entries are all multiples of 1.0.4.0 (20 computing years). The entries are:

65 =	1 ×	65		
130 =	2 ×	65		
195 =	3 ×	65		
260 =	4 ×	65		
325 =	5 ×	65		
390 =	6 ×	65		
455 =	7 ×	65		
520 =	8 ×	65		
585 =	9 ×	65		
650 =	10 ×	65		
715 =	11 ×	65		
780 =	12 ×	65		
845 =	13 ×	65		
910 =	14 ×	65		
975 =	15 ×	65		
1040 =	16 ×	65		
1105 =	17 ×	65		
1170 =	18 ×	65		
1235 =	19 ×	65		
1300 =	20 ×	65		
1365 =	21 ×	65		
1430 =	22 ×	65		
1495 =	23 ×	65		
1560 =	24 ×	65		
1625 =	25 ×	65		
1690 =	26 ×	65		
1755 =	27 ×	65		
1820 =	28 ×	65;	7 × 260;	5 × 1.0.4
3640 =	56 ×	65;	14 × 260;	10 × 1.0.4
5460 =	84 ×	65;	21 × 260;	15 × 1.0.4
14560 =	224 ×	65;	56 × 260;	2 × 1.0.4.0
21840 =	336 ×	65;	84 × 260;	3 × 1.0.4.0
29120 =	448 ×	65;	112 × 260;	4 × 1.0.4.0
36400 =	560 ×	65;	140 × 260;	5 × 1.0.4.0
43680 =	672 ×	65;	168 × 260;	6 × 1.0.4.0
50960 =	784 ×	65;	196 × 260;	7 × 1.0.4.0

58240 =	896 × 65;	224 × 260;	8 × 1.0.4.0 (uinals written 10)
65520 =	1008 × 65;	252 × 260;	9 × 1.0.4.0
72800 =	1120 × 65;	280 × 260;	10 × 1.0.4.0 (0 kins omitted)
87360 =	1344 × 65;	336 × 260;	12 × 1.0.4.0 (added in red; 0 kins omitted)
94640 =	1456 × 65;	364 × 260;	13 × 1.0.4.0
109200 =	1680 × 65;	420 × 260;	15 × 1.0.4.0

There is a final entry, written 1.0.12.3.0 (?), which is obviously in error. It should perhaps be 1.0.4.8.0, which is 14,5600 (2240 × 65; 560 × 260; 20 × 7280).

The 6 × 13 table is given on pages 44b–43b of Dresden. It is connected with the IS and ring number transcribed above, with 9.19.7.15.8 3 Lamat 1 Zotz' as the base. The arrangement (fig. 64,*2,3*) is:

78 =	1 × 78			3 Cimi
156 =	2 × 78			3 Kan
234 =	3 × 78			3 Ik
312 =	4 × 78			3 Ahau
390 =	5 × 78			3 Etz'nab
468 =	6 × 78			3 Cib
546 =	7 × 78	6 × 91		3 Ix
624 =	8 × 78			3 Eb
702 =	9 × 78			3 Oc
780 =	10 × 78;	3 × 260		3 Lamat
1560 =	20 × 78;	6 × 260		3 Lamat
2340 =	30 × 78;	9 × 260		3 Lamat
3120? =	40 × 78;	12 × 260 (written 9.7.0; 13 × 260)		3 Lamat
3900 =	50 × 78;	15 × 260		3 Lamat
7800? =	(100 × 78;	30 × 260)		3 Lamat
or				
13260? =	(170 × 78;	51 × 260)(written 1.16.2.0; 50 × 260)		3 Lamat
15600 =	200 × 78;	60 × 260		3 Lamat
31200? =	400 × 78;	120 × 260 (written 4.5.17.0; 119 × 260)		3 Lamat
62400? =	800 × 78;	240 × 260 (written 9.13.6.0 for 8.13.6.0)		3 Lamat
72800 =	.... ;	280 × 260;	200 × 364	3 Lamat
109200 =	1400 × 78;	420 × 260;	300 × 364	3 Lamat
131040 =	1680 × 78;	504 × 260;	360 × 364	3 Lamat
151320 =	1940 × 78;	582 × 260		3 Lamat

There are in the table two apparent errors which can be rectified by the addition or subtraction of 260 days. The last four numbers are seemingly attempts to relate the 780-day period to the computing year. If that assumption is correct, the last number probably needs the addition of 6 × 260 to reach the number 1.1.4.12.0 (152,880: 1960 × 78; 420 × 364), but so many alternative rectifications are possible that one can not feel sure that the correction is justified. Indeed, it is possible that no changes in this and the other tables are required, and that in the seeming errors lie the clues to the correct application of the tables.

A second table of multiples of 78 occupies page 59 of Dresden. The *lub* is 13 Muluc. The following multiples are given:

78 =	1 × 78	
156 =	2 × 78	
234 =	3 × 78	
312 =	4 × 78	
390 =	5 × 78	
468 =	6 × 78	
546 =	7 × 78	
624 =	8 × 78	
702 =	9 × 78	
780 =	10 × 78	
2340 =	30 × 78	
3120 =	40 × 78	(written 8.13.0 for 8.12.0)
3900 =	50 × 78	
4680 =	60 × 78	(written 13.13.0 for 13.0.0)
5460 =	70 × 78	
6240 =	80 × 78	
7020 =	90 × 78	
7800 =	100 × 78	
8580 =	110 × 78	
9360 =	120 × 78	
10140 =	130 × 78	
10920 =	140 × 78	
11700 =	150 × 78	
12480 =	160 × 78	
13260 =	170 × 78	
14040 =	180 × 78	
14820 =	190 × 78;	19 × 780
29640 =	380 × 78;	2 × 19 × 780
44460 =	570 × 78;	3 × 19 × 780
74100? =	950 × 78;	5 × 19 × 780
88920? =	1140 × 78;	6 × 19 × 780
103740 =	1330 × 78;	7 × 19 × 780
118560 =	1520 × 78;	8 × 19 × 780
133380 =	1710 × 78;	9 × 19 × 780
134160 =	1720 × 78	
138840 =	1780 × 78	
140400 =	1800 × 78	
144300? =	1850 × 78	

One wonders whether the compiler of this table intended to give the multiples of 19 × 780, for such an arrangement is quite different from that found in other multiplication tables. I would be inclined to suppose that when the number 19 × 780 (14,820) was reached, he thought he had reached 20 × 780 (15,600), and proceeded to multiply 14,820 by 2, 3, 5, 7, 8, and 9 under the mistaken impression that he was recording 20, 40, 60, 100, 140, 160, and 180 × 780. However, it must be borne in mind that other tables show no evidence of having been composed in that manner, for mistakes do not repeat, and one must not ignore the possibility that 14,820 is the key number, and a reasonable explanation for it may yield an entirely new interpretation of the table. The explanation, however, must be reasonable and not a forced interpretation offered only because it agrees with the correlation its author supports.

Tables of multiples of 91 and 364 days are given on Dresden 31a–32a, 45a, and 63–64. They are imperfect, owing both to wear and to mistakes by the Maya scribe, probably through hasty copying from an earlier edition of the codex. The computations are reproduced in figures, obliterated material being restored in dotted outline. The totals are added in Arabic figures. Readings and restorations do not differ materially from those made by other students. They are discussed in some detail, so that the reader may follow their arrangement, which is in general that observed by all the tables.

In the first case (fig. 46,*17*) the calculations, based on the day 13 Akbal, start at the bottom right corner of the right upper half of page 32a, and read as is the usual, but not the invariable, custom in these tables, right to left. After four places the table passes to the right of the upper horizontal row and, on reaching the left of that row, it continues leftward from the bottom right corner of the left half of the page as far as the right column of page 31a (four places). It then follows the second, third, and fourth horizontal rows in the same manner from right to left. Only the zero kins of the first two numbers of the fourth row remain. The series starts with 91 and its multiple up to 1001 (11 × 91). The fourth and eighth multiples (364 and 728) are omitted from this first part of the table, and placed instead at the start of the second half of the table, where, as units in the 364-day count, they more correctly belong. The calculations, restored, corrected, and rearranged to conform to our method of transcribing tables, are:

Days		
91	= (1 × 91)	
182	= (2 × 91)	
273	= (3 × 91)	
455	= (5 × 91)	
546	= (6 × 91)	
637	= (7 × 91)	
819	= (9 × 91)	
910	= (10 × 91)	
1001	= (11 × 91)	
364	= (1 × 364)	
728	= (2 × 364)	
1092	= (3 × 364)	
1456	= (4 × 364)	
1820	= (5 × 364; 7 × 260)	(zero transposed)
3640	= (10 × 364)	
5460	= (15 × 364)	
7280	= (20 × 364)	or 1 unit of second order
14560	= (40 × 364)	or 2 units of second order
21840	= (60 × 364)	or 3 units of second order
29120	= (80 × 364)	or 4 units of second order
36400??	= (100 × 364)	or 5 units of second order
72800??	= (200 × 364)	or 10 units of second order
109200??	= (300 × 364)	or 15 units of second order
145600??	= (400 × 364)	or 1 unit of third order

Beneath the right of the table the 20 days are arranged to read from right to left and top to bottom in five horizontal rows of four glyphs each. The series starts with 13 Ix, which is 91 days after 13 Akbal (the *lub* of the series), and proceeds horizontally through 13 Chicchan, 13 Cib etc. (i.e. at intervals of 91 days). If the columns are read vertically, the intervals are 364 days (i.e. 104 days plus one round of the 260-day cycle). On reaching the end of a horizontal line, one passes to the right edge of the row below. Since the counts are re-entering, the last glyph of the table, that is the one in the bottom left corner, is 13 Akbal, the *lub,* from which a new count starts. In vertical reckoning one passes from bottom to top of each column.

As an example of how the table can be used, let us suppose that one wishes to count 819 days from 13 Akbal. The table shows this to be 9 × 91. To get the correct day sign, count forward nine places horizontally from the starting point (always one step horizontally for each 91 days; one step vertically for each 364 days). Nine places forward will carry to the first (right) glyph of the third column, the day 13 Ik. Accordingly, 13 Akbal + 819 = 13 Ik. Similarly, to reckon forward 11 × 364 + 2 × 91 from 13 Ahau count 11 spaces vertically from 13 Ahau to reach 13 Kan, and then two spaces horizontally: the answer is 13 Cimi. The numeral 13 can naturally be replaced by any other number in making the calculation. The same sum added to 4 Ahau will lead to 4 Cimi.

The table at the top of Dresden 45 handles only multiples of 364 days. The top line is almost entirely obliterated, but its restoration as given below conforms to the pattern of the table. The multiples are: 1, 2, 3, 4, 5, 10, 15, 20?, 40, 60, 80, 100?, 200?, 300?, and 400. On the left is an IS 8.17.11.3. (0) and a ring number of 1.10 which together lead to 13 Oc (3 Mol), indicating that that day is the base of the table. Beneath 2 × 364 stands 13 Etz'nab, which is 728 days from 13 Oc. Beneath 3 × 364, 4 × 364, and 5 × 364 stand respectively 13 Ik, 13 Cimi, and 13 Oc, which are those distances from the base. The last is a repetition of the *lub* of the table because 5 × 364 = 7 × 260. The day 13 Ix, reached by an addition of 364 days, is not found at the right of the row because for some reason 364 days is not in the bottom division of the table, but occurs on the right of the second division.

A multiplication table, formed in the same way by additions, occupies the whole of Dresden 64 and the right half of 63. It starts at the bottom of page 64, to be read from right to left, and then passes to the right edge of the second division of the table. The multiples are:

91	= (1 × 91)
182	= (2 × 91)
273	= (3 × 91)
364	= (4 × 91; 1 × 364)
455	= (5 × 91)
546	= (6 × 91)
637	= (7 × 91)
728	= (8 × 91; 2 × 364)
819	= (9 × 91)
910	= (10 × 91)
1001	= (11 × 91)
1092	= (12 × 91; 3 × 364)
1183	= (13 × 91)
1274	= (14 × 91)
1365	= (15 × 91)
1456	= (16 × 91; 4 × 364)
1547	= (17 × 91)
1638	= (18 × 91)
1729	= (19 × 91)
1820	= (20 × 91; 5 × 364)
3640?	= (10 × 364)
5460	= (15 × 364)
7280	= (20 × 364)
14560	= (40 × 364)
21840	= (60 × 364)
29120	= (80 × 364)

36400?	=	(100 × 364)
72800?	=	(200 × 364)
109200	=	(300 × 364)
145600	=	(400 × 364)

Beneath the calculations are five sets of glyphs, spaced (right to left) at intervals of 91 days, as far as the column giving 5 × 364. Beyond this the same date repeats, since 5 × 364 and its multiples are divisible by 260. The starting points of the calculations are 3 Chicchan, 3 Kan, 3 Ix, 3 Cimi, and 13 Akbal. These are precisely the days reached by the so-called serpent numbers, on pages 61 and 62, which precede this table.

THE COMPUTING YEAR

In a previous paper (Thompson, 1941c) I have discussed the possible use of multiples of 364 days for rapid computation of dates, and I have shown how with pebbles or something of that nature, perhaps even a mechanism approaching a simple abacus, it is easy to calculate positions in the Maya calendar with great rapidity. This is so because in all reckonings in 364 days and its multiples the day number remains unchanged. The addition of 364 days involves only two changes: moving four places in the list of day names and subtracting one day from the month position:

9.17.0.0.0	13 Ahau 18 Cumku
1.0.4	*Add*
9.17.1.0.4	13 Kan 17 Cumku
1.0.4	*Add*
9.17.2.0.8	13 Lamat 16 Cumku

Twenty of these years of 364 days, which I have called computing years, are handled with greater ease, for the addition of 20 × 364 involves no change in the day, and merely the subtraction of one month:

9.17.0.0.0	13 Ahau 18 Cumku
1.0.4.0	(20 × 364)
9.18.0.4.0	13 Ahau 18 Kayab

In subtraction one reverses the processes, adding the same amounts instead of subtracting them. For example, one wishes to find the CR date corresponding to 9.16.12.5.17 and one knows the date 9.10.10.0.0 13 Ahau 18 Kankin. Add six of the 20 computing years (subtracting six months), and then add one computing year (advancing the day sign four places, and subtracting the day from the month position):

9.10.10.0.0	13 Ahau 18 Kankin
6. 1.6.0	(6 × 20 × 364)
9.16.11.6.0	13 Ahau 18 Mol
1.0.4	(364)
9.16.12.6.4	13 Kan 17 Mol

The calculation has overshot the mark by seven days. These can be readily subtracted in one's head, and the answer 6 Caban 10 Mol thereby obtained.

For a fuller examination of this method of computing the reader is referred to the paper already cited. Nevertheless, it appears probable that these tables of multiples of 91 and 364 days have some further use in addition to that of serving as ready reckoners. That other purposes are involved is, I think, indicated by three factors: the association with IS; the presence of various bases for counting, such as 13 Oc, 13 Akbal, 3 Chicchan; and the presence of three such tables in the codex where one would have sufficed had simple computations been the only factor involved.

There is another use for this table, although I would not regard it as of primary importance. The 5 × 13 table has all the simple multiples until it reaches 28 × 65, which is 1820. Thenceforward 1820 is the multiplicand. Similarly the 78 table on pages 44b–43b switches in its higher numbers to multiples of 364. Accordingly, tables of multiples of 364 could have served for calculating over long intervals positions in the 5 × 13 and 6 × 13 tables.

There may be a reference to the computing year on Tikal Alt 5, where the last date, 9.13.19.16.9 1 Muluc 2 Kankin, is exactly 20 computing years after the date 9.12.19.12.9 1 Muluc 2 Muan, which opens the inscription. The former is followed by a completion sign of the hand type, another hand, and a head.

SIX TIMES NINE MULTIPLICATION TABLE

This table starts on Dresden 71a and proceeds, unlike other tables, to the right, as far as page 73a, where 12 × 54 is reached. It then passes to page 71b and continues from left to right as far as page 70b, whence it passes to 71a, and ends at 70a. An odd high number (20 × 13 × 54), apparently omitted by mistake, is inserted on the right of page 73a. The arrangement is:

54	=	1 × 54
108	=	2 × 54
162	=	3 × 54
216	=	4 × 54
270	=	5 × 54
324	=	6 × 54
378	=	7 × 54
432	=	8 × 54
486	=	9 × 54
540	=	10 × 54
594	=	11 × 54
648	=	12 × 54
702	=	13 × 54
1404	=	2 × 13 × 54
2106	=	3 × 13 × 54
2808	=	4 × 13 × 54
3510	=	5 × 13 × 54
4212	=	6 × 13 × 54
4914	=	7 × 13 × 54
5616	=	8 × 13 × 54

6318 =	9 × 13 × 54		
7020 =	10 × 13 × 54;	27 × 260;	1 × 7020
14040 =	20 × 13 × 54;	54 × 260;	2 × 7020
28080 =	40 × 13 × 54;	108 × 260;	4 × 7020
42120 =	60 × 13 × 54;	162 × 260;	6 × 7020
56160 =	80 × 13 × 54;	216 × 260;	8 × 7020
70200 =	100 × 13 × 54;	270 × 260;	10 × 7020
84240 =	120 × 13 × 54;	324 × 260;	12 × 7020
98280 =	140 × 13 × 54;	378 × 260;	14 × 7020
112320 =	160 × 13 × 54;	432 × 260;	16 × 7020
126360 =	180 × 13 × 54;	486 × 260;	18 × 7020
140400 =	200 × 13 × 54;	540 × 260;	20 × 7020
154440? =	220 × 13 × 54;	594 × 260;	22 × 7020
168480? =	240 × 13 × 54;	648 × 260;	24 × 7020

The basal date of the table is 9 Ix. It requires 7020 days to recover this *lub*.

INITIAL SERIES ASSOCIATED WITH THE TABLES

Initial Series, together with their ring numbers (p. 253), are associated with all the tables, except the short one of 4 × 13, which, as noted, was seemingly an afterthought. There are errors in several of the dates, and corrections can not be safely made because month positions are usually omitted.

In some cases the number to be added is a multiple of the basic number handled in the adjacent table, but I am far from sure that the numbers were deliberately chosen because they were multiples of the basic multiple; they may well possess those properties through coincidence. Thus one of the dates associated with the 780-day table (p. 43b) has already been transcribed (p. 253). The addition (1,435,980 days) is 1841 × 780 and 3945 × 364.

With the table of the 364-day computing year on pages 32a–31a there are three IS, two of which are multiples of 364 days:

13. 0. 0. 0. 0	4 Ahau 8 Cumku
6. 1	Ring number. *Subtract*
12.19.19.11.19	(13 Cauac) 7 Ceh
8.16.14.15. 4	*Add*
8.16.14. 9. 3	13 Akbal (16 Pop)
13. 0. 0. 0. 0	4 Ahau 8 Cumku
17	Ring number. *Subtract*
12.19.19.17. 3	(13 Akbal) 11 Kayab
8.16. 3.13. 0	*Add*
8.16. 3.12. 3	13 Akbal (11 Yaxkin)

The first addition (1,272,544 days) is 3496 × 364; the second (1,268,540 days) is 3485 ×364. The third IS contains mistakes, but can be restored because it is repeated on page 63. It has the largest ring number in the codex, 7.2.14.19 (51,419 days). It is not divisible by 364.

It is far from clear what objectives the Maya astronomer-priests had in picking the bases for these sundry tables. A ring number to reach the *lub* of the table immediately before 4 Ahau 8 Cumku is understandable, but why should they have used a ring number of over 50,000 days? Presumably the date far in the past thus reached had certain ritualistic or astrological values, which it is our business to discover. It has been claimed that the additions represent multiples of planetary revolutions, but over such long distances one can reach agreement between the number and the revolution of a planet by juggling the figures below the decimal point of the mean synodical revolution of a planet. I myself do not believe that the tables have to do with the revolutions, synodical or sidereal, of planets.

One might suppose that these tables of 4, 5, 6, and 7, times 13 and of 6 times 9 were used only as ready reckoners. That is surely one of their purposes but, in all probability, not the only one, for in that case there would be no apparent need for the sundry IS which introduce them.

PLANETARY TABLES?

Several students of Maya astronomy have supposed that these tables are connected with the revolutions of the more conspicuous planets. Teeple, on the other hand, has expressed his doubts as to the validity of that assumption. Because of the very close approximation of the synodical revolution of Mars (779.936 days) to 780, Willson (1924) was convinced that the two tables of multiples of that number referred to that planet, and on that conviction he largely based his correlation. He took the date 9.19.7.15.8 3 Lamat 6 Zotz', and assumed that one of the subdivisions (19 + 19 + 19 + 21) in the divinatory almanac connected with the table gave an important position of Mars.

In the correlation, as he finally developed it from the Venus and eclipse tables with the supposed Mars table as a check, Mars was in conjunction with the sun 39 days after the date 3 Lamat 6 Zotz'; and, as this was within one day of one of the subdivisions of the table, Willson regarded it as of great significance. He seemingly did not realize that there are no less than 40 subdivisions of the 780-day period, and, except in the case of 3 Lamat, there is no reason to suppose that any one of them would be of outstanding significance in a Mars pattern. This was, indeed, strange reasoning. In the Venus table the important dates are 1 Ahau, the *lub,* and dates at intervals of 584 days therefrom. In this table 3 Lamat is the *lub,* and should by analogy coincide with the most important point in the revolution of Mars, if the table does in fact deal with that planet. Dates 19, 38, 57, 78, 97, . . . and 759 days later can hardly be more than of minor importance. The huge number of subdivisions of the period, patterned in regular intervals, must make one very suspicious of any planetary association.

Mrs. Makemson (1943, p. 243) shares Teeple's uncertainty as to the use to which the multiples of 780 are to be put. Spinden (1942, p. 43) believes that the 3 Lamat table refers to Jupiter. He points out that the IS 9.19.8.15.0 (1,435,980) represents 3600 synodical revolutions of Jupiter. The revolutions would average 398.883 days as against the true average of 398.867. One must beware, however, of the long arm of coincidence; division of large numbers by small numbers allows of much unconscious manipulation. Actually, 3600 average revolutions of Jupiter amount to 79 days less than the IS. Naturally, no one supposes that the Maya had measured Jupiter's synodical revolution so accurately that they were able to calculate its length to their equivalent of the third decimal point. On the other hand, one must use great care in assigning a table to a planet and one is not justified in doing so on the grounds that the IS is divisible by an approximation to the true length of a planet. A shift in the supposed Maya calculation of the length of the revolution by only one-tenth of a day would make a difference of 360 days in this calculation.

The second table, on page 59, of multiples of 78 and 780 has been interpreted by Willson as pertaining to Mars; Spinden assigns it to Saturn. In an unpublished manuscript of another student the case is presented for regarding this as a table to be used in connection with the revolutions of Jupiter, and the 780-day table on pages 44–43 with Mercury. It must be remembered that some of these are attempts to fit those tables into correlations regarded by their authors as proved.

It is almost inconceivable that there could be 40 points, such as conjunction, opposition, stationary points, and heliacal rising and setting, in the synodical revolution of Mars which could be reflected in the formalized pattern of subdivisions of the 780-day period. The possibility that any planet other than Mars could be associated with the table is even less, for one would have to seek some number that is a multiple of 78 or 780 and is also divisible by the average synodical revolution of the planet in question. It would then be necessary to account in terms of astronomy for the scores, perhaps hundreds, of subdivisions which would be produced by the intervals of 19, 19, 19, and 21 days, into which every 78 days is divided.

It would seem, then, highly improbable that the 780-day table refers to Mars, and even more improbable that it refers to any other planet. The same is even more certain so far as the other tables are concerned, for none has a basic number close to the synodical revolution of any planet. Furthermore, none of the glyphs found in the planetary bands is prominent in any of the multiplication tables, yet the introductory page to the Venus table displays massed Venus glyphs, and with the eclipse table prominence is given to solar and lunar glyphs.

FARMERS' ALMANACS?

If these tables do not concern planets, of what do they treat? The head of an animal with a prominent snout which is bent back accompanies 3 Lamat at the head of the 780-day table. The four pictures of the almanac on pages 44b–45b, which is clearly to be read with the table, show this animal hanging from planetary bands, and its glyph stands above each picture (fig. 64,*3*,*4*).

The animal has cloven hoofs, drawn with great clarity in all four pictures. Tozzer and Allen (1910, pp. 351–53) identify it as a peccary. Seler (1902–23, 4: 549–52), remarking that the pictures evade zoological determination, calls attention to the parallel passage on Madrid 2, where these same beasties are given human hands which hold axes and, in one case, what may be a torch. Glyphic elements in both texts include axes and reversed comb elements. Eight of the animals are distinguishable on page 2, and there may have been more on page 1. They form a divinatory almanac, the visible intervals of which are 19 and probably 21 days. There are good grounds for supposing that they are closely associated with rain, for alternate pictures are streaked with falling rain, and the adjacent texts—in fact, the whole of this section of Madrid—have a markedly pluvial character. In Madrid the bodies are covered with crosshatched patches, circular to oval in shape, which are the characteristic markings of snakes. Furthermore, the upturned snouts are usually diagnostic of snakes or crocodiles in Maya symbolism. Lastly, this same beast reappears on Dresden 68a in a section clearly dealing with rain. The skies, from which it is pendent, pour streams of rain on the seated maize god, who holds the Kan-Imix sign; the flanking pictures are also rain-swept. His glyph appears elsewhere only on Dresden 71a and 72a, and in both cases the compartment is filled with falling rain, and the axe is prefixed to the glyph. There are, accordingly, good grounds for believing that this beast is a symbol of rain or, conceivably, of some planet or constellation regarded as a sender of rain.

With each creature there are six glyphs which in a number of cases parallel those found with the 6 × 9 and 5 × 13 table and which, as we shall see (p. 260), probably treat of agricultural activities, particularly the planting and germination of the crops. They probably denote, too, days which are unfavorable for such activities.

It would seem, therefore, that the pendent beasts and the glyphs above them together indicate the weather and general agricultural prospects for the days associated with each of the four divisions they occupy. These, with their intervals of 19, 19, 19 and 21 days, have the following pattern when fully expanded:

9 Manik + 19	2 Cimi + 19	8 Chicchan + 21	3 Cimi + 19
9 Chicchan	2 Kan	8 Akbal	3 Kan
9 Akbal	2 Ik	8 Imix	3 Ik
9 Imix	2 Ahau	8 Cauac	3 Ahau
9 Cauac	2 Etz'nab	8 Caban	3 Etz'nab
9 Caban	2 Cib	8 Men	3 Cib
9 Men	2 Ix	8 Ben	3 Ix
9 Ben	2 Eb	8 Chuen	3 Eb
9 Chuen	2 Oc	8 Muluc	3 Oc
9 Muluc	2 Lamat	8 Manik	3 Lamat

The arrangement is not that of a simple divinatory almanac, but of a triple one. If rain, let us suppose, was to be expected on a certain 3 Lamat or on 9 Manik, 19 days later, the same expectations would not be in order for the following appearance of 3 Lamat or 9 Manik; three cycles of 260 days would have to pass before the same conditions would recur. To judge by page 2 of Madrid, rains should occur on days in the columns of 9 Manik and 8 Chicchan because those panels are filled with falling rain; thunderstorms, perhaps with little or no rain, might be expected on days in the columns of 2 Cimi and 3 Cimi because the symbols of thunder and lightning are present, but rain is not pictured.

One might ask what purposes the multiples of 780 days and the IS serve. Let us suppose that the Maya priests are engaged in collecting all data which will throw light on the luck of the coming Katun 2 Ahau, which has the LC position 10.9.0.0.0. The priests know that 2 Ahau is a day on which, let us assume, no rain may be expected because it is in the 2 Cimi column, but that is true only of every third appearance of 2 Ahau. If the 2 Ahau of 10.9.0.0.0 is one of those on which no rain is to be expected, it may, let us suppose, be indicative of a katun of scant rains. The Maya priest turns to his codex. He finds the IS 9.19.7.15.8 3 Lamat 6 Zotz' as a day on which the table ends (p. 253). By the addition of 272 (3 × 78 + 38) he arrives at the 2 Ahau of the table. He then adds multiples of 780 until he reaches or passes 10.9.0.0.0:

9.19. 7.15. 8	3 Lamat	
13.12		(3 × 78 + 38)
9.19. 8.11. 0	2 Ahau	
8.13. 6. 0		(80 × 780)
10. 8. 1.17. 0	2 Ahau	
19. 9. 0		(9 × 780)
10. 9. 1. 8. 0	2 Ahau	

His calculations show him that 10.9.0.0.0 ends on a 2 Ahau, to which the luck of the 780-day table does not apply. He can disregard that aspect of the day in preparing his Jeremiad for the current katun. The tables, of course, could be used for predictions of much less importance, such as those of days suitable or unsuitable for planting, burning milpa, or fishing.

There is some confirmation of the suggested interpretation of the 780-day table as a triple almanac for predicting storms in Kaua (Maler photos 72*v*) and Perez (93–94), where there are listed series of days, against each of which is written *u syan chac,* "the birth of Chac," or "the beginning of the storm." The Kaua entries run: 9 Etz'nab, 3 Caban, 9 Cib, 3 Oc, 9 Chuen, 3 Eb, 9 Cimi, 3 Manik, 9 Ahau, 9 Imix, 9 Ik. It will be noted that the coefficients of 9 and 3 are two of those found in the 780-day table, and these two numbers are closely associated with rain or water, for the god of 3 has the Ik sign on his cheek and is patron of the day Cauac, "rain storm," and the god of 9 is the Chicchan god, the celestial water snake. Presumably the last three days have errors in their coefficients as the pattern seemingly is 9-3-9-3-9-3. One must assume that the day Lamat was omitted. With these corrections it is possible to form a 260-day cycle divided into four parts of 65 days each, the first interval being the distance from the last entry, as in the re-entering almanacs of Dresden:

+ 46	*3 Ik*	+ 6	9 Lamat	+ 13	*9 Imix*		
+ 46	*3 Manik*	+ 13	*3 Ahau*	+ 6	*9 Cimi*		
+ 46	*3 Eb*	+ 6	*9 Etz'nab*	+ 13	*9 Chuen*		
+ 46	*3 Caban*	+ 13	*3 Oc*	+ 6	*9 Cib*		

Italics represent what is given in the Kaua list (the Perez has Cib for Cimi and Tz'ib for Cib). Forty-six is not a very promising number, although the four numbers add to 78. In an expanded form, and assuming that the *u syan chac* was in the last stages of decay when these entries were made, we could get:

+ 19	*9 Etz'nab*	+ 59	*3 Caban*	+ 19	*9 Cib*	+ 59	3 Men
+ 19	9 Ix	+ 59	3 Ben	+ 19	*9 Eb*	+ 59	*3 Chuen*
+ 19	9 *Oc*	+ 59	3 Muluc	+ 19	9 Lamat	+ 59	*3 Manik*
+ 19	*9 Cimi*	+ 59	3 Chicchan	+ 19	9 Kan	+ 59	3 Akbal
+ 19	*9 Ik*	+ 59	*3 Imix*	+ 19	*9 Ahau*	+ 59	3 Cauac

This forms a triple almanac comprising 10 sections of 78 days apiece, each of which is subdivided into groups of 19 and 59 days. This is very similar to the Dresden arrangement of 10 sections of 78 days, each of which is subdivided into groups of 19, 19, 21 (=59), and 19 days. In Dresden the coefficients are reversed, running 3 Etz'nab, 9 Caban, 3 Cib, etc., since 3 Lamat, not 9 Lamat, is the *lub* of the table. The coefficients of the Kaua and Perez lists could be reversed to attain conformity with the Dresden table, although that would involve more corrections.

Of course, other reconstructions of this *u syan chac* material are possible, but I think the resemblances noted are of sufficient significance to lead us to believe that we are on the right track. It should be noted that in the Dresden table the accompanying glyphs indicate rainless storms for the column of days with coefficients of 3.

Dates given for the birth of the Chacs in the almanacs do not agree with this table, either because of mistakes in their compilation or because of the existence of more than one arrangement for predicting the birth of the Chacs. It is perfectly consonant with Maya practice for different patterns to exist, the choice being governed by the year bearer.

In both the 6 × 9 and the 5 × 13 tables certain compartments have backgrounds of falling rain, and it would, therefore, seem probable that those tables were constructed also for predicting rains, storms, and such matters. In the case of the 6 × 9 table (Dresden 71a–73a) alternate days with coefficients of 11, 8, 10, 1, and 7 occupy the rain-swept compartments, that is to say, 11 Lamat, 11 Oc, etc.; 8 Etz'nab, 8 Ahau, etc.; 10 Eb, 10 Ix, etc.; 1 Ahau, 1 Ik, etc.; 7 Ik, 7 Kan, etc. As the table in its fully expanded form gives 130 days each 54 days apart, no date will repeat for 7020 (130 × 54; 27 × 260) days. Therefore, to make prognostications one needs multiples of 7020 and one or more positions in the LC from which to make the reckoning. The higher multiples are, in fact, based on 7020.

In the 5 × 13 table (Dresden 73c–71c) compartments with rainy backgrounds are: 15 × 65, 4 Manik; 16 × 65, 4 Eb; 18 × 65, 4 Ik; 20 × 65, 4 Eb; and 28 × 65, 4 Eb. Are we to assume from these occurrences of rain that a rainy day can be expected to coincide with 4 Manik only at its fourth occurrence within the cycle of 1820 (28 × 65) days, and with 4 Eb only at its fourth, fifth, and seventh occurrences? That is, perhaps, the most logical assumption, firstly because it presents a pattern similar to those of the 78- and 54-day tables, and secondly because each multiple of 65 up to 28 × 65 is accompanied by three glyphs. Although certain glyphs tend to accompany certain days—for example, the kin or kin-darkness signs with 4 Manik—there is no absolute repetition of the explanatory glyphs. I think, therefore, we can assume that the same conditions were not expected to repeat at each occurrence of the same day, but only at the indicated positions within the cycle of 1820 (28 × 65; 7 × 260; 5 × 364) days.

I feel reasonably sure that the sets of three glyphs are the equivalents of the entries in the farmers' almanacs in the books of Chilam Balam, and that they indicate what days were favorable for planting maize and other crops, and when drought might be expected. An Ik sign, of frequent occurrence, might well signify strong winds (fig. 46,*1,9*). A sky sign, on its side, with three rain drops before it appears several times—thrice above compartments filled with rain—and seems a natural sign for a rainy sky (fig. 46,*1,9*). A glyph, the main element of which consists of a small oval or circle with a vertical line joining it to the top and bottom of the border, is particularly frequent (fig. 43,*38–43*). In other texts this is often combined with the Caban, "earth," glyph. This is the glyph for seed, germination, and sowing (p. 271). Other glyphs in this and other tables include the Kan, "ripe maize," sign, the head of the maize god, the drought glyph, and the sign for misery and misfortune (fig. 20, *3,7*). The sun-darkness glyph (fig. 43,*50*) which also occurs might well stand for the darkening of the sky before a storm. Should that be the case, divinatory passages probably occur also on the stelae, for this same glyph is of common occurrence on the monuments. These signs are also represented in the texts which accompany the so-called Mars beasts of the 780-day almanac of pages 44 and 45, although new elements are there combined with them (fig. 64,*3,4*).

On Paris 23–24 there is an incomplete cycle of 1820 days (65 × 28; 7 × 260; 5 × 364) which appears to have started with 10 Ahau. It advances from right to left at intervals of 28 days with five rows of 13 columns. The table is surmounted by a planetary crocodile. Beneath this various members of the animal kingdom, such as a tortoise, a scorpion, a rattlesnake, and birds, grasp in their mouths or beaks sun disks which dangle from the planetary band. Actually, there are only seven animals, but there are six, perhaps seven, more in the section below the table. Stansbury Hagar (1917) identified this table as a zodiac, and this identification later received support from Spinden (1916; 1924, p. 56). It is hard, however, to see how such a table could have been used in connection with the sidereal year, for it has a length of 1820 days, whereas five sidereal years are 1826.28 days. I would rather suppose that this again was a divinatory almanac of the expanded type, reaching, as in the case of the 5 × 13 table and the 7 × 13 table, 1820 (7 × 260) days. The glyph which I have suggested means seed is prominent in the text above the planetary crocodile. Perhaps the same general idea is behind the incomplete almanac of 260 days which stretches across Madrid 13–18, and, with its repetitive sections of rain and drizzle, is faintly evocative of an English (or New England) landscape in early spring.

Following the 7 × 13 table on Dresden 31a–32a, there is an arrangement of additions which carry the dates forward 208 days. Förstemann (1906, p. 138) supposes that this leads from a day with coefficient of 1, but there can be little doubt that the count is from a day with coefficient of 13, presumably 13 Akbal. The additions are: 11, 28, 13, 26, 12, 19, 5, 1, 20, 12, 6, 8, 5, 7, 11, 5, 8, and 11, a total of 208 days, from 13 Akbal to 13 Chuen, another of the five day signs in the 13 Akbal group on page 32a (fig. 46,*17*). Förstemann has supposed that the additions of 208 days represent an incomplete cycle of 260 days, but there is no need to make such an assumption, for additions of 208 days lead from 13 Akbal to 13 Chuen, to 13 Cauac, to 13 Manik, to 13 Men, and, at the end of 1040 days (5 × 208; 4 × 260) once more to 13 Akbal.

As in the case of the divisions which follow the 6 × 13 table, the series must repeat until the *lub* is once more reached. In this case it is reached after 4 × 260, in contrast to the 3 × 260 total of the 6 × 13 table. I take it that the days in the remaining three columns of page 32a, 13 Ix, 13 Chicchan, and 13 Cib, could also be bases.

The first five pictures associated with the divisions of the 4 × 260-day cycle are of unusual size, for they occupy the width of a half or a whole page instead of the customary third. This may have no significance, for the arrangement may have been imposed on the artist by spatial considerations. Of the 17 pictures or groups, four show water or falling rain, three represent deities with torches in their hands, apparently a symbol for thunder and lightning, one represents a sacrifice of a head decked as that of the maize god, and the remainder are nondescript, although several have secondary characteristics which suggest that rain and crops are the subjects under discussion. God B holds the earth symbol in one picture; a Kan (ripe maize) glyph in another; in a third God B with a Kan sign in his hand lies on the roof of a temple, inside which is seated God C also holding a Kan sign. This scene may correspond to that which Roys (1933, p. 182) cites from Tizimin: Chilam Balam lay prostrate in a trance while the god or spirit, perched on the ridgepole of the house, spoke to him. The trance aspect of the ceremony may well have been a later accretion. The primary date associated with this picture is 13 Imix.

The glyphs connected with the pictures are noncommittal, at least to us at the present state of our knowledge. The sun-darkness glyph for which the meaning of darkened day has been suggested (p. 272) occurs, as well as the glyph tentatively identified as storm with lightning (p. 147), and the axe comb and *u* glyph, found also with the Mars beast (p. 258). The glyph which represents planting or seed, however, is absent. It is, all things considered, not improbable that these divisions were used for divinations in connection with agricultural activities. Nevertheless, it is difficult to relate the arrangement to the 364-day year, for not until the passage of 7280 days (1.0.4.0), that is 20 × 364 or 28 × 260, will the two series 364 and 208 reach again their common *lub*.

I think, therefore, that the main purpose of these tables was to supply ready reckoners to be used in conjunction with divinatory almanacs, not of the simple type of 260 days, but multiples thereof. As the divisions were arranged in such a way that, for example, the day 3 Lamat will not reappear until the 260-day almanac has repeated three times, it was necessary to list multiples of 780 so that the priest could quickly discover whether a particular 3 Lamat was that affected by the aspect of the day, or whether it was one of the other two which were passed over. This arrangement, of course, parallels that of advancing by multiples of two CR in order to recover correct days in the uncorrected Venus calendar.

There is, however, one line of evidence which appears to contradict the interpretation I have advanced. If, for example, the 9 × 6 times table supplies us with a series of days, starting with 9 Ix, for which certain prognostications were made, not at each occurrence of the day but only at every 27th occurrence, that is at intervals of 7020 days, then one would expect the final dates of the four IS which lead to 9 Ix to be separated by multiples of 7020 days. That, however, is not the case. Accordingly, if the IS were used, as I have suggested, as bases for calculating whether any given repetition of a day qualifies for the prognostications, a priest calculating from all four 9 Ix IS would get different results. This is an argument against my thesis, for which at present I can offer no convincing rebuttal, other than to note that we are very much in the dark as to how the mechanism of these divinatory almanacs was manipulated.

Despite this objection, I believe that these tables have nothing to do with the synodical revolutions of planets, but were used in connection with stations in almanacs expanded to some multiple of 260 days. These stations, I am strongly inclined to think, were primarily for agricultural divination, and marked days when rains or storms might be expected. Probably they record, also, days which were suitable for planting and perhaps for sacrificial ceremonies in connection therewith, for Maya thought is like a glade in a woodland, in which are two altars: one is dedicated to the earth; the other, to eternal time. No matter what path is followed, it will lead to one or other of the twain.

GENERAL OBSERVATIONS

It would be difficult to summarize adequately the diffuse and tedious contents of this cave of Adullam which I have labeled Chapter 11. The argument of its final pages prefaces much in Chapter 12.

The discussion of these various multiplication tables, the short cuts in computations, and the rotation of periods in relation to world directions and colors do not take us far along the path of decipherment, but they are of indirect aid because they give us an insight into the workings of the Maya mind. Moreover, the divinatory aspects of the tables present a purpose different to that which the manipulation of time served.

The IS, with its divisions, the coordination of the moon and Venus with the 260-day cycle, and the unintermitting engagement of the vague year with the tun stand forth as mighty monuments of the Maya concept of the inherent orderliness of time. The various divisions served also astrological ends, but the grandeur of the whole is breath-taking. In its contemplation, as in contemplation of the soaring tracery of Lierne vaulting, man is made to realize how transitory and trivial is his part in the pageant of eternity. That exalting nobility is not to be found in the divisions and manipulations of segments of the count of time for divinatory purposes, for in seeking their domination man would exalt himself, and would claim divine knowledge of the laws which govern the actions of the gods themselves. The mystery of eternity is dispelled; man deludes himself that he has learned how to control its goings out and comings in; the village *hmen* pries into the control of eternity for a few tamales, and tells man's birthright for a mess of potage.

Man has ever found it hard to divorce magic from religion and to acknowledge that there are no hocus-pocus formulae to control destiny. It is disappointing to find that the Maya were no better in that respect than others at a comparable level of civilization, although, one has the consolation of knowing that that aspect of the calendar was practiced, so to speak, in booths around the portals of the temple.

It might be argued that there is little difference between the priest-astronomer, with his astrological practices, and the village *hmen* who told the farmer on what days to burn his milpa or plant his crop. Actually there was a great gulf between them. The one probed the recesses of heaven and pried deep into the past to gain guidance in assessing the fortunes of the katun; he weighed the factors, and followed what were, to his way of thinking, scientific lines, making his deduction objectively. His premises were at fault, but that he did not know, and, in any case, the same charge can be made against not a few modern scientists who start with the premise that the stone of materialism will satisfy mankind, ignoring man's far greater need for the bread of spiritual life. On the other hand, the village *hmen* made no attempt at deduction; he relied entirely on magical formulae from a book, believing that rules had been mastered which permitted man to control his fate, provided rigid conformity to certain practices was enforced. The priest-astronomer would ascribe failure to foretell the future to incomplete data or a faulty interpretation of the data he possessed; the village *hmen* would lay the blame for his failure to some little irregularity which caused the magical formula to go awry.

It has been necessary to view this somewhat tawdry aspect of Maya culture in order to present a more complete picture of the whole, just as no study of Florence, which confined itself to the Giottos, Brunelleschis, and Donatellos, but ignored the more ignoble of the Medicis, would be a true portrait of that culture.

I am convinced that the almanacs placed after the multiplication tables are primarily for predicting weather and crops, but it does not necessarily follow that the use I suggest for the multiplication table is correct. The explanation is weak. I can only echo the words of Hilaire Belloc: "The student should be warned that they are theories, and theories only, that their whole point and value is that they are not susceptible to positive proof; that what makes them amusing and interesting is the certitude that one can go on having a good quarrel about them, and the inner faith that when one is tired of them one can drop them without regret. Older men know this, but young men often do not. . . ."