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The Moon

Night seems endless and the day
In fear or shyness stays away.
—J. H. B. Peel, *Mere England*

THE MOON GODDESS IN MYTH AND LEGEND

The Maya moon, who treads her constant path across her stellar fields, yet shows her fickle nature in every human deed, is a moving figure of pathos, whose waywardness should be presented in a bitter setting comparable to that of Rachmaninoff's second concerto. Instead, the atmosphere, surcharged with arithmetical computations, is more reminiscent of Shostakovich or even of five-finger exercises. The Maya story of the moon goddess is "an empty tale, of idleness and pain, of two that loved—or did not love—and one whose perplexed heart did evil, foolishly, a long while since, and by some other sea." It is a moving tragedy, the only one that has survived in Maya folklore. Perforce, it must be compressed and bowdlerized in the worst tradition of the monthly digests to make room for the too arid discussion of the intellectual patterns to which the Maya scientists sought to reduce her erratic ways. We can only glance at that unhappy goddess who still holds the affections and receives the prayers of countless living Maya, before turning our full gaze upon the tailor's dummy on whom the Maya astronomers draped their involved calculations. For the argent moon, which in the skies of Central America seems so much closer and so much more effulgent than in these northern climes, failed not to arouse the curiosity of the Maya astronomer and to stir the imagination of those of humbler rank.

The Maya, like many peoples of the Old World, regarded the moon as the goddess of love, but they endowed her with a harshness of character which sharply differentiated her from Aphrodite and Venus. According to Maya legend (Thompson, 1930, pp. 119–40), the moon goddess is called Xt'actani. At the time the story opens, in the period before the creation of the sun, she lives with her grandfather and spends much of her time weaving.

The young man, who later becomes the sun, decides to woo her. He poses as a great hunter and wins her admiration. Later he borrows the skin of the hummingbird, and in that guise flies to the hut where moon lives. While sipping the honey from tobacco flowers he is hit by a clay pellet from the blowgun of the girl's grandfather. She picks up the unconscious bird and takes it to her room, where it recovers. During the night Sun resumes his human shape, and persuades Xt'actani to elope with him. This they do. The girl's grandfather, seeking to recover her, enlists the aid of one of the Chacs, who hurls a thunderbolt at the pair fleeing in a canoe. Sun turns himself into a turtle, Moon into a crab (alternative versions convert her into an armadillo or another turtle). Sun escapes injury, but Moon is killed. Dragonflies collect her flesh and blood in 13 hollow logs (perhaps those used as beehives). After 13 days Sun uncovers the logs. Twelve contain various noxious insects and snakes, which, escaping, spread all over the world; the thirteenth holds Moon restored to life.

Moon has no vagina, but with the aid of the deer this defect is remedied. Thereupon Sun and Moon have intercourse, the first persons ever to do so. The future god of the planet Venus, Sun's elder brother, comes to live with them. Later, Sun suspects that Moon is having relations with Venus (a Kekchi version has Cloud as the suspected adulterer). In revenge, he plays a trick on them. Moon is very upset. As she is crying on the riverbank a vulture persuades her to go with him to the house of the king vulture (a devil with four horns in another version). This she does, becoming the wife of the king vulture. Sun, seeking his errant wife, borrows the skin of the small deer and hides under it. When the vultures come to eat the carcass of the supposedly dead deer, Sun puts out a hand, and seizes one of them. He rides on its back to the vicinity of the home of the king vulture. Eventually he recovers Moon, who is somewhat reluctant to return with him.

Sun and Moon then ascend to heaven to take up their celestial duties. Moon is so bright that the people on earth complain that they cannot sleep as it is always day. To dim her brightness Sun plucks out one of her eyes.

The myth from which the above incidents are extracted is current among the Kekchi, and is also found in its entirety among the Mopan Maya of southern British Honduras. Various incidents in the narrative occur in myths and stories almost throughout the Maya area, and even among the Zapotec and other non-Maya peoples of southern Mexico. The popularity, the length, and the strong qualities of survival of this story attest to its importance and to the esteem in which its principal characters were held by the Maya. The antiquity of the myth is demonstrated by the painting of the incident of the deer guise on a vase of the Initial Series Period (Thompson, 1939, p. 151).

Other Maya groups say that Sun and Moon are always quarreling, and that eclipses are due to fights between them. The Tzutuhil Maya, living in the vicinity of Lake Atitlan, relate that the fights arise because Moon tells Sun lies about the conduct of the people on earth; the Quiche say that Moon is erratic, difficult to understand, a deceiver. These concepts also occur among people of Nahuatl and Nahuat speech. Although, so far as I know, cause and effect are no longer related by the modern Maya, one can assume that the quarrels and actual blows between Sun and Moon are renewals of the old grievance of Sun against Moon because of her promiscuity.

FUNCTIONS OF THE MOON GODDESS

Among most Maya groups the moon is recognized as the wife of the sun, and is usually given the title of "Our Mother," "Our Grandmother," "The Lady." She is the patroness of weaving, of medicine, of procreation, pregnancy, and birth. In central Mexico her counterpart is also a deity of the earth and of the crops. There is no direct evidence for the moon's being a goddess of the earth among the Maya, but the indirect evidence is very strong. The glyph of a goddess whom I identified many years ago as the moon goddess has as its principal characteristic a sign like a query mark, which actually appears to represent a lock of her hair. This same symbol is the principal element of the day sign Caban, "earth," which was under the patronage of the moon goddess, the deity of number 1. At the time I made that identification I had not realized that the Maya informant had given Bishop Landa for the sound *u* a drawing of this conventionalized lock of hair. The reason for his choice was that *u* means moon in Yucatec. This evidence is complete confirmation of the correctness of the identification of this glyph as that of the moon goddess (fig. 14,*23*,*24*). It is therefore virtually certain that the moon goddess was also a goddess of the earth and, by extension, of the crops it yields.

As the first person to weave, the moon goddess was patroness of the art of weaving, and was the object of reverence of all engaged in that craft. There is some evidence that a spider and its web symbolized that aspect of her functions.

Because of her adulterous conduct, the moon goddess symbolized promiscuity, and because she and Sun were the first to cohabit, both of them were regarded as closely associated with the sexual act. Furthermore, the moon, as the first woman, was the mother or grandmother of mankind. Yet, the attitude of the Maya to the moon goddess is not one of filial affection. It would be difficult to maintain such an attitude toward a mother who was manifestly a wanton. The moon goddess, rather, is regarded as capricious, quarrelsome, and a prevaricator.

The Mexicans, whose ideas concerning the moon were very close to those of the Maya, believed that the moon goddess lived in the layer of the heavens which was the abode of the Tlalocs, the gods of rain, and that this was the land of rain and mist. Indeed, the moon crescent is frequently filled with water in Mexican codices. There is some evidence, both in folklore and in the glyphs themselves, that a somewhat similar idea existed among the Maya (p. 238).

There is a possibility that the Maya personified the moon not as one woman, but as two, a young goddess and an old goddess, the former perhaps representing the waxing, the latter the waning, moon. There is a great deal of material on the subject of the moon goddess which I have discussed elsewhere (Thompson, 1939). It should be noted that evidence forthcoming since that study was written has considerably strengthened the thesis (Wisdom, 1940; Siegel, 1941; Amram, 1942; Cline, 1944).

Although the Maya, particularly those from the lowlands, generally regard the moon as the consort of the sun, among the Tzeltal and Tzotzil of Chiapas she is thought to be the mother of the sun (Barbachano, 1946, p. 122; Guiteras, 1946, p. 97) and also the spouse of the lord of the realm of the dead, which is called Olontic. The sun goes thither each night to visit his father and the newly deceased (Pozas Arciniega, 1947, p. 452). This belief reaffirms the connection of the moon with the earth and its interior. The confusion between the spouse and the mother of the sun may be reflected in the two forms of the moon, the youthful goddess and the aged woman, just as there are some reasons for believing that the Maya worshipped both a youthful and an aged sun god. This dual concept probably accounts for the obscurity in the relationship between the Yucatecan goddesses Ixchebelyax and Ix Azal-Uoh.

In representations of the moon in Mexican codices a rabbit or a stone knife may be set in the crescent of the moon (really a recurved *u* apparently made of a section of shell or bone). Mythology accounts for the presence of the rabbit, which also serves to connect the moon with the earth, for 1 Tochtli (1 Rabbit) is a name for the earth, and the rabbit is sometimes depicted emerging from the jaws of the Quetzal snake, which symbolizes the surface of the earth covered with vegetation. The connection between the flint blade and the moon is not apparent, but flint knives are sometimes set in the night sky.

So far as is known, neither the rabbit nor the flint knife is connected with the moon in the sculptural or graphic arts of the Maya.

GLYPHS OF THE MOON GODDESS

The various names and titles bestowed on the moon goddess have already been discussed (pp. 47–48, 87). Several glyphs can be identified as belonging to the moon goddess. These include glyphs corresponding both to functions and to titles. A functional glyph of the moon goddess has been noted in the series of directional gods listed with the Venus tables (p. 223; fig. 42,*18*). This same glyph, it will be recalled, appears also in the eclipse tables of Dresden. A similar glyph, combining the features of the youthful goddess with the symbol of the moon, appears with some frequency in the lunar series of the inscriptions, particularly in the full-figure glyphs (fig. 29, *12,17*).

A glyph which clearly corresponds to an honorific is that which embodies the curl of hair (fig. 14,*23,24*). This pretty certainly means something like "the woman," for the moon was "the woman" to the Maya. (She had something in common with Irene Adler of "A Scandal in Bohemia.")

There are certain variations in prefixes which probably refer to descriptive titles. Thus the prefix for white is often attached to her glyph, and "the white lady" is a natural title to bestow on the moon. Moreover, this emblem for white is sometimes set in her hair (fig. 14,*18*).

So far as the hieroglyphic texts are concerned, the observed or predicted movements of the moon are of greater consequence than the mythological aspects of the goddess, and we shall now turn to that interesting but vexatious problem.

A great deal of ink has flowed in discussing Maya methods for recording the age of the moon on a given date, for grouping moons, and for establishing tables of dates on which eclipses might fall. Other matters which have engaged the attention of students include Maya ideas as to the length of the lunation as revealed by their computations over nearly 4000 years to learn the age of the moon at dates in the neighborhood of 13.0.0.0.0 4 Ahau 8 Cumku.

Brilliant studies by scholars, particularly Meinshausen, Willson, Guthe, Teeple, Pogo, Makemson, Beyer, and Satterthwaite, have revealed much concerning the achievements of the Maya in that field. As an illustration of how each student has builded on the foundations of his predecessors, I purpose on another page to give a brief outline of the history of the elucidation of the eclipse tables of Dresden.

Such studies are, of course, more than a tribute to modern scholarship; they reveal the wondrous achievements of the Maya scholar, and replace many tesserae in the mosaic of the Maya intellect. He who would display the peaks of Maya achievement for the general reader, yet would not neglect to chart for the specialist the confusion of foothills with which they are girt, faces a problem in the presentation of data which is not easily solved. A literature of frightening proportions on the subject has already appeared, and there is little that I can add either to a discussion of the arithmetical and astronomical angle or to the dissection of the explanatory texts. I shall accordingly confine myself largely to a résumé of the subject.

THE ECLIPSE AND LUNAR TABLE OF CODEX DRESDEN

Pages 51–58 of Dresden have for long excited the curiosity of students and aroused the interest of astronomers. They follow the Venus table already discussed, and conform to the same general pattern in so far as a lower row of numbers gives the interval between the accompanying date and the previous one; an upper row of numbers gives the accumulated totals (reproductions of the table are given in Guthe, 1921, and Willson, 1924). The lower numbers are for the most part intervals of 177 days or, occasionally, of 178 days, but before each of the nine "pictures," which interrupt the tables at somewhat irregular spacing, the interval is 148 days. There is a tenth picture at the end of the table, which is not preceded by an interval of 148 days and which in fact has an entirely different function, for it appears to have served primarily to mark the conclusion of the cycle.

The total number of days recorded is 11,958 by the upper row of additions; 11,959 by the intervals. Actually, there can be no reasonable doubt that the table is meant to record a re-entering cycle of 11,960 days (1.13.4.0). Month signs are omitted, but with each column are given three sequent day signs. The first entry (p. 53a, left) records an addition of 177 days leading to 6 Kan, 7 Chicchan, 8 Cimi. By subtracting 177 days, the bases of the table are easily obtained. They are 11 Manik, 12 Lamat, and 13 Muluc.

The Pictures

Eight of the pictures which follow intervals of 148 days hang from stylized planetary bands representing the heavens; in the ninth picture this celestial band is missing, presumably because the picture is that of the death god, a deity of the underworld. Pictures 4, 5, 7, 8, and 9 represent the kin, "sun," glyph against a background part black, part white. No. 2 shows the head of the aged sun god in a black frame with a white design overlaying a part of it. The head of Picture 3 is that of God D. It is within a cartouche, half black and half white, and a kin glyph immediately above indicates that the solar aspect of God D is intended. Picture 1 is the death god; Picture 6 a dead woman with a black spot on her cheek. A rope, joined to the celestial band, passes loosely around her neck. Emblems of death and darkness or the underworld, such as crossed bones or death eyes, accompany Pictures 2, 5, 7, and 8.

The kin glyph or head of the sun god against a background of black and white can be reasonably interpreted as pictures of darkness (p. 272), the black areas presumably indicating the obscurity associated with eclipses. The deities of death and the mortuary symbols logically express the same idea, for at a solar eclipse the sun may have been thought to depart to the underworld, his abode during the hours of darkness.

The tenth picture, which ends the table, is that of a monster who plunges head first from a celestial band, to which are attached two pairs of black and white ovals, one of which has a kin sign in the center, the other a lunar glyph. The head of the monster is hidden by a large glyph of the planet Venus. One is instantly reminded of the Aztec belief that during eclipses the monsters called Tzitzimime or Tzontemoc (head down) plunged earthwards from the sky. These monsters include Tlauizcalpantecutli, the god of Venus as morning star (Thompson, 1934, pp. 228–30). It is therefore highly probable that this picture represents a Tzitzimitl plunging head down toward earth during the darkness of an eclipse. A glyph immediately above the picture appears to confirm this identification, for it shows the glyph of Venus with a prefix which is a picture of a person placed upside down (fig. 42,32). It has been supposed that the presence of the Venus monster in this picture indicates some relationship with the revolution of that planet. It is very much more probable, however, that the Venus monster is depicted merely because Venus is the most conspicuous or most easily recognizable of the Tzitzimime and that, in consequence, the synodical period of Venus in no way enters into the calculations.

Historical Outline of Investigations on the Lunar Table

As early as 1901 Förstemann (1906, pp. 200–15) deduced that the table had to do with the moon, surmising that the intervals of 177 days represented groups of six lunations, thus arranged to conform as far as possible to the solar half-year. A dozen years later, a young German student, Martin Meinshausen (1913), established that the tables dealt with eclipses, for, by comparing the intervals in the lunar table of Dresden with tables of observed solar and lunar eclipses of the eighteenth and nineteenth centuries, he was able to demonstrate that the intervals in Dresden were such as normally occur between observed or predicted eclipses. Meinshausen also suggested that pictures came after the intervals of 148 days because when a solar eclipse followed another at an interval of 148 days, a lunar eclipse would occur 15 days later. Unfortunately, the career of this young student, which had opened with such brilliance, was cut short by his death on the Russian front in the early days of World War I.

Professor Robert W. Willson started his studies of Dresden 51–58 in 1910, and continued them at intervals until his death in 1923. His findings appeared in 1924. Willson recognized that the table dealt with eclipses some time before the publication of Meinshausen's conclusions, for he says of Bowditch's transcription of the Dresden tables:

> At the first glance [I] saw the number 6585.32, conspicuously displayed. . . . The idea was at once suggested that the table had to do with the Saros, or, at any rate, with a series of eclipses. . . . The codex showed . . . a series of dates on which eclipses may possibly occur, when the sun happens to be near the node of the moon's orbit on the day of new moon. For proof of this compare the upper numbers from the Dresden Codex . . . with those in column 1 of Table 11 of Schram's "Table of the Phases of the Moon," and it will be found that the numbers are identical. . . . If there is a central eclipse on a given date, there will be a central eclipse somewhere on the earth after 1033, 1211, 1388, and 1565 days, and there may be a central eclipse after 1742 days. The intervals of the pictures in the codex are 1742, 1033, 1211 thrice repeated, making three periods of 3986 days each.

With a most ingenious construction Willson (1924, pp. 13–14) compared the intervals between eclipses visible in the Maya area from 31 B.C. to A.D. 1508 with those between the nine pictures in Dresden, with the primary object of discovering whether the pictures corresponded to observed eclipses, and the secondary object of solving the correlation question. This secondary aim, naturally, could only be realized in the event that the primary object was attained. The results were disappointing: no group of nine eclipses at the requisite intervals were visible in any one part of the Maya area, and there was no series in which visible eclipses corresponded to eight of the nine pictures. Willson felt that a solution along those lines would not be found. He concluded that the purpose of the table was that of listing positions in the Maya calendar on which solar eclipses could occur.

Carl Guthe (1921) devoted considerable time to the study of Dresden 51–58, acknowledging the great help he received from Willson. Guthe's report is largely devoted to a discussion of the pattern of the eclipse table. He brought out the manner in which the table consists of three equal parts, each with 23 unequal subdivisions. He believed that the table served both for predicting eclipses and for lunar reckonings.

In 1930 John E. Teeple, who had already solved the problem of the lunar series on the monuments of the Initial Series Period by his elucidation of Glyphs C, D, and E of that series, published his great work *Maya Astronomy*. Starting where the others had left off, he was able to make two important contributions to the subject. First, he showed that if the days in the table are plotted on a wheel of 520 days, that is to say, two almanacs of 260 days apiece, the possible eclipse dates fall in three groups. That is so because an eclipse must occur within approximately 18 days of the node, and the moon's path and that of the sun cross every 173.31 days. Thrice 173.31 is less than a tenth of a day short of 520 days, the double almanac. Thus, in a wheel with 520 spokes, matching the number of days in a double almanac, there will be three main radii 173 days apart, corresponding to the node days. If the count starts with 12 Lamat (Day 168), that will be the first main radius. The second will be 173 days later at 3 Imix (Day 341); the third will correspond to a 7 Ix (Day 514). Another eclipse half-year will carry the count back to 12 Lamat. One would expect the possible eclipse dates to be clustered on both sides of these three points with a spread in each direction of about 18 days, and such is the case.

By comparing the various dates in the table, Teeple was able to establish that the three node days were 11 Manik (Day 167), 2 Ahau (Day 340), and 7 Ix (Day 514). It is a remarkable fact that three eclipse half-years correspond so closely to twice the length of the divinatory almanac, and there is no reason to doubt that the Maya priests took full advantage of the fact. The assumption has been made that the period of 260 days was chosen because twice its length was practically the equivalent of three ecliptic seasons, but that is surely another case of putting the horse before the cart, for the 260-day almanac must have been in being centuries before the Maya priests learned how to predict dates of possible eclipses. Furthermore, had an almanac been developed to conform to the eclipse half-years, why should the cycle have been 260 days rather than 520? Teeple was also the first to call attention to the importance of the recession of the node days in the double almanac. After the table has been used once, that is to say, after the lapse of approximately 33 years, the node days will have receded about 1.6 days, because 69 eclipse half-years are approximately that much less than 46 cycles of 260 days. After the table has been used a couple of times some possible eclipse dates falling 16–18 days after the nodal points will have lost their significance, for with the recession of the nodal points, the sun will be too far from the point of intersection with the moon's path on those days for an eclipse to occur. An extra group of five moons would in time have to be inserted in order to recover all possible eclipse dates.

An important contribution to the problem of the eclipse table was made by Alexander Pogo (1937), who returned to the theory, first advanced by Meinshausen, that the nine pictures in the Dresden table represent lunar eclipses following 15 days after the end of a group of five lunations. He concluded that an alert Maya astronomer could have constructed this table in Dresden from data obtained by observation of lunar eclipses over a third of a century, and by careful handling of the intervals between observed eclipses and combinations thereof.

Maud Makemson (1943) calls attention to the three IS at the start of the table, which throw light on the problem of node days. These are the dates 9.16.4.10.8 12 Lamat 1 Muan, 9.16.4.11.3 1 Akbal 16 Muan, and 9.16.4.11.18 3 Etz'nab 11 Pax. Obviously, she notes, they must represent two solar eclipses with a lunar eclipse between, or two lunar eclipses with solar eclipse in the middle. In either case 1 Akbal must have coincided with the node passage, or fallen not more than a couple of days from it. The IS date 9.16.4.10.8 12 Lamat 1 Muan was, therefore, 13–15 days before node passage, whereas Teeple had shown that the 12 Lamat of the table was at node passage or within a day thereof. It follows that when 1 Akbal coincided with the node passage, certain dates, such as 5 Imix which ends the sixth lunation group, 4 Ahau which ends the twenty-first lunation group, and 3 Cauac which ends the thirty-sixth lunation group, will be too far from node passage (22, 23, and 24 days) to coincide with solar eclipses. The table, now lost, which accompanied the IS 9.16.4.10.8 12 Lamat would have had a different arrangement of the 148-day groups, and a consequent shift of 29–30 days in many of the possible dates for eclipses. That indicated that the tables were constructed in their present form at a date sufficiently removed from the IS to account for a recession of the node passage of approximately 15 days, from 1 Akbal to 12 Lamat. As Teeple had shown that the node passage recedes at the rate of 1.61 days each time the table (1.13.4.0) is used, approximately 9 × 1.13.4.0 must have passed between the 12 Lamat of the IS (9.16.4.10.8) and the 12 Lamat of the table, and therefore the 12 Lamat of the table was within three or four katuns of 10.10.0.0.0:

9.16. 4.10.8	12 Lamat
14.19. 0.0	(9 × 1.13.4.0)
10.11. 3.10.8	12 Lamat

This was an exceedingly important point, for it eliminated consideration of 9.16.4.10.8 as the base of the table, and enabled the date of the table to be fixed approximately in terms of the Maya calendar, and without reference to the conveniences of advocates of the several correlations.

The date Dr. Makemson favored for the start of the eclipse calendar was 10.12.16.14.8 12 Lamat 1 Ch'en, because in the 11.16.0.0.0 correlation this corresponded to Julian day 2,116,732. Dr. Makemson further demonstrated that with that base for the table, pairs of partial eclipses of the sun, enclosing lunar eclipses, occurred at the same intervals as those that mark the positions of the nine pictures in Dresden.

Satterthwaite (1947) has made many experiments in grouping of moons, and has discussed how the Maya might have constructed the eclipse table.

That is the history in brief of progress in that one small field of Maya hieroglyphic research. It illustrates well how the torch has passed from one hand to another.

Possible Method of Correcting the Lunar Table

One should not paint the lily nor lose sight of creation in a pollen count. The construction of the eclipse table was a magnificent feat; its reconstruction by scholars in the past half-century from defective source materials is also a resounding triumph. I do not wish to dim these achievements or to lose the reader in a fog of speculative reconstructions, and for those reasons I shall suppress some pages of discussion about groupings of moons which I had written, and deal with only one point.

It is very probable that the equation 405 moons = 46 × 260 (11,960 days) was used for lunar calculations before it was adapted by changes in its internal structure to the prediction of eclipses. Indeed, its use at Palenque before the initiation of the eclipse calendar, as demonstrated by Teeple, is strong evidence for this view. I am inclined to believe that corrections were made to this equation for reckoning lunations, but not for its use as a table of possible eclipse dates. It is reasonable to suppose that the Maya, had they realized that 11,960 was a trifle too long, would have applied corrections to it in approximately the same way as they corrected the Venus tables with the primary object of retaining the *lub* at 12 Lamat. The Venus table, it will be remembered, was corrected by dropping four days at the sixty-first revolution or eight days at the fifty-seventh revolution so that with the correction the count could start again with 1 Ahau still as the *lub;* the lunar (but not the eclipse) count can be corrected by dropping one day at the three hundred and sixty-first lunation, and starting the count over again at 12 Lamat. The three hundred and sixty-first lunation ends on 13 Muluc, but the correction is greater than the error in the 11,960-day equation. The latter would have to be used five times before a sufficient error had been accumulated to be offset by the correction at the three hundred and sixty-first moon:

Maya moons		*260-day cycles*		*Astronomical moons*
5 × 405 moons	= 59800 d. =	5 × 46 × 260 :	5 × 405 moons	= 59799.44 d.
361 moons − 1 d.	= 10660 d. =	41 × 260 :	361 moons	= 10660.54 d.
2386 moons	= 70460 d. =	271 × 260 :	2386 moons	= 70459.98 d.

This correction is remarkably accurate, but we have no reason to believe that the Maya knew that the 405-moon table should be repeated five times before 44 moons and a day were dropped from the sixth round. Yet there is some evidence that this correction was applied, although not at a 1:5 ratio.

The red IS of page 52e reads 9.19.8.7.8 7 Lamat, but this is an impossible combination, for the date does not reach 7 Lamat nor does it reach the expected 12 Lamat. Previously, I had suggested to Mrs. Makemson that it should be corrected to 10.19.9.12.8 12 Lamat, so as to reach a date which was a multiple of 1.13.4.0 removed from 9.16.4.10.8, but that amendment calls for drastic changes. The scribes were careless, but three errors in five numbers is an unwontedly low level of accuracy. Furthermore, with three periods of an IS corrected, one can get almost any result one wants. With my thought centered on a multiple of 1.13.4.0, I ignored the much simpler correction which, I now believe, should have been made, namely, the change of the tun coefficient from 8 to 7. This correction was first proposed by Schulz (1940). The resulting position is distant one cycle of 405 moons plus 361 moons less a day from 9.16.4.10.8:

9.16. 4.10.8	12 Lamat
1.13. 4.0	(405 moons : 46 × 260 d.)
9.17.17.14.8	12 Lamat
1. 9.11.0	(361 moons − 1 d. : 41 × 260 d.)
9.19. 7. 7.8	12 Lamat

The date 9.19.7.7.8 cannot be a position in a table for eclipse predictions, for it is an odd number of 260-day cycles from the starting point of the eclipse table and, furthermore, does not occur as one of the endings of a lunation group, but it could have been used for reckonings in lunations.

There is some evidence that the Maya combined two groups of 405 moons to one 361-moon group, although the ratio is not constant. The distance 9.16.4.10.0 which leads from the 12 Lamat immediately after 4 Ahau 8 Cumku at Baktun 13 can be resolved into 70 × 1.13.4.0 and 54 × 1.9.11.0, which is a ratio of 1:1.3. The distance number of 2.10.16.3.0 on Copan I′ has been long suspected to have lunar significance. It reduces to 19 × 1.13.4.0 and 13 × 1.9.11.0, a ratio of 1:1.46. If the count is then projected backward not to 13.0.0.0.0, as Teeple suggested, but to the nearest occurrence of 9 Ahau, just 60 days earlier, the interval of 7.1.14.0.0 equals 55 × 1.13.4.0 and 34 × 1.9.11.0, a ratio of 1:1.6. The ratio has to be kept nearly constant, in these cases at approximately 2:3, or one can make any recurrence of a day far in the past or future the same moon age as one's starting point. Actually, the two formulae used in a 2:3 ratio are less accurate than the 1.13.4.0 equation used by itself, but we have no reason to assume that the Maya were aware of that.

On present evidence one can not assert that the Maya used this 361-moon formula in combination with the 405-moon equation, but I think there are enough hints to justify us in watching for further indications of its existence.

THE MAYA AND THE ASTRONOMICAL NEW MOON

The point from which the moon age is counted is not surely known. The possibilities are disappearance of the old moon, conjunction, or appearance of the new moon. Teeple assumed that the age of the moon was reckoned from conjunction; Beyer (1937a) believed that the calculation was made from disappearance of the old moon. The latter method of counting is still current in some Tzeltal, Chol, and Tzotzil villages of Chiapas, for Schulz (1942) says: "the day in which the moon was last seen before sunrise is counted as the last day of the old moon. The following day is the first of the new moon, even though the moon be not yet visible."

According to Schulz, the villagers of the three linguistic groups cited say that when the old moon disappears "the moon has now died." The Aztec used a similar term for the disappearance of the old moon, saying "now the moon dies; now it sleeps a lot." At the time of conjunction they said "now the moon is dead." The Kekchi and Pokomchi, also, say of the waning crescent "the moon sleeps." In the Carcha district, according to Dieseldorff, the Kekchi say for new moon *x'cam li po,* "the moon is dead." Unfortunately, it is not clear whether Dieseldorff referred to the astronomical new moon, or the moon when first observed. In view of the other evidence, the reference is more probably to conjunction.

The Kekchi say of the first phase of the moon "the moon is born." A similar concept appears to have existed among the Yucatec, for the Motul and San Francisco dictionaries give for new moon *pal u. Pal* means child.

The Motul dictionary also lists as a term for the waning moon when it is about to disappear *benel u tu ch'een,* the translation of which appears to be "the departure of the moon to its well." As noted on page 238, this appears to be an obscure reference to a supposed sojourn of the moon, during her period of disappearance, in the heaven of the rain gods, or possibly in a well sacred to the rain gods (cenotes assuredly were regarded as places for offerings to the rain gods).

In the Vienna dictionary the same expression is given for the moon when it is no longer visible, although only the first two letters of *luna* are now legible: *lu . . . no se ve, binaan u, binan u tu ch'en* (literally "the moon gone, the moon gone to her well").

Two distinct concepts or metaphors are contained in these sundry terms: after disappearance the moon is said to die and, at reappearance, to be reborn as a child, or to go at disappearance to the heaven of the rain gods, or to enter some body of water on or under the surface of the earth. Venus similarly was believed by the Mexicans to die at disappearance, and to come to life again at heliacal rising.

The linguistic evidence, I think, rather favors a count from disappearance or, perhaps, from conjunction. It is certainly not in conformity with Spinden's thesis that the Maya reckoned the moon age from full moon. That thesis was adopted by Spinden and by Ludendorff, his fidus Achates, because Maya dates which were declared to be new moons actually fell some 10 days after new moon in the Spinden correlation, published before Teeple had discovered the meanings of Glyphs C, D, and E of the lunar series. To reconcile his correlation to the new data, Spinden made two assumptions: one that the Maya reckoned lunations from full moon to full moon; the other that the Maya calculated the length of the moon slightly under its true length, and allowed that error to accumulate, with the result that Maya full moons are recorded four days before they actually occurred. Ludendorff offered a somewhat more complicated explanation. According to his theory, the Maya overcalculated the length of the lunation, and when the error had reached about three days, they applied a correction, but the correction was approximately twice as great as the accumulated error, and produced full moons four days before they actually occurred.

Nevertheless, so far as is known, no American Indian group reckoned lunations from full moons. At one time the Haida were believed to have been an exception in that respect, but more careful observation of their customs revealed that they reckoned their months only from new moon to new moon (Murdock quoted in Thompson, 1932b, p. 412).

LUNAR SERIES ON THE MONUMENTS

Most IS on the monuments of the Initial Series Period are expanded to include a number of glyphs which record the age of the current moon, the position of that moon in a lunar half-year, and the number of days in the current moon or, perhaps, that immediately past. These glyphs, together with others, such as Glyphs G and F which actually do not belong with the group, are known as the lunar or supplementary series. The latter name, now somewhat obsolete, was applied to the group before its main function was known to indicate that the glyphs of which it is composed appeared to supplement the IS.

The lunar series sometimes follows the day and month glyphs of the IS, but more often it lies between them; occasionally it precedes both, intervening between the kin glyph and the day sign. In exceptional cases the sequence is: day sign, Glyphs G and F, month sign, remaining glyphs of the lunar series.

The number of glyphs in the lunar series varies. Generally there are eight, including, for convenience and because of their nocturnal associations, Glyphs G and F in the tally. The others are Glyphs E, D, C, X, B, and A. Occasionally two other signs, the so-called Glyphs Y and Z, are inserted between Glyphs F and E.

The desire to record with an IS data concerning the moon appears to have existed from the earliest times. There are hints of a lunar reckoning on the Leiden plaque (Nottebohm, 1944), and definite lunar series accompany some early IS, namely that of Uaxactun 18 (8.16.0.0.0) and Balakbal 5 (8.18.10.0.0), although these are of a somewhat abbreviated form, giving merely the moon age and the number of moons of the current group. Glyphs A, B, and X were later additions to the series, the first making its appearance at an early date, followed by Glyph X (present on Uaxactun 22, 9.3.10.0.0, and on Yaxchilan L. 48, 9.4.11.8.16). The first appearance of Glyph B is seemingly on Piedras Negras 25, 9.8.15.0.0. At Copan it is first recorded on Stela 7, dedicated at 9.9.0.0.0, whereas at Pusilha it does not appear until 9.11.0.0.0 (Stela H).

The decipherment of Glyphs C, D, and E, which are the kernel of the group, was made by John E. Teeple (1925, 1925a, 1930). The discovery of their meaning had a significance far greater than the disclosures of their general import, for it not only supplied a new test which correlations of the Christian and Maya calendars must pass, but also threw light on the intellectual processes and the spirit of scientific co-operation which animated the Maya astronomers. Correlations which failed to produce new moons close to the dates on which the lunar series indicated them had to be rejected. The rapid spread to important Maya centers of the uniform system of grouping moons in lunar half-years (p. 244) reflects a close cooperation in scientific advance and a marked absence of local jealousies and intellectual isolationism.

Glyphs D and E record the age of the current moon (figs. 36; 37). When the moon is less than 20 days old, Glyph D, with coefficient of 1–19 inclusive, alone is used; when the moon age is 20 days or over, Glyph E, which has the value of 20 days or nights, is included. Its coefficient does not exceed 9. To record a moon age of exactly 20 days, Glyph E appears without a coefficient. When Glyph E is necessary, Glyph D also appears, but without a coefficient. It is clear that Glyphs D and E function as a distance number, corresponding broadly to kins and uinals. In fact, they often have the distance-number postfix and Glyph E sometimes occurs in distance numbers which are in no way part of a lunar series (p. 167). Thus to express a moon age of 27 days, both Glyphs D and E would be used. Glyph D would lack a coefficient; Glyph E would have a coefficient of 7. On the other hand, a moon age of seven days would be expressed by the attachment of a bar and two dots to Glyph D. Glyph E would not be present.

Glyph D

The most usual form of Glyph D is composed of three or four elements. On the left there is a hand (usually the right with back to the observer, but sometimes the left with palm visible) which is placed in a position usually about halfway between vertical and horizontal with wrist to left. The forefinger usually points diagonally to the right; the other fingers are usually bent. On the right there is half of the normal moon sign but with three dots, arranged diagonally, replacing the circle generally found in the interior of the moon sign. A postfix, the attributive *il* sign (p. 285), is beneath the hand or underlies both hand and half-moon sign. Sometimes, the distance-number postfix is added as a second postfix, or, more rarely, the two postfixes are merged. The coefficient is usually to the left; quite rarely, above. Most irregularly, Glyph D of Pusilha K is formed of what seems to be a complete moon sign above a hand placed horizontally with wrist to right (figs. 36,*11,15,35,39,44,57,61*; 37,*7,11,27,36,41,46,53,58*).

I had formerly thought that the half-moon indicated the crescent of the waxing moon, but such an assumption is surely erroneous. The moon sign is halved to economize space, for in variants which lack the hand the full glyph is used, and in a few instances (e.g. Glyph A, Coba 20) moon signs, which are normally shown as full glyphs, are cut in half when combined with another glyph. The normal form of Glyph D is essentially the same as Glyph C, which is known to declare the number of complete moons. The different position of the hand in Glyph C is in all probability due to the need to place it in such a position that it would not obscure the variable element added to Glyph C, which is absent from Glyph D. It is, accordingly, probable that Glyph D represents a completed moon, to which the coefficient is added, rather than a lunar period of 24 hours which is multiplied by the coefficient. Apart from the testimony of the resemblance of the normal form of Glyph D to Glyph C, there are two other lines of evidence in favor of this interpretation. In a number of cases glyphs which stand for day (more probably a count by nights, p. 174) are inserted between the coefficient and Glyph D, but these would be redundant had Glyph D the meaning of a lunar period of 24 hours. The *il* postfix is usually present with Glyph D, as with Glyph C, and there seems little doubt that this should be read with the lunar element (*u*) to produce *uil,* a term used in reference to moons, the *il* being an attributive or relationship suffix. There is a third, but weaker, argument in favor of the thesis: did Glyph D refer to a single night, there would be no need to carve the glyph when Glyph E was also present. I think, therefore, that we have good reason to accept Glyph D as meaning completed moon, the coefficient, together with the distance-number postfix, indicating a distance number of *n* days (or nights or dawns) from the last completed moon.

This normal form of Glyph D can be modified in several ways, of which the most important involves the elimination of the hand, the conversion of the half-lunar element to a complete lunar disk, and, sometimes, the addition of a prefix (figs. 36,*6,25,49;* 37,*23,67*). Beyer (1941) has ably discussed at some length the various forms of Glyph D, and in particular the variant with full lunar disk. He notes that when this is employed as a symbol for 20, it has in its center a circle (figs. 4,*16–18;* 37,*5,10, 25,31,40,46* etc.); when it serves as Glyph D the circle is replaced by an eye (figs. 36,*6,25,49,54;* 37,*1,23*) or two or three circlets (fig. 37,*67*). Beyer thinks the eye in moon means "shining moon," but it is much more probable that the eye represents the death eye, and the whole means death of the moon.

In a number of cases in which the hand is eliminated, a jade symbol, which we have previously encountered with the meaning of water, is prefixed (figs. 36,*49;* 37,*23*). Beyer (1941a, p. 65) also recognizes the affix as a jade symbol, but attributes to it the meaning of shining, for he writes: "the polished (that is the shining) green stone. In this connection the symbol evidently is used to characterize the shining of the moon." With this interpretation I hardly agree. The primary symbolism of jade is that of water, and, so far as I know, the value of brilliance, as that of the argent moon, would not normally be expressed by the symbol of jade. Furthermore, Beyer accepts the meaning of moon completed ("end of moon" in his terminology) for the normal form of Glyph D, and, therefore, he should have sought a similar idea for this variant to express; "shining moon" is the exact antithesis.

According to Mexican belief the moon resided in Tlalocan, the abode of the rain gods; Vatican A speaks of one of the celestial layers as "the kingdom of the rain god and the moon," and the moon symbol in the Mexican codices usually contains water. Moreover, both Maya and Mexican goddesses of the moon are closely associated with water (Thompson, 1939, p. 143). The Cakchiquel of Panajachel, for instance, consider the moon goddess to be the "owner" of Lake Atitlan, and believe that she has a palace beneath its waters.

In Yucatan, as we have seen, one of the terms for the disappearing of the moon was *benel u tu ch'een,* "the departure of the moon to her well." This, I think, must mean that the Yucatec believed that when the waning moon disappeared, she went to the land of rain, the abode of the Chacs, the rain gods, or in line with the Cakchiquel association of the moon with a lake, she entered some lake or well or cenote, perhaps connected, in thought, with the primal waters in which the earth monster floats, or, in view of the association in Yucatan and among the Chorti (p. 75) of rain gods with wells and cenotes, a temporary abode of those deities. It will be remembered that the month Ch'en, "well," has the moon goddess as its patroness.

It is at least possible, if not highly probable, that this variant of Glyph D with the jade prefix expresses the idea of the moon disappearing, after it wanes, to the land of water. Thereby, this variant connotes the same general idea as is conveyed by the variant with outstretched hand, namely, a count from the completion of the moon. In one variant a hand indicates the completion of the moon; in the other, a jade symbol appears to represent the abode of the rain gods to which the moon goddess at her death may have been thought to retire for the period between disappearance and reappearance.

There is, however, a slight complication. A Yucatec word used for the setting of the moon, and also for the setting of the sun, is *t'ubul,* which means to sink or be submerged in water or some hollow or concave object. The root also appears in *t'ubtal* with the meaning of being submerged in water, but also used in the sense of being (deep) in a hammock or cradle. It does not necessarily follow, therefore, that the Maya thought of the moon and sun as sinking into water when they used this expression, and I know of no combination of kin and a jade symbol which could represent the setting sun. The expression was probably used in precisely the same way as we speak of the sinking sun or moon, without any image in our minds of sinking into water. Moreover, as we have seen, Glyph D almost surely refers to the completed moon, not to its daily setting.

In another variant of Glyph D the jade prefix is attached to an element resembling a little head on its side, and the distance-number postfix is below (fig. 37,*48*). This element sometimes occurs with head variants of the completion sign. Beyer (1941a, pp. 67–68) regards it as a death or an ending symbol, with which identification, so far as death is concerned, I am in agreement. The element with its jade prefix, accordingly, would seem to be translatable as "the dead one (the moon) in the land of the rain gods." The meaning therefore would be the same as that of the variant just discussed.

In two instances (Naranjo 13, Xcalumkin IS) the hand element of Glyph D is present, together with the normal suffix of that glyph, but the moon sign is suppressed. Presumably it was so obvious that the completion referred to the moon that the latter glyph could be omitted without any danger of ambiguity.

A head variant of Glyph D is common at Palenque but quite rare at other sites. This takes the form of a grotesque head, clearly that of an animal or a reptile, which is placed mouth upward (figs. 36,*20*; 37,*36*). Beyer regards this as identical with the frog head used as the personified form of the uinal glyph (fig. 27,*40–52*). The resemblance is certainly close, but this head variant of Glyph D invariably has an upturned snout, not a characteristic of the uinal head, although it occurs in a vestigial form in some examples of that glyph. Also, this Glyph D variant lacks the triangular arrangement of dots almost invariably found in the ear of the uinal head. These differences are sufficient to enable the two heads to be distinguished easily from one another, quite apart from differences in affixes and positions, but they are probably not sufficient to require us to seek outside the frog or toad groups for the prototype. As noted (p. 47) the generic name for frog or toad in many Maya languages and dialects of the highlands is *po,* a word which also is the name of the moon in Kekchi and Pokoman. Nevertheless, I would be inclined to regard this head as signifying in some way as yet not clear disappearance of the moon.

On Quirigua G there is an unusual variant of Glyph D, consisting of a hand, with distance-number prefix below, a skull or death head in a vertical position, and a vestigial moon sign (fig. 37,*17*). The whole must surely mean "completion of the death of the moon."

The variants of Glyph D with their probable meanings are accordingly:

1. Hand and moon sign. "Completion of the moon."
2. Hand. "Completion."
3. Moon with eye infix. "Death of moon?"
4. Moon with eye infix and jade. "Dead moon (?) in the heaven of the rain gods."
5. Little head on side and jade. "The dead one in the heaven of the rain gods."
6. Head of frog or toad in vertical position. Meaning uncertain.
7. Hand, skull, moon. "Completion of death of moon."

The evidence of the glyphs themselves seems to indicate that Glyphs D and E were not counted from observed new moon, but either from the disappearance of the old moon or from conjunction with the sun during the period of disappearance. Thus the glyphic evidence appears to substantiate deductions from the linguistic data.

These seven variants of the Glyph D provide a good example of how richness in glyphic combinations reflects the flavors of a wealth of metaphors and synonyms in the spoken language. The wide choice of glyphs emphasizes how numerous and how diverse may be glyphs with the same general meeting and function, but each with its individuality corresponding to the wide range of idiomatic expression. The Maya priest could pick the glyph he wanted as the author chooses the word that adds most flavor or beauty to a passage.

Glyph E

In contrast to Glyph D, Glyph E is confined to a single variant of the main element. That is the complete moon sign with a circle or dot in the center. This element may be personified (fig. 37,*16*). Generally the distance-number postfix is added, and rarely other affixes appear (figs. 36,*25,34*; 37,*46,67*), but sometimes there is no postfix (fig. 36,*66*). Glyph E has a value of 20; the coefficient, never greater than 9, has to be added to this. As already noted, Glyph D, without a coefficient, is usually present when Glyph E is recorded, but in a few texts Glyph D is omitted after Glyph E (Yaxchilan 6, Chichen Itza 1).

Glyphs for Day, Dawn, or Night

Beyer (1936a) has called attention to certain extraneous glyphs which sometimes intervene between Glyphs D or E and their coefficients. He identifies them as symbols for day, and supposes they were inserted at the whim of the sculptor or because of considerations of space. I have already discussed some of these variants, and concluded that they probably refer to a count by nights or dawns (p. 174). The variants encountered with Glyph D and, very rarely, with Glyph E are the *bix* glyph (fig. 31,*11,34,36–38*), the conch (fig. 31,*10,35,37*), and the head of an animal, either a jaguar or a dog (figs. 31,*30–32;* 37,*26*). Copan 9 has a most unusual sign with a coefficient of 5 (fig. 37,*32*). The moon age corresponding to the IS (9.6.10.0.0) is about 28 days. Teeple read the glyph in question as 5E, but I think it must be meant for 5D, although that involves a considerable error in the calculation. Nevertheless, no element which would seem to have the meaning of 20 is present. The glyph consists of the head of God C with a water symbol before his face and, to the left, an Ahau sign on its side as a prefix. There is a second prefix above the main element. As noted (p. 171), the glyph would appear to mean 5 dawns. Apparently Glyph D has been suppressed, and one must understand that the 5 dawns or, more probably, sunrises are reckoned from the completion of the previous moon.

Copan N has a somewhat similar sign. In that case the head of God C has a single prefix; water symbols, to the left of the head, flank a numerical dot (fig. 36,*1*). The whole would then mean "1 dawn," and, again, Glyph D, indicating the departure point of this count, has been suppressed. The lunar age corresponding to the IS (9.16.10.0.0) is, in effect, about one day.

Glyphs for Last Day of Moon

There are two or three unusual glyphs which seem to refer to disappearance of the moon or perhaps to conjunction. They replace the normal forms of Glyphs D and E. Unfortunately, the details in none are entirely clear. Texts which seem to refer to the completion of the moon accompany the following IS:

1.	Copan 1	9.12. 3.14. 0
2.	Quirigua E	9.17. 0. 0. 0 (fig. 36, *29–33*)
3.	Quirigua D	9.16.15. 0. 0
4.	Quirigua F	9.16.10. 0. 0 (fig. 37, *63–66*)
5.	Piedras Negras 13	9.17. 0. 0. 0
6.	Quirigua Alt O	9.17.14.16.18 (fig. 37, *26–31*)

In Text 1 Glyph D is present, but it is upside down, and has three little circles as an infix instead of the eye. There is a superfix, perhaps a jade symbol, flanked by little death heads of the type already discussed. To the left there is a queer combination. The main element appears to be a Cauac sign, above which is a knotted element and, above that, again, an element of unknown meaning, conceivably but not probably a stylized hand. The whole might indicate dead moon in the house of storms.

Quirigua D has a head in a vertical position surmounted by a second glyph, possibly, although not probably, a sign for darkness.

In the text of Quirigua E also there is a pair of glyphs. That on the right is a variant form of the normal sky sign; that on the left is somewhat eroded. Quirigua F is equally unsatisfactory. The right glyph is a frog head in a vertical position; the left glyph is hard to identify, although a Cauac infix is recognizable. Maudslay's drawing leaves much to be desired. Piedras Negras 13 is also defective. There is a complete moon sign to the right; probably two signs to the left, the topmost having a large crosshatched dot in the center. Quirigua Alt O is also a little dubious. There seems to be a manikin death sign before the first glyph. These signs which indicate a moon age of no days are too uncertain to be used in reaching any conclusions but I think the future will produce special glyphic arrangements to indicate the completion of the moon. See Addendum, page 296.

Glyph C

Glyph C indicates the number of complete moons. It consists of a minimum of three elements, and a maximum of six including the coefficient (fig. 36,*2,7,12,16,21,26*,etc.). The essential elements are:

1. A hand in a horizontal or nearly horizontal position with fingers to right and back toward observer. This hand occupies the bottom part of the glyph, often extending the whole width of the sign.
2. A half-moon which occupies the right part of the glyph. It rests on the forefinger of the hand or is at the right of the hand.
3. A small head or other sign, a variable factor, which occupies the top left corner of the glyph.

The elements which may or may not be present are:

4. A coefficient between 2 and 6 inclusive.
5. A prefix which may be the flattened fish head ("count of"), the *u* bracket ("of" or converting number to an ordinal), or the skull or death eyes ("expiration of").
6. The *il* postfix, similar to that found with Glyph D but seldom used.

Teeple, who deciphered the meaning of Glyph C as a count of completed lunations, showed that Glyph C without a coefficient should be read as one month completed, for calculations during the period of uniformity (p. 244) prove that Glyph C without a coefficient falls one lunation after Glyph C with coefficient of six (written 6C) and one lunation before Glyph 2C. Glyph C without a coefficient usually has the *u* bracket or *xoc* prefix, the whole presumably declaring "count of completion of a moon" or merely "the completion of a moon." It is strange that the numerical coefficient should be omitted when one lunation is recorded, since that practice was not followed in recording other counts (but see "Ben-Ich" katuns). The omission probably corresponds to a linguistic variation.

Teeple thought that Glyph C recorded moons in the group already completed, and that a record of, say, 12D 4C meant that 12 days of the fifth moon had been counted. This is perhaps the more logical interpretation, but Glyph C may well refer to the current, not the last elapsed moon, as both I (Gann and Thompson, 1931, p. 218) and Satterthwaite (1947) have suggested.

Three texts which apparently record conjunction or disappearance or new moon, since no moon age is given, favor the interpretation of C as the current moon. These are on Quirigua F, D, and E and have 6C, C without coefficient, and 2C for the dates 9.16.10.0.0, 9.16.15.0.0, and 9.17.0.0.0. According to the uniform system and a reading of Glyph C as elapsed moons, these dates call respectively for C without coefficient, 2C, and 3C. That is to say, in each case one moon more than is recorded. Yet, other lunar series on Stelae D and E are in agreement with lunar groupings of the period of uniformity, and it is logical that all five texts should give the moon number in the uniform system. However, if Glyph C denotes the current moon, the coefficients of C are what one would reasonably expect in the uniform system, for, as the new moon has not yet started, the moon just ending is current, and it is logical so to record it. In the suggested arrangement of a count by current moon three consecutive days with that of Quirigua F in the middle would run: 6C 29DE (or 28DE if this were a 29-day moon), 6C no moon age, C without coefficient 1D. In this text Glyph A records a 30-day moon, but if the cyclic base has no number the coefficient of DE can not exceed 29. These three texts do not prove the contention, but they weigh the scales in its favor.

The function of the small head, occasionally replaced by a symbolic element, is not certain. In about half the legible texts the head is that of the death god or an aged being; in other cases it is that of a youthful personage. The head of the Chicchan god, the god of number 9, and that of the moon goddess herself, as deity of number , occasionally occur, as well as the jaguar god of number 7 and the head of number 6. Unfortunately, these heads are carved on such a small scale that they are veritable miniatures. A small amount of weathering suffices to obliterate characteristics with the result that in most texts an exact classification is not possible.

Glyph X

This glyph, which follows Glyph C and is dependent on it, is thus named because of its great variability. Teeple (1931, pp. 61–62) demonstrated that the form of Glyph X was governed by the coefficient of Glyph C; Lawrence Roys numbered the principal variants X1 to X6 inclusive. The form which consists of the head of God C (X2) in the jaws of a celestial monster, and with varying prefixes indicative of water is carved only when the coefficient of Glyph C is absent or is 2 (fig. 36,*3,8,17,27,37*). A form (X3) which has as its main element a horizontal band enclosing two or more vertical or up-curving lines, and usually a tassel-like prefix, and a postfix placed on its side and with lines cut in it, occurs only when the coefficient of C is 2 or 3 (fig. 36,*22,31,41*). A skull over crossed legs or crossed legs over a skull, or crossed legs over a kin sign or a complete moon sign (X4, fig. 36,*46,51,56,69*) may occur when the coefficient of C is 3 or 4, but is present once when the coefficient of C is 2 (Yaxchilan L 46). It has been supposed that it follows Glyph C5 on Yaxchilan L 29, and is thus given by Teeple (1931) and by Morley (1916 and 1937–38), but a photograph of the lintel shows that the coefficient of Glyph C is probably 3, and that this text may not, therefore, be an exception to the rule. Another form (X4a) has as its most distinctive feature a double fret, like an angular reversed S, which divides the glyph into two fields (fig. 36,*59*). This may occur when the coefficient of C is 3 or 4. A form (X5) which is commonly used when the coefficient of C is 4 or 5 consists of a face with a beaked nose and a hollow in the top of the head. This has a prefix, usually the completion sign (probably used here with the value of water), but often the cauac sign, also a symbol of water, which may be an infix of the head (figs. 36,*63*; 37,*3,13,19,29*). There is a symbolic variant which is a water sign, and appears to correspond to the beak-nosed combination.

There are various forms which occur when Glyph C has a coefficient of 6, but they do not at first glance conform to a single type. In two cases (X6) the sky sign is one of the elements; in another the kan cross with a "Ben-Ich" superfix forms Glyph X (fig. 37,*47,50*). The commonest form with C5 or C6 is X1, consisting of three or four elements, the most constant of which appears to be an elaboration of the bundle element used as an affix with some glyphs (figs. 16,*13,14,16,17,28–31*; 26,*47,48*). With this may be joined or fused an element which resembles, but probably is not, the symbol for white, or a small element containing three circles, like an inverted Ahau. A human fist and/or yet another element may be present (fig. 37,*9,34,38,43,55,60,69*). These seem very diverse elements, but the bundle variant, the pseudo-white symbol, the three circles, and the fist also appear together in various forms of Glyph G7, corresponding to the seventh lord of the night (fig. 34,*32–35,37*), and in the variable element of the IS introductory glyph assigned to

Pax (fig. 23,*18–20,34*). As they appear in three distinct glyphs we can be sure that they belong together.

When Glyph C has no coefficient (given the value C1), Glyph X, with one definite exception, is always X2, that is, the variant with the head of God C in the jaws of a monster. The clear exception, on Copan J, is an obvious example of X1 (fig. 36,*13*). Andrews (1934), who published Lawrence Roys' chart showing the correspondences between Glyphs C and X, put forward this one example as evidence that just as each of the other forms of Glyph X accompanies two consecutive coefficients of Glyph C, so this variant of Glyph X covered two sequent lunations, namely, C6 and C1, and that was evidence that the two cycles overlapped. Nevertheless, this theory will not hold water because this form is commonly found with C5 and C6. If it occurs also with C1, the whole pattern of each form of Glyph X following two sequent forms of Glyph C breaks down, for in that case it would be found with three sequent coefficients of C, to wit, C5, C6, and C1.

As every other Glyph C1, with the possible exception of the lunar series of Copan 7 where the combination C1 and X3 may be given, is accompanied by X2, I think either that the pattern of a form of Glyph X with two sequent coefficients of C is not a rigid one or that this appearance of X1 with C1 represents an error on the part of the Maya who prepared the blueprint of this text.

As this is only one of several disagreements with the Glyphs X and C cyclic pattern, I feel that we are not justified in labeling as Maya errors these exceptions to the rule which we ourselves have formulated. Rather, I would suppose that there is some factor, still unknown to us, which causes these divergences from the regular pattern. It is surely wrong to charge the Maya with errors until we are certain that the supposed mistakes are not the result of an incomplete knowledge of the subject on our part.

The solution of this problem is made more difficult by the presence of yet other forms of Glyph X, as, for instance, the kan cross with "Ben-Ich" prefix (fig. 37,*47,50*). This may be an independent form of Glyph X or it may be an unrecognized variant of X6. I am inclined to think it was an independent form, appearing only with C6.

The close connections between X2 and Glyph G1 and between X1 and Glyph G7 suggest that the lords of the nights, or some of them, may be involved; it is worth noting that one variant of X1 (fig. 37,*38*) has the distinguishing feature of Glyph G8 as one of its elements. The preponderance of symbols denoting water, death, and the underworld suggests that Glyph X is connected in some way with the aquatic abode of the moon goddess during conjunction.

There is inconclusive evidence that whereas the coefficient of Glyph C restricts the form of Glyph X to two choices (perhaps three in one group), the head accompanying Glyph C may determine which of those alternative forms is to be used.

The heads attached to Glyph C are perhaps assignable to two main groups: Group 1, comprising youthful heads; Group 2, heads representing death or old age, together with the symbolic variant, the "pack" or "eye" sign (fig. 36,*2,58*,etc.). The apparent relationship of Glyph X to the head and coefficient of Glyph C is shown in tabular form:

Glyph C		Glyph X
Number	*Head Group*	*Form*
0	2	2 (God C in snake's jaws)
2	2	2 (God C in snake's jaws)
2	1	3 (tassel variant)
3	1	3 (tassel variant)
3	2 (usually death)	4 (crossed legs)
3	2 (aged and "pack")	4a (fret)
4	2 (aged and "pack")	4a (fret)
4	2 (usually death)	4 (crossed legs)
4	1	5 (beaked nose)
5	1	5 (beaked nose)
5	2	1 (hand-bundle-"white")
6	2	1 (hand-bundle-"white")
6	2 ("pack" only)	6a (kan cross)
6	1	6 (sky combination)

Because of weathering and the smallness of the heads, one cannot say how strictly these categories were observed, and there appear to be cases which fail to conform to the apparent arrangement, just as there are exceptions to the apparent relationship between Glyph X and the coefficient of Glyph C. Nevertheless, the general pattern is too regular to be the result of chance.

Glyph B

Glyph B comprises four elements (figs. 2,*50–56;* 5,*28–33*): (1) the sky sign shaped as an elbow, but sometimes reduced to one arm, (2) the head of an animal of uncertain species within the elbow, (3) an oval sign which may be a postfix or an infix usually replacing the animal's ear, and (4) a prefix of the "count" group, the *u* bracket, the fish head, or the death eye. The prefix is lacking in a few texts at Copan. There is a symbolic form of the animal head. This consists of two circles containing what appear to be drops of water or cursive Ik signs (fig. 2,*55*). Occasionally the head with its infix or postfix is replaced by the muluc (water or *xoc*) symbol, and in two texts the head of God C is the main element within the elbow (fig. 2,*52,56*).

Glyph B is lacking in a number of texts, particularly those of early date; it is never present when Glyph X is suppressed. Teeple and Lizardi Ramos (1941) have supposed that Glyph B is to be read in conjunction with Glyph A, but the text of Quirigua B suggests that Glyphs B and X be read together, for the animal of Glyph B carries Glyph X on his back (fig. 29,*14*). Moreover, B is never present when X is absent.

With regard to the identity of the animal, Lizardi Ramos (1941) has demonstrated that the two circles with drops of water or cursive Ik signs replace the head of this animal in other contexts. We can assume, therefore, that those circles are the glyph for the animal in question. They do not correspond to the name glyph of the species of dog found in Dresden, for that is the composite sign consisting of the rib sign and another symbol (fig. 14,*10*).

The oval suffix or infix has been identified by Beyer (1930, p. 14; 1937, p. 55) with some plausibility as a long bone. The combination of two circles with Ik centers over the supposed bone element is given three times in Dresden in this simple form: on page 57 it occurs in the group of glyphs above one of the pictures in the eclipse table; on page 46 it appears above the picture of the Venus god preparing destruction for dwellers on earth; on page 58 the glyph is in the introductory text to the IS which head the table of multiples of 78 and 780. To make the matter still more complex, the rare substitution of the muluc, "water," symbol for the head of this animal must be taken into account in interpreting the animal heads. Furthermore, in one case (fig. 2,*50*) there is a kan cross on the animal's cheek. This symbol has the values of both yellow and water; presumably it is to be interpreted as the latter in this case in view of the substitution of the water symbol for the head and "bone" elements.

The elbow element which stretches across the top and down the right side is clearly the sky sign distorted to occupy this space (fig. 2,*57*). It has been suggested that this is a symbol for house or temple. Be that so, or be it not, the important point is that the elbow is merely the usual sky symbol, bent to that shape. It is conceivable that in view of the aquatic associations already noted, the whole represents the celestial realm of the rain gods in which the moon, according to the cosmological ideas of the Mexicans, had her abode. As we have seen, there is some evidence that a similar concept was current among the Maya. That interpretation must be regarded as extremely tentative, for the link between the little animal with the "bone" affix or infix and water is tenuous. If the two circles which form the symbolic variant corresponding to the animal head do, indeed, have the meaning of water (jade), the case would be much stronger. Should some such meaning in reality correspond to Glyph B, the three glyphs C, X, and B would convey some such idea as "completion of *n* moons, Glyph *Xn* in power, in the celestial realm of the rains."

Glyph A

It has long been known that Glyph A indicates whether the month be of 30 or 29 days. It consists of a moon glyph with a coefficient of 10 or 9 in the form of a postfix. At one time it was thought that the coefficient appeared as a postfix instead of as a prefix in order to indicate that the number was added to the number 20, for which the moon glyph stands, and did not serve as a multiplier. That idea, of course, no longer holds good, for it was subsequently learned that the coefficient of Glyph E also is added, but that is a prefix, not a postfix. Furthermore, there is one case in which the coefficient of A is a prefix (Quirigua I). Therefore, the postfixal position of the coefficient is not necessarily indicative of addition. In the absence of any better information, one may surmise that the coefficient was placed below or to the right of the moon glyph as a ready means of distinguishing Glyph A from Glyph E.

Teeple (1931, p. 63) writes: "There is a regularity about the 29 and 30 of Glyph A that makes one believe it is a predicted and not an observed figure. Whenever Glyph C has an odd coefficient, 1, 3, or 5, the chances are about three to one that Glyph A will show 30 days; whenever Glyph C has an even coefficient, 2, 4, or 6, the chances are about three to one for a 29-day Glyph A. This goes beyond the bounds of probability for observation, hence I regard Glyph A as a more or less arbitrary prediction of the length of the current moon."

This interpretation must be accepted except conceivably for the designation of Glyph A as a record of the current moon, for if Glyphs C, X, and B should refer to the lunation last completed, Glyph A might similarly deal with the last completed moon, indicating whether it was of 29 or 30 days. The minority of 29-day lunations with C1, C3, and C5 and the minority of 30-day lunations with C2, C4, and C6 presumably reflect the occasional conversion of a 29-day span to one of 30 days, and a consequent derangement of the sequence. As the lunar half-year is 177.18 days, a 29-day moon would have to be converted to one of 30 days every fifth or sixth lunar half-year.

Glyphs Y and Z

Except that both Glyph Y and Glyph Z appear to indicate dawn or night, and that Glyph Z is the same as that called the *bix* glyph, I have no idea as to how they function in those cases in which they are not to be read with Glyphs D and E, because they are inserted between those glyphs and their coefficients.

GROUPINGS OF MOONS

Teeple (1928 and 1931) in a brilliant analysis of the coefficients of Glyph C was able to establish three periods, which he named the periods of independence, uniformity, and revolt.

During the period of independence which lasted from the start of the lunar series to around 9.12.10.0.0, each city appears to have been attempting to coordinate its lunar calendar to the solar calendar by interpolations which varied from city to city. The second, which he named the period of uniformity, is marked by the standardization of the lunar groups into lunar half-years which were always of six months. This system spread rapidly and was soon adopted by most Maya cities, although it does not appear to have been accepted in outlying sites in Campeche, such as Calakmul. During this period one can predict what the coefficient of Glyph C will be for any date found on a monument erected during this period at any city that had adopted the system. This is simple, because as five tuns are just about one day less than 61 moons, one knows that as, for example, the standard system calls for 3C at 9.14.0.0.0, at 9.14.5.0.0 (61 moons later) the coefficient of C will be 4: 3C+1 (61÷6=1)= 4C, and five tuns later still it will be 5C. Therefore, to get the coefficient of Glyph C for any date in a city that was using the standard system, one has merely to take the interval from some recorded example in that system, convert the figure into lunations, divide the result by 6, and add the remainder to the base. As an example, we wish to check the moon age of Piedras Negras L 3, which carries the date 9.15.18.3.13 and for which the moon age is given as 9D 1C (fig. 57,*1*). Stela 10 at this site gives the moon age of 9.15.10.0.0 as 9D 3C (fig. 57,*7*) which is in agreement with the system of uniformity. The interval between the two dates is 8.3.13 which reduces to 2953 days; 100 moons are 2953.06 days. Therefore the interval is 100 moons without remainder. When these are divided by 6, the remainder is 4, which must be added to the moon age of 9.15.10.0.0: 3C 9D+4C=1 (7−6) C 9D. The lunar record of Lintel 3, therefore, is given in the uniform system, and the moon age of 9D is correct.

This is a very simple calculation. Let us try one that is somewhat more involved. At Piedras Negras the IS 9.12.2.0.16 appears on both Stela 1 and Stela 3. On the former the moon age is recorded as 3C 8D; on the latter it appears as 2C 7E (fig. 36,*25–28*). There is not only a difference in the coefficient of Glyph C, but a difference of 10 or 11 days or of 19 days in the age of the current moon (i.e. the interval from 7E to 8D or 8D to 7E).

Stela 6 at Piedras Negras gives the moon age of 9.12.15.0.0 as 4C 5E, and is in agreement with the uniform system. The interval between the two dates is 12.17.4, which reduces to 4664 days. This is the equivalent of 157 moons and 27.7 days, which must be subtracted from the moon age of Stela 6 after casting out all multiples of six lunations:

Moon age Stela 6	4 C	25 D
Subtract interval	1 C	27.7
Calculated moon age of Stelae 1 and 3	2 C	26.8

The moon age of 9.12.2.0.16 is, accordingly, in the uniform system 2C 7E, and is correctly given as such on Stela 3. Stela 1 is not in agreement with the uniform system, and records a moon age of 8D, whereas it should be about 7E.

Teeple has supposed that these two texts at Piedras Negras record the change from the old system of the period of independence to that of the period of uniformity, and that one text gives the new method, the other the old. This seems logical, particularly in view of the two IS at Naranjo for the date 9.12.10.5.12, one of which gives the lunar count 1C 18D, the other 6C 19D, one month less one day earlier, the former being in the system of uniformity. However, if these two dates at Piedras Negras do treat of the inauguration of the uniform system, it is surprising that the Maya priest should have made an error in one of the three or four glyphs which are essential to the exposition of the problem, for the substitution of one glyph for another (D for E) can hardly be attributed to the sculptor.

At 9.16.5.0.0 Copan abandoned the uniform system of grouping lunations, and instituted a new system which, in Teeple's opinion, was probably of the type found in the eclipse tables of Dresden. That is to say, instead of a straightforward grouping of lunations in sixes, an occasional group of five lunations was inserted so as to make each group of lunations end on a date on which an eclipse might fall. As Teeple points out, there are insufficient lunar series for Copan after 9.16.5.0.0 to make the proof complete.

For other cities, except Quirigua, the number of lunar series after 9.17.0.0.0 is too small to indicate what system was used. All that can be said is that the uniform system was not followed. On late monuments at Quirigua there is an apparent tendency to keep the same moon age for two or three consecutive quarter-katun endings. Thus, for 9.16.10.0.0, 9.16.15.0.0, and 9.17.0.0.0 the moon age is nil; for 9.17.5.0.0, 26 days; for 9.17.10.0.0, 27 days; for 9.17.15.0.0, 9.18.0.0.0, and 9.18.5.0.0, 23 days; for 9.18.10.0.0 and 9.18.15.0.0, 18 days, but the former may read 16 days.

Normally the moon age at each succeeding quarter-katun should be reduced by one or two days, for 1800 days (five tuns) are 1.36 days less than 61 moons. Apparently the astronomers of Quirigua liked to equate five tuns with 61 moons, and at intervals reduce the moon age by three, four, or five days to offset the error which had accumulated or which would accumulate in the next two or three quarter-katuns.

THE INTRODUCTION OF THE UNIFORM SYSTEM

The period of uniformity at Copan first appears in the lunar series of Altar H′. The inscription on Altar H′ is continued on Altar I′, and there is not the slightest doubt that the two should be read together. Their dedicatory dates are either 9.12.10.0.0 9 Ahau 18 Zotz', which is declared on both monuments, or the current katun ending, 9.13.0.0.0 8 Ahau 8 Uo, which is recorded on Altar H′. Attention has already been called to the apparent use on these monuments of combinations of 405 and 361 moons in lunar calculations far into the past which lead from 9.12.10.0.0.

The IS is 9.12.8.3.9 8 Muluc 17 Mol which is recorded in the uniform system as 5C 22D. The distance to 9.13.0.0.0 is 4251 days, whereas 144 moons are 4252.4 days. Teeple believed that the people of Copan may have set the moon age of 9.13.0.0.0 as 22 days; 144 months are 12 lunar years. Thus, Copan inaugurated the uniform system with a date 12 lunar years before the current katun ended.

The uniform system is marked at Naranjo by Stela 24, which gives the date 9.12.10.5.12 4 Eb 10 Yax as 1C 18D. Stela 24 was dedicated at 9.13.10.0.0, which is the closing date of the text. The interval between these dates is 7088 days which is .66 days less than 240 moons. As 240 is divisible by 6, the lunar data for 9.13.0.0.0 at Naranjo would have been calculated in the uniform system as 1C 18D, or 1C 17D. The interval between the two dates is 20 lunar years.

As in both these texts the dates chosen to inaugurate the uniform system are within a day or so of an even number of lunar years from the dedicatory date of the monument, one would expect the same to happen at Piedras Negras. There the uniform system is inaugurated with the IS on Stela 3, which records 9.12.2.0.16 2 Cib 14 Yaxkin as 2C 27D. The dedicatory date of this stela is 9.14.0.0.0 6 Ahau 13 Muan, which occurs on the left side of this stela as an IS. The corresponding moon age, as first read by Morley, is 3C 17D. There is, therefore, no lunar relationship between the two dates. However, there is a relationship with the moon age of the current quarter-katun. On Stela 39 the moon age of 9.12.5.0.0 is given as 1C 27D in the system in use at Piedras Negras prior to the introduction of the uniform system. The interval between the two dates is 1064 days, within a day of three lunar years (36 moons=1063.1 days).

No inauguration dates of the period of uniformity are known from other cities, for it is hardly reasonable to suppose that the double lunar recording of 9.16.1.0.0 on Yaxchilan 11 refers to the inauguration of the uniform system by that city, for at the date (9.17.0.0.0) on which that monument was probably erected, the uniform system had run its course and had already been replaced by another at Copan.

At Copan and Naranjo, therefore, dates to mark the inauguration of the uniform system were chosen apparently because they were calculated to be 12 and 20 lunar years, respectively, before the dates which the monuments commemorated; at Piedras Negras the inaugural date of the uniform system was three lunar years before the end of the quarter-katun, then running its course. The dedicatory date of the monument was considerably later:

Copan H′	9.12. 8. 3. 9	8 Muluc 17 Mol
	11.14.11	(4251 d.; 12 lunar years = 4252.4 d.)
	9.13. 0. 0. 0	8 Ahau 8 Uo
Naranjo 24	9.12.10. 5.12	4 Eb 10 Yax
	19.12. 8	(7088 d.; 20 lunar years = 7087.3 d.)
	9.13.10. 0. 0	7 Ahau 3 Cumku
Piedras Negras 3	9.12. 2. 0.16	2 Cib 14 Yaxkin
	2.17. 4	(1064 d.; 3 lunar years = 1063.1 d.)
	9.12. 5. 0. 0	3 Ahau 3 Xul

SUMMARY

The moon goddess was the wife of the sun, and patroness of weaving, childbirth, women in general, the earth, and probably, too, the maize crop. Because of her promiscuity, she symbolized wantonness. Her very human nature is unfortunately lost beneath the furbelows of arithmetic and astronomy with which she is decked.

Dresden 51–58 comprise an arrangement of moons which produces the equation 405 moons=46×260=11,960 days, thereby constituting a re-entering cycle of the type beloved by the Maya which brings the period under discussion into relationship with the 260-day cycle by seeking the lowest number divisible by both. The *lub* of the series is the day 12 Lamat. The equation 405 moons=46×260=11,960 days was apparently used by the Maya for making calculations to obtain the age of the moon at dates far in the past.

The arrangement of the groups of moons within the table in Dresden is such that there is no doubt whatsoever that the cycle of 11,960 days had been divided in such a way as to give a series of days, at intervals of 177 (occasionally 178) and 148 days, on which eclipses might,

but not necessarily would, occur. After each occurrence of a five-lunation group of 148 days there is a picture. Most of these carry symbols indicative of an eclipse.or at least of conjunction (areas of black and white, solar and lunar glyphs together, the sun with symbols of death, etc.). It has been suggested that these pictures may indicate lunar eclipses between two partial eclipses of the sun one lunation apart.

Teeple showed that because three eclipse half-years (519.93 days) almost exactly equal a double 260-day cycle, possible eclipse dates of the table cluster around three points in a 520-day wheel, and from those clusters the nodal points may be deduced. The starting point of the table, 12 Lamat, was about one day from the node day. On the other hand, Mrs. Makemson proved that 12 Lamat of the IS 9.16.4.10.8 12 Lamat 1 Muan, fell 14 or 15 days before node day. Therefore, the date of the table in Dresden cannot have been 9.16.4.10.8, but 9 or 10 $\times$ 1.13.4.0 later (because the node day recedes approximately 1.6 days each time the table is used), that is to say, about 10.12.0.0.0. The actual date Mrs. Makemson favored was 10.12.16.14.8 12 Lamat 1 Ch'en.

I doubt that the Maya had any inkling of the passage of the nodes. If an addition of six lunations to a possible eclipse date carried to a position in the 520-day wheel beyond the segment of 36 consecutive days, the priest would have known that an interval of five lunations would be necessary, for thereby the next date of a possible eclipse would fall within the allowable spread of 36 days.

For calculating the age of the moon on any given date far in the past or far in the future, the Maya of Palenque, as Teeple has demonstrated, appear to have used the equation 1.13.4.0=405 moons. This, of course, is the same as the length of the eclipse cycle in Dresden. There is some evidence, here presented for the first time, that the Maya, perhaps realizing that 1.13.4.0 was a trifle more than 405 moons, may have tried to correct the equation by the addition of twice 1.9.11.0=361 moons to approximately thrice 1.13.4.0=405 moons. This formula may have been used at Copan, and there are some grounds for believing that it appears in Dresden, for one of the IS is probably 9.19.7.7.8, which is 1.13.4.0+1.9.11.0 from 9.16.4.10.8. It is a variant of that which Teeple attributed to Copan.

The various glyphs of the lunar series are reviewed with regard to their functions and probable meanings, and evidence is adduced that the Maya probably counted their moons from disappearance. A relationship between the head attached to Glyph C and the variant of Glyph X is noted. The three periods of lunar groupings, as demonstrated by Teeple, are briefly reviewed. Evidence is presented that the inaugural dates of the uniform system were chosen so as to be an exact number of lunar years before the dedicatory date of the monument in question or, in one case, of the current quarter-katun. A review of three lunar series at Quirigua suggests that, contrary to general belief, Glyph C may refer to the current, not the elapsed, moon.

It should be noted that in Chapter 9 and in this chapter the expression "new moon" does not refer to any definite astronomical point, such as new moon visibility, but is used to indicate the cyclic base—disappearance, conjunction, or reappearance—from which the Maya reckoned moon age. This is done because of the uncertainty as to what point was used as the cyclic base. Indeed, it may well be that that point shifted from time to time and from city to city, as Satterthwaite believes.