Ivan Šprajc

Venus-Rain-Maize complex in Mesoamerica: Associated with the evening star?

El planeta venus muestra en sus movimientos cíclicos algunos fenómenos fácilmente observables que coinciden, aproximadamente, con los fenómenos estacionales para largos períodos de tiempo. En Mesoamérica tienden a coincidir, de tal manera, los extremos septentrionales y australes de la estrella vespertina con el comienzo y el fin de la época de lluvia. Se encuadran en este patrón de asociaciones los simbolismos cósmico-religiosos, manifestados en un conjunto de deidades mayas, aztecas y tarascas, los alineamientos en la arquitectura sagrada prehispánica, y varios rituales y prácticas en el ciclo agrario de pueblos indígenas recientes.
El presente trabajo intenta apoyar y corroborar las hipótesis de Closs, Aveni y Crowley sobre el complejo Venus-maiz-lluvia y el simbolismo del templo 22 de Copán en una perspectiva común mesoamericana, con nuevos argumentos de la arqueología, etnografía y etnohistoria.

The importance attributed to the planet Venus by the ancient Mesoamericans is a well-known fact. The most famous is probably the malevolent aspect of the planet, since according to some written sources from the post-Conquest Central Mexico the morning star at its first appearance was believed to inflict harm to the nature and mankind in a number of ways. In various codices there are iconographic elements which seem to confirm these reports. Although there is considerable amount of this kind of data, some recent studies have revealed the inadequacy of the common assumption that the heliacal rise was the most, if not the only, important Venus phenomenon. It has been argued that

> in spite of the obvious importance of the first appearance of the Morning Star, however, the Evening Star which disappears into inferior conjunction in the underworld had an equal, if not greater, significance (Klein 1976: 87).

Furthermore, in Mayan inscriptions some dates, which are associated with one or another Venus glyphic symbol, coincide (in the GMT correlation) with certain characteristic positions of Venus cycle, i.e. with first appearances of the evening star, maximum elongations, stationary points and - in few cases - with heliacal risings and inferior conjunctions (Closs 1979, 1981; Lounsbury 1982).

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The Grolier Codex also shows that first appearances of the morning star were not the only stations in Venus cycle that were important to the Maya (Carlson 1983). Consequently, the symbolism associated with the planet Venus in Mesoamerica must have been much more complex than it was commonly thought.

Venus-rain-maize complex

One part of this symbolism was related to rain and maize. Since a rather extensive and convincing argument for this relationship was recently presented by Closs, Aveni and Crowley (1984), I will only briefly summarize their conclusions, and add some data not included in their paper.

It is well known that the god Quetzalcóatl was related to Venus, on the one hand, and to rain, maize and fertility, on the other. The feathered serpent was a mythical creature which, from the remote past, represented celestial water, clouds, and also the rainy season (cf. Piña 1977). K'ucumats, the Quiché deity corresponding to Quetzalcóatl, was associated with both water (Recinos 1976: 157-n.1, 166-n.16) and Venus; a modern tradition, which tells that K'ucumats is a great serpent carrying the sun from the east to the west every day, is in accord with the text of the *Título de Totonicapán*, where Venus is said to guide the path of the sun (Carmack and Mondloch 1983: 185, 232-n.184). According to Carmack (1981: 84), Venus is associated among the Quiché with rain and birds, particularly with the quetzal. A notion of a feathered-serpent-Venus relationship was also found among some Tzotzil groups (De la Garza 1984: 185). The Maya deity Itzamna was said to be "el rozio, o sustancia del Cielo, y nubes" (Lizana 1893: 4); he is normally represented in a saurian/ophidian form, with sky symbols and occasionally with Venus glyphs (De la Garza 1984: 163ss). Itzamna held the ultimate power over the rains and therefore over the Chacs - the popular rain gods. Among the modern Chorti, who are most probably descendants of the ancient inhabitants of Copán, a comparable rain deity is Chicchan, having the characteristics of both Itzamna and the feathered serpent (Wisdom 1940: 395s, 445). Itzamna was a quadruple divinity (Thompson 1939: 157ss), and likewise there are four "sky Chicchans, who produce most of the sky phenomena" (Wisdom 1940: 393). A relationship between Chicchan and the planet Venus is very probable (Closs et al. 1984: 226). The god Kukulcan of the postclassic Yucatán was but a variant of Quetzalcóatl, intruded to the Maya religion by foreign invaders. Most surely Itzamna, Chicchan and Quetzalcóatl/K'ucumats/Kukulcan were essentially identical deities, having the same conceptual roots. The development of local variants from their common origin can be traced back to the Preclassic (cf. Piña 1977; De la Garza 1984: 141s), although the Venusian associations in such a distant past have not been proved (Closs et al. 1984: 229).

In view of Venus-rain connections, the relationship of the planet with maize is understandable. According to Closs (1979: 149ss), the Vase of the Seven Gods represents Mayan Venus deities; three of them wear the "sprouting grain of corn" glyph in their headdress (Dütting 1981: 212). Xulab, the Mopan and Kekchi Venus god, is the patron of agriculture, hunting and fishing (Thompson 1930: 63). The calendric name of the Aztec maize god Cintéotl was 1 Xochitl (Caso 1967: 198), and the corresponding Maya name, 1 Ahau, was probably a collective title of Venus deities (Thompson 1970: 250; see also Kelley 1965: 108ss; 1980: 524ss). Graulich (1983: 577) identifies Cintéotl with the morning star, while Dütting (1981: 210s) relates him with the evening star. Because Atamalcualiztli, the Aztec feast of the rejuvenation of maize, was celebrated every 8 years, Seler related it to the Venus cycle (Garibay 1958:154); it is in 8-year intervals that Venus phenomena recur at about the same dates of the tropical year. On the other hand, the 'canonical' period of the planet's invisibility around the inferior conjunction was 8 days.[1] In this connection it should be remembered that the Maya god of the maize was a patron of number eight (Thompson 1971: 134s, 137). Considering these facts Cohodas (1976: 160) concludes "that for certain purposes Venus and the Maize God were meant to be seen as equivalent."

As it can be realized, there is plenty of evidence which demonstrates the conceptual relationship between Venus, rain and maize in Mesoamerica. A question that logically arises concerns the nature of the observational facts that could have accounted for this relationship. Regarding the maize, it has been suggested that the "disappearance of Venus for 8 days in the underworld was associated with the maize god's (the maize seed's) invisibility in the earth before appearing as young maize plant" (Dütting 1980: 156s). Although such an association seems probable, it can not explain satisfactorily the relationship between Venus and rain. The rainy season, determining the agricultural cycle, is a seasonal phenomenon, which means that it recurs in one-year intervals. The motion of Venus, with its synodic period of 583.92 days, apparently does not exhibit any concordance with the tropical year of 365.2422 days and, thus, with cyclic changes in the nature. The same moments of the synodic period - inferior conjunctions, for instance - fall on the same dates of the tropical year only every 8 years, and even these dates are actually only approximately the same, because they gradually move backwards through the calendar. Nevertheless, Venus in its apparent movements *does* exhibit certain phenomena, which remain relatively fixed in the tropical year for very long periods of time.

Venus extremes

Because Venus is an inferior planet, it can only be seen in the morning or in the evening, at most a few hours before sunrise or after sunset. The rising and setting points of Venus move along the eastern and western horizon, respec-

1 As Aveni (1983) showed, this canonical period has its observational basis: the duration of invisibility at inferior conjunction varies considerably, but the mean disappearance interval is precisely 8 days.

tively, reaching northerly and southerly extremes. When attaining its extreme declinations, Venus on the horizon reaches its extreme angular distances from the east-west line, measured towards the north and towards the south. The azimuth values of the extremes obviously do not depend only on the declination, but also on the observer's geographical latitude. The extremes are not equal each time that Venus moves towards the north or south along the horizon; in an 8-year period they vary considerably. As it is the case with other Venus phenomena, the values and dates of the extremes repeat, approximately, after 8 years, but in longer periods these 8-year patterns also change. The *maximum* extremes are greater than solstitial extremes, attained by the sun in its annual movement along the horizon, because the plane of Venus orbit is slightly inclined to the plane of the ecliptic.

These phenomena were also discussed by Closs, Aveni and Crowley (1984: 222s). They noticed that *all the great northerly extremes* (when the planet attains a declination in excess of 25.5°) in the 8th and 9th centuries were visible in *April or May*; more specifically, they tended to occur in late April or early May, which means that they coincided, approximately, with the onset of the rainy season (ibid.: 234s). Comparing the dates of these extremes (ibid.: 239ss, Table 1) with the dates of conjunctions (found, for example, in Meeus 1983), one can come to an additional conclusion, which seems of particular interest: *all these extremes were visible in the west, Venus being the evening star*!

During the Classic period in Mesoamerica (between the 3rd and 9th centuries) Venus could attain a declination in excess of about Ã24°10'Ã(up to a little more than Ã27°Ã) exclusively when it was the evening star, and always some time *before* the solstices. In spring this could occur between April and June (northerly extreme), and in autumn between October and December (southerly extreme). The *great extremes* (when the declination exceeded Ã25.5°Ã - here I follow the definition of Closs et al. 1984: 223), however, always fell in the second half of April or in the first half of May, and in the second half of October or in the first half of November. On the other hand, when Venus was visible as morning star, the extreme declinations were always attained after the solstices, between late December and February (south), and between late June and August (north), but they *never exceeded* the Ã24°10'Ã (see Table 1). This means that the greatest extremes, visible in the east, were about 3° smaller than those, visible in the west. It means, furthermore, that Venus' rising point, while moving southwards and northwards along the *eastern* horizon, never passed much beyond the points of solar solstitial extremes.

In one 8-year cycle, 5 northerly and 5 southerly extremes of the evening star can be observed. The pattern of values and dates of Venus extremes, as exhibited in a cycle of 8 years, changes through time gradually.[2] But it is particularly noteworthy that the relationship of the extremes with certain seasons of the year practically does not change for many centuries and even millenia (see

2 These changes also exhibit a long-term periodicity: a given pattern of Venus phenomena is almost exactly repeated after 251 years (cf. McCluskey 1983).

Table 1); the astronomical explanation of these phenomena has been given elsewhere (Sprajc 1987: Appendix).

The astronomical evidence shows, thus, that Venus extremes, visible on the *western horizon*, are greater than those on the eastern horizon and, furthermore, they approximately coincide with the start and with the end of the rainy season in Mesoamerica (cf. Vivó Escoto 1964: 201); in various regions they also delimit the agricultural cycle. As we shall see, it is highly probable that the Maya were particularly interested in the *great* extremes of the evening star; in their Lowlands these extremes delimited the rainy season and the agricultural cycle quite exactly, since they always fell in late April or early May, and in late October or early November. Nowadays, for example, the Chorti of Guatemala plant the maize in the first half of May and harvest it in November (in their Lowlands it is already the second harvest) (Wisdom 1940:437ss). Likewise, in Yucatán the planting starts in May and the harvest in November (Enciclopedia Yucatanense, tomo VI: 203); these works coincide with the onset and with the end of the rainy season (cf. ibid.: tomo I: 88s, 91). It is very likely that the circumstances were comparable in prehispanic times.

Another phenomenon, related to the seasonal occurrences of the extremes, may have come to the attention of the ancient Mesoamericans. Venus, in its swinging path along the *western* horizon, is practically always a little ahead of the sun. The evening star turns back from the extremes before the sun does - before the solstices. In a way it anticipates the sun's annual movement along the western horizon (along the eastern horizon, however, Venus follows the sun). Was it for that, too, that this planet was deemed to be so powerful? This is, of course, a speculation, but perhaps this phenomenon was alluded to in Motolinía's (1903: 53s) statement:

> [...] contaban por una estrella que en el otoño comienza á aparecer á las tardes al occidente, y con luz muy clara y resplandeciente [...]. Llámase esta estrella Lucifer, y por otro nombre se dice Esper [...]. Como el sol va abajando y haciendo los días pequeños, parece que ella va subiendo: á esta causa cada día va apareciendo un poco más alta, hasta tanto que torna el sol á alcanzar y pasar en el verano y estío, y se viene á poner con el sol, en cuya claridad se deja ver [...].

Evening-star-rain-maize complex

Considering these peculiarities of certain Venus phenomena, observable in the western sky, especially the specific seasonal relationship of the extremes, it can be assumed that Venus-rain-maize symbolism in Mesoamerica originated and developed primarily in association with the *evening star*. Various kinds of evidence can be cited in order to support this proposition.

Historical and ethnographic evidence

In Citlala, a Nahua-speaking village in the Mexican state of Guerrero, the Holy Cross festival is still an extremely important annual rain-making ceremony. One of the deities addressed is San Nicolás, who is said to have been substituted for Venus, the evening star, which previously had a sanctuary in the village (Olivera 1979: 144).

Tiripeme-thupuren, one of the brothers of the sun god Curicaueri in the Tarascan mythology, was a patron of the evening star. He dwelled in the West and had a certain relation with winds and rains (Corona 1957: 37s). Tiripeme-xungápeti, another brother of Curicaueri, was associated with the north and fertility (ibid.: 36). The following observation about this god is particularly interesting:

> La Relación (de Michoacán) coloca a Tiripeme-xungápeti en Pichátaro, que ahora queda más o menos al poniente de la laguna de Pátzcuaro, y no sabemos el porqué de esta colocación, pues el color amarillo parece ser el del norte (Corona 1957: 35).

Could it be that the direction associated with this god was actually the northwest, where the evening star announces the coming of rains? Such an assumption may be supported by the fact that there are allusions, in Tarascan mythology, to the movements of Venus tracing the *ollin* sign (ibid.: 46), and is also in accord with the evidence, obtained by Preuss among the Cora of Nayarit.

In the Cora mythology Venus has a great importance. The morning and the evening star are distinguished as two deities, although their characteristics are sometimes confused (Preuss 1912: XXVIIIs). The maize god is identified with the evening star (ibid.: XXXII, XLIV, 111s). One of the chants that mention Venus is of particular interest because it seems to associate the movement of the planet in the western sky with climatic changes quite explicitly:

> Von Norden komme tanzend und (trage als Krone) deine jüngeren Brüder.
> Von Norden komme tanzend mit Blauelsterfedern.
> [...]
> Von Norden (komme tanzend) mit Tùras-Blumen
> Trage Cempasuchil-Blumen.
> Trage Zacalosuchil-Blumen.
> Trage Tsakwas-Blumen.
> Wolken trägst du als Krone.
> Das Weiße trägst du als Krone.
> Leben trägst du als Krone.
> (Preuss 1912: 230)

According to Preuss (ibid.) it is the morning star that is invoked in this chant, because the same kinds of flowers, mentioned here, appear as younger brothers of *Sautari* in another song (ibid.: 94). But such an interpretation does not agree with the fact that *Sautari* ('he who gathers flowers') is the name of the *evening star* (ibid.: LXIss). In his notes to the chant Preuss (ibid.: 230) says that it is not very clear, why the morning star comes from the north, embellished with flowers and clouds. In another place (ibid.: LXIV) he expresses an interesting opinion that the associations of the morning star with North and South, mentioned in various songs, are to be attributed to the observation of the annual movement of the sun. It is more logical, however, to relate these associations with the movements of the planet itself. In the quoted song the evening star comes from the north, bringing clouds, feathers of the blue magpie, and some flower species, which the Cora associate with the rainy season (ibid.: LXXXI). The poetic narrative agrees with astronomical and climatic facts. When Venus is visible in the western sky, its northerly extreme is a harbinger of the rainy season, and its 'return' from the north coincides with progressively heavier rainfalls.[3]

The Cora song appealing to the evening star to bring clouds and, ultimately, life from the north reminds of the Chorti rain-bringing ritual, in which "Noh Chih Chan, the great water serpent of the north, [...] must be awakened to begin the rainy season" (Cohodas 1976: 163). The Chorti beliefs, placing the chief of the sky Chicchans at the north (Wisdom 1940: 393), and the fact that north is described as "from here the water" in some Mayan tongues (Thompson 1971: 249), may also reflect the observed coincidence of Venus northerly extremes with the onset of the rainy season, as already suggested by Closs et al. (1984: 235); but this coincidence holds, of course, only for the extremes of the evening star.[4]

In the Lacandon mythology there is a connection, although not very clear, between Venus and the rain god Mensäbäk (Bruce 1974: 358). It is probable that it was the evening star that originally played the important role in this relationship: Äh Säh K'in, the evening star, is addressed in a chant to the new incense burners during a ceremony, which includes - or included in the past - the first-fruit offerings (Bruce 1974: 311; cf. Tozzer 1907: 106). On the other hand, the morning star appears in another song as the antagonist of the rain: its arrival is destructive and brings about Mensäbäk's death (Bruce 1974: 83ss). The story re-

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3 In another chant it is the morning star (Hatsikan) that asks the (god of) North for the clouds (Preuss 1912: 247). Various explanations are possible. The east, where the morning star appears, is thought of as the place of rain gods (ibid.: LXXVII); indeed, the rains are brought by the winds from the east. The interchangeable characteristics of the morning and evening star may also account for the confusion. What seems significant, however, is that although Venus is associated in various chants with different sky directions, it is exclusively its associations with the north that bring about the rain: it should be recalled that both evening and morning star northerly extremes could have been associated with rain: while the evening star northerly extremes coincide with the start of the rainy season, the morning star reaches the northerly extreme after the summer solstice, i.e. *during* the rainy season.

4 On the geographical latitude of the Chorti region the maximum *northerly* extremes of Venus coincide almost exactly with the first solar zenith passage (around April 30), when the sun is moving *northwards*. Both astronomical phenomena may account for the mythological importance of the north, since they both announce the coming of rains.

sembles a Cora myth, in which the morning star kills with an arrow shot the water serpent of the West, thus preventing the flood (Preuss 1912: XXVIII).

In Central Mexico the god Xólotl was associated with Venus as evening star (González 1979: 112; Seler 1960), and also with the maize, according to Sahagún (Anderson and Dibble 1953: 56) and *Histoyre du Mechique* (Garibay 1979: 106). *Codex Borgia* shows this god in a close connection with water, thunderbolt and maize (Seler 1963, II: 34, 45s). Both *Codex Borgia* and other sources suggest a close relationship of Xólotl with Quetzalcóatl and Tláloc (Seler 1960; 1963, I: 146ss; Klein 1980: 167s). Nanahuatzin, who can be considered as a variant of Xólotl (Seler 1963, I: 148s, II: 77; Thompson 1971: 79), also had an important role in the discovery of maize (Códice Chimalpopoca, p. 121).

It seems probable that Cintéotl, 1 Xóchitl, the Aztec maize god, was also associated with the evening aspect of Venus, as Dütting (1981: 210s) suggested. In a hymn that was sung during the Atamalcualiztli festival every eight years, Cintéotl is born in Tamoanchan, in the mythical land, which in some contexts may be identical to Cincalco, 'The place of the House of the Maize', and to Cihuatlampa, the western part of the sky (cf. Seler 1963: passim; Garibay 1958: 169). Thompson places Cintéotl in the west, remarking that "all the western deities, except the sky bearers, are associated with maize" (Thompson 1934: 225); one of them is Xipe Tótec, who is also suspected to have a certain connection with Venus (Seler 1963, I: 133). Garibay analyzed the song of Atamalcualiztli as consisting of three parts: Cintéotl is born in the first part, in the *night*, while Quetzalcóatl - the morning star - comes with the dawn, in the second part. Likewise, in the song of Xochipilli it stands: "By night did the god of corn shine" (Anderson and Dibble 1981: 231).

The beliefs concerning the maize god must have been similar among the Maya. In the Chilam Balam of Chumayel the following dialogue takes place:

> How was the grain of maize born?
> How indeed, father?
> Thou knowest. The tender green (shoot) was born in heaven.
> (Roys 1967: 112).

Thompson (1970: 285) felt sure that *Ah Mun* ('the tender one') was a name for the young maize god. Indeed, the repetition of the word gracia in this obscure part of the text suggests it has to do with maize (Roys 1967: 111-n.6). In relation to the maize god's birth in heaven, the following passage, taken from the same part of the Chumayel, is noteworthy:

> Esperas was the name of the sixth heaven; Isperas was the name of the seventh heaven (Roys 1967: 111).

It is possible that the context refers not only to the maize but also to the planet Venus: in the preceding text the creation of the planets is mentioned and, furthermore, in the books of Chilam Balam of Ixil and Kaua various spheres around the earth are labeled with names of the planets (Roys 1967: 110-n.7); *Esperas* and *Isperas* may, therefore, be derivatives from *Héspero*, "el planeta Venus cuando a la tarde aparece en el Occidente" (Diccionario, p. 704). The term must have been rather common in the 16th century: in the *Histoyre du Mechique* the smoke of Quetzalcóatl's burning body is said to have changed into a great star called *Héspero* (Garibay 1979: 116); the star named *Esper* by Motolinía (1903: 53ss) is also clearly identical to Venus.

Alignments

The interest of the Maya in the evening star is attested not only in the hieroglyphic inscriptions (cf. Lounsbury 1982; Schele and Miller 1986: 123ss) but also by some alignments in their architecture. Exploring the astronomical properties of the Caracol of Chichén Itzá, Aveni, Gibbs and Hartung (1975) discovered that some of the lines with a possible astronomical significance point to the northerly and southerly Venus extremes on the western horizon. The azimuths of the perpendiculars to the base of the lower platform and to the base of the stylobate platform correspond to the azimuth of the maximum northerly extreme of Venus on the western horizon. Two of the three windows preserved at the top of the tower also possess Venus alignments: the maximum northerly extreme could have been observed along one diagonal line of the window 1, and the maximum southerly extreme along one diagonal of the window 2 (Aveni, Gibbs and Hartung 1975: Table 1, Figs. 2, 4, 5, 6).

At Uxmal, Aveni (1975: 184s, Fig. 6, Table 5) observed that the straight line from the western doorway of the House of the Magician toward the southwest, passing through the center of the ballcourt, the center of the northern plaza of the south group, and the principal doorway of the west group, lies within 1° of the Venus set position at its maximum southerly extreme around A.D. 750. A Venus alignment was also suggested for the House of the Governor, which is skewed about 15° relative to the common orientations at Uxmal. The line from the principal doorway toward the southeast, perpendicular to the front face of the Palace, passes almost exactly over the ruins of Nohpat, about 6 km away. According to Aveni (1975: 184),

> the alignment from the Governor's Palace to Nohpat points almost exactly to the azimuth of Venus rise when the planet attained its maximum southerly declination around A.D. 750.

The azimuths of the line from the principal doorway to Nohpat and of the maximum southerly Venus rise position are given to be 118°13' and 118°03', respectively (ibid.: Table 5). It should be pointed out, however, that here the asymetry between visible Venus rise and set azimuths was not taken into account: the azimuth 118°3' corresponds on the latitude of Uxmal to the declination of about -26°23' (taking 0° as the horizon altitude and allowing for refraction), which could be attained, around A.D. 750, *exclusively when Venus was visible as the evening star*! Table 1 shows that in the 8-year cycle between A.D. 748 and 755 (other cycles in the 8th century exhibit very similar patterns) Venus as morning star attained its maximum southerly extreme on December 25, 754 (Julian), having a declination of -24.11° (-24°06'36")[5], which means that its rising point on the eastern horizon of Uxmal never reached an azimuth greater than 115°36', i.e. it almost did not pass beyond the point attained by the sun at winter solstices. It follows that the azimuth of the alignment between the Governors Palace and Nohpat is more than 2½° greater than the azimuth attainable by the morning star around A.D. 750. The difference is equivalent to about 5 sun diameters. It seems improbable that the Maya would have made such a great error, if indeed they wanted to embody this Venusian alignment into their architecture.

Nevertheless, taking into consideration the great number of Venus glyphs in the decoration of the Governors palace (cf. Aveni 1982: 15), it is difficult to accept that the uncommon orientation of this structure has nothing to do with Venus. What seems more probable is that the alignment was intended to work in the opposite direction: an observer of the 8th century, standing at Nohpat, would have been able to see Venus *setting* behind the House of the Governor, when the planet attained its *greatest northerly extremes*. The hypothesis that the alignment was associated with the evening star agrees with the plastic decoration of the palace, characterized for the Chac masks, in which Venus glyphs are placed (cf. Aveni 1982: 15): it should be recalled that the greatest northerly extremes of the evening star, occurring around May 1st (see Table 1), coincided with the beginning of the rainy season! Aveni (personal communication, Oct. 1987), although accepting that the alignment may also have functioned in the reverse direction, thinks that the disorientation of the Governors Palace relative to the other buildings at Uxmal is the soundest indication that it was the place from which Venus was watched. But on the other hand, it may be significant that it was at Nohpat, at the base of the stairway to the principal pyramid, where Stephens (1843: 221, Fig. 19) saw a stela which, as Aveni and Hartung (1986: 33s) noted, "depicts a figure with a hand raised pointing to a star-like image over it".

One further detail should be mentioned. Table 1 shows that the maximum northerly declination, attainable by Venus as evening star around A.D. 750, was 27.21°, corresponding to the azimuth of about 299°17' (taking 20' as an approximate value of the altitude of the Governors Palace, viewed from Nohpat, and allowing for refraction). The line from Nohpat to the principal doorway of the Governors Palace points, however, to the azimuth of 298°13'. So the error is of about 1°, if we place the construction of the Palace in the middle of the 8th century. But accepting Kowalski's (1987: 51) dating at about A.D. 900, a better fit is obtained between the alignment and the maximum northerly extreme of Venus on the western horizon (and an even poorer fit on the eastern horizon): around A.D. 900 the maximum northerly declination was 26.90° (on April 30, 904, Julian), corresponding to the azimuth of 298°56'. The agreement would be even

5 Moreover, Venus was on that day rather close to the sun, at less than 4° of western elongation, and was therefore quite probably already within the invisibility period before the superior conjunction (which fell on January 11, 755, Julian). It is more probable that the planet was visible for the last time a few days before, when it had not attained yet the declination of -24° and thus rose even further towards the north.

better with a few decades earlier chronological placement, which is, indeed, possible considering the extensive survey of Puuc chronology given by Kowalski (1987: 25ss) in relation with the House of the Governor.

In view of the alignment hypothesis, a chronological correspondence between the Governor's Palace at Uxmal and (at least part of) Nohpat ruins should be expected. Not much is known about Nohpat chronology, but the only date recovered so far at this Puuc site seems to be in a good agreement with this requirement. The inscription on an altar found at the south foot of the north and highest mound reads 'Tun 9 - 3 Ahau' (Pollock 1980: 277, Fig. 475 b). According to what we know of Puuc chronology in general (cf. Andrews and Andrews 1980: 276; Kowalski 1987: 25ss - with further bibliography), the most probable Long Count position of this date in terms of the GMT correlation is 10.1.9.0.0, falling in A.D. 858.

The great palace of Santa Rosa Xtampak may also be oriented to Venus extreme, since Aveni (1982: 14) mentions that it possesses the same orientation as the Governor's Palace at Uxmal.

So far only few alignments in Mesoamerican architecture are known, which possibly refer to Venus extremes. But it is remarkable that all of them can be claimed to record the *evening star* extremes, visible in the *west*. Many years ago Seler (1963, II: 117) observed that the fronts of the temples consecrated to the planet Venus deity face *west*. Regarding the Caracol of Mayapán, comparable to the Caracol of Chichén Itzá, Aveni and Hartung (1978: 7) pointed out that the only doorway on the west, the stairway and the probable 'window' of the upper chamber all emphasize the importance of the western side of the building. Another similar structure is the Castillo of Paalmul, which faces northwest and likewise has the access from the western side. No exact measurements could be accomplished, due to the poor preservation of the building, but it was quite possibly also oriented relative to Venus (Aveni and Hartung 1978: 11, Fig. 5). The Venusian alignments, examined so far, refer to the extremes. Another building should be considered, however, because its astronomical implications, although of different kind, offer further support to the hypothesis about the agricultural significance of the evening star in Mesoamerica.

Temple 22 at Copán

Temple 22, one of the most important structures at Copán, is particularly famous for the rich plastic decoration of its inner doorway, which offered grounds for interpretations about the temple's function. According to Morley, it was dedicated to Venus, while Girard and Kubler related it to agriculture (Robicsek 1972: 121, 123). Closs, Aveni and Crowley (1984) presented a number of arguments to demonstrate that both of these aspects are but interrelated parts of one conceptual whole.

One of the distinctive features of the temple is a narrow window in the western wall (Closs et al. 1984: Figs. 3 and 4, p. 247). It was recognized that the sun sets behind the local horizon along the axis of the window on the same dates as it sets behind Stela 10, viewed from Stela 12, i.e. on April 12 and September 1 (Aveni and Hartung 1976: 11; Aveni 1977: 13, Fig. 1.6). Closs et al. (ibid.) suggested that the window may have also served for observations of Venus above the western horizon. According to them, in the 8th and 9th centuries the days of visibility of Venus through the window almost always fell in April or May. Although the phenomena did not occur each year, the apparitions of Venus through the window, combined with the great northerly extremes of the planet, which likewise occurred in April or May and thus exhibited the same type of seasonal relationship, generated an almost annual pattern of observable Venus events, which approximately coincided with the start of the rainy season and the planting of maize (Closs et al. 1984: 235s, 239ss, Table 1).

However, checking the dates of inferior and superior conjunctions of Venus in Meeus' (1983) tables, one can realize that in the great majority of time-spans, given in the quoted article (pp. 239ss, Table 1) as the dates of Venus visibility through the window, Venus was either within the invisibility periods around conjunctions, or was the morning star and therefore could not have been visible in the western sky.[6] Calculating only all those dates, when Venus as *evening star* would have been visible through the window, the pattern shown on Table 2 was obtained. The table covers the time-span between A.D. 758 and 790, which is the most probable period of the temple's construction and use. The stratigraphic evidence indicates that Temple 22 is earlier than the adjacent Temple 21a (Trik 1939: 93). The period ending date, found on the latter and corresponding to 9.17.0.0.0., can therefore serve as the *terminus post quem non* for the construction time of Temple 22. The date falls in A.D. 771 by GMT correlation. Because Venus symbols appear on Temple 21a as well, it is not unreasonable to suppose that both temples were functionally related (cf. Closs et al. 1984: 228) and that there may not be any considerable chronological gap between the two. Indeed, the construction of Temple 22 is generally placed at about A.D. 765 (Gendrop 1983: 35; Robicsek 1972: 121; Stromsvik 1946: 69).

On Table 2, the time spans of Venus visibility through the window are indicated with black stripes. In certain cases the first appearances of Venus after superior conjunctions and its last visible settings before inferior conjunctions could have been observed within the sighting angle of the window. To calculate the dates of the planet's first/last visibility in these cases the *arcus visionis* was taken into account, i.e. the necessary depression of the sun below the horizon, or the minimum vertical separation between the sun and Venus, required for the planet to be visible in the moments of setting (for a more exhaustive discussion of the *arcus visionis* problem and for other details concerning Venus and Temple 22 see Sprajc, in press). Because the *arcus visionis* values for various planets are not reliably established, it is impossible to give the exact dates of first/last

6 That is, unless the Maya observed it by daylight: the idea does not seem probable, but it should not be entirely ruled out (cf. Motolinía 1903: 54).

appearances after/before conjunctions. I indicated the decreasing probability of Venus visibility by narrowing the black stripes on Table 2, and I made them fade out on the dates when the vertical depression of the sun below the astronomical horizon becomes less than 3°.

Table 2 shows that Venus was visible through the window some time from February to April and from June to September, exhibiting an eight-year pattern of appearances. A possible relationship between the periods of Venus visibility through the window and the maize cultivation may be exemplified by the ethnographic evidence. The modern Chorti start their agricultural cycle with the first cleaning of fields and gardens. This can be done at any time from January on. By the beginning of April, however, the *milpas* must be definitely cleaned of wild vegetation, which is then heaped together in small piles to dry in the sun. By the middle of April these piles are fired. The planting of maize starts after May 3, and weeds are cleaned twice in June. Around the middle of July, the first roasting ears are gathered in the lowlands, and the first-fruit festival is celebrated immediately after that; feasting and *chicha* drinking lasts for several days. July 24 is the day of the patron saint of Jocotán, and it opens a 13-day feast which is the most important one in the rainy season. At the beginning of August the first maize ears can be gathered in the highlands, which is again followed by feasting. In the latter part of this month the first lowland crop of maize ripens and is ready to be harvested. The stalks are cut partially in two and the ears bent downward to dry the following two weeks. Around the middle of September, after the first harvest, the second planting starts in the lowlands. Both this crop and the highland maize are harvested in November (Wisdom 1940: 43ss, 437ss, 462ss, 47ss).

The schedule of agricultural works and festivities in Classic period Copán was probably comparable to this one of the present-day Chortis, who live in approximately the same ecological conditions and are, furthermore, quite possibly descendants of the ancient inhabitants of Copán (Closs et al. 1984: 226). Consequently, the pattern of their activities, bound to the maize cultivation, is not only a result of environmental constraints, but also, to a certain degree, of cultural continuity. It is, therefore, allowable to hypothesize that seasonal Venus appearances through the window of Temple 22 may have had an agricultural significance.

It can be assumed that the February-March-April appearances corresponded to the first annual agricultural works before the planting. The July-August appearances, on the other hand, roughly coincided with the time when the first young maize ears were gathered. Among the modern Chorti this is a very important event. The first ears in July and August are, for many families, the first maize after several months of scarcity. It probably was not much different in Classic period Copán. First-fruit festivals are common all over the world, and we know that the Aztecs of Central Mexico also had important ceremonies of this type at the time of the first ripe *xilotes* (Broda 1971: 282s; 1983: 151s, 154).

It seems of particular interest that some first and last appearances of Venus after and before conjunctions could have been observed through the window. A possible conceptual relationship between Venus disappearance at inferior conjunction and the maize seed's invisibility in the earth before appearing as young maize plant has been indicated by Dütting (1980: 156s). He suggests that

> the *western head* of the rain-bringing sky-monster of Temple 22 symbolizes [...] the 'beginning of the rainy season' (the maize seed and Venus enter the interior of the earth) (ibid.: 146).

It may also be noted that whenever the last visible setting before inferior conjunction could have been observed in March, Venus 'entered' the window on February 2 (e.g. A.D. 762, 770 etc.); the date *remained unchanged* throughout the period, charted on Table 2. This is surprising, if we consider that the dates of other phenomena, repeating in 8-year cycles, gradually move through the calendar. February 2, in Julian calendar of the 8th century, corresponds to February 6, Gregorian. The date is remarkably close to February 8, which is, according to Girard (1949: 411ss), the starting date of the Chorti agricultural year, determined by the horizon observations of the sun.[7]

Another interesting detail is that first appearances of Venus after superior conjunctions, visible through the window of Temple 22, occurred on dates fairly close to April 12 and September 1, which are the dates when the sun sets along the axis of the window (not so close, however, as it might appear at a first glance, since all the dates on Table 2 are Julian and, accordingly, the setting sun in the 8th century faced the mid-line of the window on approximately April 8 and August 28, Julian). It seems as if one of the window's functions was to provide a viewing aid for locating Venus at its first visibility after superior conjunction: the planet was visible only one evening or so before moving out of the window, setting very close to one of the limiting lines of the window's viewing angle.

It should be noted that if the Copán astronomers observed the first appearances of Venus after superior conjunction in April, the burning of the *milpas* in these cases could hardly have started before this event, because the smoky air would have impeded the observations (cf. Morley's difficulties when he wanted to secure the azimuth of the line from Stela 12 to Stela 10 - Aveni 1977: 11). Wisdom (1940: 462) mentions, that the wild vegetation is, nowadays, fired by the middle of April. Could it be, that in the late-eighth-century Copán the burning began, at least each eighth year, only after the first appearance of the evening star, i.e. after about April 20, Gregorian?

Among the modern Chorti the first harvest of maize and beans in the lowlands starts around September 1, followed by the second planting in the middle of the month (Wisdom 1940: 445). Again a question arises: were the September first appearances of Venus after superior conjunction announcing, every 8 years, the first harvest and the second planting?

Both the first and the second planting are nowadays preceded by rain-making ceremonies, which could have had, originally, some relationship with Venus. The main ceremony, held from April 25 to May 3, is principally dedicated to the Working Men, who are the most important Chorti rain deities, while in the

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7 Wisdom (1940: 462), however, asserts that the social, religious and economic year starts on April 25.

September rites, performed by each family in the *milpa*, the Youthful Working Men are addressed, who act as assistants of the former. There are sound grounds to identify the Chorti Working Men with Chacs (Thompson 1970: 264), and it may be recalled that the Chac masks appear in the four corners of Temple 22 (Closs et al. 1984: 227). But the Working Men, in spite of their importance, do not act on their own, since they are only helpers of the Chicchans, who are, in fact, the true masters of water conditions (Wisdom 1940: 395s, 445s); a plastic representation of what is most probably a Chicchan deity is, accordingly, one of the most prominent iconographic elements of Temple 22. Venus symbols on this monster indicate its relationship with the planet; the characteristics of the Chorti Chicchan deity, on the other hand, also suggest an association with Venus (Closs et al. 1984: 225ss). If, consequently, "the ultimate power over the rains is implicitly held by Venus and the rain gods are his servants" (ibid.: 230), then it is not unreasonable to suppose, that the April appearances of Venus after superior conjunction were associated with rainmaking rites, sponsored by the Chacs and followed by the planting of maize, while the September phenomena were related to the first harvest and the ceremonies before the second planting in the lowlands. The Copán astronomers and priests of the late eighth century may have found it significant that certain phenomena on the celestial body, which had already been associated with rain and maize, came to coincide, every few years, with two important moments in the agricultural year. Perhaps it was this concern that was at least partly responsible for the construction of the window of Temple 22.

One further argument may be adduced in favor of the assumption that first appearances of Venus after superior conjunctions were observed through the window. Among the iconographic elements of the inner doorway decoration there are two skulls flanking the entrance. The 'toothy skull' has been recognized as an alternative Venus glyph (Lounsbury 1982: 153); moreover, in certain cases it seems to have been specifically connected with the evening star: three figures in the Grolier Codex, which are characterized by skulls, correspond to first appearances of the evening star after superior conjunction (Carlson 1983: 45ss).

Although the pattern of Venus visibility through the window of Temple 22 as presented here differs from the one proposed by Closs et al., it actually reinforces their argument about the Venus-maize-rain complex and the symbolism of Temple 22. The fact that the window faces west also favors the hypothesis that rain and maize symbolism was primarily attached to the evening star.

Conclusion

The planet Venus in its apparent movements exhibits some easily observable phenomena, which remain seasonally fixed for very long periods of time. Northerly and southerly extremes of the evening star approximately coincide with the onset and with the end, respectively, of the rainy season in Mesoamerica. Assuming that the climate has not undergone notable changes in the last few millenia, this coincidence could have been observed at least from the Preclassic on (cf. Table 1) and was probably responsible for the beliefs associating the planet Venus with rain and maize.

The basic assumption, underlying the hypothesis advanced, is that the beliefs about how the universe functions, constituting a structured and coherent world view shared by culturally related people, always have some observational grounds. The world views of different peoples, and sometimes even of social strata within a single complex society, can differ greatly, being conditioned not only by natural environment but also by the technological and intellectual level achieved. To the modern man, living in the 20th-century urban civilization, conceptual associations found in other cultures may seem bizarre and illogical; in many cases they do not establish a correct cause-and-effect relationship, as understood in terms of modern scientific reasoning. But the possibility that in one way or another they do reflect the observation of reality should never be ruled out. The cyclic changes in the nature are manifested by innumerable observable phenomena coinciding in time and space; the perception of these coincidences, many of which are peculiar to a particular environment and not at all obvious to a foreigner, gives rise to specific mental constructs and associations.

> Understanding the symbolism of culture often begins by bearing witness to the complex behavior of the things and phenomena of that segment of the world view we call 'natural'. For Maya symbolism specifically, this means we are obligated to know the life cycle of the toad, the stingless bee and the maize plant, to name but a few entities that we, in our unfortunate wisdom, separate from the rest of nature and relegate to the zoological and botanical realms. Also we must be able to follow the course of the sun, the stars, and the intricate movement of Venus, matters which we choose to label astronomy (Aveni 1986: 1).

In most of the history of mankind the celestial order, stable and apparently immutable, was considered to be superior to the earthly order and believed to excercise influence on the course of terrestrial affairs in a number of ways. If Venus extremes on the western horizon were perceived to coincide with the start and end of rainy season, it is natural to suppose that, consequently, the evening star was incorporated in the explanations of cosmic order as one of the agents responsible for important periodical changes in natural environment. The evidence presented, indicating that Venus-rain-maize complex was principally connected with the evening star, is in accord with this hypothesis. In order to test it, additional archaeological, historical and ethnographic evidence should be brought under consideration. Further alignment studies are also expected to shed light upon the validity of the proposition.

It should be noted that a number of Mesoamerican deities, known from the time of the Conquest, had some relation with Venus, and there seems to have been some confusion regarding the morning and evening star attributes. Quetzalcóatl, for example, who was chiefly associated with the morning star, was evidently connected with water, maize and fertility. He had certain characteristics in common with Xólotl, the evening star deity, and the role of both gods in myths is sometimes interchangeable. It seems that Quetzalcóatl was actually related to both aspects of Venus (Sáenz 1962: 15, 23; Iwaniszewski 1986: 106ss). It is possible that the originally distinct attributes of morning and evening star began to merge, when the apparently two luminaries were recognized as a single celestial body. On the other hand, a possibility remains that Venus, rain and maize symbolism is to be attributed to certain phenomena which we have not yet been able to recognize.

Whatever the correct and complete answer may be, it is most probably not a coincidence that Venus was found to have some relationship with fertility in many parts of the world. Surprisingly enough, *all* the cases of Venus-fertility symbolism cited by Iwaniszewski (1983) in his comparative study embracing widely separated cultures of the world are associated exclusively with the evening star. It would be interesting to investigate whether the climates of the regions where those cases of evening-star-fertility symbolism have been documented also exhibit a seasonal relationship with Venus extremes. Comparative evidence from other parts of the world would be very illuminating and might also help evaluate the hypothesis about the 'evening-star-rain-maize' complex in Mesoamerica.

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Appendix

Table 1

Dates and values of extreme declinations of Venus as morning/evening star in various 8-year cycles from the 6th century B.C. to the 16th century A.D. (N - northerly declination; S - southerly declination). All dates are Julian. The calculations were based on Tuckerman's (1962; 1964) tables, where Venus' positions appear at five-day intervals. To obtain values and dates of extreme declinations linear interpolations were carried out for intermediate days. The declination values are in decimal degrees and hold for 16:00 hours UT. The values of obliquity of the ecliptic were obtained from Aveni's (1980: 104) data. The underlined figures represent the maximum northerly and southerly declinations in each 8-year cycle. The asterisks indicate that the planet's elongation in the moment of extreme declination was less than 5° for which reason it probably could not have been visible.

	Date	Morning Star		Evening Star	
		N	S	N	S
-596	Jan 10		-24.36		
	Jun 2			25.36	
	Nov 2				-<u>26.61</u>
-595	Feb 22		-21.24		
	Jul 20	24.16			
	Dec 9				-25.16
-594	May 9			<u>26.63</u>	
-593	Jan 25		-23.87		
	Jun 19			24.96	
	Nov 12				-26.36
-592	Aug 4	23.59			
	Dec 19				-24.77*
-591	May 19			25.91	
-590	Feb 8		-23.10		
	Jul 4	24.58*			
	Nov 24				-25.65
-589	Apr 5			20.22	
	Aug 19	22.61			

	Date	Morning Star		Evening Star	
		N	S	N	S
-340	May 17			25.90	
-339	Feb 6		-23.01		
	Jul 2	24.51*			
	Nov 22				-25.63
-338	Apr 7			20.35	
	Aug 17	22.49			
-337	Jan 7		-24.29		
	Jun 1			25.34	
	Oct 29				-26.58
-336	Feb 21		-21.22		
	Jul 17	24.09			
	Dec 7				-25.13
-335	May 6			26.72	
-334	Jan 22		-23.80		
	Jun 16			24.91	
	Nov 9				-26.40
-333	Aug 2	23.52			
	Dec 22				-24.72*
-84	May 5			26.78	
-83	Jan 20		-23.71		
	Jun 14			24.85	
	Nov 8				-26.42
-82	Jul 31	23.42			
	Dec 21				-24.65
-81	May 15			25.90	
-80	Feb 5		-22.93		
	Jun 29	24.44*			
	Nov 20				-25.62
-79	Apr 2			19.97	
	Aug 15	22.42			

	Date	Morning Star		Evening Star	
		N	S	N	S
-78	Jan 5		-24.23		
	May 29			25.30	
	Oct 29				-26.52
-77	Feb 18		-21.20		
	Jul 16	24.01			
	Dec 5				-25.09
132	Apr 9			22.83	
	Aug 15	22.07			
	Jan 5		-24.09		
	May 30			25.18	
	Oct 31				-27.22
134	Feb 18		-20.57		
	Jul 16	23.86			
	Dec 6				-24.97
135	May 5			26.70	
136	Jan 21		-23.54		
	Jun 14			24.74	
	Nov 8				-26.29
137	Jul 31	23.24			
	Dec 21				-24.53*
138	May 15			25.79	
139	Feb 5		-22.70		
	Jun 30	24.32*			
	Nov 21				-25.51
324	Aug 2	22.95			
	Dec 23				-24.37*
325	May 17			25.58	
326	Feb 6		-22.28		
	Jul 3	24.15			
	Nov 23				-25.33

	Date	Morning Star		Evening Star	
		N	S	N	S
327	Apr 21			25.62	
	Aug 17	21.54			
328	Jan 8		-23.91		
	Jun 1			25.03	
	Nov 1				-27.30
329	Jul 18	23.66			
	Dec 8				-24.82
330	May 5			26.47	
331	Jan 23		-23.32		
	Jun 17			24.58	
	Nov 10				-26.07
500	Jul 21	23.41			
	Dec 11				-24.63
501	May 7			26.13	
502	Jan 26		-23.01		
	Jun 20			24.40*	
	Nov 12				-25.78
503	Aug 6	22.58			
	Dec 27		-24.19		
504	May 20			25.37	
	Oct 8				-22.73
505	Feb 9		-21.73		
	Jul 5	23.96			
	Nov 26				-25.13
506	Apr 30			27.06	
	Aug 19	20.67			
507	Jan 11		-23.70		
	Jun 4			-24.85	
	Nov 2				-26.94

Date		Morning Star		Evening Star	
		N	S	N	S
644	Feb 14		-20.47		
	Jul 11	23.69			
	Dec 1				-24.86
645	May 1			26.83	
646	Jan 16		-23.37		
	Jun 10			24.61	
	Nov 4				-26.33
647	Jul 27	23.06			
	Dec 17				-24.40*
648	May 11			25.74	
649	Jan 31		-22.53		
	Jun 25	24.17*			
	Nov 16				-25.45
650	Apr 5			22.07	
	Aug 10	21.94			
651	Jan 1		-23.94		
	May 25			25.10	
	Oct 27				-27.31
748	Feb 8		-21.55		
	Jul 4	23.86			
	Nov 24				-25.06
749	Apr 30			27.21	
	Aug 17	20.45			
750	Jan 10		-23.60		
	Jun 3			24.77	
	Nov 1				-26.92
751	Jul 20	23.31			
	Dec 10				-24.56
752	May 5			26.11	
753	Jan 24		-22.91		
	Jun 18			24.32*	
	Nov 10				-25.75

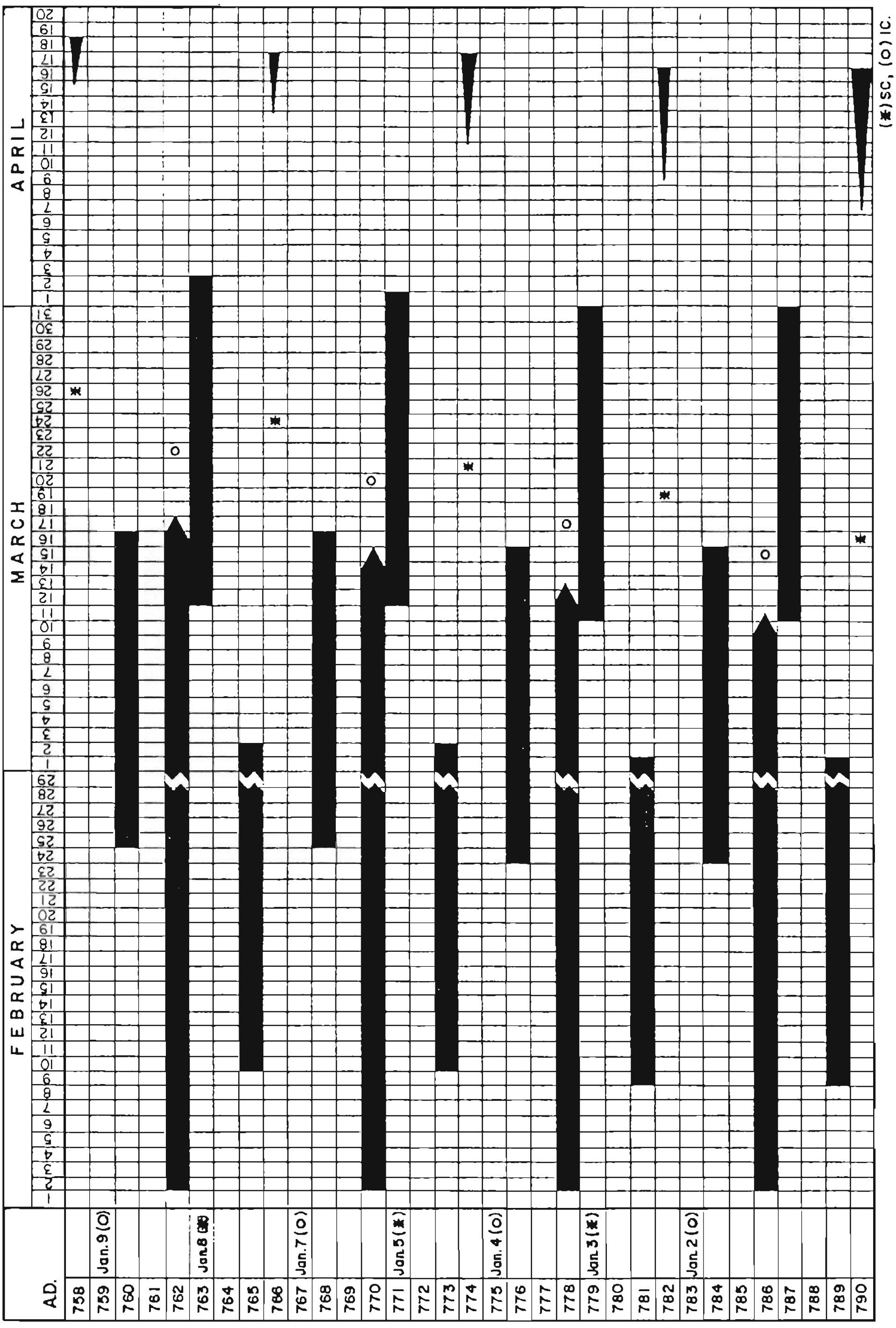
Date		Morning Star		Evening Star	
		N	S	N	S
754	Aug 4	22.47			
	Dec 25		-24.11*		
755	May 19			25.32	
	Oct 6				-22.73
852	Feb 1		-22.20		
	Jun 26	24.01			
	Nov 17				-25.28
853	Apr 14			24.96	
	Aug 11	21.50			
854	Jan 2		-23.78		
	May 27			24.95	
	Oct 31				-27.59
855	Feb 14		-19.71		
	Jul 13	23.52			
	Dec 3				-24.73
856	May 1			26.62	
857	Jan 17		-23.19		
	Jun 11			24.47	
	Nov 4				-26.14
858	Jul 28	22.83			
	Dec 18				-24.27*
859	May 13			25.59	
996	Jan 23		-22.78		
	Jun 16			24.22*	
	Nov 9				-25.69
997	Aug 2	22.32			
	Dec 23		-24.02*		
998	May 17			25.25	
	Oct 5				-23.31

Date		Morning Star		Evening Star	
		N	S	N	S
999	Feb 6		-21.45		
	Jul 3	23.77			
	Nov 23				-25.00
1000	Apr 27			<u>27.34</u>	
	Aug 15	20.33			
1001	Jan 7		-23.50		
	Jun 1			24.70	
	Oct 29				<u>-26.95</u>
1002	Jul 18	23.21			
	Dec 8				-24.49
1003	May 4			26.10	
1244	Jan 7		-23.39		
	May 30			24.61	
	Oct 28				<u>-26.94</u>
1245	Jul 16	23.10			
	Dec 6				-24.41
1246	May 2			26.04	
1247	Jan 21		-22.69		
	Jun 15			24.15*	
	Nov 7				-25.65
1248	Jul 30	22.22			
	Dec 21		-23.94*		
1249	May 15			25.20	
	Oct 2				-23.28
1250	Feb 3		-21.36		
	Jun 30	23.68			
	Nov 21				-24.94
1251	Apr 25			<u>27.46</u>	
	Aug 13	20.22			

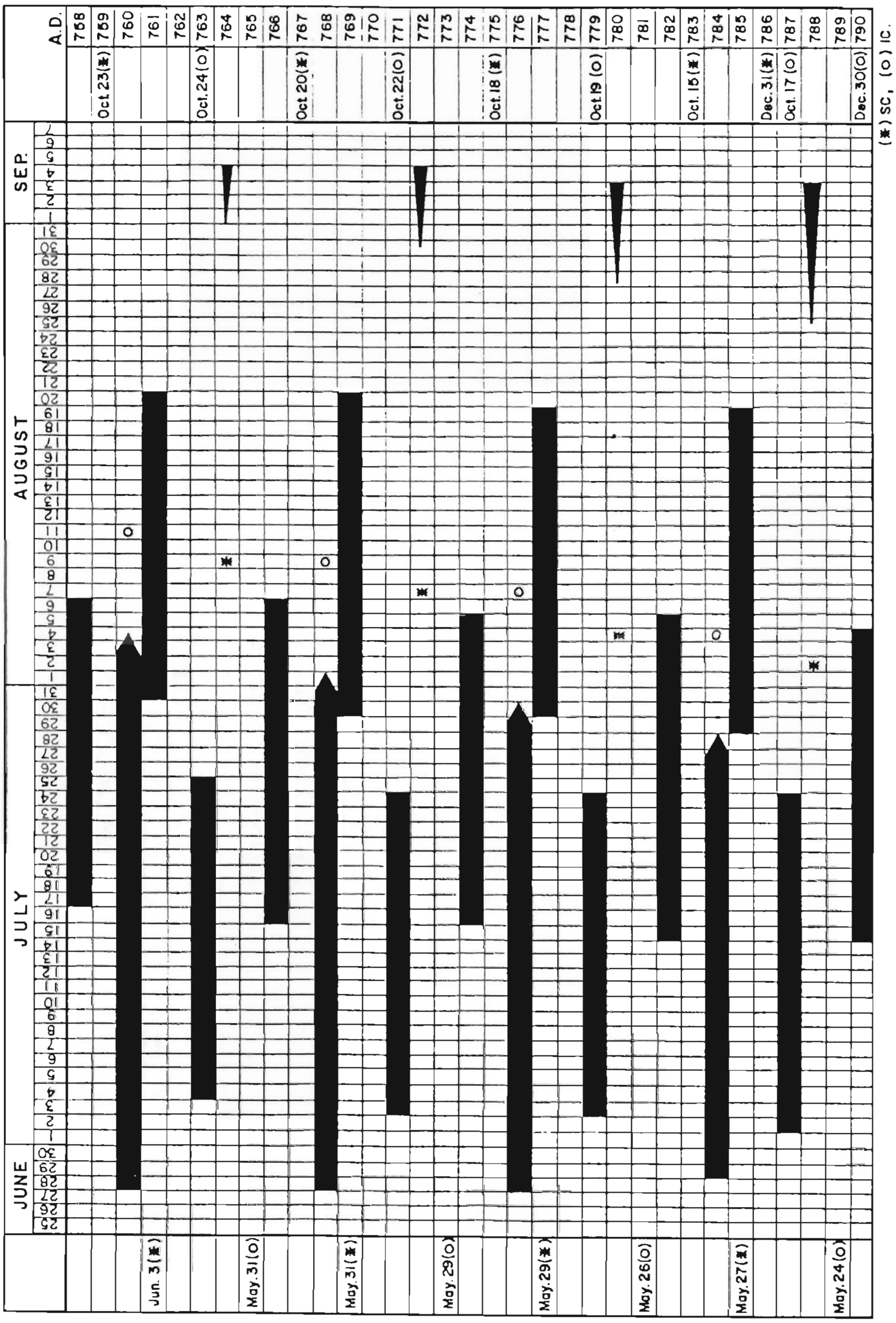
Date		Morning Star		Evening Star	
		N	S	N	S
1500	May 13			25.14	
	Oct 4				-23.29
1501	Feb 1		-21.26		
	Jun 28	23.59			
	Nov 19				-24.88
1502	Apr 25			<u>27.56</u>	
	Aug 10	20.11			
1503	Jan 4		-23.32		
	May 28			24.55	
	Oct 28				<u>-27.02</u>
1504	Jul 13	23.02			
	Dec 4				-24.35
1505	Apr 30			26.06	
1506	Jan 19		-22.62		
	Jun 12			24.07*	
	Nov 5				-25.64
1507	Jul 29	22.15			
	Dec 20		-23.86*		

Table 2 (following pages)

Venus visibility through the window in the western wall of Temple 22 at Copán, for a sequence of years around 9.17.0.0.0 in the GMT correlation. All dates are Julian. Conjunctions (o - inferior conjunction; * - superior conjunction) are indicated on dates which were current, at the moment of conjunction, at 90° of W geographical longitude. Therefore they do not always coincide with those, given by Meeus (1983) for the Greenwich meridian. The black stripes, indicating Venus visibility, are broken, when there was no February 29 (Diagram by Arturo Ponce de León).



FEBRUARY
MARCH
APRIL
A.D.
758
759 Jan. 9 (O)
760
761
762
763 Jan. 8
764
765
766
767 Jan. 7 (O)
768
769
770
771 Jan. 5 (✱)
772
773
774
775 Jan. 4 (O)
776
777
778
779 Jan. 3 (✱)
780
781
782
783 Jan. 2 (O)
784
785
786
787
788
789
790
(✱) SC, (O) IC.



A.D.
758
Oct.23(✱) 759
760
761
762
Oct.24(O) 763
764
765
766
Oct 20(✱) 767
768
769
770
Oct.22(O) 771
772
773
774
Oct.18(✱) 775
776
777
778
Oct.19(O) 779
780
781
782
Oct.15(✱) 783
784
785
Dec.31(✱) 786
Oct.17(O) 787
788
789
Dec.30(O) 790
JUNE
JULY
AUGUST
SEP.
Jun.3(✱)
May.31(O)
May.31(✱)
May.29(O)
May.29(✱)
May.26(O)
May.27(✱)
May.24(O)
(✱) SC, (O) IC.