

The Maya Katun Cycle and the Retrograde Periods of Jupiter and Saturn

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Abstract

Astronomy among the ancient Maya became an integral part of daily life. Classic period Maya rulers often claimed divine status by linking dynastic rituals to astronomical events. This article explores the possible astronomical significance of Katun ending dates, proposing that for a great part of Classic period history Tikal and neighboring sites recorded only the Katun endings that coincided with the retrograde motion of Jupiter or Saturn. It also proposes that the God K, or K'awil, one of the Triad at Palenque, represents the planet Jupiter or the concept of retrograde motion. Images depicting K'awil or his title often relate to dates coinciding with Jupiter's or Saturn's retrograde motion during the Late Classic, an association that can be traced back to the fourth century A.D.

Resumen

La astronomía entre los mayas antiguos se convirtió en el elemento esencial de su vida diaria. Con frecuencia los soberanos mayas del periodo Clásico reclamaban su estatus divino asociando los rituales dinásticos con los fenómenos astronómicos. El presente trabajo estudia el posible significado astronómico de las fechas del fin del katún y plantea que durante la gran parte del Clásico Tikal y sus

vecinos registraron los fines de los katunes sólo cuando coincidieron con el movimiento retrógrado de Júpiter y/o Saturno. También se propone que el Dios K'awil, uno de los dioses que conforman la Triada de Palenque, representa al Júpiter o al mismo concepto del movimiento retrógrado. Las imágenes que representan a K'awil o su título con frecuencia se relacionan con las fechas que coincidieron con la retrogradación de Júpiter o Saturno durante el Clásico Tardío; esta asociación parece trazarse al siglo IV d.C.

It is now widely accepted that the Classic Maya observed and recorded planetary events. Their interest in Venus has been noted in many studies, but records of events involving the superior planets are more difficult to document. In a 1994 study, Anthony Aveni and Lorren Hotaling used statistical analysis to investigate the astronomical patterning of what they refer to as “culturally tagged” dates, those previously identified as marking significant astronomical events by a number of scholars, including Floyd Lounsbury (1989), John Justeson (1989), and Linda Schele and David Freidel (1990:444–446n47). Their statistical analysis provided support for linking dates with planetary events, especially those involving Venus at maximum altitude and the retrograde motion of Jupiter and Saturn. Following their lead, I initiated a study of Jupiter's retrograde

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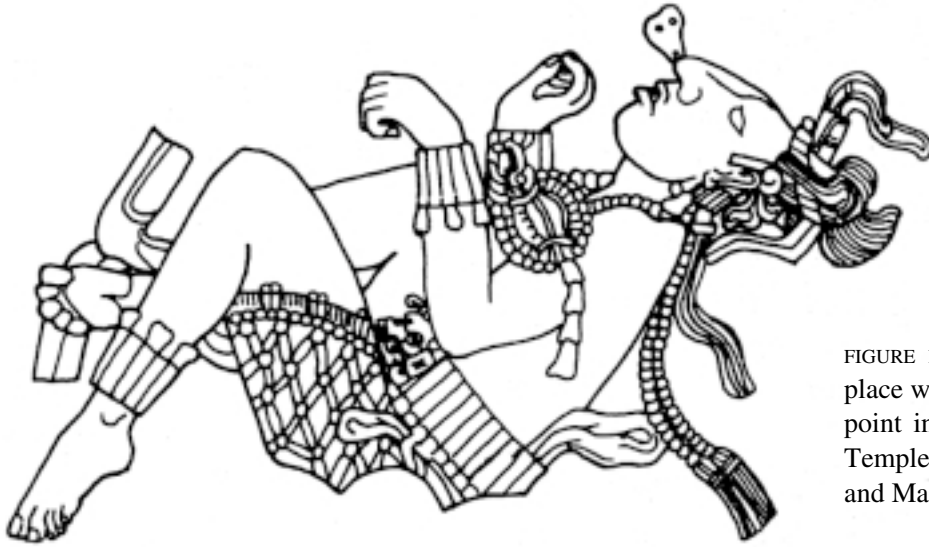


FIGURE 1. Pacal's apotheosis as K'awil took place when Jupiter reached its first stationary point in 683. Detail of Sarcophagus Lid of Temple of Inscriptions at Palenque (Schele and Mathews 1998:Figure 3.23).

period in relation to dates recorded on monuments that depict God K, or K'awil, a deity with clear celestial attributes (Milbrath 1999:233–240). Using dates for stationary points calculated by Jean Meeus (1997), this study revealed a link between Late Classic images of K'awil and dates coinciding with Jupiter's position in retrograde, when the planet seems to stop and move backward in the sky.

K'awil is an apparent manifestation of the planet Jupiter or, more specifically, the retrograde cycles of Jupiter and Saturn. One of the most interesting images in this regard is the Sarcophagus Lid at Palenque (Figure 1). This intricate relief depicts the deceased king Pacal (Pakal), transformed into a deity with attributes of K'awil. Linda Schele and Peter Mathews (1998:115–117) suggest that the deceased ruler is transformed into the Maize God with the flaming ax of K'awil emerging from his forehead as a marker that he is divine. This transformation is described with an unusual phrase, “he entered the road,” often interpreted as Pacal's death event (Schele 1992:133). My 1999 study indicates that the key event is Pacal's apotheosis after death, when he was transformed into K'awil at the moment that Jupiter reached its first stationary point on August 26, 683, Julian (first stationary point, August 28, 683 [Meeus 1997]). Among the observable planetary events, stationary points are especially notable because the planets are their brightest at this time (Fox 1997:19). At the beginning of the

retrograde period in 683, Jupiter seemed to stand still in the night sky, apparently waiting for the deified ruler to join the planet in the heavens (Milbrath 1999:234). Lounsbury (1989) notes that Pacal's son, Chan Bahlum (Kan B'alam II), was not crowned until Jupiter departed from its second stationary point. Putting this together with Pacal's apotheosis date, it seems that the priests of Palenque thought that the period of Jupiter's retrograde motion was an inauspicious time to crown the new ruler, for Chan Bahlum's ceremony took place when Jupiter had just completed its retrograde motion. After studying a number of different dynastic events, Lounsbury (1989:254) concluded that Jupiter's departure from the second stationary point marked a preferred time for the dynastic rituals of Chan Bahlum.

John Justeson (1989:102–103, Table 8.6) notes that the Maya apparently used the Tun, the 360-day civil year, to correlate the cycles of the superior planets. Classic Maya priests were also aware of some connection between Jupiter's retrograde period and the Katun, a period in the Long Count calendar just under 20 years, totaling 7,200 days or 20 Tuns (20 x 360 days).

My 1999 study demonstrates that Palenque, Tikal, and Yaxchilán all represent K'awil on Late Classic monuments that bear dates coinciding with Jupiter's retrograde motion (Milbrath 1999:233–240, Table 6.1). K'awil images on Yaxchilán and Palenque

Table 1. Jupiter and Saturn Positions on Early Classic Katun Endings

Long Count Date	Katun Ending Date	Julian Date 584,283 Correlation	Jupiter Retrograde (*also Saturn)	Retrograde Period or Station
8.14.0.0.0	7 Ahau	317, Aug. 29	Saturn retro.	6/26–11/10
8.15.0.0.0	5 Ahau	337, May 16	Saturn retro.	3/2–7/21
8.16.0.0.0	3 Ahau	357, Jan. 31	Jupiter 1st st. pt.*	2/1
8.17.0.0.0	1 Ahau	376, Oct. 18	Jupiter 1st st. pt.*	10/11
8.18.0.0.0	12 Ahau	396, July 5	Jupiter retro.*	5/30–9/27
8.19.0.0.0	10 Ahau	416, Mar. 22	Midpt. Jupiter retro.*	1/24–5/26
9.0.0.0.0	8 Ahau	435, Dec. 5	Jupiter retro.	10/2–1/29
9.1.0.0.0	6 Ahau	455, Aug. 25	Jupiter retro.	5/20–9/17
9.2.0.0.0	4 Ahau	475, May 12	Jupiter 2nd st. pt.	5/18
9.3.0.0.0	2 Ahau	495, Jan. 27	Jupiter ~2nd st. pt.	1/18

Note: During the Early Classic, Saturn was in retrograde at Katun end from 258 to 416 (8.11.0.0.0–18.19.0.0.0); Jupiter was in retrograde at Katun end for the first time in 357; all dates noted as stations are within 7 days of stationary points (st. pt.) of Jupiter or Saturn, but those noted with ~ are within 8–21 days; from 9.4.0.0.0 to 9.11.0.0.0 (514–652), no link between Katun end and retrograde of either Jupiter or Saturn; inscriptions of Tikal correspond to troubled times in 508–562 and complete hiatus 562–692; all data from Meeus (1997) and Sharer (1994:Table A.3, adjusted for Julian calendar).

monuments most often relate to dates marking the retrograde of Jupiter or Saturn, but none of these dates are Katun endings.¹ On the other hand, Tikal monuments depicting K'awil images often are inscribed with Katun ending dates. This pattern inspired me to extend the scope of my study to investigate the pattern of Katun endings throughout the Classic period in relation to the retrograde period of all three superior planets. The results were surprising. For more than 120 years during the Late Classic, between 751 and 869, Jupiter and Saturn were both in retrograde motion at Katun end. The Katun ending in 869 was certainly spectacular because both planets were precisely at their second stationary points and only 5° apart (Tables 1 and 2).² Oddly enough, Mars almost never joined this retrograde dance. During Katun endings of the Late Classic period (600–900), Mars was in retrograde motion only twice: once in 613 and again more than a century later in 790 (Meeus 1997). Throughout the Early Classic period (250–600) Mars was in retrograde at the Katun ending only on the Katun endings in March 278 and July 534, although one other Katun ending was only four days before the

planet's first stationary point on February 4, 357. The Katun ending in 357 may have been especially noteworthy because this was also the first stationary point of Jupiter, so the two planets seemed to be frozen in place in the night sky while Saturn was moving in retrograde motion (Table 1).

Interest in the retrograde periods of Jupiter and Saturn apparently first developed in the Katun ceremonies during the Early Classic. As far back as 258, Saturn was in retrograde at the Katun end, a pattern that continued through the Katun ending 10 Ahau on March 22, 416. Jupiter joined Saturn in retrograde motion at the Katun ending 3 Ahau in January 357 (8.16.0.0.0; Table 1). Saturn's retrograde motion continued to mark the Katun end until the eighth Baktun came to a close. An asterisk on Table 1 signals the simultaneous retrograde motion of both planets at Katun end from 8.16.0.0.0 to 8.19.0.0.0 (357–416). By December 5, 435, the Katun ending 8 Ahau (9.0.0.0.0), Saturn's second stationary point, had slipped back to over three weeks before the Katun end, and Jupiter's retrograde now became the focus of attention at the Katun ending.

Table 2. Jupiter and Saturn Positions on Late Classic Katun Endings

Long Count Date	Katun Ending Date	Julian Date 584,283 Correlation	Jupiter Retrograde (*also Saturn)	Retrograde Period or Station
9.12.0.0.0	10 Ahau	672, June 26	Saturn ~1st st. pt.	7/17
9.13.0.0.0	8 Ahau	692, Mar. 13	Saturn 1st st. pt.	3/20
9.14.0.0.0	6 Ahau	711, Nov. 29	Saturn 1st st. pt.	11/29
9.15.0.0.0	4 Ahau	731, Aug. 16	Saturn retro.	7/19–12/2
9.16.0.0.0	2 Ahau	751, May 3	Jupiter 1st st. pt.*	5/2
9.17.0.0.0	13 Ahau	771, Jan. 18	Jupiter ~1st st. pt.*	1/1
9.18.0.0.0	11 Ahau	790, Oct. 5	Jupiter retro.*	9/6–1/2
9.19.0.0.0	9 Ahau	810, June 22	Midpt. Jupiter retro.*	4/21–8/21
10.0.0.0.0	7 Ahau	830, Mar. 9	Jupiter retro.*	12/23–4/24
10.1.0.0.0	5 Ahau	849, Nov. 24	Jupiter retro.*	8/26–12/22
10.2.0.0.0	3 Ahau	869, Aug. 11	Jupiter 2nd st. pt.*	8/10
10.3.0.0.0	1 Ahau	889, Apr. 28	Jupiter ~2nd st. pt.~*	4/15

Note: All dates noted as stations are within 7 days of stationary points (st. pt.) of Jupiter or Saturn, but those noted with ~ are within 8–21 days; all data from Meeus (1997) and Sharer (1994:Table A.3, adjusted for Julian calendar).

Table 3. Jupiter and Saturn Positions on Postclassic Katun Endings

Long Count Date	Katun Ending Date	Julian Date 584,283 Correlation	Jupiter Retrograde (*also Saturn)	Retrograde Period or Station
10.15.0.0.0	3 Ahau	1125, Nov. 15	Jupiter ~1st st. pt.	12/8
10.16.0.0.0	1 Ahau	1145, Aug. 2	Jupiter 1st s. p.~*	8/7
10.17.0.0.0	12 Ahau	1165, Apr. 19	Jupiter retro.*	3/24–7/25
10.18.0.0.0	10 Ahau	1185, Jan. 4	Jupiter retro.*	11/29–3/30
10.19.0.0.0	8 Ahau	1204, Sept. 21	Midpt. Jupiter retro.*	7/27–11/22
11.0.0.0.0	6 Ahau	1224, June 8	Jupiter retro.*	3/14–7/15
11.1.0.0.0	4 Ahau	1244, Feb. 24	Jupiter retro.*	11/20–3/20
11.2.0.0.0	2 Ahau	1263, Nov. 11	Jupiter 2nd st. pt.*	11/11
11.3.0.0.0	13 Ahau	1283, July 29	Saturn retro.	4/17–9/5
11.4.0.0.0	11 Ahau	1303, Apr. 15	Saturn retro.	12/28–5/14
11.5.0.0.0	9 Ahau	1323, Dec. 31	Saturn 2nd st. pt.	1/2/1223
11.6.0.0.0	7 Ahau	1342, Sept. 17	Saturn ~2nd st. pt.	9/6

Note: From 10.4.0.0.0 to 10.14.0.0.0 (A.D. 909–1106), no link between Katun end and retrograde of Jupiter or Saturn; all dates noted as stations are within 7 days of stationary points (st. pt.) of Jupiter or Saturn, but those noted with ~ are within 8–21 days; no correlation between Katun end and retrograde of Jupiter for next three centuries through epoch of Spanish conquest in 1520; all data from Meeus (1997) and Sharer (1994:Table A.3, adjusted for Julian calendar).

Retrograde Periods of Jupiter and Saturn at the Katun End

Tables 1–3 list the Katun endings from 317 to 1342 that correspond to periods when Jupiter was in retrograde motion, clustering in three peak periods noted on the tables. The intervals between these peaks are periods when there was no correspondence between the Katun ending and retrograde events of Jupiter. Notes and entries in the tables incorporate Saturn's retrograde at Katun end from 258 to 1342, showing similar peaks in the pattern of correspondence.

Statistically, we would expect the incidence of such a correspondence to range somewhere between 30 percent and 67 percent. The 30 percent figure is the result of calculating the percentage of time Jupiter spends in retrograde during a Katun period of 7,200 days (120 days of retrograde motion per synodic cycle of 399 days and a total of 18 retrograde periods in a Katun). Calculating the same figure for Saturn yields 37 percent (140 days per synodic cycle of 378 days and a total of 19 retrograde periods in a Katun). If you target both planets and seek one of them retrograde, you would add the two figures to get a total probability of 67 percent. In fact, the probability is lower because the two retrograde periods are not independent. At some points in time both planets are in retrograde at the Katun ending. The Classic and Postclassic periods from 258 to 1520 incorporate almost 13 centuries with a total of 66 Katun endings. During this period 37, or 56 percent, of the total number of Katun endings (66) correspond to the retrograde period of one or both of the planets, if we include the three Katun endings (8.11–8.13) that coincide with Saturn's retrograde added in the note in Table 1 and notes in Table 3 that extend the study through the Katun ending in 1520 (11.15.0.0.0).

Table 3 includes all Katun endings of the Postclassic period that correspond to the retrograde periods of Jupiter or Saturn, reflecting a relatively restricted period. This is also precisely the period when there was a revived interest in recording Katun endings, as seen in the Postclassic monuments from Mayapán (Milbrath and Peraza 2003:Table 1). Classic period Katun endings that correspond to retrograde periods (Tables 1 and 2) also cluster during a period when Katun endings were most commonly

recorded on monuments, especially at Tikal, a major center of power in the central Maya Lowlands. Tikal recorded Katun endings almost exclusively at times when there was a clear correspondence between the Katun ending and the retrograde of Jupiter or Saturn. The first recorded Katun ending at Tikal coincides with the beginning of a cycle of Early Classic Katun endings that correspond to Saturn's retrograde. Saturn reached its first stationary point at the Katun ending on July 10, 258. This date is not preserved at Tikal, probably because many Early Classic monuments were destroyed or mutilated at the site.

K'awil, a Royal Deity Linked with Jupiter and Saturn

The correspondence between Katun records and planetary retrograde becomes even more interesting when we study the Katun endings in relation to imagery of K'awil, a complex deity associated with thunder, lightning, and royal lineage. One of the earliest-known monuments depicting K'awil is the Early Classic Tikal Stela 31, which records a number of early Katun endings (Figure 2).³ This stela depicts the ruler Stormy Sky (Siyah Chan K'awil or Siyaj Chan K'awil II) with a headdress depicting K'awil emerging from a sky symbol, combining two elements that appear separately in the king's name glyph. The K'awil glyph had been interpreted logographically as "stormy" because of K'awil's connection with thunder and lightning. The name *K'awil* is an enigmatic word that refers to a grackle, called *k'awil* in Yucatec Maya dictionaries, apparently because the sound of this word mimics the bird's call (Milbrath 2002). K'awil is represented in avian form in a number of contexts, as in the Postclassic murals of Tulum, where a winged K'awil has a skyband body (Milbrath 1999:Figure 6.3b).

K'awil is a royal title that was added to a ruler's name to evoke a link with the planetary gods. The K'awil title seems to link the ruler to Jupiter as the planet of kings (Milbrath 1999:248). The royal K'awil title and imagery of this god on monuments depicting rulers do not necessarily overlap. For example, Yaxchilán apparently lacks the K'awil royal title, but images of K'awil abound in monumental sculpture representing kings. At least five Tikal rulers



FIGURE 2. Tikal Stela 31, depicting Stormy Sky with K'awil in his headdress, bears a record of the Katun ending 9.0.0.0.0, when Jupiter was in retrograde at Katun end (Jones and Satterthwaite 1982:Figure 51) (image provided courtesy of University of Pennsylvania Museum Tikal Project [Neg.69-5-175]).

bear the K'awil title, and Calakmul, Naranjo, and Dos Pilas each have three rulers with this title in lists of Classic Maya rulers (Martin and Grube 2000). On the other hand, rulers at Caracol, Tonina, Piedras Negras, and Palenque do not have the K'awil title, but there are repeated references to a solar title in the king lists. Royal titles employed by the Classic Maya often refer to the Sun, and some rulers were seen as the earthly incarnation of the Sun (Milbrath 1999:83-87). Copán shows a preference for the solar title early on, but then there is a switch to the K'awil title in the reign of "18 Rabbit" (Waxaklajuun Ub'aah K'awiil), probably reflecting a change in the religious cults of the Late Classic period when three kings in sequence bear this name.

The K'awil title and imagery of K'awil are quite frequent at Tikal; therefore, it seems appropriate to focus on Tikal in our study of K'awil as a possible manifestation of Jupiter. The earliest-known K'awil title is apparently from Tikal. This title is part of the name of an early fourth-century ruler (Siyaj Chan K'awiil I) in the king list developed by Simon Martin and Nikolai Grube (2000:26). This name does not appear in the list of Tikal rulers compiled by Peter Harrison (1999:Tables 2, 3), who first notes the K'awil title in reference to a later ruler known as Stormy Sky or Siyah Chan K'awil. His most important monument, Stela 31, records the earliest-known Katun record, the Katun ending 8.14.0.0.0, when Saturn was in retrograde motion in 317 (Jones and Satterthwaite 1982:Table 5). Stela 31 may record the Katun ending on 8.17.0.0.0 (October 18, 376), which correlates with Jupiter's first stationary point and Saturn's retrograde period (Table 1; Jones and Satterthwaite 1982:Table 5). Stela 31 notes the Katun ending 8.18.0.0.0, when both Saturn and Jupiter were in retrograde motion at Katun end. Stela 31 also records the Katun ending 9.0.0.0.0, which is simultaneously a Baktun ending on December 5, 435, when Jupiter was in retrograde motion at the Katun end (Table 1). The dedication date of the monument is an Initial Series date that is not a Katun ending (9.0.10.0.0; October 16, 445), but it does fall in Jupiter's retrograde period and also coincides with the heliacal set of Mars (Alexander 1992:Table 1; Milbrath 1999:239).

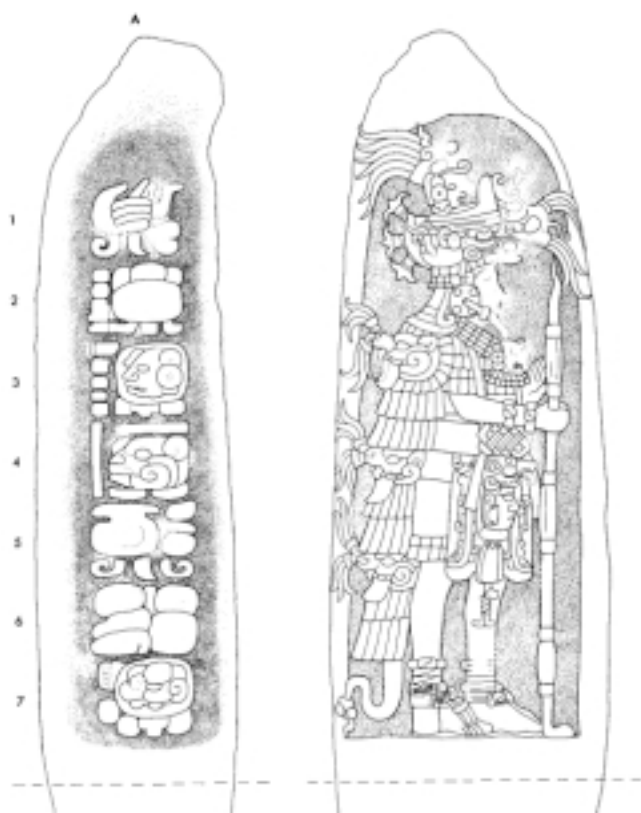


FIGURE 3. Tikal Stela 9 with K'an Chitam holding "fire-drill" staff at the Katun ending 9.2.0.0.0, introducing a new form of Katun monuments that extended through 9.3.0.0.0 (Jones and Satterthwaite 1982:Figure 13) (image provided courtesy of University of Pennsylvania Museum Tikal Project [Neg.69-5-8]).

Saturn's Retrograde at Katun End and the Fire-Drill Staff

Even though Tikal has the longest record of Katun ending inscriptions, monuments specifically erected to mark the Katun end do not appear until 9.2.0.0.0 (475), when a new style of representation is first seen on Stela 9. K'awil is not apparent on the stela, which depicts the ruler K'an Chitam (K'an Ak or Kan Boar) holding a long staff that has been interpreted as a fire drill (Figure 3; Martin and Grube 2000:37). At the Katun ending, Jupiter reached its second stationary point (Table 1). Perhaps the fire drill was used in ceremony at the Katun end to symbolize this planetary event. The subsequent Katun end (9.3.0.0.0) is

recorded in a similar style on Stelae 7, 15, and 27 during the reign of Jaguar Claw II (Chak Toh Ich'ak II or Chak Tok Ich'aak II). This Katun ending on January 27, 495 (9.3.0.0.0) coincided approximately with Jupiter's second stationary point, which was reached nine days earlier. This was the last time that Jupiter was in retrograde at the Katun end during the Early Classic period (Table 1).

Tikal Stela 6 records the Katun ending 9.4.0.0.0 in 514, the last in a series of Katun stelae showing the ruler with an elaborate staff (Harrison 1999:95; Jones and Satterthwaite 1982:Table 5). The staff image was later replaced by imagery of K'awil as a manikin scepter, which first appears in the Late Classic period at Tikal (Coggins 1988:126-127). The K'awil scepter, which often appears in the context of Late Classic monuments marking the Katun endings at Tikal, may have a similar symbolic meaning as the staff images of the Early Classic. K'awil is not represented on monuments erected at the Katun endings of the Early Classic period; indeed, K'awil is rarely represented in monumental art of this period.

The Hiatus and Katun Records

Near the end of the Early Classic period, the inscriptions of Tikal reflected "troubled times" of political upheaval between 508 and 562 (Martin and Grube 2000:38-39, 104). Caracol even attacked Tikal in 562. There follows a 130-year period when there were no inscriptions whatsoever on Tikal monuments (Martin and Grube 2000:40). Indeed, the so-called hiatus lasted longer at Tikal than at any other site. During the period of Tikal's silence other sites seem to gain power. Katun records in the period from 9.5.0.0.0 to 9.11.0.0.0 (524-652) are known from other sites, indicating that the hiatus in the record was predominantly a Tikal phenomenon. Even at Tikal there are some Katun records during this period, but not on public monuments (Martin and Grube 2000:39, 41). Political problems during this period are well documented, but a contributing factor at Tikal could be a loss of faith in the astrological portents of Katun ending ceremonies.

There was a complete hiatus in Tikal's monumental inscriptions when the Katun endings no longer coincided with the retrograde periods of either Jupiter

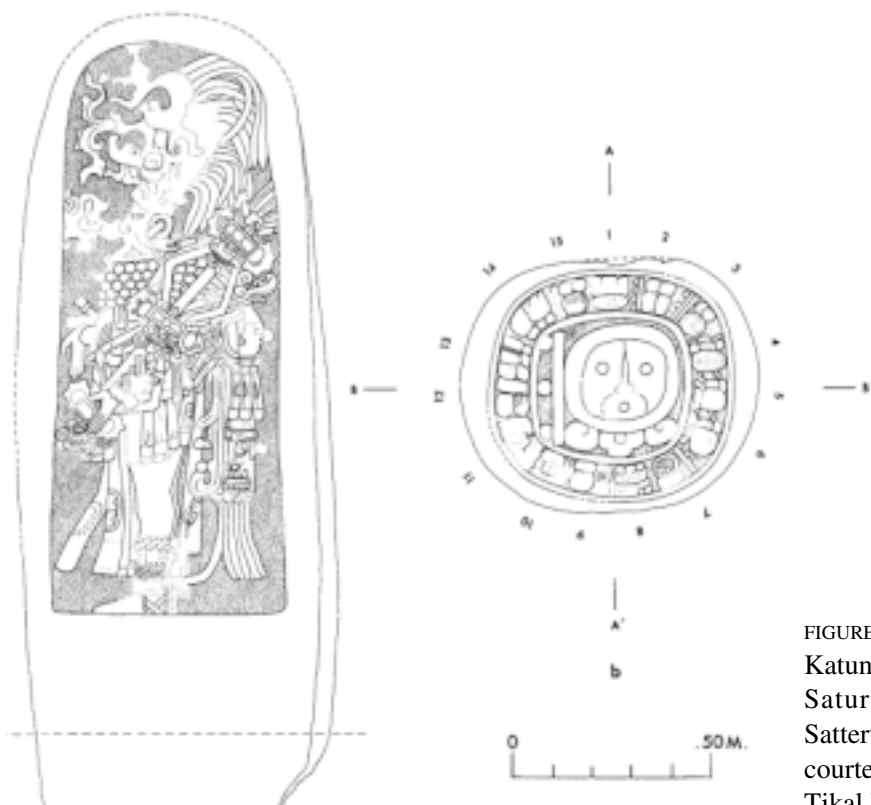


FIGURE 4. Tikal Stela 30 and Altar 14 marking the Katun ending 9.13.0.0.0 in 692 associated with Saturn's first stationary point (Jones and Satterthwaite 1982:Figure 50) (image provided courtesy of University of Pennsylvania Museum Tikal Project [Neg.69-5-30]).

or Saturn. Tikal exhibits the greatest elaboration of the Katun ending monuments, and it is noteworthy that this is where we see the greatest disruption in records of Katun endings. Apparently the priests of Tikal had come to expect Jupiter to be in retrograde motion at Katun end, as had been the case for more than 140 years; but as the Early Classic came to a close, the planet seemed to shirk its duties. Possibly there was an edict against recording the Katun ending on monuments until the planets returned to a favorable position.

Perhaps Tikal's priests fell into a power struggle with others who did not see any threat in the changing astrological portents at the Katun end. Dos Pilas was established by people who left Tikal and claimed Tikal's emblem glyph, allying themselves with Tikal's enemy, Calakmul (Martin and Grube 2000:55-57). The Katun endings during Tikal's hiatus were recorded on the Hieroglyphic Stair at Dos Pilas, rather than on stelae, which suggests Dos Pilas was reluctant to erect stelae marking the Katun ending.

We have evidence from other sites that dates coinciding with Jupiter events were recorded on monuments featuring K'awil during the seventh century, but none of these records are Katun endings (Milbrath 1999:233-234). Such images include Pacal's sarcophagus (Figure 1) and K'awil images linked with dates marking Jupiter's retrograde motion, especially in the reign of Chan Bahlum II (Milbrath 1999:233-234).

Resumption of Late Classic Katun Records

Tikal initiated new records of the Katun endings only when the planets once again resumed their dance of retrograde motion at the Katun end. The Katun ending records on monuments at Tikal begin again in the Katun ending 8 Ahau (9.13.0.0.0) in 692, a date recorded on Tikal Altar 14 (Figure 4). This altar and its companion stela were erected by Ruler A, whose glyphic name includes the K'awil title (Hasaw Chan K'awil or Jasaw Chan K'awil I). Stela 30 depicts the ruler wearing an elaborate headdress that is eroded

but seems to depict K'awil with a smoking tube in his brow. Although Jupiter had not yet entered retrograde motion at the Katun end, Saturn was almost precisely at its first stationary point, which would have been considered auspicious since Saturn was the planet that marked the Katun endings for many centuries during the Early Classic period.

Tikal Altar 14 and Stela 30, dating to 692, the Katun 9.13.0.0.0 in the reign of Ruler A, are the first known Katun monuments associated with a twin-pyramid complex (3D-98/100; Jones 1969:110, Table 1). In the Late Classic period, there are five such complexes developed to house stelae and altars recording the Katun end.⁴ The formal elements of the twin-pyramid complex include twin radial pyramids on the east and west of a defined plaza area, an enclosure for a stela and altar pair on the north side, and a nine-door building on the south side of the complex.

The next Katun ending in 9.14.0.0.0 (711) commemorated on Stela 16 was an even closer match, for the Katun ended exactly on Saturn's first stationary point. At this time, Venus was about to reappear as the Evening Star, which may explain why Ruler A's headdress shows a skeletal aspect of Venus, symbolizing the underworld associations of the Evening Star invisible in superior conjunction (Figure 5; Milbrath 1999:192). It is noteworthy that Tikal did not represent K'awil on this monument. However, communities that claimed independence from Tikal, such as Dos Pilas and Naranjo, featured K'awil on monuments recording the Katun ending 9.14.0.0.0 (Dos Pilas Stela 14 [Graham 1967:Figure 9] and Naranjo Stela 23 [Maler 1908:Plate 37]). This may be another indication that these communities did not follow Tikal's lead in the type of astronomical imagery represented. A number of sites record the Katun ending in 731 (9.15.0.0.0). Aguateca Stela 3 depicts K'awil prominently at this Katun ending, when Saturn was in retrograde motion. Oddly enough, Tikal has no record of this Katun ending. Proskouriakoff (1993:95) explains that since this Katun ending coincided with a period of mourning for Ruler A, and Ruler B had not yet been crowned, it was considered inappropriate to erect a Katun ending stela. Another relevant factor could be that the astronomical events

were not so interesting at this Katun ending. Saturn was in retrograde but no longer at its first stationary point at Katun end, and Jupiter had not yet joined Saturn in retrograde motion.

The next Katun ending in 751 is commemorated on Tikal Stela 20, a monument with only one date. Stela 20 was found in Complex P, one of the five twin-pyramid complexes at Tikal devoted to Katun ceremonies. Stela 20 depicts Ruler B (K'awil that Darkens the Sky) at the first Katun ending ceremony in his reign (Figure 6). This eighth-century Katun ending in 751 was surely the focus of major ceremonies involving Jupiter, for it was the first time in the Late Classic period that the Katun ending correlated with Jupiter's retrograde period. The ruler's mouth mask is decorated with a star glyph, indicating an astronomical symbolism appropriate to a date precisely marking Jupiter's first stationary point on 9.16.0.0.0 (Table 2). Ruler B not only bears K'awil's title but his headdress also features K'awil prominently, recalling the headdress of the Early Classic ruler Stormy Sky, whose name also incorporates the K'awil title (Siyah Chan K'awil). The Katun ending in 751 is aligned with Jupiter's first stationary point, and the planet seemed to stand still in the night sky to honor Ruler B on the first Katun completed in his reign. It was also the first Katun ending in the Late Classic period when both Saturn and Jupiter were in retrograde motion together. It seems that the Maya focused on observations of these two planets at the Katun end, especially in the period between 751 and 869, when every Katun ending coincided with the retrograde period of both planets. The Katun end in 751 had added astronomical associations, for Mars rose at dawn and Venus was very prominent, located near its maximum altitude (Milbrath 1999:237).

Stela 22, housed in the twin-pyramid Complex Q, records the Katun ending 9.17.0.0.0 in 771. This stela depicts Ruler C (Yax Nuun Ayiin II) at a Katun ending ceremony (Figure 7). The Katun ending date is only a few days before Venus would emerge as the Evening Star. Ruler C's monument does not depict K'awil and instead substitutes a "cloud-rider" figure that is also seen on later monuments (Proskouriakoff 1993:98). Clearly, Tikal was the first to develop this new form of imagery.⁵ On Stela 22, the cloud rider apparently

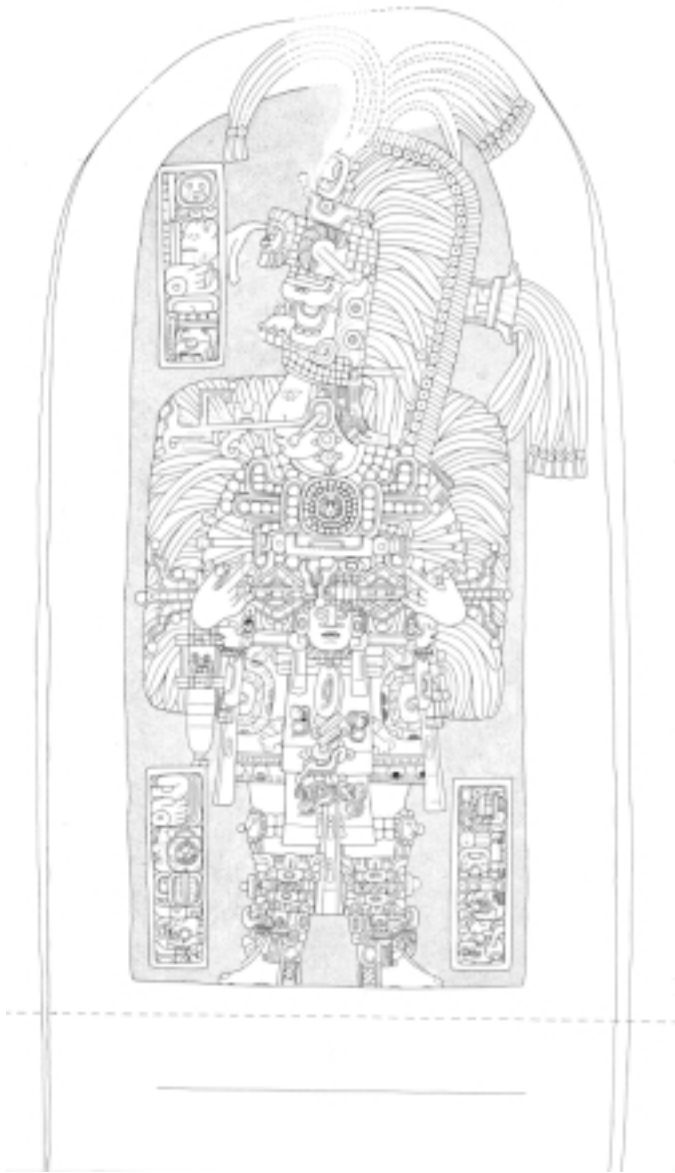


FIGURE 5. Tikal Stela 16 marking the Katun ending 9.14.0.0.0, showing Ruler A wearing a star glyph headdress on the date of Saturn's first stationary point in 711 (Jones and Satterthwaite 1982:Figure 22) (image provided courtesy of University of Pennsylvania Museum Tikal Project [Neg.69-5-55]).

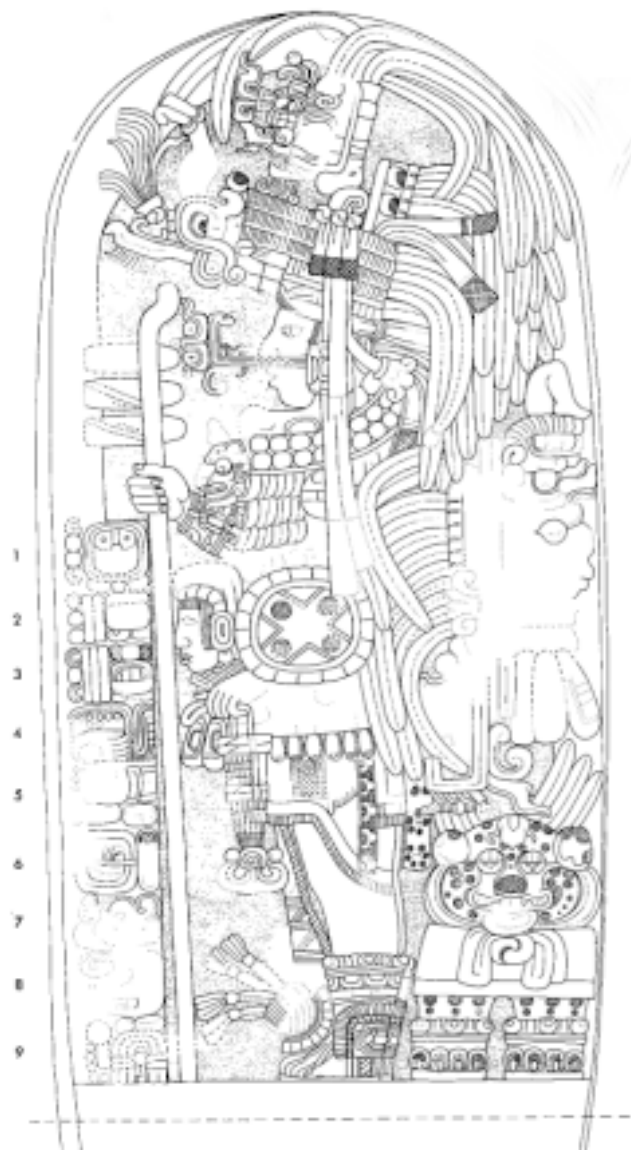


FIGURE 6. Tikal Stela 20 depicting Ruler B wearing star mask and headdress crowned by K'awil at the time of Jupiter's first stationary point on 9.16.0.0.0 in 751 (Jones and Satterthwaite 1982:Figure 29) (image provided courtesy of University of Pennsylvania Museum Tikal Project [Neg.69-5-57]).

replaces K'awil as an astronomical image representing Jupiter and Saturn in retrograde motion at Katun end. Tikal Stela 19, from the twin-pyramid Complex R, records the Katun ending 9.18.0.0.0 in 790 (Jones and Satterthwaite 1982:Figure 27, Table 5). The top of the monument is so destroyed that we cannot see whether K'awil or cloud riders were represented. Naranjo Stela 14 features K'awil on a double-headed serpent bar at this Katun ending (Maler 1908:Plate 33). Aguateca Stela 7, marking this Katun ending, features K'awil prominently as a manikin scepter (Figure 8). Also, Nim Li Punit Stela 21 shows K'awil as a scepter in the ruler's hands on this Katun ending (Stuart and Grube 2000:2–5, Figure 1). The text of associated glyph blocks names K'awil as the principal actor at this Katun ending.

Stela 24 at Tikal marks the Katun ending 9.19.0.0.0, but the monument is so poorly preserved that it is not possible to determine if K'awil is represented.⁶ Machaquila Stela 2, marking the Katun ending 9.19.0.0.0, and Machaquila Stela 7, recording the ending of the ninth Baktun in 10.0.0.0.0, both feature K'awil as a manikin scepter on a Katun ending coinciding with Jupiter's retrograde motion (Table 2; Graham 1967:Figures 44, 57). Commemorating the 10.0.0.0.0 Baktun ending was apparently avoided at Tikal (Coggins 1990:83), and the next Katun was also not recorded on a Katun monument.

Despite Tikal's lack of records for the Katun ending 10.1.0.0.0 in 849, this date appears on four monuments at Seibal, located on the Pasión River in the Petén. All four stelae bear prominent K'awil images (Figure 9; Schele and Mathews 1998:Figs. 5.10, 5.14, 5.17, 5.21). Stelae 8, 9, 10, and 21 all record a single Calendar Round date, 5 Ahau 3 Kayab, the end of the Katun 10.1.0.0.0 in 849. The Katun ending (November 24, 849) coincides with the retrograde periods of both Jupiter and Saturn, only nine days before Saturn's second stationary point (Table 2). All four show the ruler with an image of K'awil, but each shows K'awil in a different aspect. On Stela 10, the ruler's headdress bears K'awil's smoking mirror, whereas the other three monuments show the ruler holding different K'awil images. One is a manikin scepter (Stela 21), and another is a K'awil head in the ruler's hand (Stela 8; Figure 9). Stela 9 shows K'awil

at the ruler's feet on the tail end of a serpent bar. Thus, we seem to have four different manifestations of K'awil all linked with the same date.

There is one final Katun record at Tikal. Stela 11 marks the Katun ending 10.2.0.0.0 in 869, the very last inscription at the site (Figure 10; Harrison 1999:166–167, 192). The two gods in sky scrolls are poorly preserved, making it unclear whether they represent ancestors or deities who are cloud riders representing the planets. It is certainly tempting to identify these gods as Saturn and Jupiter, for these planets reached their second stationary points within three days of the Katun ending, and they were only 5° apart in the sky at the time of the last Katun record at Tikal (August 11, 869).

For almost 120 years, from 751 to 869, Saturn and Jupiter continued their dance of retrograde motion at the Katun end. Tikal recorded its last inscription on the Katun ending 3 Ahau in 869 (10.2.0.0.0), when the dance came to an end. The Katun ending 1 Ahau (889) could be considered the last gasp of this pattern. Both Jupiter and Saturn were departing from their second stationary points as the Katun came to a close, bringing to an end a Late Classic cycle that linked the Katun end to the retrograde of the two planets (Table 2). This last Katun was recorded at Jimbal, the same year that Uaxactún erected its last stela, Stela 12. After this there are no other known records of Katun endings on monuments in the Petén area, one of the symptoms of the “Maya collapse.”

Date Patterning in the Northern Maya Area

The Katun endings were never of great interest in the records of Yucatán during the Classic period. At Chichén Itzá, recorded dates span the period from 832 to 894, but many of these Terminal Classic dates are Tun–Ahau records, and none seem to refer to Katun endings (Krochock 1998:Table 1). The relationships of these dates to the retrograde period of the superior planets will be analyzed in a future study.

Uxmal stelae are so poorly preserved that they are difficult to date, but they include both Tun–Ahau records and at least one Katun ending. Stelae 2 and 3 depict winged deities flying over a ruler holding a manikin scepter, an image that seems to borrow

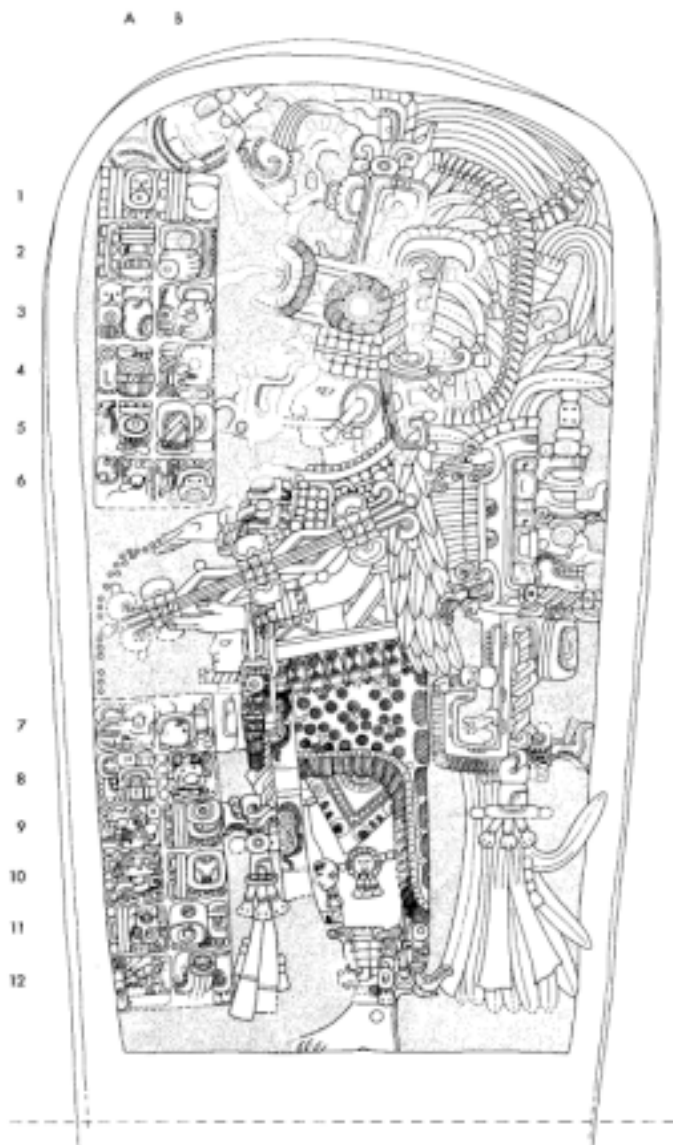


FIGURE 7. Tikal Stela 22 depicting Ruler C performing Katun ending ceremonies with cloud riders overhead on 9.17.0.0 in 771 (Jones and Satterthwaite 1982:Figure 33) (image provided courtesy of University of Pennsylvania Museum Tikal Project [Neg.69-5-59]).



FIGURE 8. Aguateca Stela 7 depicting the ruler holding a K'awil manikin at Katun ending ceremonies in 9.18.0.0 in 790, when Jupiter and Saturn were both in retrograde motion (Graham 1967:Figure 17).

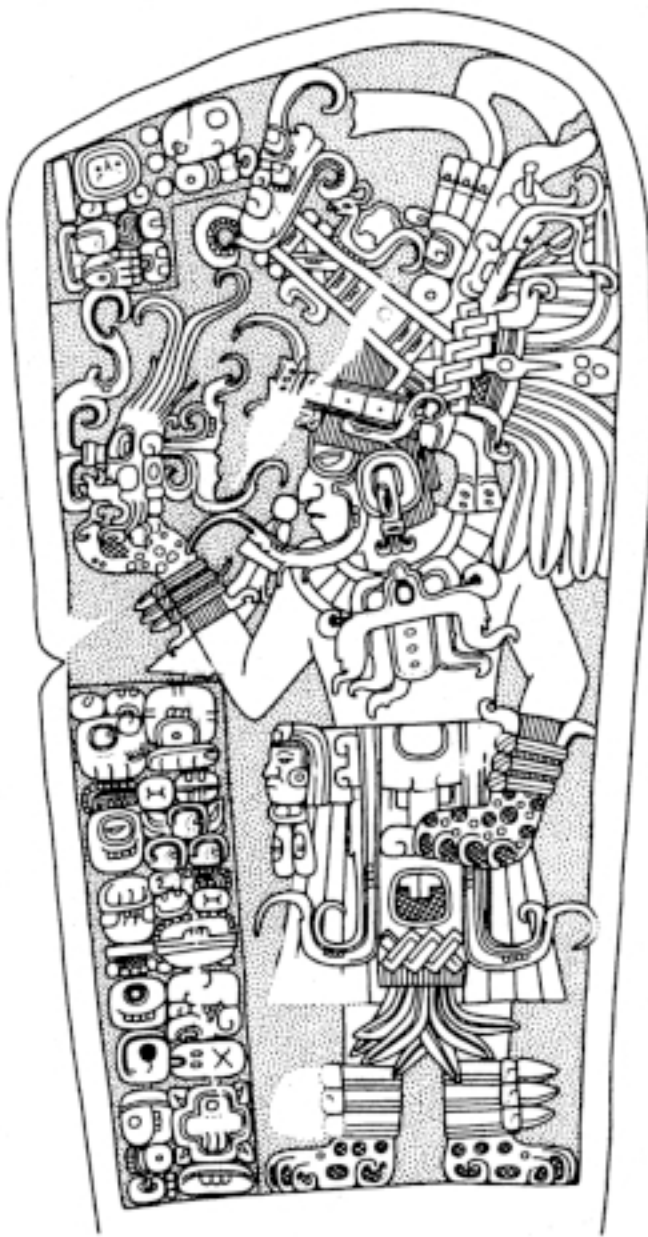


FIGURE 9. Seibal Stela 8 depicting the ruler holding a K'awil head at the Katun ending 5 Ahau, 10.1.0.0.0 in 846, when Jupiter and Saturn were in retrograde motion (Schele and Mathews 1998:Figure 5.17).

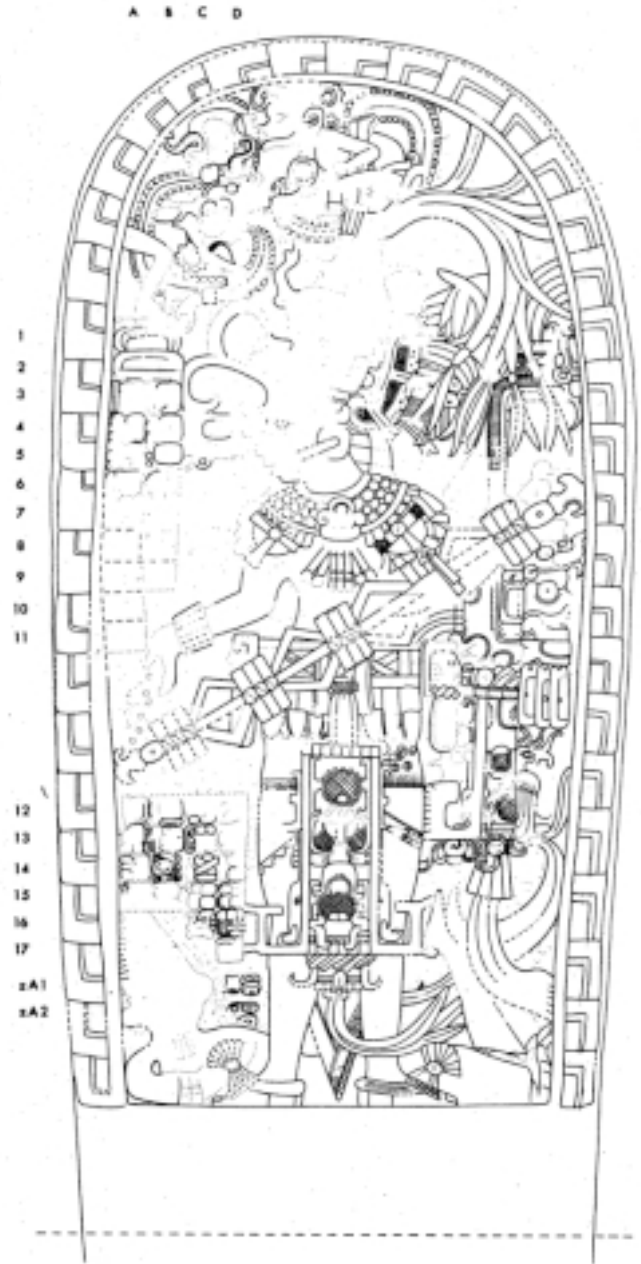


FIGURE 10. Tikal Stela 11, the last dated monument at the site, records the Katun ending 10.2.0.0.0 precisely when Saturn and Jupiter both reached their second stationary points in 869. The cloud riders may represent the two planets, positioned very close together at this time (after Jones and Satterthwaite 1982:Figure 10) (image provided courtesy of University of Pennsylvania Museum Tikal Project [Neg.59-5-54]).

elements from the Late Classic Katun ending monuments of the Petén (Morley 1970:Figures 6, 8). A Tun–Ahau date recorded on Stela 3 has been interpreted as Tun 8 in Katun 4 or 5 Ahau (Morley 1970:167). Morley suggests three reconstructions of these dates, but they seem to be too late for Uxmal’s apogee, because the city began to decline at the time that Chichén Itzá was at its peak power during the late Sotuta phase (900–1100 [Milbrath and Peraza 2003:3, 23, 33]). The significance of these Tun–Ahau dates will be part of a future study. Stela 14, one of the best preserved at the site, records a 12 Ahau Katun ending, but once again Morley’s (1970:177) readings (1165 and 1421) appear to be too late. A more likely reading would be 10.4.0.0.0 (909). The monument depicts three gods flying over the ruler, but we cannot be sure whether K’awil is represented because of the poor preservation. Neither Saturn nor Jupiter was in retrograde at the Katun ending in 909, but a new celestial pattern had emerged that may have been noted in the group of celestial deities represented on Stela 14. For the next 11 Katuns, from 909 to 1086, Jupiter and Saturn were always close together at Katun end, their distance apart averaging about 7°. Perhaps Stela 14 refers to this celestial conjunction at Katun end by representing a cluster of deities in the sky.

Other monumental images from the north representing K’awil include painted capstones from Campeche and Yucatán. Such capstones date back to the eighth century at Ek’ Balam. Painted Capstone 14 depicts a serpent–legged K’awil seated on a throne and a Calendar Round date (13 Caban 0 Xul) that Grube et al. (2003:24) link to the Long Count date 9.17.10.7.17 (May 4, 781, in the Julian calendar). This date coincides with the retrograde periods of Jupiter and Saturn. Painted Capstone 1 from the same site notes the date 11 Oc 13 Ceh in Tun 12 of Katun 5 Ahau, a Tun–Ahau date reconstructed as August 28, 841, in the Julian calendar (10.0.11.11.10 [Grube et al. 2003:70]). This date corresponds to the second stationary point of Saturn (8/30/841), providing another connection between K’awil and the cycle of planetary retrograde.

Elin Danién (2002) dates a painted capstone featuring K’awil in the University of Pennsylvania collec-

tion to 1001 (9 Muluk 12 Uo), but more likely it dates to an earlier Calendar Round. The previous Calendar Round (1/12/949) date corresponds to the retrograde periods of both Saturn and Jupiter and falls very close to Jupiter’s first stationary point. It is noteworthy that in the northern area, where Katun ending records are very rare, monuments depicting K’awil at times that Jupiter or Saturn were in retrograde may date almost a century after the Maya collapse farther south. In contrast, in the Petén where monumental inscriptions of Katun endings were dominant, the records came to a close precisely when the planetary retrograde no longer coincided with the Katun endings.

A new pattern linking the retrograde period to Katun endings emerged in the Postclassic period, one that coincides with the revival of Katun ending stelae in the northern Maya area at Mayapán (Table 3). By 1125 (10.15.0.0.0), Jupiter once again approached its first stationary point at the Katun end, and it remained in retrograde at Katun end for more than 130 years, through Katun 2 Ahau (1263, 11.2.0.0.0). The revival of the stela cult marking the Katun endings at Mayapán began only two Katuns after there was a renewed correspondence between the Katun end and Jupiter’s retrograde period. The earliest–known Mayapán monument is Stela 1, dated to the end of Katun 10 Ahau in 1185 (Milbrath and Peraza 2003:39, Table 1; Schele and Mathews 1998:204). Stela 1 is closely linked to the style of the *Paris Codex* Katun pages, and both seem to be contemporary (Milbrath and Peraza 2003:39, Figures 30, 31). Stela 1 depicts a Katun ceremony featuring an enthroned deity wearing a headdress representing K’awil. *Paris Codex* pages 2–12 also represent K’awil prominently in the imagery of the Katun cycle (Milbrath 1999:230). The K’awil imagery linked with Katun ending ceremonies on these pages and on Stela 1 corresponds to the time Jupiter was once again in retrograde motion at the Katun end. The latest preserved stela at Mayapán, Stela 6, dating to 1283 (Milbrath and Peraza 2003:Table 1), coincides with the period when Saturn’s retrograde took over Jupiter’s role marking the Katun end, a role it maintained through the Katun ending in 1323 (Table 3). During the remainder of the Postclassic, neither of the two planets was in retrograde motion

at the Katun end. As in the Classic Maya period, the Katun endings were no longer recorded on monuments once the retrograde periods of Jupiter and Saturn fell out of alignment with the Katun end.

Tracking Planetary Retrograde in the Katun Cycles

The most commonly recorded events on Classic period monuments were Katun endings (Justeson 1989:104). Study of Katun endings in the Classic period reveals why Saturn and Jupiter played a prominent role. Between 8.11.0.0.0 and 8.15.0.0.0 (258–337), Saturn was in retrograde at each Katun ending. From 8.16.0.0.0 to 8.19.0.0.0.0 (357–416), both Saturn and Jupiter were in retrograde motion at the Katun end. From 9.0.0.0.0 to 9.3.0.0.0 (435–495), Jupiter was in retrograde motion at the Katun end. Neither planet was in retrograde from 9.4.0.0.0 to 9.12.0.0.0 (514–672), the Katun endings that overlap with the hiatus, a temporary halt in the erection of Tikal monuments. At Tikal, where the hiatus lasted the longest, monuments were not erected until 9.13.0.0.0 (692), when Saturn reached its first stationary point at the Katun end. At this Katun ending a new type of architectural construction was developed to house the Katun monuments.

Saturn's retrograde marked the Katun end through the remainder of the Classic period, and in the Katun ending 2 Ahau, 9.16.0.0.0 (in 751), Jupiter joined Saturn in retrograde motion at Katun end. For more than a century, the two planets were both in retrograde motion at the Katun end. The last Katun records in the Petén date to 889, when the pattern linking the retrograde of Jupiter and Saturn to the Katun end finally came to a close at the end of the Classic period.

The incidence of the actual records of Katun on monuments of the Classic and Postclassic periods seems to be significant when we look at the patterning in relation to retrograde. At times that Jupiter or Saturn were in retrograde at Katun end, the Tikal monuments most often record Katun endings. Tikal showed a preference for recording Katun dates at times that Jupiter or Saturn was in retrograde motion. Conversely, during the periods (hiatus and Terminal Classic to early Postclassic) when there is no corre-

spondence between the Katun ending and the retrograde periods, these Katun records are lacking, especially at Tikal, where the Katun cycle seems to have strongest and longest development. In the Postclassic, Mayapán seems to revive the tradition of recording Katun endings during the epoch when the planetary retrograde coincided with the Katun end.

The celestial dance performed by Jupiter and Saturn in retrograde motion at Katun end marked time at important periods in Maya history. There is a clear pattern linking recorded Katun endings to dates when either Jupiter or Saturn was in retrograde motion, especially at Tikal, a site that was the largest and longest occupied of the Classic Maya cities. The first epoch of such a correspondence was in the Early Classic period. The written record ceased on Tikal monuments around the time the planets failed to perform their retrograde dance at Katun end. It is noteworthy that at Tikal, where interest in marking Katun endings seems to be exceptionally well developed, the hiatus in monumental records lasted until the Katun ending in 692, when there was a renewed correlation between the Katun ending and the timing of retrograde events. Furthermore, Tikal shows a great focus on Katun endings by erecting special twin-pyramid complexes to house Katun ending monuments beginning in 692. The last inscription at Tikal was the Katun ending in 869 (10.2.0.0.0; Stela 11), which coincides with a spectacular conjunction of the two planets located very close together at their second stationary points, when they were especially bright in the sky. After 889, throughout the central Maya area there was an abrupt halt in the long sequence of monuments marking the Katun end precisely at the moment that the synchronicity of the planetary retrograde with the Katun ending came to an end.

The collapse of Maya civilization is a complex and multifaceted event, involving warfare, environmental degradation, and drought. At the time of these multiple calamities, it would seem that the Maya gods were not following their appointed duties. A lack of faith in the future could have contributed to the demise of important political centers like Tikal, where the astronomical cult associated with Katun endings had the longest history.

Notes

1. The priests of Palenque apparently linked K'awil to subdivisions of the Katun that marked Jupiter positions. In a newly discovered text in Temple XIX at Palenque, David Stuart (2000) notes that K'awil is mentioned (at D 5) in relation to 9.14.2.9.0 9 Ahau 18 Tzec (May 17, 714), a date one-half Hotun after the Katun ending 9.14.0.0.0 (Sharer 1994:Table A.3, adjusted for Julian calendar). This date in mid-May marks the midpoint of Jupiter's retrograde motion (3/14 to 7/14 [Meeus 1997]), clearly connecting K'awil to a subdivision of the Katun that coincides with a significant Jupiter position.

2. Because of the periodicity of their celestial motions, Jupiter and Saturn will move into conjunction approximately every 20 years (Milbrath 1999:240). Nonetheless, the two planets were close together (within 12° of celestial longitude) at Katun endings only twice during the entire Classic period. The first instance was in the Katun ending 11 Ahau in 278, when they were 9° apart. The second occurrence was a true conjunction, when they were only 5° apart in 869 (10.2.0.0.0). Thereafter, these planets came together repeatedly at Katun end for a 200-year period between 869 and 1086, but only in 869 and 889 do we also see a correspondence with the retrograde period at the end of the Katun (Table 2). Significantly, these are the last Katun endings recorded in inscriptions on Classic Maya monuments.

3. Tikal Stela 4, one of Curl Snout's monuments, may depict an early image of K'awil (Bolon Ts'akab [Coggins 1988:126–127]). The proposed date, 8.17.2.16.17 (9/10/379), is that of Curl Snout's accession to the throne (Jones and Satterthwaite 1982:Table 5). The date falls about one month after Saturn's first stationary point (Meeus 1997).

4. Christopher Jones (1990:114–115, 119) proposes that the origins of the twin-pyramid complex can be traced back to twin pyramids in the East Plaza (Structures 5D–Sub 16 and 5E–Sub 1) dating to the Katun ending 534 (Katun 13 Ahau) and two other twin pyramids dating to Katun endings in 652 and 672 (Groups 4D–2 and 5B–1).

5. A more conservative tradition is expressed at the cave site of Naj Tunich, which followed the earlier patterns by representing K'awil at the Katun ending in 771. Murals depict a K'awil portrait glyph with the date 13 Ahau, referring to the Katun ending 9.17.0.0.0 13 Ahau 18 Cumku (January 18, 771 [Stone 1995:142, Figure 6.27]). The 13 Ahau date falls less than three weeks after the first stationary point of Jupiter (January 1, 771 [Meeus 1997]).

6. Beneath Stela 24, archaeologists found an offering of eccentric flints and incised obsidian, an assemblage associated with Katun ending monuments that first appeared in the cache of Stela 16 in 9.14.0.0.0 (Coe 1963:54).

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