

Analysis of Astronomy Associated with the Dates on Zacpetén Altar 1

John Major Jenkins. © January 5, 2016.

If we focus on the near-solstice date on Zacpetén Altar 1, we can consider several different positions that are likely to be taken by scholars and astronomers, based on two different correlations entertained by Maya scholars. All my dates are in the Julian calendar, as that is the default system used in the astronomy software.

In the 584283 correlation, the Altar 1 date reconstructed by Stuart falls on December 21, 809 AD. This is three days past the precise solstice date in that era (see Appendix 2). As I explained in my post to Stuart's blog (January 1, 2016), the ancient Maya skywatchers may have preferred, conceptually and visually, a date several days after the precise solstice, as that corresponds to the first inkling of the sun's movement northward (its rebirth) along the eastern horizon at sunrise (or, it is within a 6-day minimum range during which no changes can practically be observed). Details follow.

The solstice sunrise azimuth (on December 18) = $114^{\circ} 25$ minutes of arc. On December 21, 809 (the date of the Zacpetén Altar 1), the sunrise azimuth was $114^{\circ} 22$ minutes --- a mere 3 minutes of arc difference compared to the azimuth position of the sun at the precise solstice date, 3 days earlier. The sun's width is $\frac{1}{2}$ a degree, or 30 minutes of arc, so the difference between the two sunrise positions is $\frac{1}{10}^{\text{th}}$ of the width of the body of the sun. This is the metric that is critical to understanding that Stuart's interpretation of solstice birth on Altar 1 is completely within the limits of solar horizon risings around the solstice. If a similar argument was being made for a date three days after a precise *equinox* date, the situation is very different because the sun's azimuth rise positions change very quickly around the equinoxes. There are several charts in an appendix to my 1998 book *Maya Cosmogogenesis 2012* which analyze the details of this phenomenon at different latitudes in Mesoamerica. I devised these charts because it was necessary to understand this phenomenon as a basis for my reconstruction of one of the ancient Maya's precessional tracking methods.

The December 21, 809 date also allows a greater distance of the sun from the crossing-point of the Milky Way and the ecliptic, corresponding to the open doorway (portal or maw) of the Dark Rift in the Milky Way (mythologized in various ways by the Maya), visible over the eastern horizon just prior to sunrise. This area, conceptually compelling since it could very well be the "sky-cave" mentioned in the hieroglyphic text, rises earlier and earlier as dates progress into January. Any planet, or the moon, which happens to be near this crossing-point (the center of the four-road Crossroads in the Maya *Popol Vuh*, which resembles the Altar 1 image), will likewise be visibly rising before the sun just prior to sunrise. This is called the "first heliacal rise" and is best known in the Venus observations of the Maya, where the first heliacal rise of Venus is generally acknowledged as occurring roughly 4 days after the precise Inferior Conjunction of the sun with Venus (explored in detail in my 1992/1994 book called *Tzolkin*). This is when Venus achieves a minimal 9-to-10-degree separation from the sun, such that it can be viewed rising in the east before the rays of sunrise obscure its viewability.

The same principle can be applied to any other planet moving into heliacal rise east of the sun. A planet such as Saturn, which is not as bright as Venus, will be obscured

by the rays of the sun a few days earlier. The magnitude (brightness) of Jupiter can be considered roughly equivalent to morningstar Venus. Again, Venus requires a minimum 9 degrees of separation from the sun to be viewed in its first appearance as morningstar. We can hold these facts in mind as we look at the astronomy associated with the Altar 1 near-solstice date.

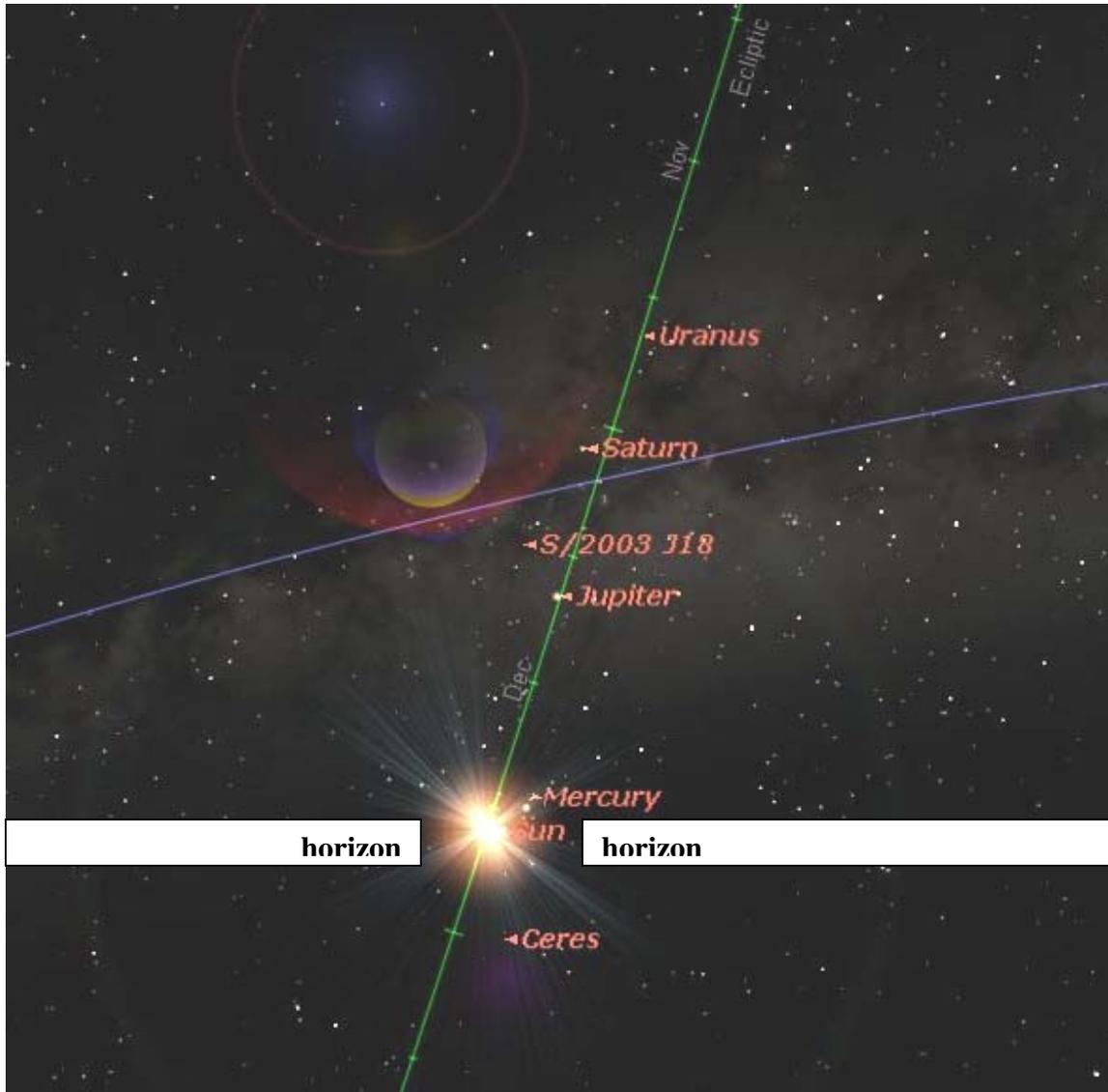


Diagram 1. The sun is positioned at the eastern horizon in this image. December 21, 809 AD

I bring up Saturn and Jupiter because on December 21, 809, those two planets straddled the Dark Rift / Crossroads location (see Diagram 1 above). Saturn rose 21° ahead of the sun, less than 1.5° from the precise crossing-point (the “Crossroads”), while Jupiter rose 13.5° ahead of the sun, on the other side of the crossing-point from Saturn and roughly 7° from the crossing-point. For both planets, this is fully within the parameters of being visible rising in the east before the sun, even if we adjust for the magnitude of each planet being less bright than Venus. Significantly for the implied meaning, heliacal rise has been associated in the Venus-Quetzalcoatl mythology as a birth, resurrection, or rebirth.

If we want to entertain the 584286 correlation (Martin & Skidmore 2012), the Altar 1 date is then 6 days past the precise solstice (December 18 to December 24), but still maintains an important status of indicating when the sun is beginning to progress northward in its horizon risings (its rebirth). The details: The sun's rise azimuth on December 24 was $114^{\circ} 13.3$ minutes of arc. The solstice sunrise azimuth (on December 18) = $114^{\circ} 25$ minutes of arc. The difference is less than 12 minutes of arc, or roughly $1/3^{\text{rd}}$ of the width of the body of the sun. Still a *very negligible* amount in terms of viewable shifts along the eastern horizon.

In addition, the December 24 date derived from the 286 correlation provides an even greater separation between the sun and the crossing-point area which is straddled by Saturn and Jupiter, thus affording an even longer viewing-time of the heliacal positions of those two planets. Jupiter is now 16° above the sun at sunrise, and Saturn is 24.5° above the sun. As the days pass, Saturn and Jupiter rise earlier and earlier, clearly revealing their position at the Sky Cave at the center of the Crossroads. As I argued in earlier work (e.g., Jenkins 1998), the Dark Rift in the Milky Way was mythologized by the Maya as the birth-cleft on top of the Cosmic Mountain, at the center of all the sky-earth. This reading is supported by the text on Altar 1 that Stuart has translated.

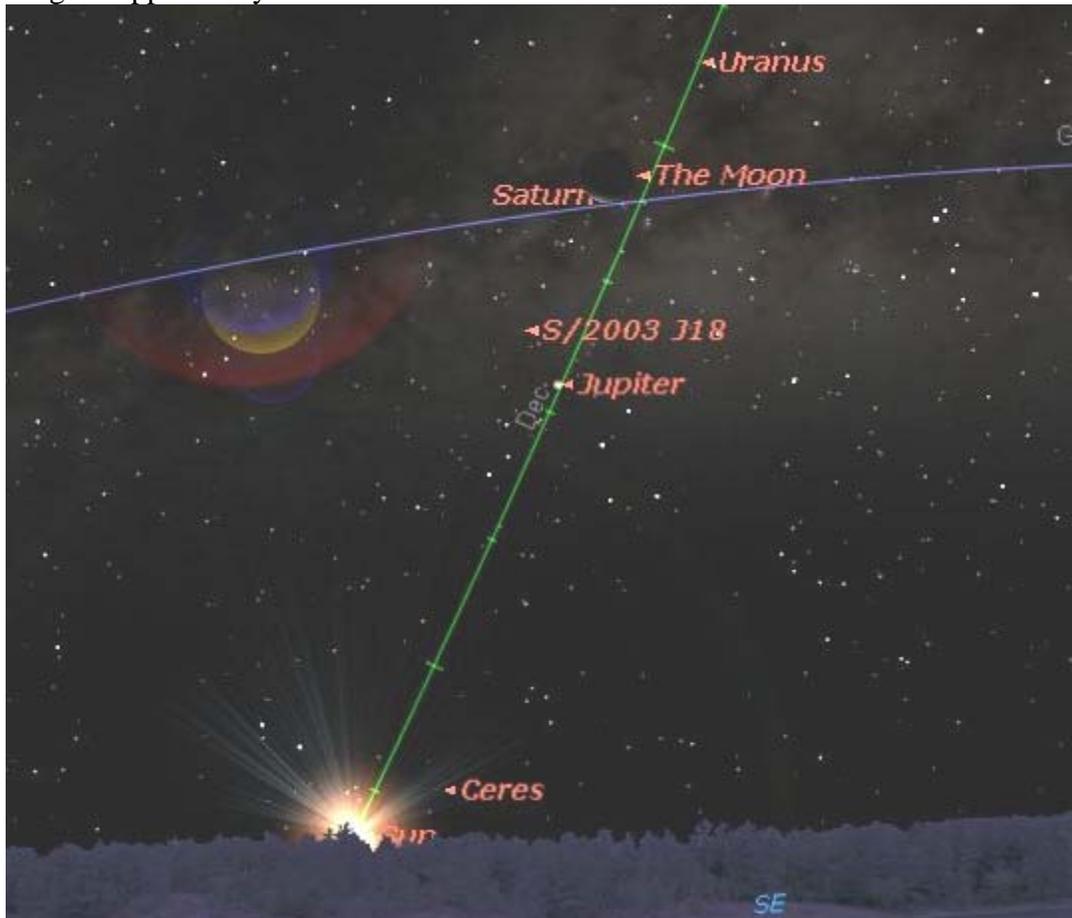


Diagram 2. Moon occulting Saturn. January 6, 810 AD

One final observation can be made about this period of time (see Diagram 2 above). By January 6, 810 AD, Saturn achieves precise alignment with the galactic equator and, more

importantly, the waning moon is very closely aligned with Saturn. It's a Saturn-Moon alignment with the Crossroads, which I've found to be important in the 2012 text of Yuknoom (Block 5 from La Corona; see Jenkins 2012), reflecting his birthday astronomy. On the date in 810 they were so close, in fact, as to be going into lunar occultation of Saturn just prior to sunrise. And the next morning the moon was very close to Jupiter. In addition, for what it's worth Uranus was 8° above Saturn, rising even earlier than the rest. Uranus is barely within the limits of naked-eye sky observations.

To compare with previous data, at sunrise on January 6 the sun has an azimuth of $112^\circ 40$ minutes. On the solstice, 16 days earlier, it had an azimuth sunrise position of $114^\circ 25$ minutes --- a $1\frac{3}{4}^\circ$ difference, amounting to the width of $3\frac{1}{2}$ solar diameters along the horizon. This now provides a definitive indication of the sun's rebirth up the northern sunrise, the return of solar light in the New Year.

Concluding Thoughts

A conceptual cognate between solar rebirth on the solstice and planetary alignments with the Dark Rift seems evident in the Altar 1 date. While the rebirth of the sun at the southernmost solstice "portal" on the horizon (perhaps a kind of earthly cave) may have its own independent meaning of rebirth, planets aligned with the Dark-Rift Sky-Cave can also have this meaning. The two occurring together, as on the 9.18.19.8.17 date on Zacpetén Altar 1, provides a double-whammy narrative underscoring the Maya's interest in rebirthing metaphors connected to kings and rulers, earth geography, and astronomical alignments to a sidereal location attested in the Maya Creation Mythology.

Appendix 1: The DN

Based on several decades of work on the subject, I prefer the 584283 correlation, and this places the December 21, 809 Altar 1 date three days after the precise solstice. A reconstructed DN in the text is clearly 1.0.9.3, connecting the 809 date to the PE 10.0.0.0.0. This is March 9, 830 (J), a date near an equinox that has Saturn and Moon conjunct, and the Sun in superior conjunction with Venus. It's not clear why Stuart calls the DN 2.0.9.3 and thus points it to 10.1.0.0.0 --- November 24, 849 (Julian) in the 283 correlation. (Mercury was 10.5° above the sun on that date, near its last appearance as morningstar; also within seven days of the date of the sun's alignment with the Dark Rift / Crossroads in that era.) As Anna Vanichkin commented on Stuart's blog, the correct DN math is:

$10.0.0.0.0$ minus $9.18.19.8.17 = 7,383$ days, which equals the 1.0.9.3 DN evident in the upper left cartouche of the Altar 1 image.

She suggests the connection is relevant because of eclipse cycles in the month of Cumku. It could thus be an attempt to understand the Lunar Node Cycle shifting from solstice to equinox, which would be $18.54 \times 1.25 = 23.175$ years, but the DN = 20.213 years.

Appendix 2. My Comments Posted to Stuart's Essay on His Blog

After Stuart entertained eleven exchanges with others, including Barb MacLeod, I sent in my observations. No further comments as of January 6, 2016. Brick wall, once again.

First comment:

[John Major Jenkins](#) says:
[January 1, 2016 at 6:17 PM](#)

Dave, very interesting work here, thank you for posting.
9.18.19.8.17 is December 21, 809 (in the Julian calendar, according to the 584283 correlation). We can confirm its relation to the solstice with the following method. We know 13.0.0.0.0 was a solstice, in 2012 (in the 584283 correlation). If the date in 809 AD was an accurate solstice date, then the remainder after dividing by the Tropical Year (365.24219) would be zero:

$$\begin{array}{r} 13.00.00.00.00 \\ -09.18.19.08.17 \\ \hline \\ = 439383 \text{ days.} \end{array}$$

After dividing by the Tropical Year, the remainder is 3.35 days. Thus, 9.18.19.8.14 would be the precise solstice (December 18, 809 in the Julian, 283 correlation). The three-day variation can be explained because they sought the seating of Cumku as a conceptual and/or calculational anchor. It can also be explained by the first perception of the sun inching northward (its rebirth) in its daily horizon-risings after the standstill period of several days. Solstice turnabout phenomenon, for naked-eye skywatchers of the horizon, certainly can support a "zone" of at least three or four days on either side of the solstice. And the first indication of it definitely moving northward occurs several days after the technically precise solstice date. This was quite possibly the more important indicator of the date of solar rebirth for the Maya, even if we accept they knew the precise date of a given solstice. So I think your solstice rebirth interpretation can be maintained.

Second comment, clarifying in simpler terms:

[John Major Jenkins](#) says:
[January 3, 2016 at 1:25 AM](#)

Said in a simpler way, using Julian Day Numbers (JDN):

$$\begin{array}{l} 12/18/809 \text{ (J)} = 2,016,897 \text{ (JDN)} \\ 12/21/2012 \text{ (G)} = 2,456,283 \text{ (JDN)} \text{ (A solstice date)} \end{array}$$

2456283
-2016897
= 439386

439386 / 365.24219 = 1202.999029 (remainder of .35 of a TY day)

Thus, 12/18/809 AD (Julian) = winter solstice, 3 days before the Zacpetén Altar 1 date

Appendix 3. Related Communications with Barb MacLeod

Hi Barb,

January 6, 2016

Happy New Year. I was going to send a third post to Dave's blog, to share the data comparing the difference between the azimuth rise positions of the sun on the solstice date (Dec 18, 809 Julian 283 --- which I demonstrated the veracity of) and the Zacpeten Altar 1 date (December 21, 809 Julian 283). It's 3 minutes of arc. If we entertain the ridiculous 286 correlation it's 12 minutes of arc --- still very negligible. It was unfortunate to see Dave confused by other comments, when his solstice-rebirth interpretation can strongly be maintained, if we only consider what horizon watchers were looking at rather than an abstractly precise solstice moment. The same problem has afflicted the 2012 topic. Anyway, now that Mardyks has entered the scene there's no point, as he will construct counterattacks to anything I post, but it would have been nice to receive a response from Stuart, considering that my posts affirmed his position.

Another issue is how Dave doesn't mention the DN in his blog post, but the original essay of 2009 (in the *Kowoj* publication) that he linked to does. But there, he calls it 2.0.9.3 and links it to 10.1.0.0.0. As Anna Vanichkin noted, it is certainly 1.0.9.3, linking to 10.0.0.0.0, which can be seen in the drawing. It would be helpful to other scholars if errors were acknowledged and corrected in a timely way. His blog post could have been more forthright about that, which otherwise shares some brilliant work.

As you'd expect I was alerted by Dave's intriguing discussion of the portal glyphs, Sky Cave, celestial mountain, etc. Although he is entertaining here the astronomy of the solstice, Dave (and Stephen Houston) tend to avoid astronomy and treat "mythological landscapes" as existing solely within the imagination of the Maya, when those topographies often point to astronomical places. Thus, I expected there to be something compelling connected to the Dark Rift / Crossroads. But I was in L.A. for the holidays and didn't have access to my astronomy software. When I got home yesterday I looked up the Altar 1 date and found Saturn and Jupiter straddling the DR / XRDS (details are in the enclosed essay). But of course we know that the Maya only rarely took note of things going on in the sky at compelling celestial locations attested in the Creation Myth --- the text alluding to a Sky Cave / portal of rebirth and a Celestial Mountain must only refer to hallucinations the drugged-out savages were having. See Diagram 1 in my enclosed essay. Best wishes,

John

Bibliography

Jenkins 1992/1994 (*Tzolkin*)

Jenkins 1998 (*MC2012*)

Jenkins 2012a (on La Corona)

Martin & Skidmore 2012 (286 correlation)

Jenkins 2012b (response to Martin & Skidmore)

Stuart 2009 (on Zacpeten)

Stuart 2015 (blog, Zacpeten)