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Recovering the Lost World,
A Saturnian Cosmology -- Jno Cook
Chapter 25: The Hour of Phaethon.

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"From the first, humanity had to be religious. It is still so.
Further, it will be religious so long as it will exist.
Religion is ultimately hope, and humans live on hope."
-- Alfred de Grazia *The Divine Succession* (1983)

Dating the Events of 685 BC

This chapter deals with the world following 120 years of electric contacts between Earth and Mars, from 806 BC to 687 BC, and the subsequent blazing of Venus and Mercury in 685 BC. This is an era which will see the start of history, science, and philosophy, and the genesis of contemporary religions. All four are the direct result of the events of 685 BC. The quieting of the skies after 685 BC affected how humans saw the world, and we see immediate attempts to reach a new understanding, a science not based on the willful and arbitrary actions of the Gods. At the same time, a much larger religious conceptualization comes forward, based on a power beyond the observable Universe. But first, dates for the year 685 BC.

I'll briefly describe how the four dates of the events of the year 685 BC were found. The dates can all be derived from the Maya *Chilam Balam*, verified from Mesoamerican site alignments, and partially verified from information from the Eastern Mediterranean region. [note 1]

The dates, on the Gregorian calendar and all in the astronomical year 685 BC, are as follows:

- Venus and Mercury start to blaze, June 15
- Jupiter develops a coma, July 9
- Jupiter releases a plasmoid bolt, July 14
- Jupiter's plasmoids lands at the Sun, July 25

In the later chapter "Olmec Alignments," I have determined the three previous dates when the world was destroyed and recreated (in 2349 BC, 1492 BC, and 747 BC), from site alignments in Veracruz and the Valley of Mexico (alignments of the sites to a setting sun at mountains or volcanoes). For the 13 sites which were considered, 20 alignments can be assigned to September 8, 2349 BC (or the later equivalent for the setting of the Pleiades), 16 alignments can be assigned to April 19, 1492 BC, and 10 alignments can be assigned to February 28, 747 BC. This is an astounding series of coincidences -- especially since these were distributed over only 13 sites.

Thus when I started to find additional alignments to July 9 (4 or 5 instances), July 14 (5 instances), and July 25 (7 or 8 instances), they could not be ignored. Additionally, August 12 started to show up. August 12th or 13th was a retrocalculated date for the "second creation," probably first used at La Venta, and then by the very influential city of Teotihuacan, where it was achieved with an alignment of the primary axis of the site. There may be other alignments like that, but I do not have site plans for other sites. The additional alignments, by the way, occur at sites dating in their construction to after 600 BC. Details below.

The following lists the dates in reverse order, for once the concluding date is found, the other dates can be found in reference to that.

... ending date, July 25th

The first inkling that July 25th may have been an important date in Mesoamerica was the fact that the Maya celebrated the following day as "new year's day" at the time of the Spanish invasion. The date is mentioned by bishop Landa, and was apparently set at the Maya site of Edzna in the Eastern Yucatan, where a vertical gnomon has been found, set to show the overhead passage of the Sun on July 25th. Edzna is at the same latitude as the city of Teotihuacan in the Valley of Mexico, where one of the site alignments (to a mountain) is also for July 25th. The next day, July 26th, was new year's day and the start of a seasonal agricultural period.

The importance of the date of July 25th can also be suggested from the fact that Book 10 of the *Chilam Balam* makes only one error in the recollection of the 7000-year history of celestial events, and that is to force the assignment of July 25th to the event of 2349 BC (which we know as the flood of Noah), by reassigning the event to an incorrect year (actually to an incorrect Katun and Tun). The "flood" of 2349 BC, known to the Maya as the "third creation," was very important, as can be shown from the continued iconographic references in sculptures 3000 years later. Having experienced the end of an era on July 25th, 685 BC, it became necessary to prove that all previous eras had also ended on July 25th. (More on this particular quirk in the chapters "The Books of the Chilam Balam" and "The Day of Kan.")

If July 25th is accepted as the day that the plasmoid from Jupiter landed at the Sun, and brought quiet to Venus and Mercury, ending a 120-year period of high planetary activity, then other dates and time spans will segue easily to this date in 685 BC.

... start of the eruption of Venus, June 15th

The starting date of the nova event of Venus in 685 BC can be found by collation of some disparate data. My first clue was a comment by Dennis Tedlock, translator of the Quiche Maya *Popol Vuh*. He commented on a passage where the hero twins of the *Popol Vuh*, Hunahpu and Xbalanque, willingly jump into the oven of the lords of Xibalba (the underworld). In the *Popol Vuh* the lords attempt to trick the twins into jumping into an oven. The twins see through the trick, and respond as follows:

> *"You'll never put that one over on us. Don't we know what our death is, you lords? Watch!" they said, then they faced each other. They grabbed each other by the hands and went head first into the oven.*

Little did the lords of Xibalba know that in sacrificing themselves, the twins were destined to "become" the Sun and the Moon. Mesoamerica certainly understood that both the Sun and the Moon had made their first appearances in the remote past, the Sun in 4077 BC, the Moon in 2349 BC. But connecting an event of 685 BC to events thousands of years earlier was not a problem to the Maya, especially in a popular narrative which had already existed since the Classical period (AD 400 to AD 900), as can be ascertained from depictions on vases from this period. [note 2]

In the *Popol Vuh* the twins Hunahpu and Xbalanque are understood to be Venus and Mars. This much is certain from the story of their birth, and can be collaborated from comments in the *Chilam Balam*. But this is not correct for the last instance. In actuality the two planets which were seen in flames in 685 BC were Venus and Mercury. Hunahpu definitely is Venus. As Tedlock notes, he is named after the first day of the five periodic cycles of Venus as Morning star and Evening star. Xbalanque, on the other hand, is not as easily identified. His name could be translated as "little jaguar of the night" where "X" is a diminutive. Xbalanque is always "little," whereas the term "little" is only applied to Hunahpu in a very few instances. In the *Popol Vuh*, Hunahpu always acts in the daytime, Xbalanque acts at night. This would seem to correctly reflect on what side of the Earth Mars (and in the last instance, Venus) and Mercury primarily acted during the 60-year period after 747 BC.

In the last instance, when two planets go up in flames, the two planets are Venus and Mercury. Venus is large, and seen as large, especially with a coma, whereas Mercury is definitely small. Mercury had lost most of its atmosphere two years earlier, and looked no larger than it is today, although after June 15th it was blazing like a sun.

I am making this identification, because the confusion of the planets existed already in antiquity. For example, in the Eastern Mediterranean region it was assumed (in some retellings) that the eruption of 685 BC only involved Venus. Mercury travels so close to the Sun that it could easily be confused with the Sun if it (or both) were seen blazing in the sky, and Mercury normally could not be located in the skies during the day, unlike Venus, which was visible day or night because of its coma and tail. Mars was also in the skies in 685 BC, close to the Sun but behind it.

Identifying Xbalanque as Mercury allows following up on a comment by Tedlock which comes some pages later after the following text in the *Popol Vuh* which reads:

> *And then the boys ascended this way* [leaving Xibalba]*, here into the middle of the light* [that is, this world]*, and the sun belongs to one and the moon to the other.*

Tedlock writes in his notes:

> *It is not stated literally that they became the sun and moon. ... The nature of Xbalanque's lunar role is foretold by the fact that he is face-to-face with Hunahpu when they burn together, this being the position of the moon when it is full.*

The comment is revealing, but the statement is wrong. This imposes our knowledge of how the Moon and Sun are related, and the cause for a full Moon. For a people to whom the Earth was flat, only a new Moon would fulfill the condition of the Sun and Moon facing each other. They had to be in the sky at the same time, and close together. In fact, looking at a graphical ephemeris for July 25, 685 BC (the ending date), Mercury is seen next to the Sun, and Venus next to the new Moon.

I thus started to look at new Moon dates in the year 685 BC. From about the time of the equinox, when Venus might have first returned to view from behind the Sun, through the beginning of July, before the concluding day of the nova event, there are five new Moons. In each of these instances the Moon would be very near the Sun. The condition I was looking for was the simultaneous close proximity of Venus and Mercury in the sky.

The following are the new Moon dates, and the location of the planets with respect to the Sun, shown in Right Ascension (hours and minutes of left-right location): A minute is 0.25 degrees. I have only listed the two instances where Venus and Mercury are close together, May 23 and June 22 (Julian).

> **From east to west in the sky at noon sidereal time,**
> **Mexico City. Right Ascension in hours:minutes.**
> **Dates shown as Julian.**
>
> **May 23 --**
> Mercury, Venus, Sun, Moon, Mars
> 4:50, 4:40, 3:25, 3:23, 3:05
> Mercury and Venus are close together in Gemini.
> The Sun and Moon are close together at the east end of Taurus.
> **June 22 --**
> Venus, Mercury, Moon, Sun, Mars
> 7:20, 7:08, 5:15, 5:26, 4:29
> Mercury and Venus are close together in Leo.
> The Sun and Moon are close together between Cancer and Gemini.

The above dates of May 23 and June 22 qualify. In both instances Venus and Mercury are grouped close together, one almost above the other, but slightly displaced. In effect Xbalanque and Hunahpu are facing each other, almost holding hands. The Sun and Moon are nearby and in an almost identical position with respect to each other. The point of this exercise is based on the conviction that the Olmecs would have seen these conditions, and furthermore recorded them.

I picked the June date as most likely. June 22 Julian is June 15 Gregorian. The choice of June 15 was made on the basis of information from the other end of the world, from the "Tishtar Yasht" hymn to Venus, of the *Zend-Avesta*. Tishtrya (Venus) battles demons in the sea (sky) for 34 days before victory is achieved. I have noted the details in the previous chapter. Thirty-four days fits the span of time from June 15 to July 25 (Gregorian), with a few days left over, which may also be accounted for in the hymn, but not clearly.

But much more convincing is the description of the blazing of Venus in 685 BC recorded in the *Sibylline Oracle Books*, composed at a much later date in Alexandria, Egypt. The *Sibylline Oracle Books* clearly places Venus in Leo at the start of the event. In fact, as others have noted, Venus riding on the back of a lion (the constellation Leo) was regarded as a symbol of disaster in the Eastern Mediterranean.

Does this date, June 15, show up in Mesoamerican site alignments? No. I almost wrote, "of course not." It does not show up because it is the start of an event; the structure of Mesoamerican languages recognize only the completion of events, and pays scant attention to beginnings.

However, the *Chilam Balam* records a period of time when "it came about that the sun in Katun 3-Ahau was moved from its place for three months." The complete period is noted because it was a celestial disaster of immense scope. Katun 3-Ahau includes the year 685 BC. The three months (of 20 days) are counted inclusively, as are all other intervals of time mentioned in Book 10 of the *Chilam Balam*. So the actual period is two Tzolkin Uinal months. The interval of 40 days (two 20-day months) exactly spans June 15th to July 25th.

... the release of the plasmoid bolt, July 14

This date is based on an interval of 12 days which was put to use in a reconstruction of Monte Alban in 275 BC (detailed in a later chapter), the fact that July 14th is used by five sites as an alignment, and the suggestion of possible selection of the "day of Kan" associated with the end of an era -- the delivery of the plasmoid on July 25th. Additional nuances with respect to Mesoamerican attempts to forge a science from the numerology of the Tzolkin calendar, including the elusive search for the "day of Kan," are discussed in a later chapter. July 14th also represents a reasonable interval of time for a plasmoid from Jupiter to travel the 480 million miles (773 million km) to the Sun. I develop the reasoning for this date in the chapter "The Day of Kan." Since it would take a considerable amount of text to detail all this here, I will have to leave off at this point in the retelling.

... Jupiter develops a coma, July 9

This date is based solely on the fact that it first shows up at Tres Zapotes, recurs 4 times elsewhere, and represents an adequate interval for Jupiter to have been seen with overhead plasma plumes and a lower bifurcated or trifurcated body -- so that these shapes would enter Olmec iconography. This date is thus not well supported. Although the site alignments associated with this date are within two degrees of solstice alignments, it is unlikely that these represent a solstice, despite the fact that both Vincent Malmstrom and Anthony Aveni delight in assigning Mesoamerican site alignments to Summer solstices. The later Maya (and Aztecs) had no ceremonies or festivities associated with the solstices.

Selection of this date for a sunset alignment is somewhat problematic, for "beginnings" are seldom held as significant in the Mesoamerican worldview. What could make the date of July 9 significant is the consideration that the explosion of Jupiter into a coma was a return from the dead (and thus the conclusion of a "death" period) of what would have been, at the time, the primary God, in a manner similar to the return from the dead of Jupiter in 2349 BC. This previous event was certainly remembered, and had been recorded in graphic books. The iconography of the split mountain, the Absu at the autumnal equinox of 2349 BC with an emerging and resurrected God, continues well into the future. The ballcourt imagery is based on this also.

The primacy of a chief God passes to Quetzalcoatl or to the ball-playing twins of the *Popol Vuh* after 685 BC, however. I think we need to see the July 9th alignment as one of the religious interpretations of the events of 685 BC which did not take hold in any measure.

Hour of the Thunderbolt

Mesoamerica did not see the plasmoid hit the Sun, for it happened two hours after sunset in Mexico. In the Eastern Mediterranean the flash happened two or three hours before sunrise. But in Australia it happened in full view an hour after sunrise in the morning.

The time of day can be found from an Australian Aborigine legend, called "Kirkin and Wyju," recorded by William Ramsary Smith in *Myths and Legends of the Australian Aborigines* (1930). It appears to be about Venus (Kirkin) and Jupiter (Wyju) in the winter (in the southern hemisphere) of 685 BC.

The story portrays Kirkin as very conceited and self-centered. He combs his long blond hair daily, facing the Sun, and tosses it over his head to the front at times in a vain display. (Blond hair occurs among the aborigines.) Wyju, on the other hand, is characterized as "a humble man, who did many wondrous acts." Part of the story tells of his rescue of a child who was swallowed by a God Snake. Wyju has to coax the snake into an upright position, for otherwise the local water supply would disappear. With the snake standing on the tip of its tail, Wyju sliced the snake open along its back to remove the swallowed child.

This will be recognized as an image of the polar plume, with the swallowed child as the ball plasmoid near the end. The timing is wrong, but for the sake of a moralizing story, that doesn't matter. There will be a later image of the polar plume in terms of a column of white smoke.

> *"The story of his wonderful deed reached even the conceited Kirkin, who became very jealous, and decided that if Wyju should come within the bounds of his hunting ground he would endeavour to slay him."*

Kirkin, in fact, invites Wyju to be his guest. During the evening meal Kirkin suggests they go hunting the next day for Wallows -- kangaroo rats. While Wyju sleeps, Kirkin repairs to a nearby Wallow nesting ground and places pointed sticks in the ground around a dead Wallow, with a hidden string tied to the grass and leading away from the location. Kirkin recommends to Wyju:

> *"To procure this most coveted prey no spear, boomerang, or nulla-nulla is required. You simply walk cautiously into the nesting-ground, and when you see the grass moving you know that beneath it lies the wallow, and with a mighty leap into the air straight above the prey you come down and let your feet land right upon it."*

The next day, during the hunt, Wyju does exactly that.

> *"Wuju jumped with all his might, and came down with both his feet upon the sharp spikes, which pierced them deeply."*

Wyju faints in pain, and when he comes to, Kirkin tells him:

> *"Oh my friend, when you walk upon your feet please don't forget to look me up. The sign by which you will find me is a white smoke column that rises on a still, clear day."*

Kirkin leaves, leaving Wyju to suffer and bleed.

> *"From new moon until next new moon did Wyju, overcome with pain and suffering, weep and cry unto the All Father Spirit."*

He requests having the Winjarning brothers sent. They appear at the second new moon and heal his feet. Note the *new moon* dates. The reader will recognizee the period of two new moons from the Mesoamerican *Popol Vuh* narrative.

> *"Wyju went in haste far away into the northern land, and saw a white smoke column rising straight into the clear blue sky.* [He walked until] ... *he came within sight of Kirkin, who was walking round and round the fire."*

After sunrise the next day, armed with a warrior's boomerang, Wyju closes in on Kirkin, who is facing east.

> *"He raised his weapon, and with a mighty stroke severed the head with the golden hair from the trunk. He then committed Kirkin's body to a fire. The spirit of Kirkin rose out of the flame and entered the body of a small hawk-like bird."*

I was not entirely convinced until I ran into Jupiter suffering from the spikes in his feet from one new moon to the next new moon, and then a few additional days to hunt down Venus. That matches my deduced timetable, which goes from one new moon (June 15, Gregorian) to the next (July 14, Gregorian) plus 11 more days.

The spikes in Jupiter's feet may be the "long fire-flames [which] rebelled against the Sun," although related by the *Sibylline Star Wars* text to Mercury as well as Venus. And the blood: Jupiter's plasmasphere would have been red in color, as it had in 2349 BC. When the Olmecs start to construct pyramids, they are called "red mountains," after the image of Jupiter in 685 BC.

The Winjarning brothers seem to be the Australian version of the various celestial twins and brothers of Greece, Italy, and Mesoamerica: the Dioscuri, Romulus and Remus, Apollo and Heracles, and Hunahpu and Xbalanque of the *Popol Vuh*. Wow! That places the legend in the era of 800 through 685 BC. In Australia the boys are busy with "righting wrongs." The evil wrought in the northern hemisphere was absent south of the equator.

Wyju was initially a "half day's journey toward the rising Sun." That is about right; Jupiter stood a half-day toward the east in 685 BC.

The column of white smoke (!) from Kirkin's fire is the northern plasma plume, which would have shown up very soon after the Sun's nova event started. Even Nonnos recalled this 1100 years later. Kirkin has a fire going, which matches the various polar plasma plumes given out as "the fires of the four directions," as, for example, the four braziers of the Egyptians. Kirkin's circumambulation is the apparent traversal of the north cardinal direction at about noon during most of the 40 days when Venus and Mercury appeared during daylight hours.

The bleeding of Wyju also shows up as the bright spikes shining through the last red ring of the equatorial rings. At the latitude of Perth (the likely location of the source for this tale) the Sun, Moon, Venus, Mercury are all below the equatorial at the second new Moon, and the condition of a backlighted red ring could have been seen (the red ring would not otherwise be seen in the daytime). By July 25 (Gregorian), when the skies were identical to today, Venus was probably within that band (ready to bleed), but not Jupiter. However, Jupiter's coma would be red.

In the Eastern Mediterranean the reverse was true. Jupiter may have been high enough at culmination (36 degrees at Cairo) to be behind the red ring (at 42 degrees). But it didn't matter. Jupiter had a large red coma and tail anyway. The Sun, Venus, and Mercury rode high above the equatorial, and were thus clear of the red ring.

After the spikes are removed, Wyju had traveled to the northern land where Kirkin normally resided -- "in haste." Was the plasmoid mistaken for Wyju? This actually happened in India and with Mazdaism -- the lightning bolt was a separate god. I think a substitution was made in Australia also. This allows Wyju to move "in haste" and to "sneak up" on Kirkin. As the plasmoid passed Earth it would have been seen moving rapidly. Then it slowed down visually, "sneaking up" on Kirkin.

The time of the decapitation is interesting; Wyju selects the "early morning hours of the rising Sun." If correct, this could serve as an anchor for other estimates.

In Western Australia near the end of July of 685 BC, Mercury rises at 6am, the sun rises about 7am, Venus rises two hours later at 9am. (The southern hemisphere is in winter.) Jupiter will not be in sight until late in the day, near 3pm. It is obvious that it is the plasmoid that needs to be watched, not the planet Jupiter.

If the blast at the Sun happened at 9am in Australia, it would be sensed as a flash at the horizon at 3am in the Eastern Mediterranean, which would be an hour before Mercury rose, and two hours before the Sun appeared (it is summer in the northern hemisphere). If the landing of the boomerang was seen an hour later in Australia, then the last travels of the plasmoid would still not likely to have been seen, since it was still an hour before sunrise in the Mediterranean. Mercury was above the horizon but became engulfed by the flash.

I had originally estimated the night as the time of the event for the Eastern Mediterranean, based on the fact that the Phaethon legend shows no clear idea of what entity in the sky was blasted by the thunderbolt. The estimates from Australia confirm the time.

Mesoamerica experienced the event at 9pm. The Sun and Venus had set. (Although in summer, as this location is near the tropics, the Sun had set at 7pm.) Mesoamerica also had no idea of what object in the skies was hit. Only knowing that Mars was located just to the west of the Sun (and also below the horizon) would give a clue. Venus has just set at the western horizon a half hour earlier. It might have been obvious that Venus was not the target. The plasmoid had bypassed Venus. But Mars had been the culprit for 120 years.

In Mesoamerica the splashdown would show as a flash at the western horizon, where the Sun was below the horizon, having set about two hours earlier. If the blast had lasted longer than 9 hours (my estimate of the splashdown time at the Sun) it would still have been seen in the east in the morning hours. Thus so perhaps did Quetzalcoatl "go east and set himself on fire."

The rise of Venus after "8 days" (in Mesoamerican retellings) is equated to a canonical 8 days (for a westerly disappearance of Venus) because the skies were obscured for four days and this is what Venus was expected to do if it had been properly observed. The *Popol Vuh* mentions four days during which Hunahpu and Xbalanque appear as catfish ("seen in the river"). The catfish are likely smaller plasmoids from Jupiter which kept the turmoil at the Sun alive for these four days. This is similar to the sequence of plasmoids from Venus in 2349 BC: first a large thunderbolt, followed by lesser bolts in the following days.

I considered using a later hour (like 10am), for Wyju definitely sees Kirkin preening himself before launching the boomerang. Wyju comes up from behind, with Kirkin "facing the Sun." This is indeed the situation if Kirkin is Venus. Kirkin is east of the Sun, with its main large plasma tail facing away from the Sun, and Jupiter much further east, and thus sneaking up behind him, but Jupiter remained well below the horizon. It is the plasmoid itself, as the warrior's boomerang, which is seen.

If we wait for Jupiter to show above the southeast horizon, it will be after 2pm. That invalidates any estimated times for other longitudes. I'm inclined to move the character of Wyju from Jupiter to the thunderbolt on these last few days.

Burning Kirkin's body is interesting also. It recalls the Mesoamerican Quetzalcoatl. That would also make me believe that the decapitation probably started shortly after 9am. That way we have an all-day cremation event. It is over (most of it) in a few days. The fire is likely the north polar column in arc mode at its lower portion. The fire and the column would have remained in the same location in the sky. Also, the rising of the "spirit of Kirkin" duplicates the rising up of Venus as a star ("the Morning Star") as recorded in Mesoamerica.

Some things remain unresolved, but then, I think that everywhere in antiquity there was an immediate confusion of who was struck by lightning, and who was Phaethon. Hesiod's brief description, along with Hyginus (as pointed out by van der Sluijs), has Mercury as Phaethon, the same as Nonnos and Ovid. Others have Venus. The Eastern Mediterranean actually has it more correct than Mesoamerica, for by assigning Mercury to Phaethon, there was no need for a "rising into the sky" as Mesoamerica had. After the plasmoid was delivered Mercury was no longer seen in the day skies, and was seen only at night within a few degrees of the Sun at sunrise or sunset.

The flash most likely occluded the planets near the Sun, Mercury and Mars. Venus was some 35 degrees east (about 2.5 hours) of the Sun. It probably disappeared in the flash too. Strangely, the Sun was never the suspected target.

If the Eastern Mediterranean had seen the affair in the day sky, it would have been obvious that the plasmoid traveled past Venus, and not past the Sun, but the splashdown happened at night. That the boomerang came to a halt at the Sun should have been noted in Australia. But it was Venus which had lost its tail and coma. And, of course, the Sun just went on as if nothing had happened.

Mercury was a peculiar object in that it only showed in the day skies for 40 days during this year, and then was never again seen rising that high. It had only taken up its regular station of the true morning and evening star in the previous year.

The last piece of discrepant information is the fact that Kirkin and Mercury, in addition to facing the Sun, were said to face east -- both on the last day. Only Mercury, west of the Sun could have been in a position to do both of these. Mercury was close to the Sun, about 15 degrees west.

Let me remind the reader that we are seeing all this in the southern hemisphere so that the location of the planets would seem to be reversed from what is seen in the northern hemisphere. The Sun rises in the east, but that is to the right when facing north and facing the equator, where the path of the Sun through the sky will be.

But now consider also the fact that between about July 8 and July 11 (Julian) Mercury moved from a position just east of the Sun to a location just west of the Sun. Since Mercury during these two days rode above the Sun (by 5 degrees), the effect would have been to see its plasma tail "hair" being tossed from his back over the top and to the front of his face. This matches the description of Kirkin:

> *"Every morning he would mount a high boulder and comb his hair. Then with both hands he would bring the golden shower from the back of his head to hang in front...."*

Thus Kirkin in this last scene may be the planet Mercury. If so, then the delivery of the plasmoid at the Sun would have happened between 8am and 9am. In either case, 9am is probably a close approximation of the delivery time of the plasmoid.

The Start of History

What stands out in the period after about 600 BC, and increasingly over the following centuries, is a sudden intense interest in history, which shows up, not only in the Middle East, Greece, and Ptolemaic Alexandria, but also in China. Why this sudden flurry of research and speculation on events, and specifically only events of the recent past?

There had been over 600 years of a quiet sky, from 1440 BC to 800 BC. Then, within a span of a little more than a hundred years, Venus, Mars, and Mercury closed in on the Earth (or seemed to). The length of the year changed, Mars repeatedly cruised very close to Earth (nine times) to cause massive earthquakes and interplanetary lighting strikes which traveled across wide areas and were accompanied by hurricanes of ground-up rock, burning trees, and flaming sand. Then, just as suddenly, after the nova event of Venus in 685 BC, which surpassed the Sun in brilliance and dropped fire from heaven over wide areas of the Earth, ending with a lightning bolt from Jupiter directed at the Sun, it all stopped.

During the 8th and 7th century BC, and periodically a hundred years earlier, endless wars had raged in the whole region of Mesopotamia and the Levant, mostly involving the states of Assyria and Babylonia feuding with encroaching tribes and kingdoms from the north. Starting in about 750 BC Assyria expanded to conquer all of Babylonia, Syria, the city-states along the Mediterranean coast, and eventually Egypt.

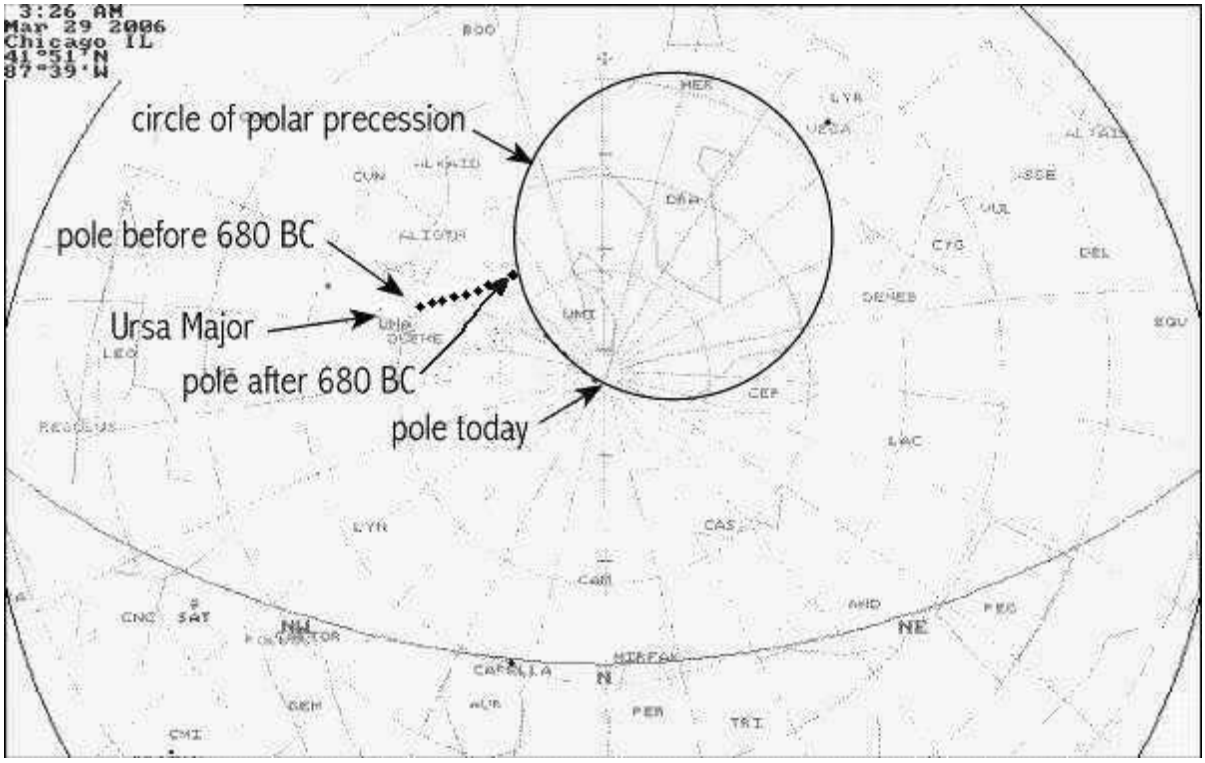
The physical and political changes required an explanation, and the first line of inquiry was to sort out the events. A change in perspective on the progress of time took place, which resulted in the increase of the number of chronicles and records. This is seen especially with the Assyrians, who start to record all their activities -- in effect, they start to write history (as do the Babylonians). The conditions of wars and the compilation of histories is the same in China.

This was followed soon by philosophical speculation, which we will eventually understand as the start of science. It should be recognized that the people of this era were technologically quite proficient. They could measure and map the stars and planets as well as the geography of the Earth, solve for the roots of quadratic equations, and undertake massive building and irrigation projects.

Bronze metallurgy was supplanted by the technology of iron after 800 BC. The smelting methods were apparently imported from regions north of the Caucasus. The Assyrians start producing iron weapons. They also adapt the horse to warfare, forging an effective and fast moving cavalry. The same Assyrians, by their own reports, model their warfare after 750 BC on the strikes of Mars and its hordes of companions, absolutely devastating their enemies with a cruelty unequaled in all previous history.

Historians after 600 BC will divide world history into two parts, the era before 747 BC, and the era after 747 BC. The year 747 BC had seen a change in the length of the year, had thrown the lunar month out of sync with the year, and had initiated 60 years of geological and climatic disturbances (or 120 years from 806 BC). However, a more important date was 685 BC, when it all stopped.

A New Order of the Sky



[*Image: The change in polar axis in 685 BC shown with a dotted-line. This is an approximation. The path of the polar precession describes a 30- to 32-degree circle about the location of the Sun's axis in space. Illustration by J. Cook.*]

In the seventh century BC, as noted in the previous chapter, the spin axis of Earth (the polar axis) changed to point to a new location in the sky. Greek, Roman, Egyptian, Chinese, and Indian sources, without being specific about a date, all extrapolate to the 8th or 7th century BC as the date when the axis of the Earth changed from Ursa Major (the Big Bear) to a location closer to the Ursa Minor (the Little Bear). Today the axis is located at the tail of Ursa Minor. But both the new location and the actual cause for the change elude us. Did the nova condition of the Sun affect the Earth's axis in 685 BC? I think it probably did. (The thunderbolt from Jupiter in July of 685 BC was not likely the cause.)

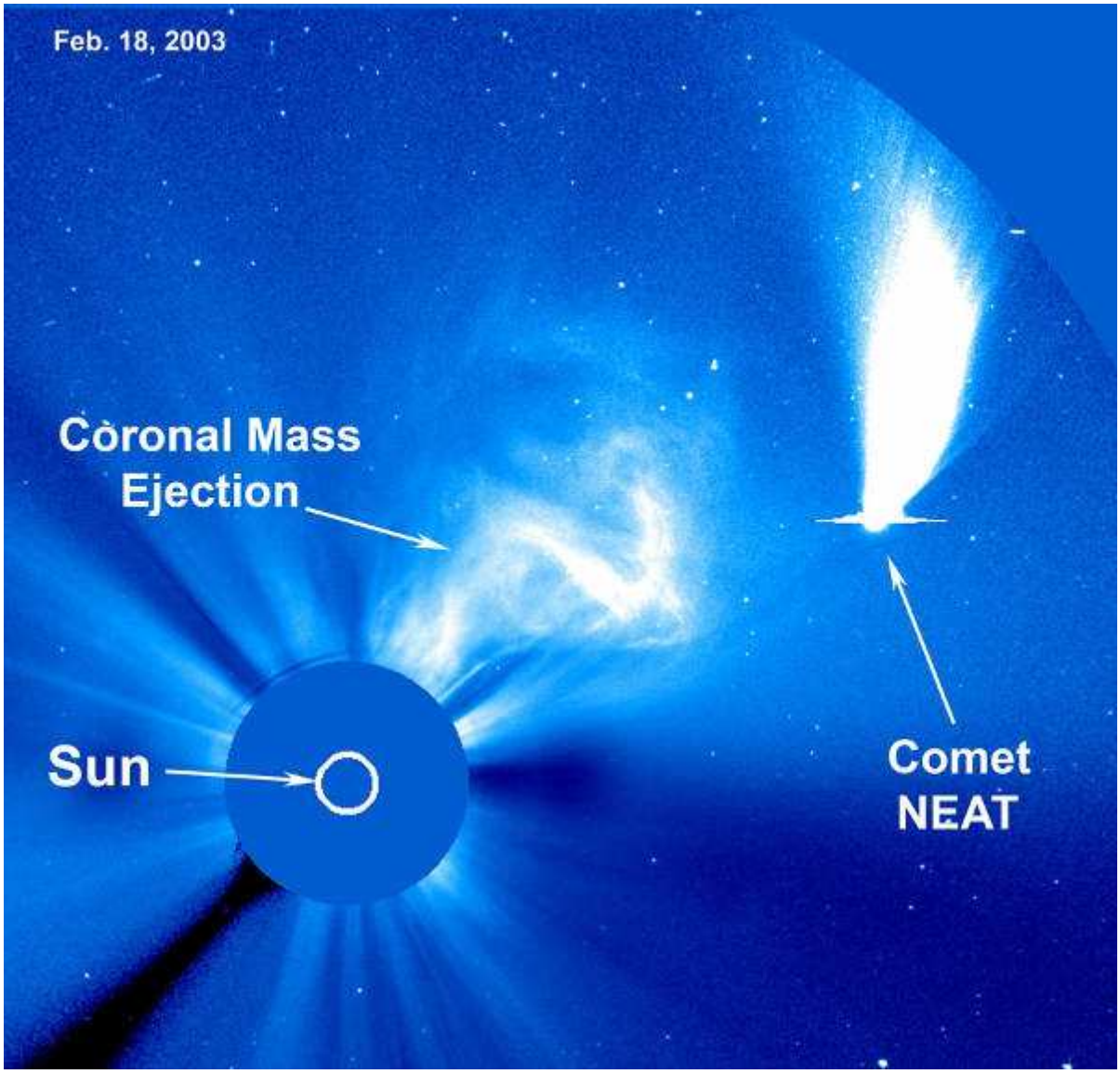
Seneca and others claim that the Earth's axis of rotation, that is, the place in the dome of the stars to which it pointed (today at the star Polaris in Ursa Minor), was located in Ursa Major before the 7th century BC. Velikovsky quotes Seneca as, "And the Wain [Ursa Major], which has never bathed in the sea, shall be plunged beneath the all-engulfing waves." But this is hyperbole from the first-century AD play by Seneca, *Thyestes*. The Wain did not plunge below the waves of the Mediterranean sea at the latitude of Rome (42 degrees north) before or after the change in the sky. It still does not do so today. The tail started to just touch the ocean (the north horizon) after AD 200 as seen from the latitude of Alexandria in Egypt. All the rest of Seneca's description is just to make drama of a transformed sky. However, it is the use of a "changed sky" as a metaphor in his play which speaks to the fact that the changes were common knowledge. [note 3]

There are many other references in Roman, Greek, and Indian sources which note that the Earth's rotational axis had at one time been located in Ursa Major. There is even an old reference among the Pyramid texts, "the king looks among the stars of The Wain, to determine true north." [note 4]

The spin axis (polar axis) of the Earth points today to the star Polaris, at the end of the handle of the Little Dipper, the constellation Ursa Minor. Over the course of time the location where the axis intersects the dome of the stars is understood to move slowly on a circular path to point to different locations in the northern sky, but always angled 23.5 degrees away from a line perpendicular ("normal") to the orbital plane of the Earth (known as the "obliquity" of a planet). This circle in the sky is known as the "precessional path" of the Earth's axis, like the circle described by the top of the axis of a wobbling top. By today's observations, it takes 26,000 years to complete the wobble. [note 5]

I will propose that the spin axis moved directly and in a very short period from a location "among the stars of Ursa Major" to a new location in the sky near the current precessional path close to Ursa Minor and then halted, changed direction, and continued at a right angle very slowly. I think this happened in 685 BC during the 40 days when Venus and Mercury blazed in the sky. The nova event of the Sun would have represented an absolutely gigantic electric storm capable of twisting the Earth's rotational axis. I will thus suggest that the blazing of Venus and Mercury, and the simultaneous change in the location to which the Earth's spin axis pointed, were caused by a mass expulsion from the Sun -- a nova event. This was not a single hit, it was an expulsion that lasted 40 days. [note 6]

Attributing the cause to an electric storm from the Sun does not seem so far-fetched. I would find this an acceptable hypothesis because the effect would have represented relatively low forces extended over a long period of time. The Earth's axis, although experiencing a bending torque, did not react in the typically violent manner that a gyroscope exhibits on the application of an impact force. It is, of course, possible that there were geological effects but these remained completely hidden among the constant earthquakes experienced since the Earth shocks of 747 BC and 686 BC. Earthquakes continued at a high frequency for a long time. Eight hundred years later Rome still reports 57 earthquakes in a single year (Velikovsky). [note 8]



[*Image: The comet NEAT in 2003, meeting up with a coronal mass ejection (CME) from the Sun, a minor nova event. The larger disk blocks the Sun's corona. The smaller diameter circle represents the size of the Sun. After NASA.*] [note 7]

It could also be suggested that the current precessional path of the spin axis -- the so-called wobble which we still experience -- is the last remnant of the event of 685 BC. A "wobble" is what gyroscopes experience, but only if the applied torque persists. But since there is currently no applied force, and precession has not stopped, it is more likely that precession is caused by the Moon's travel around the Earth on a path which each month moves the Moon out of and back into the Earth's plasmasphere. The Moon is the only satellite of any planet which does this. All other satellites of all the other planets travel within their planets' plasmaspheres, except for a few satellites which remain completely outside of planetary plasmaspheres. [note 9]

The Moon leaves the Earth's plasmasphere monthly because the Moon is on an orbit much further from its parent planet (Earth) than any other satellite of any planet, excepting the few really distant satellites of Saturn (at 6 and 11 million miles). At an orbit of 250,000 miles (400,000 km), the path of the Moon extends beyond the boundary of the Earth's plasmasphere on the Sun side. The Earth's plasmasphere extends only to 80,000 to 160,000 miles (130,000 to 257,000 km), but much further on the night side -- the "shadow" of the Sun's electric field. Thus the Moon travels within the Earth's plasmasphere only on the night side. [note 10]

The entry and exit of the Moon into and out of the Earth's plasmasphere would result in electric effects at the boundary. This would affect the boundary of the plasmasphere locally with each entry and exit. The electric effects are experienced by Earth, just as the arrival of a coronal mass ejection (CME) from the Sun causes a temporary slowing of the rotation of the Earth, although the Earth always regains its rotational speed afterward. The effect of the Moon's entry and exit from the plasmasphere, however, is unlike the effect of a CME, for the disturbance is localized and always offset from the center of the rotational axis of the Earth. All exits are always at the leading edge of the Earth's orbital path.

Since precession was not noticed by the astronomers of antiquity until after 400 BC, we could reason backwards and suggest that the Earth's plasmasphere was more extensive (larger) before that time (probably before 685 BC) such that it would contain the Moon in its travels around the Earth. This would imply that the nova event in 685 BC reduced the size of the plasmasphere to where the Moon, since that time, would cut across the plasmasphere boundary. Since the size of the Earth's plasmasphere is determined by the electric field of the Sun, it suggests also that the Sun's electric field was reduced in 685 BC.

Most likely the relocation of the Earth's axis in space had a relatively quick onset and then a rapid exponential decline, so that much of the change was accomplished within the period of 40 days, but not so suddenly that the Earth would have been jolted -- as had happened frequently in the past. We have to posit these conditions because we know the change happened, and most likely happened at this time, but went unrecorded (but certainly not unnoticed), lacking violent physical effects impinging on the Earth. The blazing of Venus and Mercury and the lightning bolt from Jupiter were seen by anyone who looked up at the day sky. The rotation in the dome of the stars to a new location was noted, especially by sailors and eventually by astronomers. I do not consider it even a remote possibility that the rotational axis of Earth shifted geographically in any significant manner. The geographic location of the axis of rotation before 685 BC was at exactly the same place (the "North Pole"), as today. [note 11]

Velikovsky mentions a Vedic source which tells that the Earth "receded 100 yojanas" from its place. This is an interesting and significant data point, and turns out to be wholly correct when compared to other astronomical sources. The measurement most likely dates from after the 7th century BC, when the oral Vedic traditions were being transferred to writing in India and emendated with contemporary historical events. One hundred "yojanas" is 720 km, or 447 miles, and would represent a change of 6.5 degrees in the latitude of stars overhead.

If the Vedic source noted that "the Earth receded 100 yojanas from its place," it would indicate a noticeable single change in the skies. The wording seems consistent, because later Roman authors agree that the Earth had sunk towards the south. Pliny called it, "a slackening of creation." But this would only be noticed with a comparison of the night skies before and after 685 BC. The question becomes, "What in the skies stood higher up after the change?"

The position (or height) of the Sun would be an indication as would a change in the background stars of the polar axis. This change can only be accounted for with a change in the inclination of the spin axis to the Earth's orbital plane.

Allowing that the Indians were competent mathematicians (and they certainly were, our algebra is derived from them), it could be suggested that the 6.5 degrees (100 yojanas) represented the shift in the Earth's axial inclination in 685 BC. The axial inclination can be easily measured from the difference (before and after) of the elevation of the Sun at the winter or summer solstice (for example). That would suggest that the axial inclination of the Earth before 685 BC was 6.5 degrees different from the present 23.5 degrees -- it was 30 degrees. [note 12]

The location of stars with respect to each other in the dome of the stars would not change with a relocation of the polar axis (or even a new orbital inclination). Thus, as far as the geography of the Earth is concerned, north would still be north, and the other cardinal directions would still be where they were expected to be. The North Pole location in the sky, also would not assume a different elevation above the north horizon. Latitudes would remain the same, although they would have to be recalculated. The Sun and the planets would still travel on the ecliptic, against the same background of stars. None of the stars would shift with respect to each other.

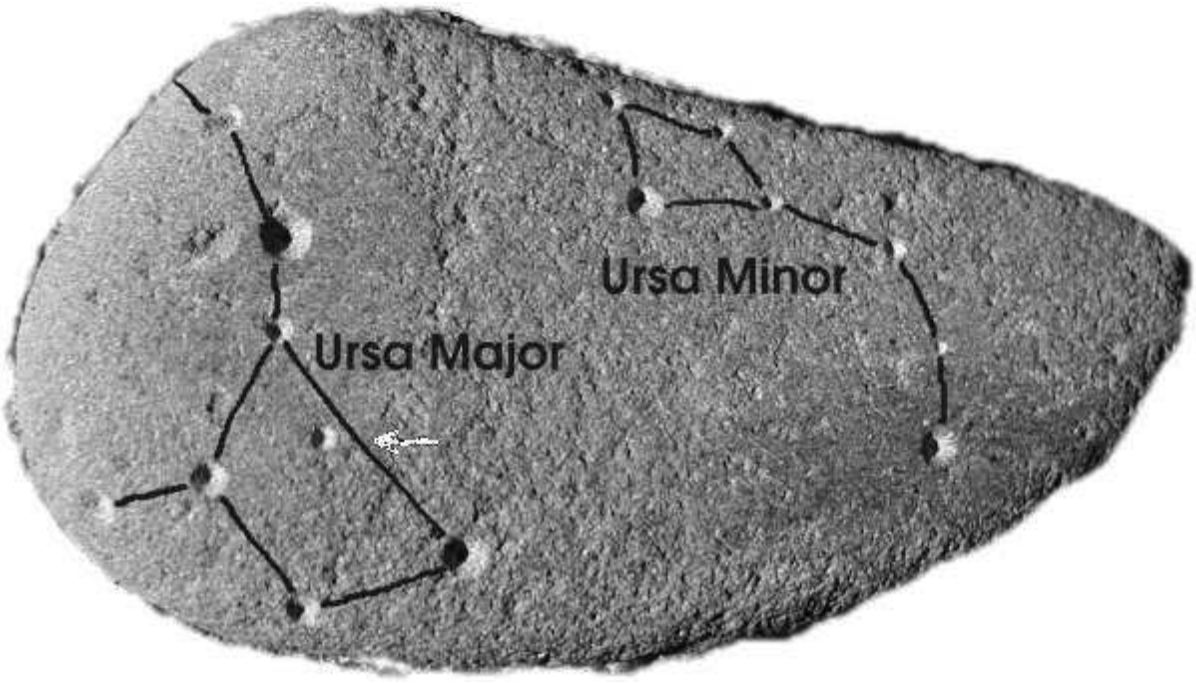
Only the relationship of the stars to the horizon and the equatorial would change, plus the intersection of the equatorial with the ecliptic (the location of the equinox). This is what I have proposed in the previous chapter and from comparison with other data, this seems to be the case. I'll describe the change in the skies further below.

A clear indication of the changes in the axial inclination probably remains obscured as yet among Babylonian records. Velikovsky brings some of the confused records forward, but he uses these in support of other events, and nothing can be gleaned from their perusal.

The fact that the Earth's axial inclination was 30 degrees at an earlier time was verified when I started to look at alignments of Mesoamerican ceremonial centers with the surrounding mountains and volcanoes. See the chapter "Olmec Alignments" for details. The chapter titled "The Chilam Balam" includes other clear numeric instances. [note 13]

The Sky in Disarray

Even if I can only suggest the mechanism involved in these changes, I can be more certain in identifying the location in the sky to which the axis of the Earth originally pointed. There is a Lakota Indian myth or legend which states that, upon death, people enter heaven through a hole in the sky where there once was a star, located within the four stars known as "the stretcher" or "man-carrier" -- the box or pan of Ursa Major.



[*Image: San Jose rock showing Ursa Major and Ursa Minor; courtesy of Keith Snyder.*]

Physical evidence for this, notably far from the Mediterranean where we find most of the mythology, is an undated hand-sized smooth stone found in California by Keith Snyder. The stone had drilled holes which exactly match the stars of Ursa Major and Ursa Minor. The sizes of the holes which pockmark the stone are proportional to the brightness of the stars in the two constellations. There is one additional hole in the pan of Ursa Major which is not included in most contemporary star charts of the Big Dipper. It is inside the pan (the "stretcher") and just below the line connecting Megrez to Dubhe and closer to Megrez than Dubhe (noted with the arrow in the above image). [note 14]

Going by the Lakota lore, Keith Snyder thinks it is a missing star which is now a mythological hole in the sky. Going by the Saturnian lore, I think it is the previous center of the sky before 685 BC and the location of the *axis mundi* before the departure of the Gods in 3147 BC. This spot is no longer the center of the sky.

We can plot a line, from the old location in Ursa Major to the current precessional path of the North Pole, to suggest the path of the pole in the last 2700 years. On this basis the center of the sky shortly after 685 BC, after the change of the polar axis, was most likely located about six to eight degrees above the line connecting Megrez to Dubhe, and perhaps some distance west (counterclockwise). [note 15]

This new location was between constellations -- which is why none of the sources describe the new location to which the pole moved. At the end of Ursa Minor, opposite from Polaris, closest to Ursa Major, there is a star named *Kochab*, which translates as "star" from Arabic, but has been referred to in ancient sources as the "pole star." This is the one star of Ursa Minor nearest to Ursa Major, and also the star closest to the most likely new location of the polar axis. [note 16]

When the polar axis relocated, the circle of the equatorial would have relocated. The equatorial is a projection of the Earth's equator into space. It is thus a flat plane extending above (out from) the equator. Seen from Earth it is a circle in the sky connecting the east and west cardinal locations which is tilted at an angle above the south horizon equal to the complement of the latitude where it is observed (90 degrees less the latitude). This new equatorial cut a new path through the dome of the stars. The Universe had been defaced and the constellations had moved, claimed the ancients. But what moved, or seemed to have moved most significantly, was the relationship of all the constellations and the zodiac to the horizon. [note 17]

The other circle in the sky is the path of the zodiac, the ecliptic, a circle which wobbles on a daily basis, and differently during different times of the year (because of the tilt of the Earth's axis). The overhead part of the zodiac moves up and down over the course of the year, traveling some 47 degrees up from its lowest position.

The intersection of this circle with the eastern and western horizon shifts from north to south (and in the reverse) in the course of each night, only standing still on the two nights of the equinoxes. (The location where the zodiac dips below the horizon changes much less in the tropics.) But one quickly gets used to this, even today, without the "zodiacal glow" which had clearly defined the ecliptic up to the early 19th-century AD; the location of the ecliptic in the sky can readily be found by spotting one or two of the planets or the Moon which move along the path.

If you live where the night sky is unaffected by electric lights or the pollution which enshroud our cities today, you become familiar with the stars. When these are identified in groups, the familiarity extends to the ability to recognize a constellation on a partially clouded night from as little as two stars. As the sky rotates each night, it seems to move constellations up and down in the sky as it rotates, expanding and contracting them. Changes happen also because at different times of the year we see different portions of the dome of the stars. But, despite these distortions, constellations can be easily recognized because the changes from night to night are minor.

However, when you move to a different latitude from where you grew up, it is initially very difficult to locate the constellations with which you were familiar. Nothing looks right; all the stars are in the wrong places. And that is what happened when the night sky was "defaced" in the year 685 BC. This rearrangement of the dome of the stars was noticed even as the changes were happening. [note 18]

These were not minor changes. If, as Hindu records suggest, Ursa Major slid down 6.5 degrees, we are talking about some constellations changing their location with respect to the horizon by 13 diameters of the Moon. Constellations directly below Ursa Major (like Leo) would have seemed to move down and constellations 180 degrees removed (like Aquarius) would have seemed to move up. Constellations east or west of these would have moved less.

There are numerous references to the changes in the dome of the stars, a "defacing of the Universe." Velikovsky notes many of them, but inevitably applies them to the wrong events, or places them in the wrong era. The very fact that the changes in the dome of the stars were remembered are an indication that they refer to a late era. I would propose that all these references date to 685 BC and after. None were remembered from 1492 BC when the inclination of the rotational axis changed from 25 degrees to 30 degrees.

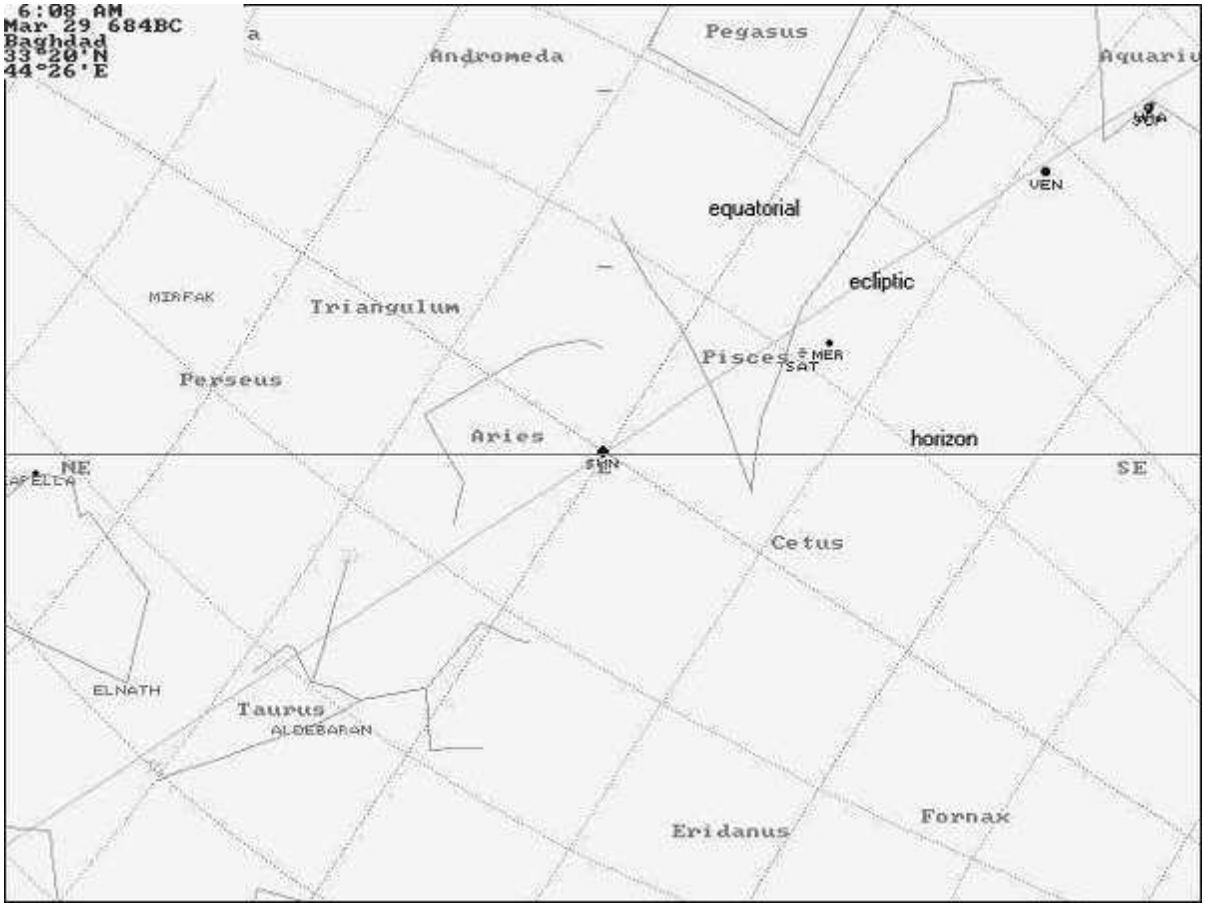
To date there has been not the slightest inkling among catastrophists of the event of Phaethon as described in these pages. Extra-terrestrial objects named "Typhon," "Phaethon, and "Apep" plus planetary thunderbolts are all guessed after and transformed like so much silly-putty, but nothing has been put in chronological order, correctly identified, or explained physically.

A Change in the Equinox

As the polar axis relocated, so did the intersection of the two great circles in the sky -- the celestial equatorial and the ecliptic. The two locations where these cross determine the rising of the Sun directly east on the vernal and autumnal equinoxes.

In 129 BC Hipparchus measured an annual "drift" of this intersection based on an 80-year record from a contemporary source. He found that the vernal equinox moved 46 seconds (of a degree) west each year -- west, that is, along the ecliptic, so that each later year the Sun would rise slightly further along the zodiac. This slippage has remained more or less at the same value. Today the accepted value is 49.6 seconds of a degree per year. [note 19]

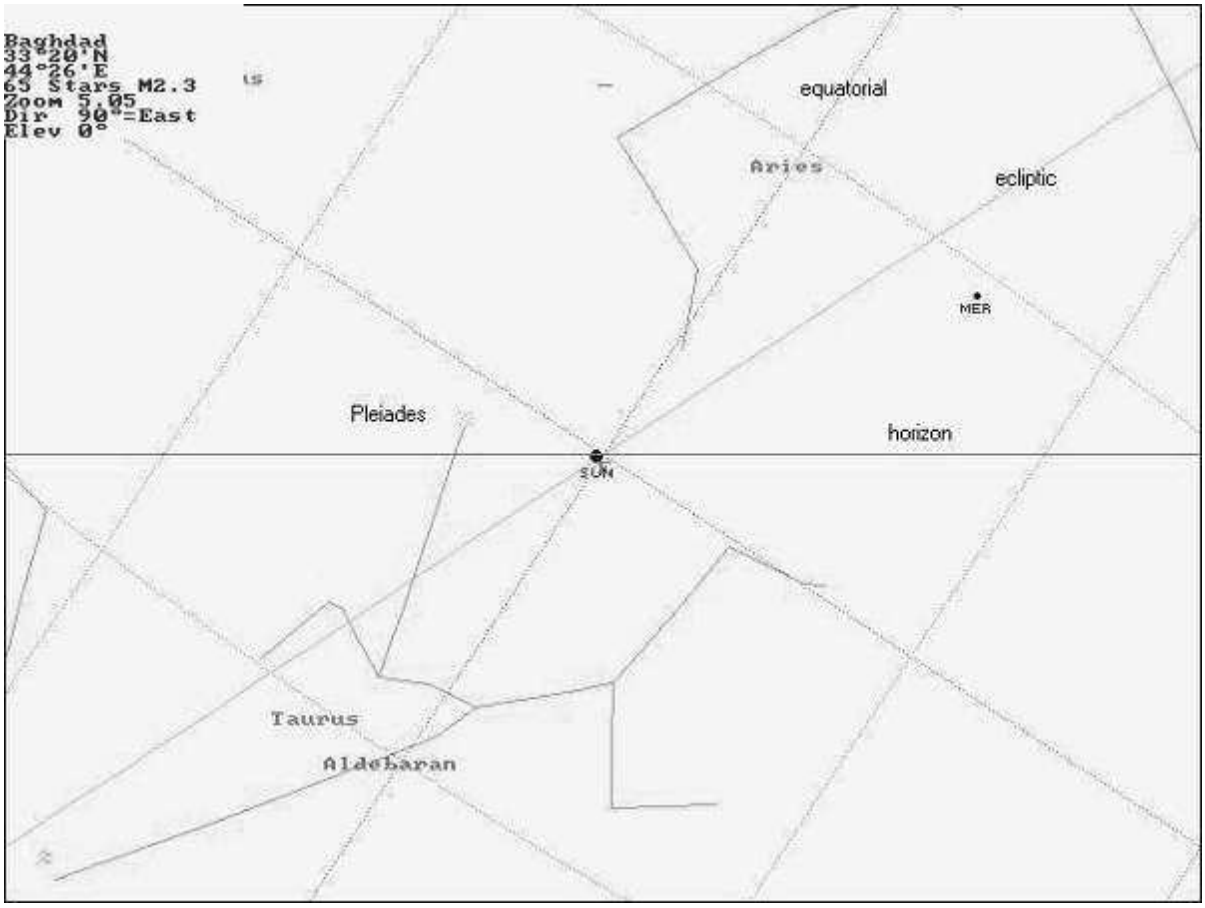
As the polar axis moves, so does the equinox, slowly moving westward from one constellation of the zodiac to the next. Today the Sun rises at the vernal equinox near the beginning (the west end) of the constellation Pisces. If we calculate 2700 years back we find that the Sun rose at 15 degrees of Aries in 685 BC, which is at the center of the constellation Aries. (The "15 degrees of Aries" above is with respect to the delineation of the Zodiac in antiquity, which places zero degrees of Taurus, 30 degrees of Aries, at a location directly between the constellations Aries and Taurus.)



[*Image: The equinox after 685 BC at 15 degrees of Aries as measured in antiquity. Looking directly east. The horizon, equatorial, and ecliptic are marked. The date is on the Julian calendar. Illustration by J. Cook, after SkyGlobe 3.6.*]

Today the division of the ecliptic into 12 segments has no relationship to the original constellations or the measurements used in antiquity. Today "zero degrees of Aries" is arbitrarily assigned to where the ecliptic and the equatorial currently cross. This defines the first day of spring for us. This is done for timekeeping and celestial navigation. Today this is not in the constellation Aries, it is actually near the west end of the constellation Pisces. In AD 150 Ptolemy was already suggesting placing "zero degrees of Aries" at the location of the equinox -- for the purposes of astrological charts.

I contend that before 685 BC (the shift in the polar axis), the equinox was located directly between the east end of Aries and the west end of Taurus -- at the start of Taurus. There are a number of indications which all point to this. The change happened in 685 BC and was spread over 40 days. The *Chilam Balam* notes the Sun "left its path" for 40 days. The most notable record from the Eastern Mediterranean is a section of the *Sibylline Oracle Books*. Although written nearly 800 years later, it recollects events spanning the movement of Venus and the Sun over a number of constellations which would account for the same time period.



[*Image: The equinox before 685 BC. As depicted here, the horizon line should be rotated 15 degrees counterclockwise (the stars moving clockwise), which will place the Pleiades almost directly above the rising Sun. Illustration by J. Cook, after SkyGlobe 3.6.*]

But what I find more convincing, is that the Pleiades were held to be the start of spring worldwide, and if not associated with the start of spring, then the autumnal equinox, when the Pleiades culminated at midnight -- rose to the highest point in the sky -- and thus also rose when the Sun set. After 685 BC it was discovered that the Pleiades no longer signaled the start of spring and that Taurus no longer started the cycle of the year. The fall culmination of the Pleiades had moved 15 days also. [note 20]

The Pleiades are an easily recognized cluster of stars located directly between the constellations (and zodiac houses) Aries and Taurus. But if we retrocalculate the skies on the basis of today, then in 685 BC the Pleiades did not start spring, nor, for that matter, and again by retrocalculation, for thousands of years earlier. This is because a retrocalculation does not account for the 15-day jump in 685 BC. [note 21]

Zero degrees of Taurus is also the only location in the whole of the zodiac which falls exactly between two constellations. This is peculiar, but, as I surmise, it was purposeful at an earlier time. The constellations of the zodiac do not occupy equal 30-degree spaces, and the constellations

assigned to any of the 12 segments ("houses") are very arbitrary. The division of the 360 degrees was probably made long before 747 BC, when the year consisted of 360 days and the Sun would move one degree each day throughout the year. The sky of 360 degrees had been divided into 12 segments to match the 12 revolutions of 30 days of the Moon during the year at that time.

The zodiac had been established in Babylon probably since 1000 BC, or much earlier, since in the *Enuma Elish*, written in 1700 or 1600 BC, Marduk had ordered the constellations of the zodiac when he recreated the world -- when they became visible after removal of the Absu (in 2349 BC actually). Although originally consisting of 18 constellations, and thus of 20 degrees each, these had been reduced to 12 constellations. [note 22]

The Pleiades are seen as a cluster of seven stars located at the leading horn of the constellation Taurus -- just east of zero degrees of Taurus (in the zodiac as in use in antiquity). The location directly at the start of Taurus places the Pleiades almost directly above the rising Sun. [note 23]

The Pleiades had been held by almost all people of antiquity (including India, China, Mesoamerica, and South America) as the first index of spring. For people throughout the world, the sight of the Pleiades in the east just before sunrise -- when they had not been seen in the skies for six months -- signified the coming of spring and the start of the new year. Hindu calendar reforms after 600 BC mention that "the people wanted to have the year start [again] at the first showing of the Pleiades."

On the other hand, it has to be admitted that the return from death of Jupiter two nights after the autumnal equinox of 2349 BC -- rising up directly below the culmination of the Pleiades -- was remembered and celebrated for thousands of years. But this was a midnight showing of the Pleiades.

With respect to the division of the year into zodiacal houses, I would suggest that long before 685 BC a system of measurements had been imposed which had purposefully placed zero degrees of Taurus (which is 30 degrees of Aries) exactly at the midpoint between the constellations Taurus and Aries, and almost directly below the Pleiades. This lines up with the edge of the first horn of the bull Taurus, and will show the Pleiades above the horizon at the equinox -- and in line with the rising Sun. I suggest this was done because this location had been the start of the year forever, and was the location from which everything else on the zodiac was measured -- in 30-degree increments, each representing 30 degrees of movement of the Sun originally. [note 24]

After the change in the heavens in 685 BC, the zodiac sign in which the Sun rose on the first day of spring was significantly different. An ephemeris program which keeps track of precession will show that, after 685 BC, the Sun rose at the equinox as the constellation Aries was at the horizon, rising at the center of Aries. This was at 15 degrees of Aries, as measured in antiquity.

A few hundred years later, in 200 to 100 BC, the Sun rose at the equinox on the longitudinal line for Mesarthim in Aries. This was identified in antiquity as "8 degrees of Aries." Retrocalculation from 200 BC to 685 BC, shows that the Sun rose 7 degrees east of Mesartim. Thus after the displacement of the pole in 685 BC the Sun rose at (7+8=) 15 degrees of Aries, as was also suggested above. [note 25]

The nova event of Venus in 685 BC moved the equinox 15 degrees. The vernal equinox thus rapidly shifted from the Sun rising at the beginning of the constellation Taurus to rising in the center of Aries. Before the changes of 685 BC, the constellation Taurus was already partially above the horizon as the Sun rose at the equinox and this had been so for centuries. The "Age of Taurus," with all the connotations

attendant to the horned deities of antiquity, did not gradually slip into the "Age of Aries" -- the age of lambs and shepherds. The change came suddenly in 685 BC.

The change in the location in space to which the rotational axis of the Earth pointed is a change in the inclination of Earth's axis with respect to the orbit. After 685 BC the Earth was differently inclined toward the Sun; the climate would have changed. However, the change in the axial inclination would not significantly move the tropics or temperate zones, although it would move the Arctic Circle with respect to the pole. It would also not change the seasonal variation in climate. Climatic disturbances and fluctuations have been noted, however. [note 26]

The orbit of Earth also remained the same. Only the starting date of the year shifted -- by two weeks. A relocation of the vernal (and autumnal) equinox did not alter the calendars and would not have been of note to farmers. Farmers do not use calendars to determine the time for planting, they use the weather. [note 27]

Although the altered sky was noted by everyone, the change in the equinox was only noticed by the astrologers and philosophers of the Middle East, Europe, China, and Mesoamerica. The sky had not really been thrown into disarray, but it had been moved -- suddenly twisted -- and, as was later observed, the equinox continued to rotate ever so slowly through the constellation Aries and further away from Taurus. It invalidated the tables which were used in Babylon to determine the start of the year and the predictions of lunar eclipses. The paths of the planets were confused and those tables also had to be redone. Comments have been made by 19th-century researchers about the records left by the Chaldean astrologers from this period (after 650 BC), mostly suggesting that the astrologers were making things up and paid no attention to the actual skies. [note 28]

At Nineveh, the principal city of the Assyrian kings, Assurbanipal founded a library in the 7th century. The library collected copies of temple records throughout Assyria and Babylonia, which included topics ranging from literature to mathematics and many letters of the kings of Assyria. When the combined forces of the Medes, Persians, and Chaldeans attacked Assyria in 621 BC, and leveled Nineveh, the library burned down, turning the clay tablets to fired clay.

David Brown, in *Mesopotamian Planetary Astronomy-Astrology* (2000), has investigated the astrological (astronomical) texts from this library in light of the extended correspondence between the Assyrian kings and the astrologers and scribes in their employ. [note 29]

John M. Steele, in a review of Brown's book, wrote:

> *"He* [Brown] *contends that all of the extant texts that are believed to have originally been written before the eighth century B.C. fit into a* [earlier] *paradigm that had no interest in predicting celestial events, and that we should see the period schemes, intercalation rules, etc. found, for example, in 'Enuma Anu Enlil' and 'MUL.APIN' as being aspects of celestial divination, not primitive or inaccurate astronomy."*

Writers in the history of science, including Brown, have dismissed documents like the *Mul.Apin* by pointing out that it was obviously written around the concept of an "ideal" year of 360 days and an equinox at the rising of the Pleiades. I would suggest, however, that the *Mul.Apin* (which mostly consists of a chart of constellations) was indeed accurate in the era before 747 BC, despite the purpose, both before 747 BC as well as after, of divination. That does not detract from the *Mul.Apin*'s

status as a "scientific" source document for the Babylonians.

I suspect that lunar eclipses were not experienced at Babylon before 747 BC. Before that time the Moon's orbit was larger (30 days), and only after 747 BC, when the Moon's orbit had shrunk to 29.5 days, did it come close enough to Earth to have the umbra of its shadow show up on the surface of Earth. Even today, because of variations in the Moon's orbit (it has an eccentricity of 0.05), the shadow at times does not show.

This would explain why the first documentation of an eclipse is from 721 BC. When the eclipses started to appear sometime after 747 BC, they were frightening, especially since these earlier solar eclipses were caused by Mars -- and inevitably accompanied by earthquakes, hurricanes, and electric bolts from the heavens.

The extensive correspondence between the kings and the astrologers was for the obvious reason that the skies had changed in 747 BC and again in 685 BC. There was a sudden urgency to develop correct methods of predicting lunar and solar eclipses, which showed up two to four times per year, and were totally unpredictable. The Babylonians never did figure out how solar eclipses were caused -- and little wonder, if their data included solar eclipses caused by Mars. Ptolemy, 800 years later also never found a means to predict solar eclipses. But by about 700 BC the lunar eclipses were correctly modeled and became predictable. Then after about 686 and 685 BC the skies changed, and all the calculation had to be started over. [note 30]

There is only a sprinkling of documents from before 747 BC because only the useful documents were retained. The *Mul.Apin* certainly was one of these, even if the year was no longer 360 days. Also retained was the *Enuma Anu Enlil*, a record of observations, detailing celestial events, water levels of the Euphrates, and economic indicators (like the price of barley). The *Enuma Anu Enlil* records included the *Venus Tablets of Ammizaduga*.

Special thanks to K Snyder for pointing up the San Jose rock.
Special thanks to S Bourke, AU, for the Kirkin story.
Special thanks to J Brookes for suggesting the Moon as the cause for precession.

Endnotes

Note 1 --

A more extensive derivation will be found in the chapters "The Chilam Balam books" and "Olmec Alignments." This requires a familiarity with the Mesoamerican calendar, described in the chapter "The Maya Calendar," and Mesoamerican thinking, some of which is discussed in the chapter "Language and Causality."
[return to text]

Note 2 --

A distinction should be kept in mind between popular narratives about the creation of the world and actual events. The *Chilam Balam* relates the sequence of four instances of actual events of the past. But these were copied from the official records. What we see in the *Popol Vuh* is a constructed narrative, made at a time when the Maya considered all of history as repeating itself endlessly anyway, so that sequencing events separated by 4000 years was not a conceptual or philosophical problem. The authors of the *Popol Vuh* claim they had the official histories at hand, and, in fact, many details slip into the story of the *Popol Vuh* which could only have come from very old codexes.
[return to text]

Note 3 --

In Europe away from the Mediterranean, throughout Northern Asia, and in North America the constellation "the Wain" was known as "the Bear," apparently since remote antiquity. Only by considering the Wain as representing a bear with four long legs extending below the pan of Ursa Major could this constellation be considered as dipping into the ocean. The Romans, however, did not consider Ursa Major as representing a bear. It was a wagon which endlessly circled the sky at the location of the old polar axis.
[return to text]

Note 4 --

"The Wain" is here translated from the Egyptian equivalent, an ox, a mummified ox, or a mummified ox leg, graphically depicted as early as 1500 BC, with an axis piercing the body of the ox. The fact that this has remained the same suggests that there was no precession of the equinox before the relocation of the rotational axis in 685 BC.

"Looking among the stars of Ursa Major" is also described in formal texts in the temple at Denderah, which was built (or rebuilt) in Roman times -- thus some 600 or 700 years after the polar axis had relocated away from Ursa Major.

Attempts in the 19th century to date the first Chinese emperor Yao to 2350 BC, by a retrocalculation based on precession which places the Pleiades at the vernal equinox are baseless, despite the fact that the results agree with the dating estimates made during the Han dynasty, by the compilers of the *Annals of Shu*, which did not involve the precession of the equinox. The Han dynasty scribes have the Pleiades appear at the spring equinox.

Why the compilers of the *Annals of Shu* would add this strange information in the 7th or 8th century BC, (which could be suggested from the fact that other astronomical and calendrical information was added at the time of the Chou or Han), is unclear, for by today's retrocalculations, the Pleiades did not define the vernal equinox in 700 BC, or, for that matter, as early as 1500 BC. Legge notes this in his commentary on the *Annals of Shu*.

Similar retrocalculations have been made in India in the last century for the start of the current era and for the Bharata battle (and placed variously at 3037 BC and 1432 BC), based on hints from the Vedas. However, all these strange retrocalculations can be resolved. See for this "A Change in the Equinox" in this chapter.
[return to text]

Note 5 --

The 26,000-year cycle is based on only a few hundred years of observation, equivalent to watching the passage of about 1 or 2 degrees of the 360 degrees of the path. The rate of precession, which currently is a movement of about one degree every 72 years (since AD 1600), has been known with some accuracy since the first century BC. There have been periods of time when the precession stopped, and when the value differed markedly from today's value.

Uwe Topper in "Cataclysms are the reason for our wrong chronology" *International Meeting of Chronologists*, Potsdam, 2008 (http://www.ilya.it/chrono/pages/), notes that the historical value for the number of years per degree has varied from 50 years (some early Babylonian sources in 330 BC, although this is disputed) to an early Greek value of 100 held by Aristarchus (210 BC), Hipparchus (130 BC), Ptolemy (AD 200), and confirmed by early Arab astronomers. Later Arab and European astronomers from AD 800 to AD 1300 used a value of 66 years. The current value of 72 years has been maintained since Kepler (AD 1600).

The "wobble" of the axis is not related to the wobble a spinning toy top experiences when the upward force at the support point at the bottom and the downward force of gravity through the center are displaced by some distance, forming a torque about the horizontal center. In the case of a toy top, the precession is the result of a torque which continues to be applied. Obviously, nothing of the sort is experienced by the Earth.
[return to text]

Note 6 --

Electric effects such as these cannot be neglected. In the thirty years since the spin of the Earth has been measured with atomic clocks, the Earth has slowed down by 30 seconds in its rotation. This is much larger than what can possibly be accounted for under present theories of astrophysics (which, however, excludes electric considerations).
[return to text]

Note 7 --

"The Sun's glare prevented observers on Earth from viewing NEAT's approach. But the SOHO spacecraft, stationed between Earth and the Sun, has an instrument called Large-Angle Spectrometric Coronagraph (LASCO), which blocks the Sun's brightest light, permitting the satellite to record the comet's dramatic swing around the Sun."

"As NEAT raced through the extended solar atmosphere, a large coronal mass ejection (CME) exploded from the Sun and appeared to strike the comet. The comet responded with a kink that propagated down the tail. The disk in the center is created by the coronograph as it blocks the Suns glare."

-- From http://www.thunderbolts.info TPOD for May 26, 2005. (Image Credit: Solar and Heliospheric Observatory (SOHO)/ESA/NASA)
[return to text]

Note 8 --

It might be suggested that the change in the Earth's axis was due to another approach of Venus, as regularly happened at 52-year intervals (supposedly) in the remote past. Since 1492 or 1442 BC, the "52-year intervals" of close approaches of Venus have been 50 years up to 747 BC, and 52 years thereafter. See Appendix B "The Celestial Mechanics," where this information is developed.

Adding 50 or 52 years (or multiples) to the dates which could be identified as a previous approach of Venus (776 BC) does not yield a date anywhere near 685 BC.
[return to text]

Note 9 --

From an essay by Walter Cruttenden, "Comparison of Precession Theories: An Argument for the Binary Model" (Internet, 2003):

"It was Sir Isaac Newton, who had just developed his theories of gravity that said if the Earth did wobble it must be due to the mass of the Sun and the Moon, the only bodies considered close enough or large enough to have such an effect. But Newton's equations never did match observed precession rates."

"Consequently, the equations were substantially revised by Jean-le-Rond D'Alembert who added factors for torque and inertia, but even this effort proved a poor predictor of precession rates."

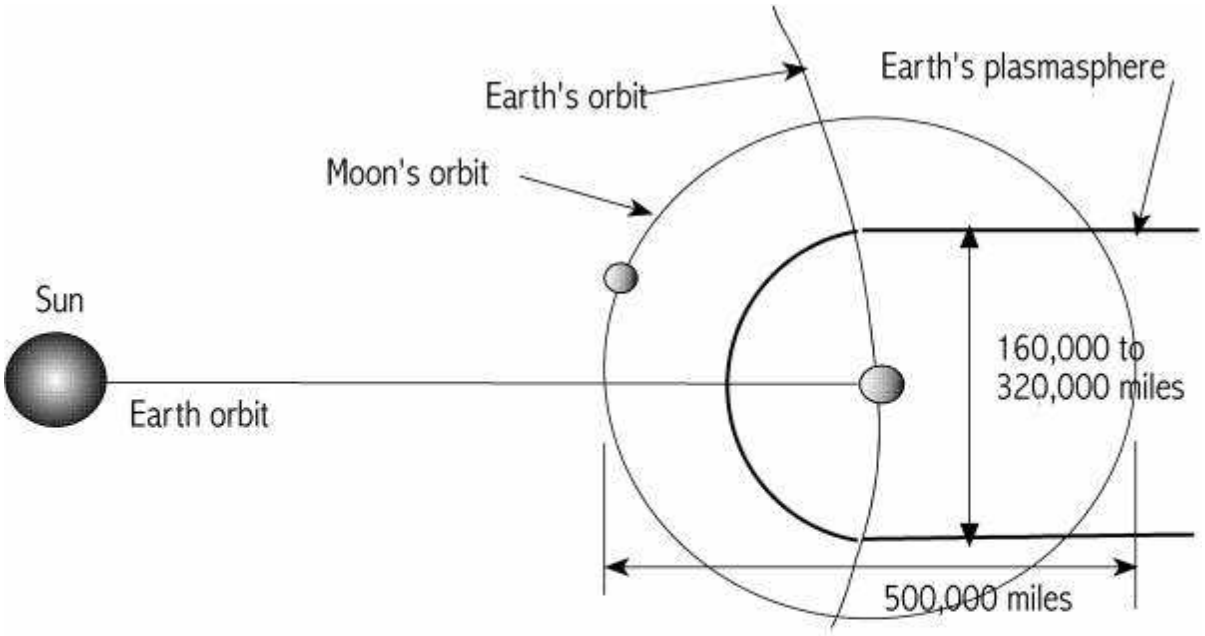
"Since then precession calculations have been continually modified and now include many factors beyond the original "lunisolar forces," including the gravitational effect of the inner and outer planets, tidal influences, effects of the 300 largest asteroids, and even a possible elliptical movement of the Earth's soft core."

"But as is apparent the calculations have become more of a 'plug' whereby inputs are gradually added or modified to fit the observation rather than being predictive or resting on solid theory."

This goes for the orbit of the Moon also. The equations describing the path of the Moon have to account for 5 separate motions, including a left-right wobble which allows us to see more than a half face of the Moon. The Moon bobs up and down also.
[return to text]

Note 10 --

The orbit of the Moon is 250,000 miles (400,000 km). The plasmaspheres of planets extend 10- to 20-planet diameters from the surface, thus 80,000 to 160,000 miles (129,000 to 260,000 km) for Earth.

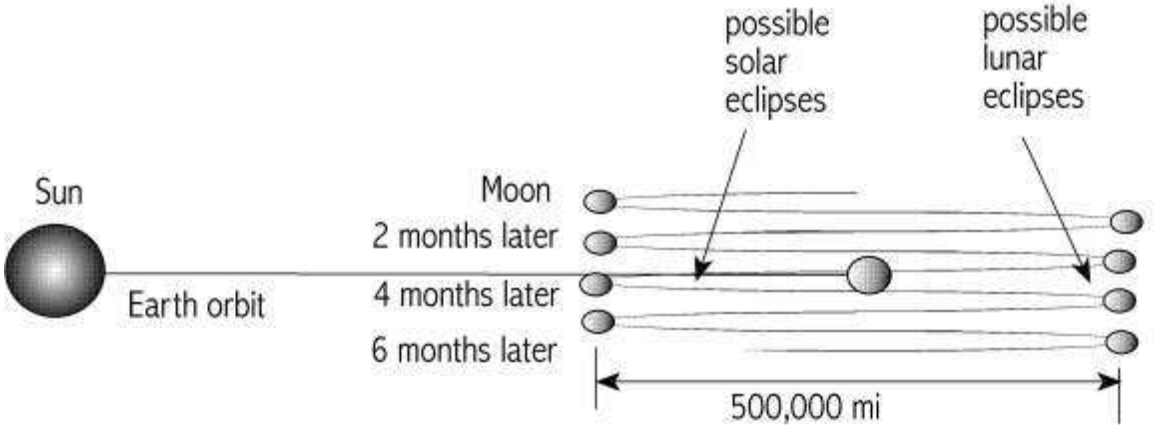


Path of the Moon during a month

The Moon spends most of its orbit outside of the Earth's plasmasphere

top view of orbits nts

Additionally the Moon's travel takes it some 20,000 miles (32,000 km) alternately above and below the Earth during the year. This affects the date when eclipses will be seen, but has little effect on its entry and exit from the Earth's plasmasphere. The actual travel around the Sun describes a cycloid pattern -- not a series of semicircles.



Path of the Moon over a Six-Month Period

The Moon follows a spiral path which reversed in the up-down direction every six months

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Note 11 --

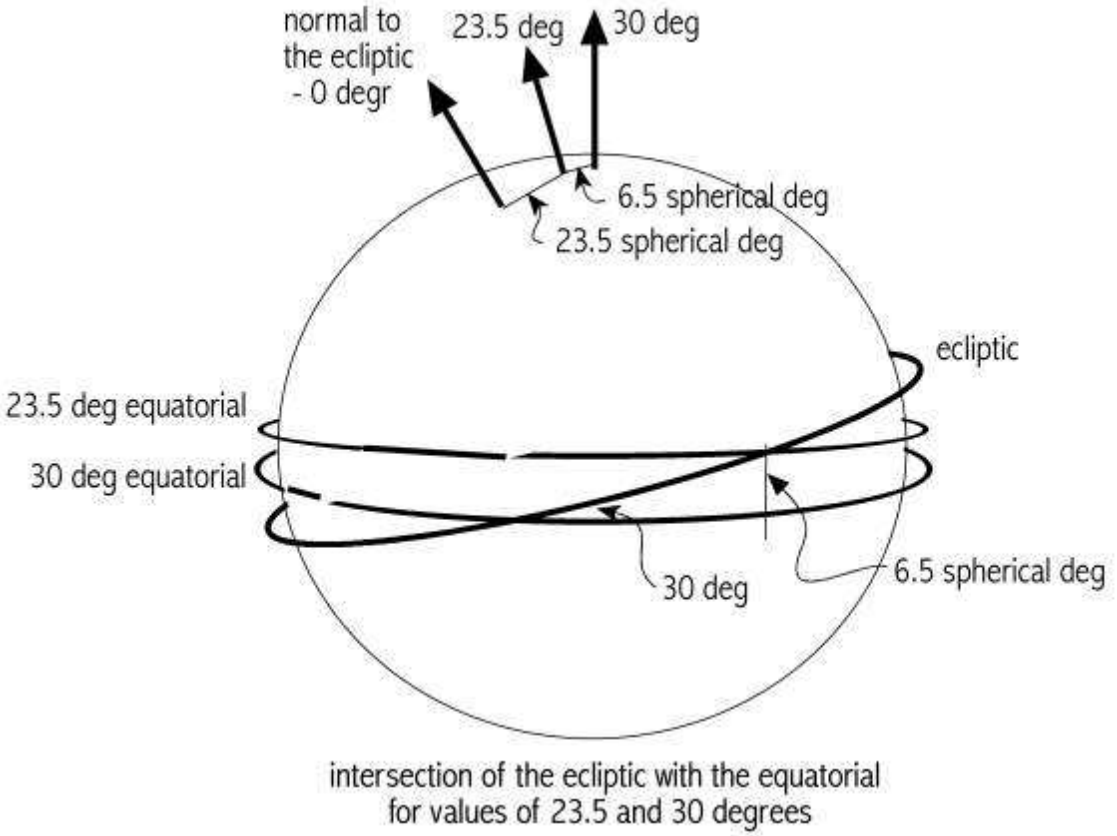
Alfred de Grazia, in *The Lately Tortured Earth* (1983), writes:

> *"Yet Velikovsky, arguing the case for axis displacement, had earlier discussed a calculation by Weizacker demonstrating that an Earth transaction with a strong magnetic field would affect its axial inclination much more readily than its rotation [13]."*

The reference is to an article in *Pensee*, by William Straka, "Straka: Science or Anti-Science," (1972). From what happened to the Earth's magnetic field in remote antiquity, that is, before 10,000 BC (see the chapter, "Event of the Younger Dryas), we know that this is not true. The possibility of a magnetic couple, induced by the extreme Solar Wind passing by Earth, is as unlikely, since the planets' magnetic poles do not coincide with the axis of rotation. A constant applied torque is required, which calls for a force applied off-center from the Earth's axis. See Appendix B, "The Celestial Mechanics."
[return to text]

Note 12 --

Although a yojana is a terrestrial land measure (distance), it can be projected to the sphere of the stars which surrounds the Earth as a change in celestial latitude. A north-south distance of 100 yojanas on Earth represents a 6.5-degree change in latitude. The same angular measure would apply to the dome of the stars. A 6.5-degree change in celestial latitude in 685 BC would place the earlier location of the rotational axis of the Earth directly in the pan of Ursa Major.



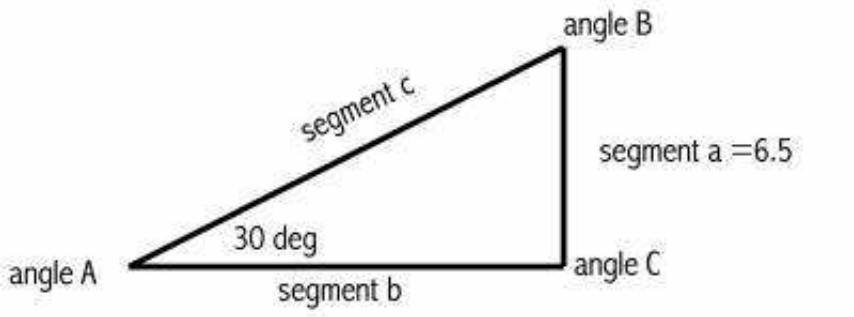
[*Image: The intersection of the ecliptic and the equatorial, in Summer of 685 BC. Illustration by J. Cook.*]

By itself, a 30-degree axial tilt will make only a minor difference in climate compared to a 23.5-degree tilt. The Arctic Circle would move closer to the pole by 6.5 degrees.

The triangle defined by the old and new equatorial projected onto the Earth (the ecliptic remains the same) determines how far the equinox advanced along the ecliptic -- and thus how many days were lost in 685 BC. The intersection of the ecliptic and the equatorial is the equinox, and thus the start of the year. The amount that the equinox advanced along the ecliptic (from the old equatorial to the new equatorial) is found from considering the angles and spherical segments.

From the relationship for spherical triangles, **sin c / sin C = sin a / sin A**, sin c is found as:

s(c) = s(pi/2) * s(6.5/deg) /s(30/deg) = 0.226 which is 13.1 spherical degrees [as the arcsin of 0.226].



Along the ecliptic (segment c) this represents a fraction of a year of 365.24 days, thus **(13.1 / 360) * 365.24 = 13.29 days.** Thirteen days of my estimate of 15 days are thereby accounted for.

Using plane trigonometry, I calculate 14.74 days.
[return to text]

Note 13 --

Book 10 of the *Chilam Balam* includes three instances of spans of time, all given as so many months or years. I have not been able to make sense of any of these time spans except by recognizing that the original author in each instance counted inclusively.

The most significant statement in the text is, *"After three heaps of years it* [the sun] *will come back into place in Katun 3-Ahau."* (The use of future tense is peculiar to the translation into an Indo-European language.)

A "heap" is probably 5 (elsewhere known as a "bundle") and a "year" is a 260-day Tzolkin year. The fifteen years is another of the instances of inclusive counting for it turns out that the "three heaps of years" represent an interval of 14 Tzolkin years in the Mesoamerican Long Count calendar.

Fourteen Tzolkin years correctly states the number of days it takes for the same day-name and day-number combination to recur for a sunset at the same horizon sunset location of the Sun before and after the change from the 30-degree axial inclination to a 23.5-degree axial inclination.

This simple fact is key to an understanding, because 14 Tzolkin cycles of 260 days do not bring us back to the same seasonal day in the year, or even present the same Tsolkin and Haab day-names of the calendar. Seasonally it falls short by about 12 days. The *Chilam Balam* thus says that the Sun set at the same horizon location as in the past, but 12 days earlier. This cannot be achieved except with a change in the axial inclination of the Earth.

I should point out also that the information as presented in the *Chilam Balam* probably refers to the setting location of the zenithal passage of the Sun at some location within the range of 15 to 20 degrees north latitude.

As I point out in the chapter "Olmec Alignments," zenithal passages of the Sun were important to the ceremonial centers of Olmec Veracruz and the Valley of Mexico. Nearly every center was aligned to have the Sun set at some mountain or volcano after a zenithal passage over the site. The difference of 12 days suggests that the information of the *Chilam Balam* was originally recorded for a latitude of

17.0 degrees (possibly Monte Alban). See the chapter "The Chilam Balam" for additional details. This is one of the clearest indications that there was a change in the axial inclination of the Earth -- in fact, from 30 degrees to 23.5 degrees.
[return to text]

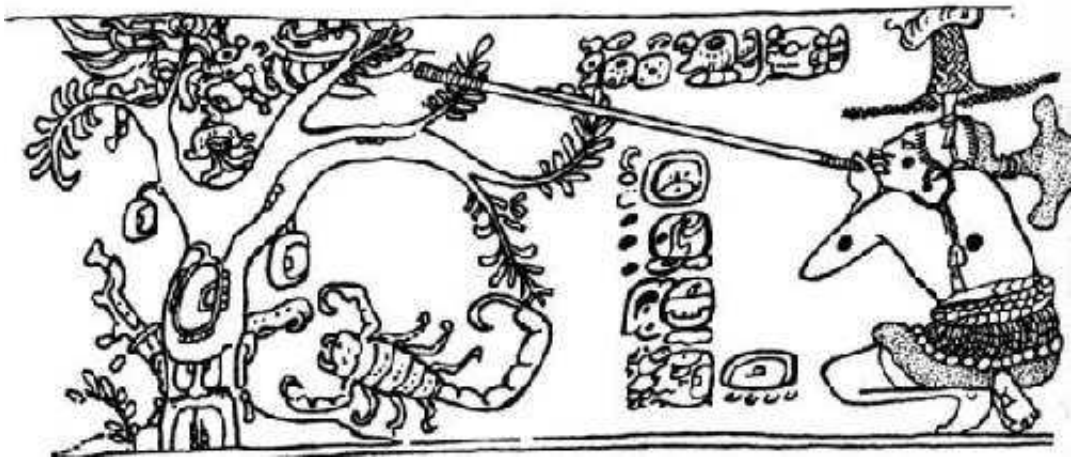
Note 14 --

I am indebted to Keith Snyder, who found and recognized the stone, and mentions the Lakota source in Ronald Goodman, *Lakota Star Knowledge: Studies in Lakota Stellar Theology* (1990), on his website at snyder_kas.home.mindspring.com/Indian_Stones.html. If the legend is still current, the age of the drilled holes does not matter.

The missing star might not be missing. A star exists at the designated location, although dim, with a magnitude of 6.1.

Interestingly, the centroid of the stone looks to be halfway between Ursa Minor and Ursa Major, at about the star Kappa in the constellation Draco. This is about where I would expect the axis of the sky to have moved in 685 BC, before eventually settling down near Kochab in Ursa Minor.
[return to text]

Note 15 --



[*Image: A pottery Image: Hunahpu shoots Itzam-Yeh (Seven-Macaw). The text reads, "Done by Hun-Ahau; on 1-Ahau 3-Kankin he entered the sky, Itzam-Yeh." After David Freidel and Linda Schele "Maya Cosmos" (1993).*]

East and west in the dome of the stars is defined by the direction the stars seem to rotate. Facing south, west is to the right. Facing north, the stars above the pole star move left to the west; the stars below the pole star move toward the right, where the geographic east is located.

The original location of the axis within the pan of Ursa Major would be at 58.5 degrees of elevation, and a Right Ascension (RA) of 11.7 hours. Right Ascension is the number of degrees from the current vernal equinox, expressed in hours, where 360 degrees represents 24 hours.

One of the ball-playing twins of the *Popol Vuh*, who represents Venus in 685 BC (Hun-Ahau, Hunahpu), has to shoot down the bird Itzam-Yeh (Seven-Macaw), who had perched on top of the central axis of the sky, the World Tree, before a new creation could start. Itzam-Yeh, Seven-Macaw, today is thought to be Ursa Major. The image above describes the removal of Ursa Major as the center of the sky, but from the perspective of Mesoamerica. The bird reference, however, is to Saturn at the polar location before 3147 BC.

The scorpion below the tree is the constellation Scorpio at the base of the Milky Way. Scorpio has the same name in Mesoamerica as in the Eastern Mediterranean. There is a snake on the left (not shown here) which is the constellation Sagittarius. Therefore the North Pole is here shown from the perspective of the south, and thus is upside down. But it is seen, not from the south horizon, but from the edge of the Absu, somewhat below the equatorial. This is not really such an outrageous presentation. The jaguar paw reaching out from behind the tree trunk is often identified as Xbalanque, but it is the hieroglyphic sign for "te" (tree), and used together with the glyph "yax" on the other side of the tree trunk, identify the tree as "yax-te" or ceiba tree.

In Classical Maya cosmology the Milky Way has replaced the World Tree, which originally was the polar configuration from before 3147 BC, but forgotten by the Maya nearly 4000 years later, and only recalled from ancient graphical books. That the Milky Way is the World Tree is the opinion of archaeologists. See David Freidel and Linda Schele, *Maya Cosmos* (1993), and Dennis Tedlock, *Popol Vuh* (1985). However, the Milky Way does not intersect Ursa Major.

The date of 1-Ahau 3-Kankin is curious, for it does not match the Maya retrocalculated date of 4-Ahau 8-Cumku in 3114 BC usually listed for this event (actually as the *completion* of the previous creation). The date 1-Ahau 3-Kankin, as Freidel and Schele note, would correspond to May 28, 3148 BC Gregorian, more than a year before my date of 3147 BC. Actually it is -3148 in numerical notation, which is 3147 BC in BC/AD notation. This would suggest either the date at which Earth was released from Saturn (which would be the Earth's aphelion), or the date at which the removal of Saturn was complete (as, for example, the end of the World Flood). I'll cover this in a later chapter.
[return to text]

Note 16 --

The Hindu poem *Mahabarhata* notes a number of locations for the pole star, which are all below the precessional path of the pole star as understood today. They are correct in Right Ascension for the 8th through the 5th century BC (when the poetry of the Mahabarhata was created), but too far below the path of the pole as described today. These locations would also not hold for a more remote antiquity. Backward in time from today, the currently defined path of the pole bisects the region between Ursa Minor and Ursa Major and curves toward the tail of Draco. Scholars who have analyzed the astronomical data of the Mahabarhata have taken note of the Right Ascension (before 685 BC) to place the war in 1400 BC, but have failed to take the altitude into consideration. See S.P Gupta and K.S. Ramachandran (editors), *Mahabarhata, Myth and Reality* (1976).
[return to text]

Note 17 --

The horizon is probably the most important anchor point in visually recognizing and locating constellations.
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Note 18 --

At age 12 I moved from 55 degrees latitude to 42 degrees latitude. It took years before I could again instantly recognize constellations which I had learned earlier in childhood. And there were new ones.
[return to text]

Note 19 --

The Babylonians (Chaldeans) may have noticed the precession about 50 years earlier than Hipparchus. In China, Yu Hsi noted the precession of the equinoxes around AD 330. John Henderson writes:

> *"This discovery is traditionally attributed to the fourth-century astronomer, Yu Xi (*[AD] *307-338), though astronomers as early as the Han era had noted that the winter solstice shifted with respect to the lunar lodges."*
>
> -- John B. Henderson "Cosmology and Concepts of Nature in Traditional China" (essay, nd)

The Han spans 206 BC to AD 220. The "lunar lodges" are the houses of the zodiac.
[return to text]

Note 20 --

Patten and Windsor, in *The Mars-Earth Wars* (1996), similarly come to the conclusion there was no precession of the equinox in antiquity, but use 701 BC as the terminal date of that condition.
[return to text]

Note 21 --

In the first and second century BC it was universally accepted by all the Mediterranean civilizations that the vernal equinox was located at 8 degrees of Aries. This is actually a peculiar location, and certainly not selected by design at that time. The reader will realize that there is no way for a slipping equinox to have started at zero degrees of Taurus and have moved to 8 degrees of Aries in the span of a few hundred years under current conditions.
[return to text]

Note 22 --

Almost all people everywhere established some sort of division of the night sky into 12 or 13 regions of marked significant stars, all to the purpose of noting the passage of the Moon. The Egyptians at a very early time used 36 notable stars for timekeeping at night. India divided the sky up into 28 sectors (called mansions) marking the progress of the Moon. This was a system dating from a yet earlier era. The Chinese year was also divided into 28 "lunar mansions" -- long before contact with India. We know of the Chinese divisions from Shang dynasty inscriptions at least since 1400 BC.

China reduced the zodiac to 12 constellations in about 100 AD, during calendar reforms. The new Chinese constellation names were both indigenous and received from Indian sources, who in turn copied Babylonian constellation names under Alexander's Greek influences after 330 BC. The European Greeks, and eventually the Romans, did the same, substituting Babylonian names for earlier local names. Thus the entire Asiatic and European zodiac of today derives from, or was modified from, the zodiac in use in Babylonia -- but in all cases long after the constellations were named in Babylon. See calendar notes in Appendix A, "Chronology."

The earliest surviving description of the Mesopotamian constellations is the *Mul.Apin* tablet series, with the oldest dated example from the 7th century BC. "The *Mul.Apin* was not a marginal source, but probably forms our most important document for ancient Mesopotamian astrology." -- vd Sluijs. The *Mul.Apin* marks the vernal equinox and autumnal equinox as follows:

> *"MUL.MUL (eta-Tauri, the Pleiades) and GIR.TAB (beta-Scorpii) were visible at the East and West points of the horizon and also defined the Vernal and Autumnal Equinoxes."*
>
> -- from http://www.lexiline.com/lexiline/lexi171.htm

This has led some to suggest that the tables date from 2340 BC, on the basis of a retrocalculation based on today's skies and today's estimate for the precession of the equinoxes. This is a ludicrous suggestion, not only because of the extrapolation to such a remote date, but also because it assumes that no changes were made in the data for the next 1600 years even though the skies (on the basis of an implied "precession of the equinoxes") would have changed continuously. It cannot be believed that the zodiac descriptions remained stuck at a value determined for the year 2340 BC for thousands of years. See for instance, Werner Papke, *Die Sterne von Babylon* ("The Stars of Babylon") (nd).

Most researchers have neglected this information, and write about the *Mul.Apin* as if it represented "an idealized year of 360 days" with an equinox at the rising of the Pleiades, a similar idealization. The *Mul.Apin* certainly dates to before 747 BC, although the oldest recopied texts date with certainty only to 687 BC. By stylistic content of the dozen copies (from Nineveh, Assur, and another location), they date to perhaps 1000 BC.

About the ecliptic, and for a later date of 400 to 300 BC, Robert Powell, in "The Definition of the Babylonian Zodiac and the Influence of Babylonian Astronomy on the Subsequent Defining of the Zodiac," PhD Thesis, Polish Academy of Science (2004), writes:

> *"According to this original definition the zodiac is defined by the two first magnitude stars Aldebaran and Antares in such a way that each is located exactly at the midpoint (15 degrees) of their respective sign, Taurus and Scorpio. Thereby these two stars define the central axis of the zodiac, which was the primary zodiacal reference axis for all other stars."*

The first part of this statement is fact; the second part is guessed after. However, selecting Aldebaran as 15 degrees of Taurus places zero degrees of Taurus within two degrees of where I suggest the division of the ecliptic started in antiquity. If Taurus was not meant to be the first constellation to show above the horizon at daybreak at the beginning of the year, why was Aldebaran selected as one of the midpoints of the ecliptic? Powell continues with the suggestion of how the sidereal ecliptic was replaced by a tropical (solar) ecliptic -- where the equinox is set at "zero degrees of Aries" -- but has difficulty substantiating his claims (which I won't cover here). He does add a note on the selection of

the equinox (apparently at a somewhat later date of 200 BC):

> *"Note that if there was a perfect correspondence between* MUL.APIN*'s solar calendar and the zodiac, the vernal point would have to be located at 15° Aries, since Aries as the first sign of the zodiac corresponds to month 1 and in the Babylonian solar calendar the vernal equinox was placed on the 15th day of month 1. However, in System A of Babylonian astronomy the vernal point was located at 10 degrees [of] Aries and in System B at 8 degrees [of] Aries."*

Changes were made in the Babylonian record keeping, but the reasons for the changes have eluded any contemporary analysis based on a continuation of present conditions into the past. The three values for the equinox suggest that the change in the heavens may have taken some years to subside, although all other data contradicts this.
[return to text]

Note 23 --

Before 685 BC both the horizon line and the equatorial would be rotated about 15 degrees counterclockwise when viewed directly east. Thus the Pleiades would rotate 15 degrees clockwise with respect to the horizon, placing them almost directly above the rising Sun.
[return to text]

Note 24 --

Note that the choice of a location from which the circumference of the night sky is measured does not depend on how many zodiacal constellations are identified or the number of degrees assigned to each. Thus, if at an earlier time, the Babylonians identified 18 constellations of the zodiac it makes no difference to the starting point between Aries and Taurus. We know from records of the 4th century BC, that by that time the zodiac had been divided into 12 sectors of 30 degrees each, even though the original reason for a division into 12 houses was no longer valid and the constellations for which the "houses" of the zodiac are named were a poor fit.

China was not wedded to a system which divided the night sky up into 12 equal segments of 30 degrees. The sectors of the sky were of unequal size, as little as 2 degrees, with boundaries along the longitudinal lines of easily recognized stars. Thus in 747 BC, when the length of the year changed, the Chinese had no reason not to reorganize the night sky over a full circle defined as 365.25 "degrees." This remained in use until circa AD 1400.
[return to text]

Note 25 --

There are suggestions that perhaps the initial displacement of the equinox was not 15 degrees, but something closer to 9 degrees. We are only certain of the complete displacement of 15 degrees in about 300 BC or 200 BC, when the equinox had moved well beyond the initial 15 degrees along the equatorial.

Velikovsky (p. 353 ff) discusses Talmudic references to calendar changes made by Hezekiah, mentioning a doubling of the month of Nisan (the post-exile name for the first month of the year) to celebrate Passover. The Talmud actually explains that this was done to adjust for the lunar year --

which lagged behind the solar year. These "corrections" would have been made after 747 BC. Hezekiah made many reforms after 747 BC, cleaning out the temple, reinstituting the priesthood, both of which had been neglected by his predecessor Ahaz.

With the Moon's period of 29.5 days, representing an odd interval of the year, which was 365.25 days since 747 BC, the religious festivals which had been signaled by visible aspects of the Moon, like the new Moon or the full Moon, now drifted around the year. Religious feast days fell 9 or 10 days behind with every following year.

This clearly shows up at least once when mention is also made in the Talmud that Hezekiah moved New Year's Day, normally celebrated at the fall equinox, back 9 days from the 10th day of the seventh month to the first. Velikovsky suggests that it was the fall equinox which had moved back 9 days. But there is no need to make this suggestion. I suspect it was a lunar adjustment, which would have failed again the following year.

Velikovsky also mentions Babylonian records of that era which at one point place the (spring) equinox at the 15th day of the month of Nisan, and on another clay tablet list it as the 6th of the same month -- 9 days difference. I suspect such differences are all due to the new orbital period of the Moon after 747 BC.
[return to text]

Note 26 --

Velikovsky notes for the 8th and 7th century BC (in an unpublished document at http://www.varchive.org/tac/polturm.htm, "Political Turmoil Around -687"), "*Climatic change was again very significant and oscillations of climate marked the ninety years from -776 to -687.*" This sums up information from his book, *Earth in Upheaval* (1955), where he also writes of the depopulation of regions north of the Alps.

These years include the period of frequent electric contacts by Mars, concluding with the (unrelated) nova event of 685 BC. Disturbances north of the Alps were also due to Mars when it continued to pass Earth on its orbit, which was inclined at an angle of 1.85 degrees to the orbit of Earth.

A depopulation of Europe, for that matter, is matched with similar demographic changes elsewhere. More properly, the demographic changes might be attributed to a combination of causes, involving not only climatic fluctuation, but the physical devastation due to some nine plasma contacts with Mars during this period, of which we certainly have a clear record for the cities and citadels of the Middle East.

The climatic changes were real; they are recorded in the tree pollen found in bogs.
[return to text]

Note 27 --

The length of the delay in the start of spring, 15 degrees, is equal to about 15 days. A degree is just short of a day. In an abridged version of James Frazer's *The Golden Bough* (Theodor Gaster, editor, 1959), a text entry reads, "The Greeks gather and press grapes in the first half of October." An endnote explains:

*"In ancient Greece the vintage seems to have fallen somewhat earlier, for Hesiod (*Works and Days*, 609 ff.) dates it to the time when Arcturus is a morning star, which was on September 18."*

This would place Hesiod's composition of *Days and Works* to before 685 BC. The date of September 18 is about correct under the composition of the skies before 685 BC and with a 15-degree displacement of the equatorial. Other details of *Works and Days* place its composition to *after* 685 BC, however.
[return to text]

Note 28 --

There are lengthy astronomical records made by the Babylonians, starting in the eight century BC directly after 747 BC (and other records supposedly since circa 2500 BC), involving the planets, the Moon, and the path of the Sun. The equinoxes, the shortest and longest days of the year, the distance traveled by the Sun each day against the background of stars, were all noted. But most of the records we have date only from after 650 BC. It looks like in most cases the data from before 650 BC was discarded.

Velikovsky wrote that, at times, as many as three differing records were kept of the path of the Sun and planets, suggesting changes in the Earth's orbit during the 8th and 7th centuries BC. It is true that multiple records were kept in this era, in sets of three, by the Babylonians, as well as the Indians and Israelis.

But Velikovsky also added information from the *Mul.Apin* which he misunderstood. He refers to the Enlil path, the Anu path, and the Ea path as if they were separate trajectories of the Sun. The *Mul.Apin* "paths," however, are sectors of the sky concentric about the polar axis, representing the constellations rising, roughly, in the northeast, the east, and the southeast. They are named after appropriate gods, so that the Enlil region represents the "air" above the ecliptic, Anu represents the central region of the sky which includes most of the "river" of the ecliptic, and Ea represents the "waters" south of the central region.
[return to text]

Note 29 --

The period Brown has reference to is 750 BC to 621 BC. The correspondence with the astrologers was generated by the last kings of Assyria, Tiglath-Pileser III (745-727), Sargon II (721-705 BC), who took up residence at Nineveh, Sennacherib (705-681 BC) who rebuilt Nineveh, Esarhaddon (681-668 BC), and Assurbanipal (668-626 BC), who built the library which burned down in 621 BC.
[return to text]

Note 30 --

The records of Babylon were translated into Greek in antiquity (on Alexander's orders), but apparently everything before 747 BC may have been discarded at an early date as being unreliable. In fact, there is also a notable absence of records until about 650 BC. A number of people have pointed out that solar eclipses (due to the Moon) would not have been experienced in the region of Babylon during this era.

Ptolemy lists 721 BC as the first lunar eclipse seen in Babylon. The first recorded lunar eclipse in China falls in 720 BC. The Chinese *Spring and Autumn Annals*, spanning the years 722 BC to 481 BC, records 37 eclipses.
[return to text]

Calculations are in Unix bc notation, where ^ denotes exponentiation; the functions a(rctangent), s(ine), and c(osine) use radians; angle conversions to radians or degrees by the divisors rad=.017+ and deg=57.2+; other functions are shown as f( ); tan( )=s( )/c( )
units: million == 1,000,000; billion == 1,000,000,000;
AU == 93,000,000 miles.

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