Meteorological Basis of Mayan Sacred Calendar Postulated

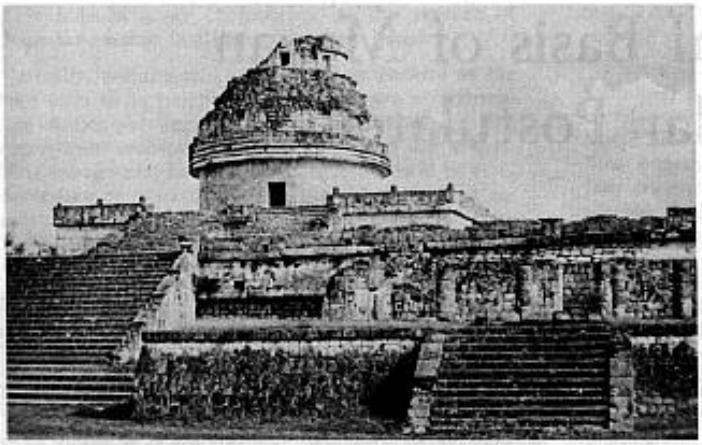
For decades anthropologists have known that natives in Mexico and Central America use two different calendars in parallel, a secular calendar of 365 days and a ceremonial calendar of 260 days. Both calendars have come out of the mists of pre-history and archaeologists, deciphering the pictograms of ancient Mayan buildings and stelae, have discovered the two distinct sets of glyphs for the two calendars.

The secular calendar contained 18 "months" of 20 days each (plus 5 unlucky days, making a 365 day year); the ceremonial calendar consisted of 13 periods of 20 days each, giving 260 days. Each of these 13 was named for a sacred animal or plant or natural force (wind, death, rain, etc.) while each of the 20 days had its own glyph. Other months were named for the monkey, iguana and jaguar. Since a 260-day calendar seems hopelessly out of phase with the solar year, and so appears utterly useless for any agricultural people, it has remained a mystery how it originated.

Model of the 12-foot-diameter late-Aztec stone calendar wheel found at base of the major pyramid at Tenochtitlan, the site of modern Mexico City. Original dates from 1400s AD. Innermost complete ring shows 20 day glyphs of sacred calendar, running counterclockwise from top pointers: alligator, wind, house, lizard, snake, death, deer, rabbit, etc.

A year ago, Prof. Vincent Malmström stood in the ancient Mayan observatory at Chichén Itzá with the eleven Middlebury students who had elected "Civilizations and Environments in the American Tropics" as their Winter Term course, and examined the port holes in the walls of that upward spiraling tower. It seemed apparent from their location in the wall that they were sighting holes f or study of the sun's apparent path across the sky. Musing on this possibility, Malmström recalls, "I suddenly realized that I

was a victim of a preconception I had introduced from my own cultural background - a notion that the Mayans, themselves, could not have shared. In northern climes agricultural peoples have always been intensely interested in the mid-summer and mid-winter solstices because these define the dates when the life-giving sun begins to "go away" and to "come back." For such peoples the sun's angle of declination at high noon is both dramatically important and readily measurable. But not so in the tropics: there the change is neither dramatically obvious nor of much importance. In the tropics, I suddenly realized, the single most noticeable annual phenomena are the days when the noon sun casts no shadow because it's directly overhead. Except on the equator, of course, this will occur twice in any solar year.

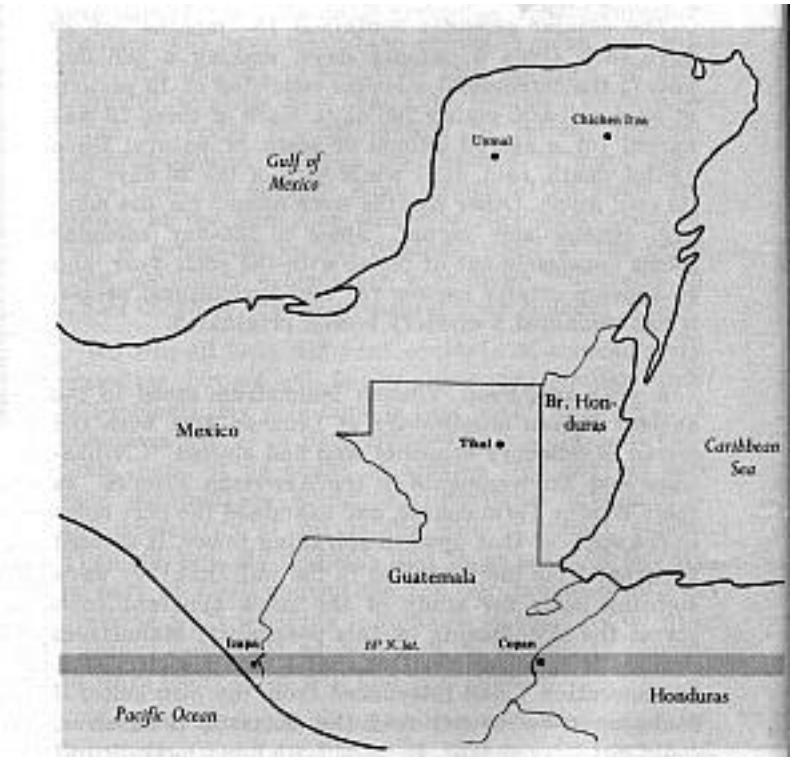


Remnant of observatory tower at Chichen Itza (6th cent. AD) whose small radial tunnels give sight lines for the celestial observations essential to confirmation and periodic correction of the Mayan calendar. Of all the world's cultures, Mayans were most obsessed with time. Although they seem to have used neither the decimal nor fractions, Mayan priests, by centuries of careful observation and record-keeping, managed to measure the sidereal year so accurately that their secular calendar contained less error than the Gregorian calendar. Opposite page, two versions of Mayan rain god, Chac: at Uxmal (left) and at Chicanna (right) where his mouth is the temple portal. All photos are by Prof. Malmström.

"Then remembering the 260-day ceremonial calendar - which I'd first learned about as an anthropology student at Michigan - I suddenly wondered whether there was a 260-day interval between such 'shadowless noons' within the latitudes of the Mayan civilization. Of course, I had no ephemeris with me so I had to wait until I got back on campus to check it out.

"When I got home, I searched in the ephemeris tables for a latitude that would have such a 260-day interval and found it to be just south of 15 degrees north latitude, and turning to a map of Mesoamerica, there sat Copán, the most important single Mayan center for astronomical studies! Suddenly I thought I knew why the Mayans had built this principal observatory 200 miles south from Tikal, their capital, and way down on the very border of their nation. Copán was established on the most accessible site within the latitudinal band where further direct calibration of the 260-day sacred almanac was possible.

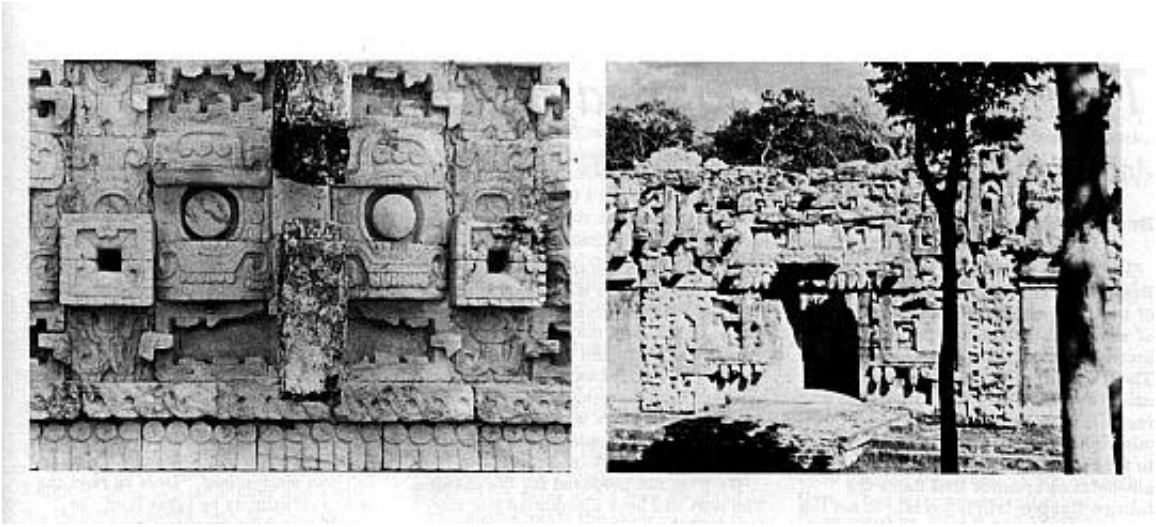
"But after reading up on Copán (which happens also to have been the first Mayan site rediscovered by modern explorers - in 1842), 1 saw that it had been founded much too late - about 465 AD - to have been the originator of the 260-day calendar, which we know is at least 500 years older. (I hadn't then discovered the evidence suggesting that it is far older yet!) I also realized that the calendar could not have originated in Copán because Copán was in the highlands, whereas the fauna for which the "months" were named - alligator, monkey, jaguar - belonged to the rain forests of the tropical lowlands.



Narrow band just south of the 15th parallel of latitude marks the area within which the sun reaches the zenith at successive intervals of 260 and 105 days—on April 30-May 1 and on August 12-13 (Mayan day began at noon, not midnight). August 12-13 accords exactly with the month and day of the zero starting point of the Mayan long-count calendar. Malmstrom believes sacred calendar originated at Izapa in pre-Christian era and that Mayans built great religious center at Copan some 5 centuries later in order to "calibrate test, and refine the measurements based on this sacred almanac".

So I looked eastward and westward along this latitude band for another ancient site that was situated in the lowlands. There was only one - the ancient city of Izapa on the Pacific coast and lying next to the border of Guatemala. So then I started reading up on Izapa and found that Yale archaeologist Michael Coe, who has excavated that and other sites, considers Izapa to be intermediate both in space and time between the earlier Olmecs and the later Mayans. (The Olmecs' was a promethean culture from which all their neighbors are thought to have borrowed; for instance, their astronomy, their mathematics, and their ceremonial ball game - in which the losers may have become sacrificial victims.) A coastal village 10 miles down river from Izapa has been radiocarbon dated at 1500 BC, making it the earliest agricultural village yet found in the Western hemisphere."

Believing that he has discovered both the empirical basis and the place of origin of the 260-day calendar, Prof. Malmström published his findings in Science, September 7, 1973.



The purpose of the Winter-Term "Civilization and Environment" course which took Malmstrom's class to Mexico was to visit about two dozen ancient sites and seek to discover by direct examination why those cities were founded just there and not somewhere else. As it turned out, the group were surprised again and again when direct examination suggested probable causes for the particular location of a site . . . . mentioned nowhere in the literature .... and even more so when the actual evidence refused to confirm the received opinions they had gathered from their preparatory readings.

"For many it was a real shock," Prof. Malmström recalls, "to realize for the first time that just because you had read it in an authoritative book, it wasn't necessarily so!"

For instance, Cholula is a huge site of some 25 acres; for perhaps 2000 years it had been the most sacred place in all of Mexico. Why was it located where it is? "Once you stand on the actual site," Malmström says, "it becomes very clear. Looking to the east you can see the sun rise out of Citlatepetl, the highest volcano in Mexico; and looking to the west you can see it set into Popocatepetl, the second highest volcano in Mexico. Of course these two peaks define a line, not a point, but Cholula was situated at the only point on that east-west line that's near an irrigable river valley large enough to support a major city. We had found nothing in the literature explaining any of this.

"Then a few days later we came to Yagul, which all the books describe as a hilltop 'fortress.' But when you examine the actual 'fort,' you see at once that other adjacent hills are both higher and command a better view of the surrounding countryside; also that all the so-called 'barracks' rooms open onto a common central courtyard from which there is only a single sally port! In event of a surprise attack, a handful of attackers stationed outside that one exit could bottle up the entire fort."

The layout of Yagul suggests to Malmström, rather, an inter-tribal Olympiad site; it has, for instance, one of the largest ball courts yet found in Mesoamerica. The "barracks" could as easily be athletes' quarters -- an Olympic Village.

This January the Geography professor, who is on leave during the winter and spring terms, is back in Mexico with a photographer as assistant, examining Mayan Old Empire sites for direct field evidence on two points: one, the relative significance of warfare in the Old Empire (300-900 AD) and, two, the area of dry climate within that Mayan region and any evidence of a sudden extension of that area near the end of the Old Empire. (A climatic shift is one of several possible causes suggested for the empire's rapid collapse.) On the assumption that men do not worship useless gods, Malmström will be mapping the occurrence of images of the Mayan rain god, Chac, in Mayan Old Empire sites as evidence of a dry climate, locally, when those images were carved.

After five or six weeks of heat and dust, he will then don his city suit and fly to Rome for a project that looks to the future; for the UN Food and Agricultural Organization, he will be assessing the immediate causes of critical food shortages in the areas of the world for which famine is now predicted within this decade.

(The above article appeared in the Winter 1974 issue of the Middlebury College Newletter.)

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