# Pre-Columbian Alignments in the Yucatán: Edzná

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## The Lines of Edzná

Edzná first came to my attention in early 1976 as the result of a deduction prompted by a computer analysis of the Maya calendar. My research revealed that the Maya seem to have reformed their calendar around A.D. 40 by moving their "New Year's Day" from 13 August to 26 July. Because they used the passage of the zenithal sun to calibrate the new date, they were obliged to have chosen a location along the parallel of 19.5º N - a line that intersects only the site of Edzná as it crosses the Yucatán Peninsula.

I found very little written about the site, for Andrews' book on Maya cities was just being published (Andrews 1975) and Matheny's excavations had yet to begin (Matheny 1976). The only two citations I found were an observation from J. Eric Sydney Thompson (1950) that a one-day correction in the calendar may have occurred there about the year 672 - although he later reversed himself on this matter - and a pointed reminder on a map by the National Geographic Society (1972) that the site was of "Late Classic" (that is, A.D. 600 to 900) origin. Although the first citation seemed to support the notion that the place had some astronomical importance, the second definitely ruled out the calendar reform suggested by my computer study, because a "Late Classic" origin put the city's founding at least six centuries too late. Confronted with such contradictory evidence, I withheld all mention of Edzná and the supposed calendar reform from the article that I published in an astronomical journal (Malmström 1978).

Although Edzná was first reported to the scientific community in 1927, the site received little study until the late 1950s when a team from the **National Institute of Archaeology and History** began a process of partial excavation and restoration (Matheny et al. 1983). Since only one structure of any size - a five-story pyramid called Cinco Pisos - was in good enough condition to date for architectural style, Edzná was considered to be a relatively minor place. In 1968, however, after a University of Oregon architectural group led by George F. Andrews surveyed the site extensively, they concluded that Edzná was a "very large and important center with definite 'urban' characteristics" (Andrews 1975).

While continuing my research in Mexico in 1978, I chanced to meet Professor Ray T. Matheny and informed him of my dilemma regarding the age of Edzná, only to have him reply that there was no dilemma. His excavations revealed that Edzná dated back to about 150 B.C. and was perhaps the oldest major Maya site yet discovered, having a population approaching 20,000 at its peak. He encouraged me to investigate the site for astronomical alignments, but cautioned me that an astronomer he had consulted found none (Matheny 1976).

Within a week of my encounter with Matheny, a visit to Edzná confirmed two hypotheses and occasioned the discovery of another totally unexpected relationship in the spatial organization of the site. At the base of the Cinco Pisos pyramid I found an ingeniously designed gnomon (the index of a sundial) fashioned from a tapered shaft of stone surmounted by a disc having the same diameter as the base of the shaft. At noon on the day of the sun's zenithal passage (26 July), the disc at the top of the shaft enveloped the entire column in a cylinder of shadow, whereas on any

other day of the year, a band of sunlight fell across it. Here, then, was strong circumstantial evidence that the astronomical exactitude Thompson postulated for Edzná was indeed possible, and that such a device allowed this ancient and important ceremonial center to serve much the same function in the calendrical year of the Maya as Greenwich does for diurnal time-keeping in our modern world. (See Figure 1 below.)

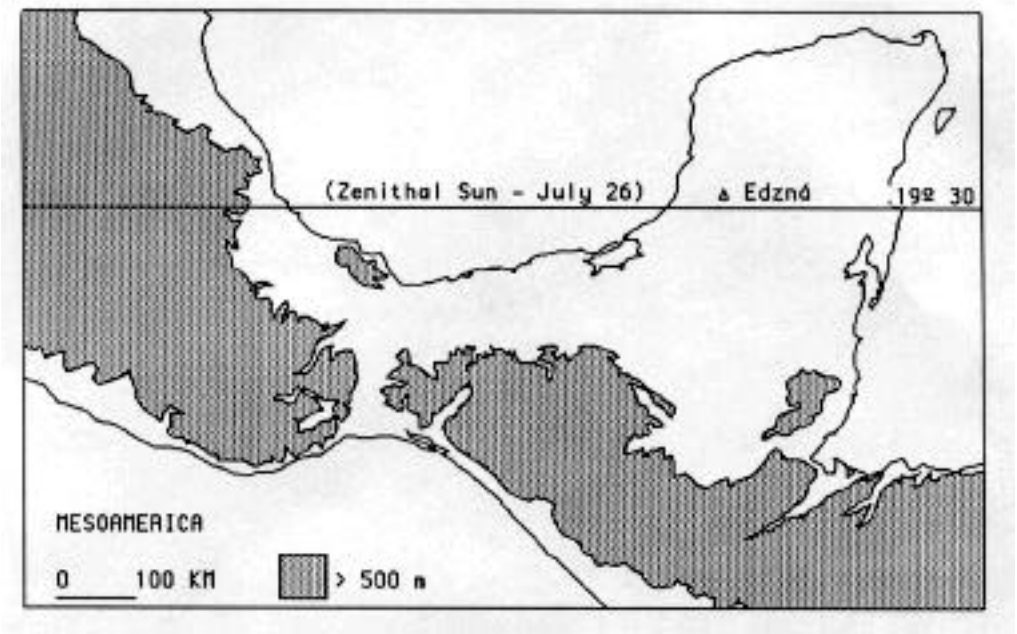


Figure 1.

The second confirmation came when I found that the meticulously laid-out ceremonial center, whose alignments Andrews (1975) noted but did not understand, was oriented to the sunset position on 13 August. This alignment I explained in 1975 at Teotihuacán, the great pre-Columbian metropolis about 50 kilometers to the northeast of Mexico City, and subsequently found repeated at dozens of other sites throughout the Mesoamerican realm (Malmström 1981). Because the 13 August alignment commemorated the "beginning of time" according to the Goodman-Martinez-Thompson correlation of the Maya calendar, it represented the most sacred day in the Mesoamerican year. To find the oldest major urban center of the Maya oriented to the same magico-religious point on the horizon as its larger contemporary on the Mexican plateau was striking proof of the communality of culture that already prevailed across the region by the time of the birth of Christ.

However, from examining the spatial relationships of the various structures at Edzná, it was apparent that the ruins of a large pyramid some 300 meters to the northwest of the Cinco Pisos (Matheny dubbed it La *Vieja* because of its antiquity) must have played a special astronomical role in the life of the city. It is the only structure which is high enough to intersect the otherwise-totally featureless horizon as seen from the top of the imposing five-story building. It appeared to have been constructed to fix some especially significant alignment as viewed from that structure; but, because the Northwest Pyramid is situated at an azimuth of 300º from Cinco Pisos, it could not have commemorated a solar position. This is because the maximum azimuth for the summer solstice sunset, as viewed from the latitude of Edznd, is 295º. But, if it was not a solar alignment, what could it be? The fact that the Northwest Pyramid lies exactly 5º beyond that point is, indeed, the clue. The orbit of the moon bears precisely this same relationship to the ecliptic of the sun. It would appear, therefore, that the Northwest Pyramid was constructed to fix the maximum northerly still-stand of the moon - the knowledge of which position was

absolutely essential to predicting eclipses. Since the moon reaches this position only once every 18.61 years, a long period of observation was necessary to pin down this point with precision. This may be why the earliest lunar inscriptions of the Maya do not pre-date the middle of the fourth century A.D. (Lounsbury 1978).

Edzná appears to have functioned as the Maya's earliest astronomical center by virtue of their recognition and demarcation of three lines in the landscape. The first of these was the parallel of 19.5ºN (Figure 1), even though the notion of a spherical earth with a coordinate grid-system was totally unknown to them. As observers of nature, what mattered to the Maya was that they could define the zenithal transit of the sun with precision. Because this happened to occur at the latitude of Edzná on 26 July, they adopted this date as the beginning of their new year - a fact recorded by a Spanish prelate who was in the region in the 1560s (de Landa 1983).

However, true to a tradition already well established within the so-called Olmec civilization, of which they were the principal heirs, the Maya continued to commemorate the date on which the present cycle of the world supposedly began. Likewise calibrated by the zenithal transit of the sun - this time at Izapa, the cradle of their calendar's origins near the Pacific coast of southern Mexico - this event explains the orientation of the entire city of Edzná to the sunset position on 13 August, that is, an azimuth of 285.5º (Malmström 1973).

Finally, the precision with which the azimuth between the Cinco Pisos and the Northwest Pyramid was fixed suggests that Edzná likewise served as the earliest lunar observatory in the New World, and that it may have been here that the Maya finally established a means of predicting the eclipses that they, like superstitious peoples everywhere, always found so terrifying. (See Figure 2 below.)

**Edzná: A Point in Space**

But why was Edzná located specifically where it was? What factors prompted the Maya to found what was to become their first major urban agglomeration at this particular location?

Unlike the Olmec, who appear to have consciously avoided the Yucatán Peninsula (Bernal 1969), Maya agriculturalists began pressing into the region from the southwest early in the second century B.C. They appreciated that the greatest challenge confronting the would-be farmer in this youthful karst area was the scarcity of surface water, a deficiency exacerbated by the monsoonal climate. Moreover, the sporadic downpours of the summer rains scoured the surface of the tabular limestone of most of its soil cover, washing it down into solution basins which the Spanish called aguadas, or washes. Edzná, as it turns out, was on the eastern edge of the largest aguada found anywhere in the Yucatán. A basin measuring almost 90 kilometers north-to-south by more than 20 kilometers east- to-west, the aguada of Edzná is the most extensive area of cultivable soils the Maya ever settled. Today it once again is the site of an ambitious agricultural development scheme.

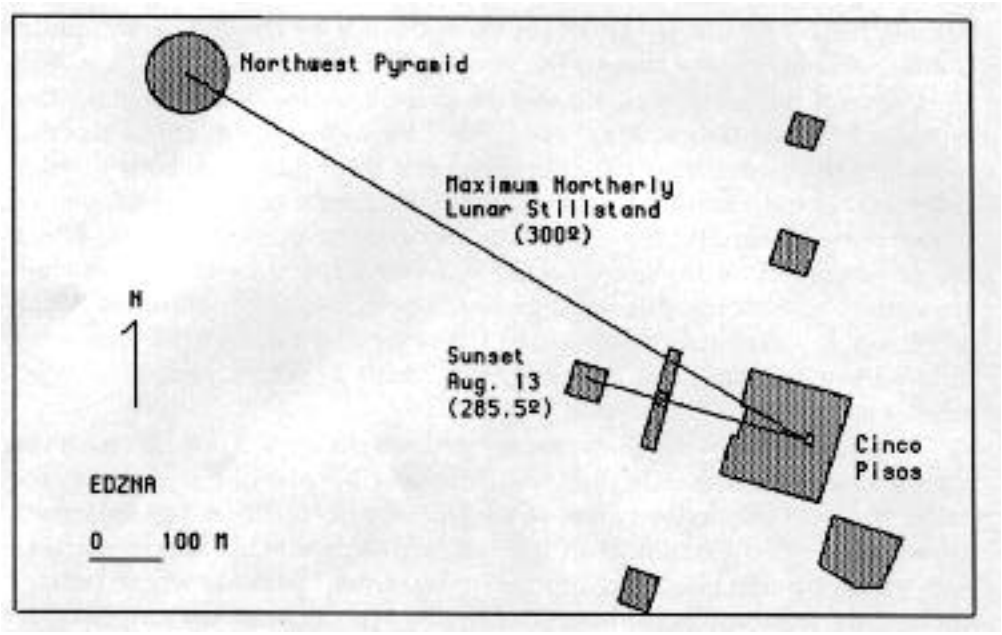


Figure 2.

Thanks to the fine-grained soils on the floor of the basin, the run-off from the summer rains tends to accumulate there, seasonally forming a sizable lake. This combination of productive soils and a more enduring water supply encouraged the Maya to develop an extensive network of radial canals reaching out across the aguada in all directions from Cinco Pisos (Matheny 1976). The earth excavated from the canals was mounded into low terraces on either side of the waterway to form the counterpart of the chinampas (floating gardens), which the Spanish found the Aztecs using to grow food for their metropolitan center a millennium and a half later. The canals themselves served both as arteries of movement for transporting foodstuffs to the city center but also, Matheny believes, for the production of fish as a source of protein. Thus, in many ways the premier Maya urban center was essentially a smaller version of both its contemporary, Teotihuacán, and the later Aztec capital, Tenochtitlán.

In theory, of course, Edzná could have been located anywhere around the perimeter of its aguada. So, what specific site factor was responsible for its having been positioned where it was? Without doubt, its Cinco Pisos pyramid constituted the very heart of its religious and astronomical precinct and, as such, must have served as its commercial center as well. The Andrews survey contended that Cinco Pisos was built atop a very large man-made platform (Andrews 1975), whereas Matheny states it was constructed on a natural rock outcrop (Matheny 1976). In either case, its location was chosen for the solid base it provided in the midst of a vast basin floored with productive but seasonally waterlogged clay soils. Once this node had been established, a network of converging canals was constructed to provide goods and services to this central place - an undertaking as momentous in its own right as the erection of the Pyramids of the Sun and Moon at Teotihuacán (Matheny 1976). But, before long, the Maya priests seeking to unravel the secrets of the heavens came to appreciate the site's wide-ranging and unencumbered view of the distant horizon likewise. Thus, to its role as the first major urban agglomeration of the Maya, Edzná could now add the distinction of becoming their earliest astronomical center as well - a fact that we have only belatedly come to recognize.

**References**

Andrews, George F. *1975. Maya Cities: Placemaking and Urbanization.* Norman: University of Oklahoma Press.

Bernal, Ignacio. *1969. The Olmec Worl&* Berkeley: University of California Press.

de Landa, Diego. *1983. Relación de Las Cosas de Yucatdn.* Mérida: Ediciones Dante, S.A.

Lounsbury, Floyd G. *1978.* Maya numeration, computation, and calendrical astronomy. *Dictionary of Scientific Biography 15:759-818.*

Malmström, Vincent *H. 1973.* Origin of the sacred *260 day* Mesoamerican calendar. *Science 181:939-941.*

- . *1978. A* reconstruction of the chronology of Mesoamerican calendrical systems. *Journal for the History of Astronomy 9:105-116.*

-. 1981. Architecture, astronomy, and calendrics in Pre-Columbian Mesoamerica. In *Archaeoastronomy in the Americas,* ed. R. W. Williamson, pp. 249-261. Los Altos, CA: Ballena Press, Center for Archaeoastronomy.

Matheny, Ray T. 1976. Maya lowland hydraulic systems. *Science* 193:639-646.

- , Guff, Deanne L., Forsyth, Donald W., and Hauck, F Richard. 1983. Investigations at Edzná volume 1, part 1: The
hydraulic system. *Papers of the New World Archaeological Foundation, Vol. 1,* No. 46. Provo, UT: Brigham Young
University.

National Geographic Society. 1972. *Archaeological Map of Middle America: Land of the Feathered Serpent. Washington,*
*DC.*

Thompson, J. Eric Sydney. 1950. *Maya Hieroglyphic Writing: An Introduction* (1st edition). Norman: University of
Oklahoma Press.

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