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MEGALITHIC YARD IN TEOTIHUÁCAN?

1. *Introductory remarks*

In 1951 J. D. Wölfel suggested that the oldest megalithic cultures of the Near East or the Iberian Peninsula created a formative matrix for ideologies and the resultant monumental architecture of the great centers of civilization of the Ancient World.

The suggestion can now be further corroborated on the following grounds:

a) R. Müller (1970) and discussions concerning the Stonehenge problem demonstrated the presence of a profound astronomical knowledge among the "Megalithics" applied to time recording and predicting;
b) more elaborated megalithic structures needed previous detailed planning and large, well-organized social labour forces directed by well-differentiated and rigidly organized religious *élites;*
c) many megalithic structures served as both cultic centers and astronomical instruments.

An astrobiological vision of the world and man's well-defined position in it not only flourished in the ancient centers of great civilisations but was their basic ideological regulating system.

An extreme example of the regulating power of such an astrobiological world model in archaïc society is found in Prehispanic Mexico.

From a series of anthropological studies dealing with intra- and interpopulational racial differentiation of both ancient and modern Amerindian groups in Mexico (A. Wierciński, 1969, 1971, 1972, 1972a, 1972b) I derived a working hypothesis according to which the "maternal" Mesoamerican Olmec civilisation was the product of an infusion of megalithic ideas resulting from sporadic transatlantic migrations from the western Mediterranean centers of megalithic cultures into the native archaic Amerindian together with transpacific impulses from China during the time between the Shang and Chou periods. The last detailed discussions and critiques of this general idea (J. Comas, 1972, 1973) bolstered my anthropological findings (A. Wierciński, 1974) particularly in regard to the presence of Negroid components among Olmec groups. In Almogaren III, Z. Krzak (1972: The problem of reconstructing an Afro-Iberian Ship from the Neolithic Age) proved the possibility of sufficient megalithic navigational skill to allow for the voyages necessary to establish the validity of the hypothesis.

In this context, "megalithic ideas" connote initially the idea of monumental stone architecture erected for both religious and astronomical functions.

If such an idea were brought to Preclassic Mexico from the western megalithic cultures between the 3rd and 2nd millennia B.C., it could be expected that the megalithic measuring unit, the "megalithic yard," which equals 0.829 m. according

to A. Thom (1962) and R. Müller (1970), was used in at least some of the Mexican centers of monumental architecture.

This paper discusses the possibility of the use of the megalithic yard in the construction of the Sun Pyramid of Teotihuacán.

2. *Analysis of dimensions of the Sun Pyramid*

The most recent publication of the dimensions of the buildings of the sacral complex at Teotihuacán is by H. Harleston (1974). He used photogrammetric data, field measurements, and archeological plans deposited in the I.N.A.H., Mexico. His data are burdened by some errors in his reconstruction, particularly his belief in a common minimum linear unit bringing all Teotihuacán dimensions into integral numbers. He holds that this unit is 1.059463 m., exactly 1/12 millionth of the earth's polar diameter and assumes the theocratic *élite* of Teotihuacán knew this diameter.

The following objections are advanced against this hypothesis:

a) there is no evidence that Teotihuacán priests knew anything about the earth's diameter;
b) presence of a common divisor for Teotihuacán dimensions can mean only that the architects built according to simple proportions;
c) dimensions given in Harleston's "Hunabs" have no relation to specific calendric cycles coded in the structure of the buildings.

Harleston's data seem to approximate real dimensions to the error of 0.25%. Converted to meters they serve as a base for this analysis. From them were selected the horizontal dimensions of one of the most conspicuous buildings, the Sun Pyramid.

The procedure accepted here included the following steps:

a) conversion of diameters to meters to diameters in megalithic yards by dividing meters by 0.829;
b) calculation of diagonals of all squares formed by edges of particular bodies of the Pyramid;
c) search for possible meaning of these figures in relation to established Mesoamerican calendric cycles known to have played a principal role in ideological regulating system;
d) if meanings were found, postulation of a means to refine dimensions;
e) conversion of accepted dimensions from megalithic yards back into meters;
f) comparison of these new metric figures with the base dimensions derived from Harleston's data.

Results of the calculations are given in Table 1. They reveal striking and probably non-random regularities.

The sum of both diagonals of the square formed by the lower edges of the first body of the Sun Pyramid is very near to 780, the longest cycle of Mars (779.94 days), and equal to 3 x 260 Tonalpohualli days.

The diagonals of its upper edges total 650 m.y., corresponding to 260 x 2–1/2 Tonalpohualli days.

The sum of the diagonals of the lower edges of the second body is near 585 m.y., very near to the Venus cycle minus one day, i.e., 583.92 days, and very near 20 lunations and 260 x 2–1/4 Tonalpohualli days. The 585 day cycle is in the Aztec Stone Calendar as two runs between 4-Ollin and 4-Ehecatl (R. Noriega, 1974).

The sum of diagonals of the square formed by the upper edges is near 460 or 463 m.y. It is difficult to explain in the context of "c)" above.

The diagonals of the square formed by the lower edges of the third body are near 390 m.y. and correspond to one half cycle of Mars, or to 260 x 1–1/2, while those of its upper edges are about 292.5 m.y., nearly 10 lunations or half a Venus cycle.

The fourth body of the Pyramid requires more complicated considerations. Diagonals of its lower edges are almost exactly 260 m.y., one sacral cycle of the Tonalpohualli! The sum of the diagonals of the central edges is about 255 m.y., which is not readily interpreted in the context of "c)" above.

The sum of diagonals of the upper edges are about 255 m.y., which corresponds to a doubled Mercury cycle (115, 88 days). It is possibly noted in the Aztec Stone Calendar as the span of 117 days between 4-Ehecatl and 4-Quiahuitl. It is near to 40 lunations.

The remaining dimensions are astonishly near to being multiples of 780 or 260 day cycles.

The diagonals from the lower edges of the fifth body are almost 195 m.y., equalling 780 x 1/4, while those from the upper edges are nearly 130 m.y., precisely half the Tonalpohualli cycle of 260 days. The diagonals formed by the lower edges of the sixth body give a value near to 86.7 m.y., corresponding to 1/3 of 260, and those of the upper edges equal 65 m.y., a well known division of the Tonalpohualli day count into 4 segments.

The accepted, more refined dimensions of diagonals were rounded numbers, and those of the edges of the bodies of the Sun Pyramid prove there was very little "cosmetisation" in the calculations.

Circumferences of particular squares formed by the edges of Pyramid bodies were also calculated. Here we point out only that the values obtained for the circumferences of the lower and central edges of the fourth body equal 368 and 361 respectively, which gives an arithmetic mean of 365!

The circumference of the square formed by the upper edges of the fourth body of the Pyramid is 82.8 m.y. This value times 10 is the circumference of the square of the lower edges of the second body. It may be connected with the Tonalpohualli day count and possibly with Venus, Mercury, and Lunation cycles, although proof is not yet demonstrable.

To look at the problem *modo geometrico,* an attitude playing a greater role in the "Gestaltarithmetrics" of ancient peoples than it does in our more purely numerical thinking, consider Figure 1. It may be interpreted as reflecting simple dependencies between 82.8, 58.5, and 11.7, as well as between them and 260.

Minor changes in figures applied to particular measurements give 58.4, 11.6, and 200 and even permit establishment of their relations with 365 and 29.

This simple geometric device allowing for all sorts of relations to dimensions of

the Sun Pyramid and known Prehispanic Mexican astronomical time cycles is left for free play of the imagination of interested readers.

3. Conclusions

The possibility of the use of the megalithic yard, 0.829 m., in Prehispanic Mexican architecture was demonstrated at one of the greatest buildings of one of the most important cultic centres, Teotihuacán, by converting the dimensions of the Sun Pyramid into megalithic yards and comparing sums of the diagonals of the six body squares of the Pyramid with known coded calendric cycles, especially those of Tonalpohualli, Mars, Venus, and Mercury. Possibilities for association with both lunar and solar cycles exist.

I do not think it possible to believe that the numerous mathematical matches are an illusion.

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Table 1. The horizontal dimensions of the Sun Pyramid in meters and megalithic yards

Description of dimensions /north to south/	d_{ij} in meters/according to H. Harleston, 1974/	d_{ij} in megalithic yards /1 m.y.=.829 m./	Diagonal in m.y. $\sqrt{2d_{ij}^2}$	Accepted diagonal in m.y.	Sum of both diagonals	Calculated d_{ij} from accepted diagonal in m.y.	Circumference of a square $4d_{ij}$	d_{ij}' converted again into meters	Difference $d_{ij} = d_{ij}'$ in meters	Corresponding time cycles for sum of both diagonals in m.y.
First body, lower edge /d_{11}/	228.84	276.05	390.38	390	780	275.8	1104	228.64	+0.20	780 days of Mars cycle = 260 x 3 of the Tonalpohualli
First body, upper edge /d_{12}/	190.70	230.04	325.33	325	650	230.0	920	190.67	+.0.03	260 x 2 1/2 of the Tonalpohualli
Second body, lower edge /d_{21}/	171.63	207.04	292.80	292.5	585	206.8	828	171.44	+0.19	584 + 1 days of a Venus cycle = 260 x 2 1/4 of the Tonalpohualli
Second body, upper edge /d_{22}/	135.61	163.58	231.34	230.	460	162.6	650	134.80	+0.81	?
Third body, lower edge /d_{31}/	114.42	138.02	195.19	195	390	138.0	552	114.40	+0.02	780 x 1/2 = 260 x 1 1/2
Third body, upper edge /d_{31}/	85.82	103.52	146.40	146.3	292.5	103.4	414	85.72	+.0.10	585 x 1/2 = near to 10 Lunations
Fourth body, lower edge /d_{41}/	76.28	92.02	130.14	130	260	92.0	368	76.27	+0.01	260 days of the Tonalpohualli
Fourth body, central edge /d_{42}/	74.80	90.23	127.60	127.5	255	90.2	361	74.78	+0.02	approach to solar cycle?
Fourth body, upper edge /d_{43}/	68.44	82.56	116.76	117	234	82.8	332	68.64	–0.20	116 + 1 days of a Mercure cycle x 2 = nearly 40 Lunations
Fifth body, lower edge /d_{51}/	57.21	69.01	97.59	97.5	195	69.0	276	57.20	+0.01[x/]	780 x 1/4
Fifth body, upper edge /d_{52}/	38.14	46.01	65.07	65	130	46.0	184	38.13	+0.01	260 x 1/2
Sixth body, lower edge /d_{61}/	25.42	30.67	43.37	43.3	86.7	30.6	122	25.37	+0.06	260 x 1/3
Sixth body, upper edge /d_{62}/	19.07	23.00	32.53	32.5	65	23.0	92	19.07	0.00	260 x 1/4

Remark: if R. Millon's (1967) assesment that some of the principal measurements in Teotihuacán exhibit multiples of ca. 57 meters, it corresponds exactly to one fourth of 228.8 what is 57.2 i.e. 69 m.y.=d_{51} which forms the square with diagonals = 195 i.e. one fourth of the cycle 780 days.

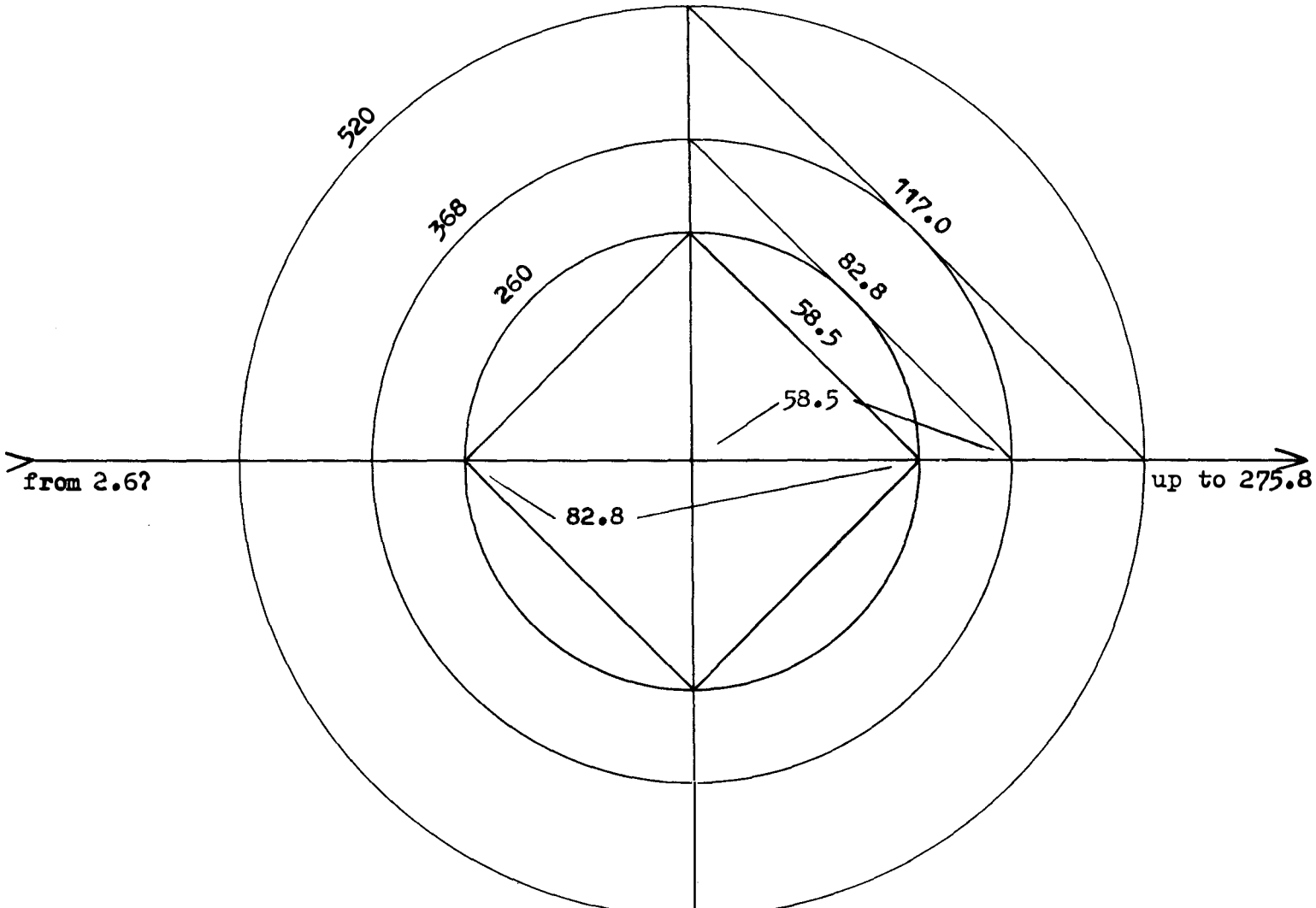

Fig. 1: A simple geometric device for calculating calendaric cycles.