THE D&M PYRAMID OF CYDONIA – THE SIBLING OF THE GREAT PYRAMID OF GIZA?

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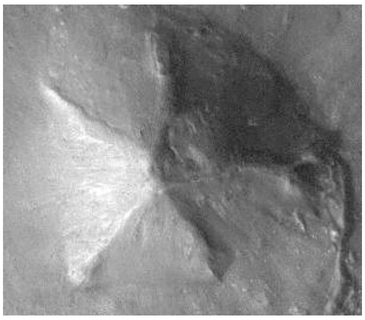


A system of close numerical correlations is revealed between the Martian ***D&M Pyramid*** of Cydonia and the ***Great Pyramid*** of Giza which, in a system and within the accuracy of the source data, show us new numerically exact bonds between these two objects – in their geographical positions and dimensions – which are expressed in the same mathematical constants and ratios, and even use the same linear measure – the Egyptian cubit.

Key words: Great Pyramid of Giza, Egypt; D&M Pyramid of Cydonia, Mars; Mathematical constants: Φ, π, e, and their ratios; Great Pyramid ratio γ, tetrahedral constant t.

1. Introduction

Since the discovery of this formation in 1976 the **D&M Pyramid** (named after DiPietro and Molenaar who revealed it) continues to present probably the most attractive artefact among those that were found on other planets. In brief, the situation with this object is described as follows (Emphasize added) [1]

"Since an unmanned NASA Viking spacecraft successfully photographed the surface of the planet Mars in 1976 – a mystery has loomed . . . a mile-long, 1500-ft high humanoid "face" discovered in a northern Martian desert called "Cydonia." In its immediate vicinity have been identified other "anthropomorphic objects": most notable, several "pyramids" ...

Torun (1988) made key mathematical discoveries within a major geometric "Rosetta Stone" located at Cydonia – a unique, five-sided, symmetrical "pyramid": the so-called "D&M." He elegantly "decoded" a series of internal angles found within the pyramid, and discovered the two mathematical constants, "e" and "pi," encoded several times and in several different ways (via angle-ratios, trignometric functions, and radian measure) – to three significant-figure accuracy …

Subsequently, using geodetic data from "The 1982 Control Network of Mars" (Davies and Katayama, 1983), up-dated by Davies for Cydonia (1988), Hoagland discovered (op cit) that the critical object Torun had "decoded" – the Pyramid – lies precisely astride the key geodetic Martian latitude expressive of the ArcTangent equivalent of "e/pi": 40.87 degrees = ArcTan 0.865! …

Following these discoveries, the authors (this paper) began the current systematic inquiry into whether there was indeed a "message" at Cydonia: encoded geometrically in terms of specific placement of specific objects, by means of redundant mathematical ratios derived by dividing the observed angular relationships into one another …

Subsequent survey of solar system geodetic maps – made from spacecraft photography of the past thirty years, encompassing planetary surfaces from Lunar Orbiter images of the Far side of the Moon, to Voyager 2 close-ups of Uranus, its satellites, and now (at this writing) the planet Neptune – revealed a remarkable (and currently inexplicable) geophysical phenomenon:

The majority of "active centres" on these objects – from the greatest shield volcanos on the "terrestrial planets" (including equivalent features on their most anomalously active satellites!), to the enormous atmospheric disturbances seen on some "gas giants" ("The Great Red Spots" of Jupiter and, now, of Neptune) seem preferentially to occur very close to ***19.5 degrees*** N. or S., irrespective of other planetary factors – mass, rotation rate, obliquity to their respective orbits, etc. … {*SS: to this end, See* [2]}"

Geomorphological and geometrical analysis of the D&M Pyramid [3] shows (Emphasize added):

"This investigation of the ***D&M Pyramid*** reveals a ***morphology*** that is ***inconsistent*** with the ***surrounding geology***. The geomorphological processes observed to exist on Mars not only fail to provide a potential mechanism for the D&M Pyramid's formation, but seem to preclude its very existence. Analysis of the object's geometry, and its alignment with other anomalous landforms, reveal intricate relationships that are numerous and logical, and are suggestive of highly sophisticated design. …

The same techniques used for most of this century in air photo interpretation show that the D&M Pyramid may be ***artificial***, or may be a ***natural landform modified by intelligence***. The true nature of this object can be resolved by re-imaging the Cydonia region to obtain high-resolution imagery of the D&M Pyramid and the other enigmatic landforms nearby. The issue of possible ruins at Cydonia is thus the only question involving extraterrestrial intelligence that can be easily resolved with known scientific means."

All these "non-random" characteristics of the D&M Pyramid provoke us to continue analysis of its geometrical and geographical properties; this automatically presumes advancing a ***hypothesis*** that the D&M Pyramid is an artificial structure, or rather a ***natural landform modified by intelligence***, since otherwise a reconstruction the D&M's design makes no sense. The latter formulation is probably more accurate due to a huge size of the D&M and observed irregularities in its design; the more so since the faces show greater liability to erosion than the edges: this may mean that the edges were somehow reinforced.

In both of these cases there exists no other alternative than to imply that the D&M's design had followed some plan. If so, it is naturally to suggest that – as in the case with the Great Pyramid of Giza (GP) – the ***Martian geographical mile*** and ***basic side*** (when taken for the ***intrinsic units of length***) specify – in a system of absolute values and dimensionless ratios – other exterior parameters of both this object and Mars itself, or take the values of primal ***unit of angular measure***, or ***most important mathematical constants*** associated with the regular triangles corresponding to the D&M's floor plan elements.

In case of the Great Pyramid of Giza a series of Earth and Space parameters, as well as the most important mathematical constants are expressed with the use of *integers* presenting its horizontal and vertical dimensions in inches and cubits. However, only an approximate floor plan of the heavily eroded D&M Pyramid is at our disposal, and without a small enough unit of length. For these reasons in analysis of the exterior of the D&M Pyramid we use the following approach.

1. Firstly, for the primal ***unit of length*** being ***intrinsic*** to the ***D&M*** the length of the ***shortest side*** of this pyramid is taken, $a = 1$. Then, with the use of trigonometry and Torun's angles [3], the lengths of other quantities: sides, perimeter and area of the D&M are obtained. This approach allows us to parameterize the geometry of the D&M so that:

- with this intrinsic unit of length both the ***ratios*** and ***absolute*** **values** of parameters are ***meaningful***;

- for any *other unit of length* we firstly obtain the length a; then, the value p of any linear (or areal) parameter obtained for the case $a=1$ takes the value $p\times a$ ($p\times a^2$, respectively).

In parallel with these ***calculated*** values, we consider ***approximants*** for the edges presenting the primal D&M elements which are used for evaluating the derived quantities in the same manner. These are the numbers pertaining to the regular triangle ($\sqrt{3}/2$ and e/π), pentagon (Golden section Φ), and 45° right triangle ($\sqrt{2}$).

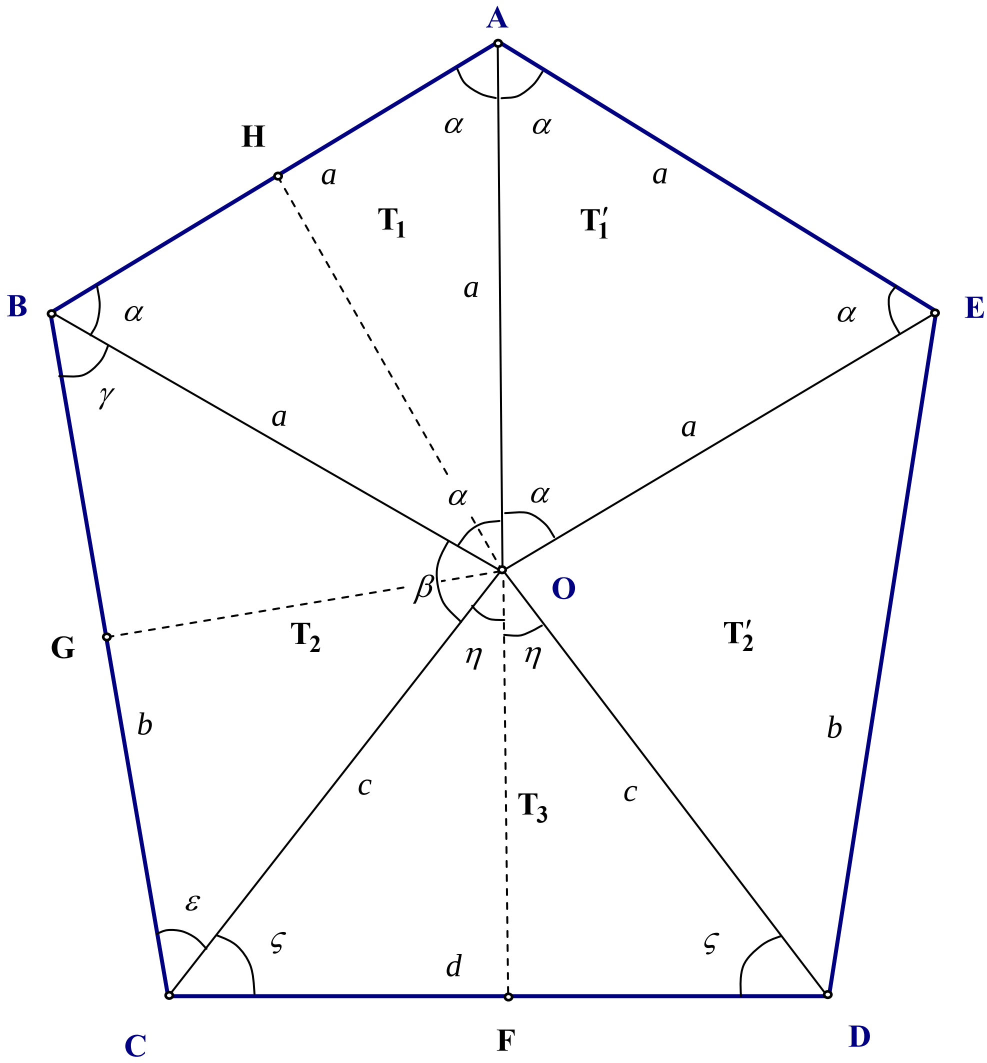
Then, if both approaches give the results which coincide within the source data error we may conclude that the primal and derived approximants are consistent and thus present the intrinsic feature of the D&M.

2. After then, for the ***unit of length*** being ***intrinsic*** for ***Mars*** a ***Martian geographical mile*** is taken. In this case, as with the Great Pyramid, both the ***ratios*** and ***absolute*** **values** of parameters are also ***meaningful***.

2. D&M Floor Plan Geometry. Basic Model

2.1. Linear parameters of the pyramid

Consider the Basic model of the D&M pyramid – the Torun's floor plan [3, A5.1], which is presented by the pentagon **P = ABCDE** (Fig. 1). As far as in the below analysis we consider both this pentagon and its fragmentation into the presented triangles, all segments shown in Fig. 1 are called sides.



$\alpha = 60.0°$ $\beta = 85.3°$ $\gamma = 49.6°$

$\varepsilon = 45.1°$ $\eta = 34.7°$ $\zeta = 55.3°$

Fig. 1. Basic Model of the D&M Pyramid [3]

Since the absolute error in the angles specified in [3] makes $\pm 0.2°$, the relative error of the source data does not exceed

$$\delta = \frac{0.2°}{34.7°} \approx 0.6\% \tag{1}$$

Within this model the pentagon **P** is symmetric along the axis **AO** where **O** is the projection of the pyramid apex. As a consequence, this means the pairwise equality of the following triangles

$$\mathbf{T_1} = \triangle\,\mathbf{AOB} \quad \text{and} \quad \mathbf{T_1'} = \triangle\,\mathbf{OAE}\,; \tag{2}$$

$$\mathbf{T_2} = \triangle\,\mathbf{OBC} \quad \text{and} \quad \mathbf{T_2'} = \triangle\,\mathbf{OED}\,. \tag{3}$$

The given angles uniquely define the form of the pentagon **P**; their properties were studied in [3]. However, its size remains indefinite until we fix up the length of one of its sides. Therefore, with the aim to investigate the linear properties of this object we have to define the length of its elements. For this, evaluate the lengths of its linear elements and areas as the functions of its shortest side **AO**, the length of which denote by *a*. Note, that this side also defines the axis of symmetry for the pentagon **P** and rhombus **OBAE**; besides, the value *a* is repeated five times among the considered sides.

Then, in compliance with the law of sines the lengths of the respective sides make

$$b = k_b \times a, \quad k_b = \frac{\sin \beta}{\sin \varepsilon}; \tag{4}$$

$$c = k_c \times a, \quad k_c = \frac{\sin \gamma}{\sin \varepsilon}; \tag{5}$$

$$d = k_d \times a, \quad k_d = \frac{\sin 2\eta}{\sin \zeta} \times k_c \tag{6}$$

The lengths h_a, h_b, h_d of altitudes **OH, OG, OF** to sides **AB, BC** and **CD** can be calculated as follows

$$h_a = m_a \times a, \quad m_a = \sin \alpha = \sqrt{3}/2 \approx 0.866\,025; \tag{7}$$

$$h_b = m_b \times a, \quad m_b = \sin \gamma; \tag{8}$$

$$h_d = m_d \times a, \quad m_d = k_c \times \sin \zeta \tag{9}$$

Then, the areas of the triangles $\mathbf{T_1}$, $\mathbf{T_2}$, $\mathbf{T_3}$ make

$$S_1 = a \times h_a / 2; \tag{10}$$

$$S_2 = b \times h_b / 2; \tag{11}$$

$$S_3 = d \times h_d / 2. \tag{12}$$

The lengths and areas obtained from (4) - (12) call the ***calculated*** values.

From (4) - (12) it is clear that the side lengths depend on *a* linearly, whereas the areas of the triangles – quadratically. This means that for any value of *a*, viz. for any unit of length, the ratios of linear objects and areas present the dimensionless invariants pertaining to the pentagon **P**, whereas the absolute values of these sides and areas may present significance only if the accepted unit of length reflects an intrinsic property of the D&M or Mars.

Thus, in the case of the Great Pyramid of Giza an analysis of its sides and height in cubits has led to obtaining of a series of Earth and GP parameters, whereas the ratios of these elements including the ratio of its side and Equator (e.g. See [4]) provide us with a series of other important parameters, whatever unit of length is used.

Similarly we may await that making use of the original Martian unit of length would benefit to disclosure of a series of important relations. And though we do not know it, even if it existed, we can suggest that the Architect of the D&M presumed that we shouldn't, and designed this pyramid so that a natural unit could be used. The most evident variants for the solutions to this problem are to choose for the unit of length (i) the smallest side of the Pyramid and/or (ii) the integer part of Martian Equator, as it is done on the Earth with the geographical mile. In these cases both the ***relative*** and ***absolute*** values are meaningful.

For these reasons we firstly consider the basic model with the ***internal measure*** where the length of the primal side **AO** is taken for the unit of length, viz. ***a = 1.*** Note, that in this case the lengths also present the length ratios of the respective sides to **AO**.

2.2. Properties of the Basic Model for the case of D&M's internal unit of length, $a = 1$

2.2.1. The Planar properties of the Basic Model

For this case the *calculated* values of sides, altitudes and areas obtained in compliance with (4) – (12) are summed up in col. 2 of Table 1. Their approximants (col. 3) are presented together with their numerical values (col. 4) pertaining to the respective equilateral triangle ($\sqrt{3}/2$), 45° right triangle ($\sqrt{2}$) and regular pentagon's central isosceles (Φ), together with comparison errors (col. 5). In parallel with the value $\sqrt{3}/2$ its approximant – the DM-ratio e/π – is considered. The area approximants are obtained through (10) – (12) with the use of the side and altitude approximants.

Table 1. The Linear properties of the Basic Model for the case of internal measure ($a = 1$)

Quantity	Internal measure	Approximant symbolic	Approximant numerical	Error	Note
1	2	3	4	5	6
a	1	**1**		*exactly*	Side **AB**
b	1.4070046	$\sqrt{2}$	1.414 214	*0.5 %*	Side **BC**
c	1.075103	$\sqrt{\frac{\pi}{e}}$ $\sqrt{\frac{2}{\sqrt{3}}}$	1.075 048 1.074570	*0.005 %* *0.05 %*	Side **OC**
d	1.224 068	$2\cdot\varphi$	1.236 068	*0.97 %*	Side **CD**
h_a	0.866 025	$\frac{\sqrt{3}}{2}$		*exactly*	
h_b	0.761 538	$\frac{\sqrt{2}}{3}\Phi$	0.762749	*0.16 %*	
h_d	0.883 890	$\sqrt{\frac{\pi}{e}-\varphi^2}$ $\sqrt{\frac{2}{\sqrt{3}}-\varphi^2}$	0.879 637 0.879053	*0.48 %* *0.55 %*	
S_1	0.433 013	$\frac{\sqrt{3}}{4}$ $(\mathbf{e/2\pi})$		*exactly*	Area of $\mathbf{T_1}$
S_2	0.535 744	$\mathbf{\Phi/3}$	0.539 345	*0.67 %*	Area of $\mathbf{T_2}$
S_3	0.540 971	$\varphi\sqrt{\frac{\pi}{e}-\varphi^2}$ $\varphi\sqrt{\frac{2}{\sqrt{3}}-\varphi^2}$ $\mathbf{\Phi/3}$	0.543646 0.543285 0.539 345	*0.45 %* *0.43 %* *0.3 %*	Area of $\mathbf{T_3}$ $S_2 = S_3;\ \delta < 1\%$
S	2.478 484	$\mathbf{e/\pi + \Phi}$ $\sqrt{3}/2 + \Phi$	2.483 290 2.484 059	*0.19 %* *0.22 %*	**DM base area** $S = S_P + S_H$
S_P	1.612 458	$\mathbf{\Phi}$	1.618 034	*0.35 %*	
S_H	0.866026	$\mathbf{e/\pi}$	0.865 256	*0.09%*	
P	6.038 077	$\mathbf{2(\sqrt{2}+\Phi)}$	6.064 495	*0.44 %*	**DM perimeter** $P = P_5 + P_6$
P_H	2	**2**		*exactly*	
P_P	4.038 078	$\mathbf{2(\sqrt{2}+\varphi)}$	4.064 495	0.6 %	$\varphi = \Phi - 1 = 1/\Phi$
P_P/P_H		$\sqrt{2}+\varphi$		0.6 %	

S_P - the area of the triangles T_2, T_2', T_3 presenting the regular pentagon's central isosceles;

S_H - the area of the triangles T_1, T_1' presenting the regular hexagon's equilateral triangles;

P_P - the length of sides **BC, CD, DE** of pentagon **P** presenting those of the regular pentagon;

P_H - the length of sides **AB, AE** of pentagon **P** presenting those of the regular hexagon.

Thus from this Table we see that the best ***approximants*** for the actual lengths of the sides of the primal pentagon **P** are expressed ***in units*** of those ***triangles*** which ***they represent***: the triangle $\mathbf{T_1}$ – in units 1 and $\sqrt{3}/2$ of equilateral triangle, the triangle $\mathbf{T_2}$ – in unit $\sqrt{2}$ of right-angled isosceles , and the triangle $\mathbf{T_3}$ - in unit φ of the regular pentagon. What is important, an average error in these approximations is less than that for the source data error (1); the only exception in the whole Table is side *d*.

What is also important the DM-ratio $g = e/\pi$ gives almost exact approximation for the internal side *c* being one order better than $\sqrt{3}/2$.

As far as the angles of the pentagon **P** differ significantly from 45°, 60°, and 72°, it is not strange that the altitudes and areas of these triangles differ from the regular ones; nevertheless, they are quite accurately approximated by the Golden section and of DM-ratio.

Amazingly, but the base area *S* and perimeter *P* are also expressed in simple relations and with the use of the same values – $\sqrt{2}$, g and Φ, as well as their parts pertaining to the regular hexagon and pentagon (engendering the five-fold symmetry); once again**, *within the tolerance of the source data error*.**

Therefore, alongside with their apparent presence in the floor plan of the D&M, the regular square, pentagon and hexagon are essentially incorporated in the mathematical design of the D&M Pyramid (Table 1) through the constants they define when triangulated: Φ, $\sqrt{2}$, and $\sqrt{3}/2$ or DM-ratio e/π. At this, use of the DM-ratio instead of $\sqrt{3}/2$ in the obtained approximants for the side lengths, perimeter and areas results in a significantly lesser error. For distinctness, call them the ***primal DM constants.***

2.2.2. The D&M floor plan as a cross-section of a planet

Draw a circle with the centre at **O** and radius *a* (Fig. 2) and liken it to a cross-section of a planet. Then, if a diameter **G*K*** presents the plane of Equator (side view), the central angle ψ presents (as in Fig. A1) the geographical latitude of the point **B**, and the central angle ξ – the geographical latitude of the point **E** as In a similar way, if a diameter defined by the straight line **H*O** is taken for the Equator, the central angle $\alpha/2 = 30°$ gives the geographical latitude of the point **B**, but in this new coordinate system. Here the segment **OG** is the altitude to the base **BC**, and **OH** – the altitude to the base **AB**. As these are altitudes, the respective angles ψ and ξ can easily be obtained: $\psi = 40.4°$**,** $\xi = 19.6°$**.**

Now, if we relate the triangle $\mathbf{T_1}$ to Earth, and triangle $\mathbf{T_2}$ (and the symmetric triangle T_2') – to Mars, we obtain that the altitude **OH**, as Equator of Earth, specifies the latitude $L_\alpha = 30°$ (exactly!), and the altitude **OG**, as Equator of Mars, specifies the latitude $L_\psi = 40.4°$. Besides, one more important latitude is specified by the vertex **E**: $L_t = 19.6°$. These are apart from the latitudes $L_{**} = (40.4° + 60°) - 90° = 10.4°$ (relative to the Mars equator) and $L_* = 90° - 19.6°$ = 70.4° (relative to the Earth equator; note that in this case **E** presents the ***North Pole***).

But ***within the accepted accuracy*** these are namely the latitudes of the Great Pyramids and the tetrahedral constant

Latitude of the ***Great Pyramid*** of Giza:	$L_{GP} = 29.9808° \cong L_\alpha \quad (\delta = 0.06\ \%)$;	(13)
Latitude of the ***D&M Pyramid*** of Cydonia:	$L_{DM} = 40.65° \cong L_\psi \quad (\delta = 0.6\ \%)$;	(14)
Latitude of the N_G (or ***tetrahedral***) ***constant***:	$L_t = 19.47° \cong L_t \quad (\delta = 0.6\ \%)$.	(15)

To this end it is also interesting to note the following. If *b* is taken for the unity of length (since the triangle $\mathbf{T_2}$ is likened to Mar's cross-section), the perimeter makes Φ^3 ($\delta = 1\%$). For $a = 1$ the altitude **OG** specifies the ratio of the Equatorial and Latitudinal lengths of 1 angular unit [A3], or geographical to latitudinal miles: $h_b = \lambda_D / \lambda_E$.

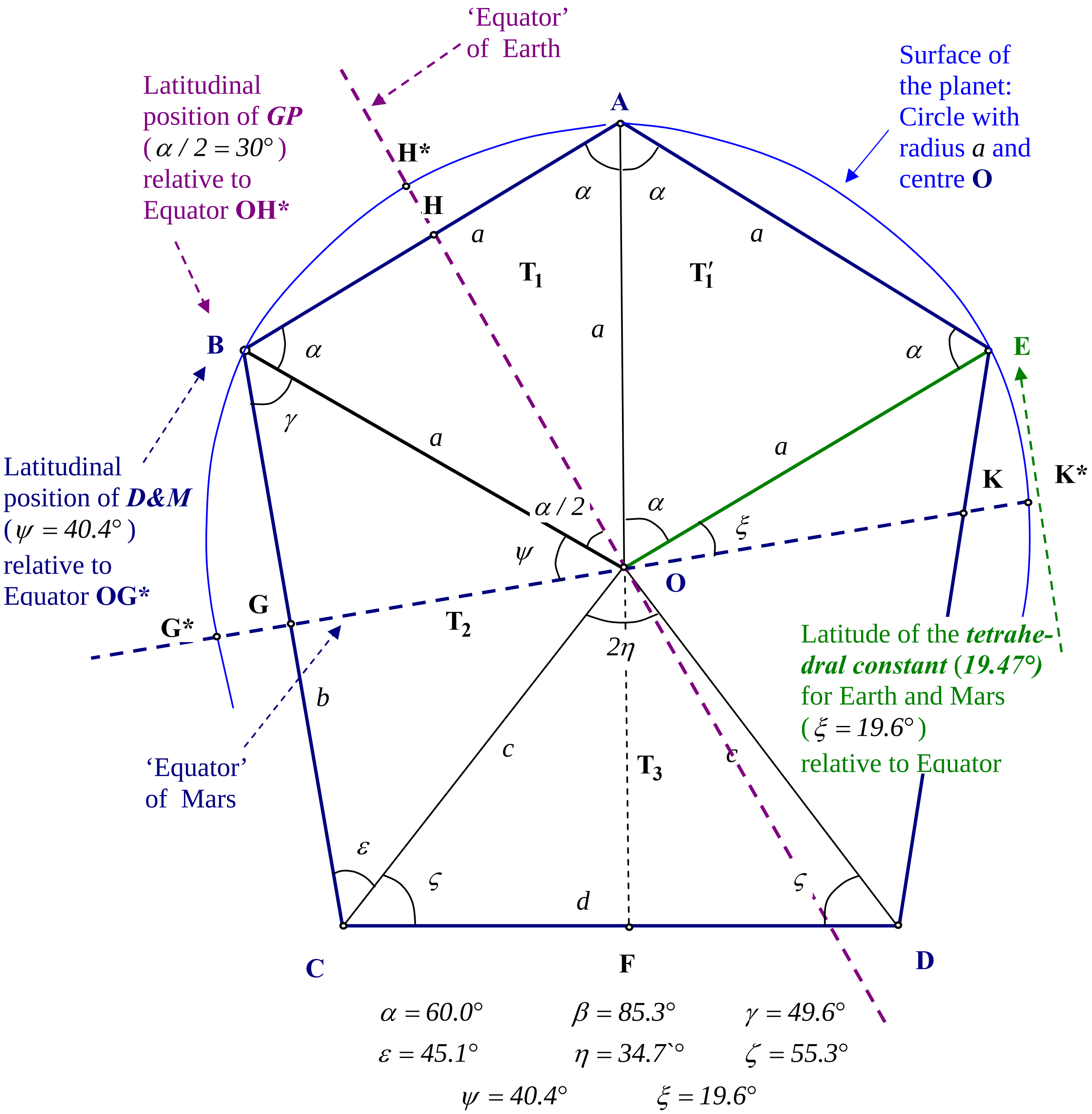


Fig. 2. D&M Floor plan as a cross-section of a planet

2.2.3. The Spatial properties of the Basic Model

Though we do not know the actual height of the D&M, we know its estimate (half a mile) and we may suppose that it was somehow associated with the base, as in the case of the Great pyramid of Giza.

To this end consider the following ***hypothesis***:

The height of the D&M was such that the face areas were equal.

Let l be the height of the G&M. Then the areas of the faces corresponding to the triangles $\mathbf{T_1}$, $\mathbf{T_2}$, $\mathbf{T_3}$ are as follows

$$Z_1 = \tfrac{1}{2} \times a \times \sqrt{h_a^2 + l^2}\ ; \qquad (16)$$

$$Z_2 = \tfrac{1}{2} \times b \times \sqrt{h_b^2 + l^2}\ ; \tag{17}$$

$$Z_3 = \tfrac{1}{2} \times d \times \sqrt{h_d^2 + l^2}\ . \tag{18}$$

The values of Table 1 show that only the areas Z_2 and Z_3 can be equal; this equality is reached at the height $l = k \cdot a$ that satisfies the equation

$$b \times \sqrt{h_b^2 + (ka)^2} = d \times \sqrt{h_d^2 + (ka)^2}\ ,$$

from which we obtain

$$1.407005\sqrt{0.761538^2 + k^2} = 1.224068\sqrt{0.88389^2 + k^2}\ ,$$

$$k = 0.216\ 228. \tag{19}$$

At this height the areas are as follows

$$Z_1 = 0.446\ 30, \quad Z_2 = 0.55692, \quad Z_3 = 0.55692; \tag{20}$$

$$Z_P = 1.670\ 768,\ Z_H = 0.892\ 606,\ Z = 2.563374; \tag{21}$$

where Z_P and Z_H are the areas of the faces adjacent to the sides **BC, CD, DE** and **AB, AE** which correspond to a regular pentagon and hexagon, respectively, and Z – is the total face area.

Then, though the absolute values of these areas are approximated by the above constants with a relatively large error, the ratio of the areas Z_P and Z_H is also expressed in the primal DM constants

$$Z \cong \Phi^2 \quad (\delta \approx 2\%),\ \ Z_H \cong \frac{e}{\pi} \quad (\delta \approx 3\%),\ \ Z_P \cong \Phi \quad (\delta \approx 3\%),$$

$$r_Z = \frac{Z_P}{Z_H} = 1.871787 \cong \frac{\Phi}{e/\pi} \quad (\delta = 0.1\%). \tag{22}$$

As far as the length of the side *a* is estimated [A5.2] as *1.15* mile, the height *l* in metres makes

$$l = k \cdot a \approx 0.216228 \times 1.15 \times 1609\ = 400\ \text{(m)} \tag{23}$$

which is close to the existing estimate (half a mile) of the D&M height.

2.3. Properties of the Basic Model with the actual length of sides

2.3.1. D&M-Earth direct connection.

With respect to [A5.2] the estimations of the lengths of the sides that correspond to ***a*** make (in meters) *1851*, ***1851***, and *1883*, and the lengths of the sides that correspond to ***c*** – two values by *2060* (m) each.

Though the values of the radial sides corresponding to *a* differ slightly, they virtually exactly present the Earth's geographical mile **1852** m as this value was established by the Int. Geographic Bureau in 1928 to present the average length of ***1 arc min of Meridian*** that changes from *1842.9* at Equator to *1861.6* – at the Pole ($l(\psi) = 1852.23 - 9.34 \times \cos(2\psi)$). At this, 1 arc min of Equator makes 1855.33 m.

2.3.2. D&M-GP direct connection

It is known that the perimeter of the Great Pyramid of Giza (about 921.43 m) makes ½ of the length of the geographical mile (the exact value of its length for the Giza latitude makes *1847.56* m), or ½ of arc min of Equatorial circumference of the Earth [4, 5]. From this we may conclude that the primal side length *a* of the D&M pyramid makes twice the perimeter of the Great Pyramid of Giza, or 8 times its side.

If so we may presume that applying the Egyptian cubit (with an integer multiple, e.g. 2 or 8) to the D&M may result, as in the case of the GP, in obtaining of some important geographical and/or geometrical information. And it is actually so; thus, consider the number *a* = 1.16479* (miles) the rounded-off value of which (***1.16***) coincides with the average for the existing estimates of primal side length *a* in miles. Then the perimeter of the D&M in cubits (*1* cubit = *0.524* m) makes

$$P_{EC} = \frac{6.038077 \times 1.16479 \times 1609.3}{0.524} = 21\ 600. \qquad (24)$$

Therefore, Within the source data accuracy the perimeter of the D&M pyramid in Egyptian cubits makes the number N_m = *21600* of arc minutes in a circle (*360*×*60* = *21600*).

2.3.3. Several more Geographical Certificates of the D&M pyramid

In Martian Equatorial miles [A3], or arc minutes, the primal side length *a* makes

$$a_E = 1.15 \times 1.6093 / \lambda_E = \frac{1.15 \times 1.6093}{0.98975} = 1.87 \text{ (arc min)} \cong \frac{\Phi}{e/\pi} \quad (\delta = 0.01\,\%) \qquad (25)$$

and coincides with the ratio of areas (22) of the pentagon and hexagon related faces.

So, once again it is expressed in the primal DM constants. Moreover, by dividing the length of Equator by this value we obtain

$$T_{PH} = \frac{360 \times 60}{a_E} = 11551. \qquad (26)$$

Within the accepted tolerance this value presents half of the **Perihelion cycle** of ***22 900*** Martian years [Table A1]. To this end it is important to note that, in contrast to Earth, this cycle is evidently more pronounced for Mars than the cycle of precession (***93 000 Martian years***) due to its duration and significant difference in Aphelion/Perihelion distances [6]

Perihelion distance: 1.381 AU $\cong 2 - \Phi \quad (0.04\%)$;

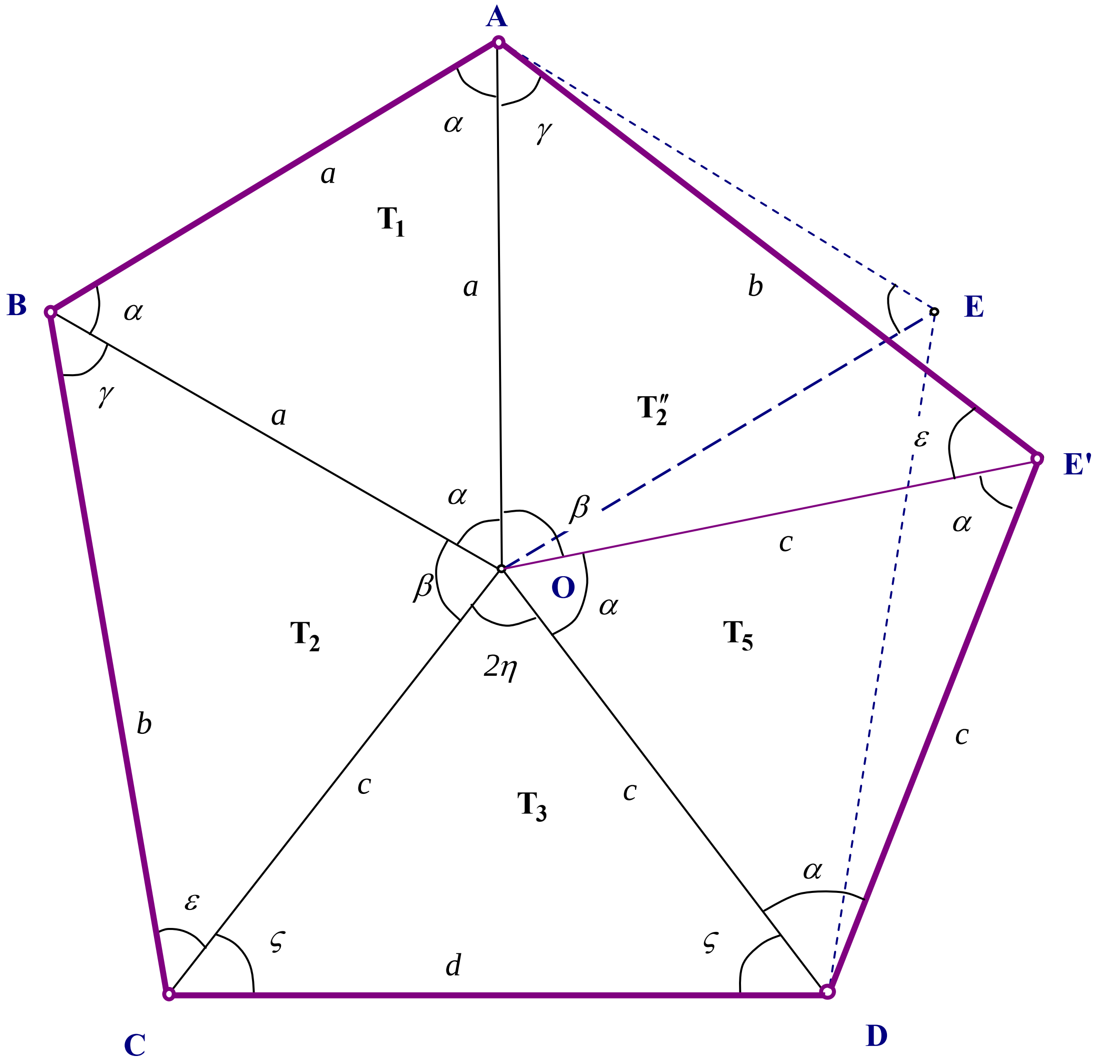
Aphelion distance: 1.666 AU $\cong \Phi \quad (3\%)$.

In D&M-latitudinal miles [A3], or D&M-latitudinal arc minutes, the primal side length *a* coincides with the area S (See Table 1), its approximant and also exactly approximated by 4φ.

$$a_{DM} = 1.15 \times 1.6093 / \lambda_D = \frac{1.15 \times 1.6093}{0.748578} = 2.4723 \text{ (arc min)} = \begin{cases} 2.478484 \quad (\delta = 0.2\%), \\ 4 \times \varphi \quad (\delta = 0.006\%), \\ \frac{e}{\pi} + \Phi, \quad (\delta = 0.4\%). \end{cases} \qquad (27)$$

3. D&M Floor Plan Geometry. SPP Model

The SPP Model [A5.3] differs from the Basic Model in new position **E'** of Vertex **E** (Fig. 3) such that the triangles $\mathbf{T_2}$ = **OBC** and $\mathbf{T_2''}$ = **OAE'** are equal; in this case the triangle **DOE' -** is equilateral.



$\alpha = 60.0°$ $\beta = 85.3°$ $\gamma = 49.6°$

$\varepsilon = 45.1°$ $\eta = 34.7`°$ $\zeta = 55.3°$

Fig. 3. SPP Model of the D&M Pyramid

(The side lengths *a, b, c, d* are the same as given in Table 1)

Under the assumption that the central angles make 90° and 60° [A5.3], this model increases the ***error*** up to ***6 %*** (respective to angle β) and to ***15.7 %*** (respective to angle 2η). Besides, it loses its symmetry and provides us with only two equal triangles – $\mathbf{T_2}$ and $\mathbf{T_2''}$. Though this model acknowledges the same principal properties associated with the basic side length and perimeter that were considered above, this loss of accuracy makes no sense in numerical study of its properties.

To this end we can but to repeat the following: "… the presence of angles ***approximately*** at ***30, 60***, and ***90 degrees*** suggests that the faces of the D&M can be described by isosceles and right triangular facets. However, ***more precise angular measurements may also confirm Torun's original model***." [7] (Emphasize added).

4. The Esoteric Symbols in the exterior of the D&M Pyramid

The above results describing the properties of the D&M Pyramid in terms of mathematical constants give extra evidences to E. Torun's conclusion [3] that: "the D&M Pyramid displays a complex interplay between five-fold and six-fold symmetry. Both symmetries are present simultaneously, with the front of the pyramid exhibiting six-fold symmetry, and the "ground level" of the pyramid yielding a 36 degree angle that is characteristic of five-fold symmetry"

However, although pentagon-like architectural artefacts are evidently very seldom on the Earth (not counting the Pentagon, USA), we cannot agree with the last statement of another conclusion [3]:

"This object {viz. D&M - SS}has been compared with the elaborate symbolic architecture of antiquity. While much of the geometry is the same utilized by Classical architects, it is important to note that the implementation is totally different. ***Nowhere in Earth history*** is ***this exact type of geometric*** **symbolism** ***to be found***." (Emphasize added).

Indeed, a ***symbol embodying*** a regular hexagon and pentagon, or rather the ***six-pointed*** and ***five-pointed stars*** presents an important artefact of ***different cultures***: the five-pointed star within the Double-Triangle is a well known symbol *in esotery* and was widely disseminated; you can find it in Lha-khangies (temples with Buddhist statues and images), in every Tzong-pa (Lamaist sanctuary) and frequently – above the relic repository, in Tibet; it was known to the Middle-Age cabbalists as well [8].

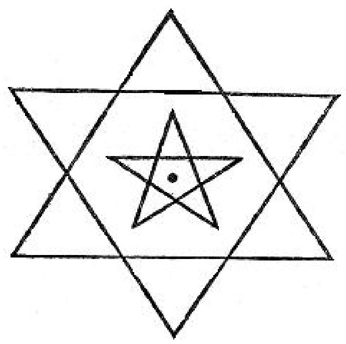


Fig. 4. The ancient symbol embodying six-pointed and five-pointed stars

The Six-pointed Star (Hexagon) is the symbol, in almost every religion, of the Logos as the first emanation. It is that of Vishnu in India (the Chakra, or wheel), and the glyph of the Tetragrammaton. It presents the "Macrocosm", whereas Pentagon or the five-pointed star represents a man, the Microcosm. So, the ***five-pointed star within the Double-triangle*** presents the ***Microcosm*** (a *man*) ***within*** the "***Macrocosm***" (*Time-Space*). [8, 9]

5. Conclusions

On the ground of quite accurate ***Torun's angular estimates*** (despite of an excessive erosion of the D&M Pyramid), and with the use of the ***internal unit of length*** ($a = 1$) it is shown that apart from a set of angular ratios [3] the D&M floor plan comprising the triangles which reflect those of the square and regular pentagon and hexagon with an angular error of up to *10* % can be accurately, to ***within the source data error*** of up to ***0.6%,*** described ***in terms of mathematical constants*** engendered by those ***regular polygons***, viz. by the ***Golden number*** $\boldsymbol{\Phi}$, $\sqrt{2}$, and $\sqrt{3}/2$ or its approximant – the DM-ratio e/π. This concerns both the lengths and areas of the D&M elements. At this, the Golden ratio Φ presents the basic element of this system of correlations. For distinctness, they are called the ***primal DM constants.***

Conversing of the existing estimates of the D&M radii into ***units of length*** being ***intrinsic*** to ***Mars – Martian geographical miles*** – reveals a system of direct correlations between this object and the Great ***Pyramid*** of ***Giza*** and ***Earth*** herself.

However, although ***this unit*** of length, when compared with the circumference of the ***Martian Equator*** defines the ***Perihelion cycle*** for ***Mars***, in the absence of a comparatively small "Martian unit of length" we have no grounds for obtaining the full scope of those great numbers which define the Martian periods (obliquity, precession, etc.) as it was possible with the Great Pyramid of Giza.

Nevertheless, the obtained results show that if the D&M Pyramid is formed with a touch of Intelligence, these intrinsic units of length – the ***length*** of the ***shortest side*** and the ***Martian geographical mile*** have reasonable chances to ***present the keys*** for other ***Martian mysteries***.

Besides, the evidences obtained in favour of ***one more constant – 19.5*** – which:

- as dimensionless constant N_{GP} is specified by the 10-fractal of the ***GP-ratio*** $\gamma = \pi/\Phi$ which defines the exterior design of the Great Pyramid of Giza [4];
- as an angle is specified by the "***tetrahedral constant***" $t = 19.5°$ [1]
- as time – by the critical period of ***GCC*** – *19.5* Julian years – the duration of coming of Sun into an exact conjunction with the intersection of the precessional Solstice and Galactic Equator [10].

To this end it is important to note, that namely these two numbers, N_{GP} = ***19.5 yr*** being associated with the duration T_{GA} ***= 22.5 yr*** of the Galactic alignment, define, but in degrees, the most common angle relationship of ***22.5°*** to ***19.5°*** in ***Cydonia*** [11]; the more so that this value ***19.5*** is treated in the analogous way, whether it defines angle, or time: it presents both the point values and intervals of latitudes $\pm$ ***19.5°*** and time $\pm$ ***19.5*** yr.

In particular, the following results of this study give evidences that ***the D&M Pyramid design*** *not only* ***integrates*** *a series* ***Mathematical and Martian constants****, but* ***a system of relations*** pertaining to ***Earth*** and ***Great Pyramid*** of Giza as well**.**

The Mathematical Portrait of the D&M

C1. Alongside with their apparent presence in the floor plan of the D&M, the regular square, pentagon and hexagon are essentially incorporated in the mathematical design of the D&M pyramid (Table 1) through the constants they define: Φ, $\sqrt{2}$, and $\sqrt{3}/2$ or DM-ratio e/π. At this, use of the DM-ratio instead of $\sqrt{3}/2$ in the obtained approximants for the side lengths, perimeter and areas results in a significantly lesser error.

C2. The ***areas*** of the ***D&M faces*** the bases of which correspond to the ***regular pentagon*** are ***equal*** just when the Pyramid apex is placed at the ***specific height***, and this height corresponds to the existing estimate of the altitude of the ***D&M Pyramid***. At this, the ratio r_z of the areas corresponding to the pentagonal and hexagonal faces is expressed through the same primal constants $r_Z \cong \dfrac{\Phi}{e/\pi} \quad (\delta = 0.1\,\%)$.

D&M's vs. GP's Latitudes

Hoagland discovered that the geodetic ***Martian latitude*** $L_{DM} = Arc\ tan\ {}^{e}\!/_{\pi} = 40.8681938\ldots$ almost exactly passes through the ***D&M*** Pyramid***.*** **Amazingly**, another trigonometrical function – Arc cosine of the same ratio – gives the latitude of the ***Great Pyramid*** of Giza $L_{GP} = Arc\ cos\ {}^{e}\!/_{\pi} = 30.08805\ldots$[12]

C3. Within the accepted accuracy ***the floor plan of the D&M*** pyramid taken as a ***cross-section*** of the ***Globe*** in a similar geometrical approach ***defines*** the co-ordinated ***latitudes*** of the ***Greatest Pyramids*** on the ***Earth*** (14) and ***Mars*** (15), alongside *with the **latitude*** (16) equal to N_G, or ***Tetrahedral Constant***.

D&M's vs. GP's Side Lengths

C4. The basic dimension of the ***D&M*** pyramid – the ***length a*** of the sides of the equilateral triangles – virtually ***coincides*** with the ***Terrestrial geographical mile***, that is with the length of ***1 arc min of Earth's Equator.***

C5. The primal linear parameter of the ***D&M*** pyramid – the ***side a*** – makes ***twice*** the ***perimeter*** of the ***Great Pyramid*** of Giza, or 8 times the length of its side.

Amazingly, but the ***Egyptian cubit*** also plays an important part in these correlations:

C6. Within the source data accuracy the ***perimeter*** of the ***D&M*** pyramid in ***Egyptian cubits*** makes the ***number of arc minutes*** in a ***circle***, $N_m = 21600$ *(viz.* $360 \times 60'$*)*

D&M vs. Mars Dimensions

C7. ***In Martian Equatorial miles*** [A3], or arc minutes, the length of the ***side a*** is also expressed in the ***DM constants,*** $a_E \cong \dfrac{\Phi}{e/\pi} \quad (\delta = 0.01\,\%)$ and ***coincides*** with the ***ratio of areas*** of the pentagon and hexagon related faces.

C8. Moreover, by ***dividing*** the ***length of Equator*** (in arc minutes) by the length of ***side*** a_E (in the same units) we obtain $T_{PH} = 11551$. Within the accepted tolerance this value presents half of the ***Perihelion cycle*** of ***22 900*** Martian years [Table A1].

To this end it is important to note that, in contrast to Earth, ***this cycle*** is evidently ***more pronounced*** for ***Mars*** than the cycle of precession (***93 000 Martian years***) due to its duration and significant difference in Aphelion/Perihelion distances [6]

C9. In ***D&M-latitudinal miles*** [A3] (or D&M-latitudinal arc minutes) the ***length*** a_{DM} of the ***side a coincides*** with the ***D&M base area*** S (See Table 1), its approximant and also exactly approximated by 4φ $(\delta = 0.006\,\%)$.

C10. The formerly obtained correlations for latitudes in degrees and the results of this study relative to length of 1 arc minute of Martian Equator and D&M latitude give us the grounds to resume that the conventional ***terrestrial grade measure*** (360°, 60') is ***appropriate*** to ***D&M Pyramid*** design and ***Mars*** as well.

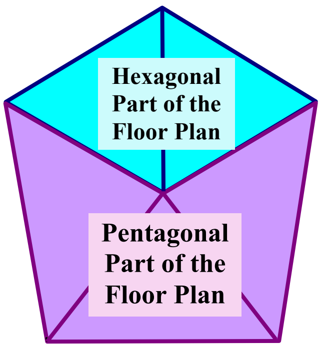
D&M and GP Faces

C11. The ***incredibly reflective faces*** is very important feature for both the ***D&M*** and the ***Great Pyramid*** of Giza; as the Great Pyramid was shining under the Sun, so "the mysterious "D&M" … literally "glow" in the pre-dawn light".

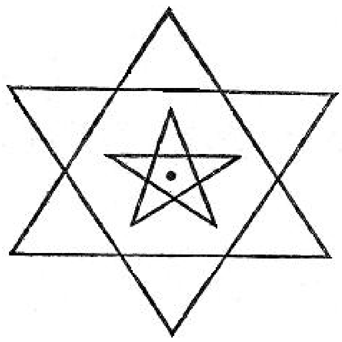
The ***concavity of the faces*** presents one more important feature being common to these two pyramids.
In details these aspects of the D&M are considered in [13] for D&M, and in [4] – for the GP.

D&M and the Symbol of Inserted Stars

C12. Although the pentagonal base of the D&M is not seen among the architectural artefacts, the ***hexa/pentagonal base of the D&M*** (Fig. 5.a) provides us with a "unitary" symbol of the universal concept which is reflected by the Terrestrials by the double ***symbol*** of the ***inserted stars*** (Fig. 5.b).



a)



b)

Fig. 5. The Martian and Terrestrial Geometrical presentation of the Concept "Microcosm" within the "Macrocosm"

a) The D&M Floor Plan as a unitary presentation of "Six" over "Five";
b) The Ancient Esoteric symbol embodying "Five" within "Six".

At the same time, as far as the new images of the D&M obtained by Mars Odyssey spacecraft have not allowed to increase the accuracy of Torun's Model (even though they provided us with better images of the most damaged Eastern side), it is still assumed that "more ***precise angular measurements may*** also ***confirm Torun's original model"*** [7]. (Emphasize added).

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***)** The references to the Appendix sections of this article are given by the Sec. number; e.g. [A2] – for Section A2.

November 5, 2007

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