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Research Article

Advances in Theoretical & Computational Physics

A Non-Regular Icosahedron Geometry Satellite Form, Mirror Invested Polyhedro Heliotrope, For Optical Tracking

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Working on relationships of three circles in common ratio [4/π or square root of the golden number] and drawing lines of related tangents, squares and triangles, viewed on the paper plan, a figure having the shape of a section [Hexagonal] similar to that of an Icosahedron or Dodecahedron. This gave me the idea of searching for an existing probable Polyhedron built upon this traced shape. In fact this Polyhedron was built[4x scale], whose geometry relates to the Icosahedron and the Dodecahedron. It is a non regular Icosahedron having 12 Isosceli triangles and 8 Equilateral triangles. Mirror triangles cut to size, invested the structure for the configuration of a "Polyhedroheliotrope"Satellite Optical Tracking application.

This work is part [mainly geometric configurations' presentation] of my published book :Treatise on Circle Generator Polyhedron Harmony and Disharmony Condition of Three Concentric Circles in Common Ratio, ISBN978 – 618 – 83169 – 0 - 4, National Library of Greece 04/05/2017 by Panagiotis Ch. Stefanides."Generator" refers to the geometric characteristics of this Solid found to be roots of the other Solid Polyhedra i.e. Platonic/Eucleidean Solids.

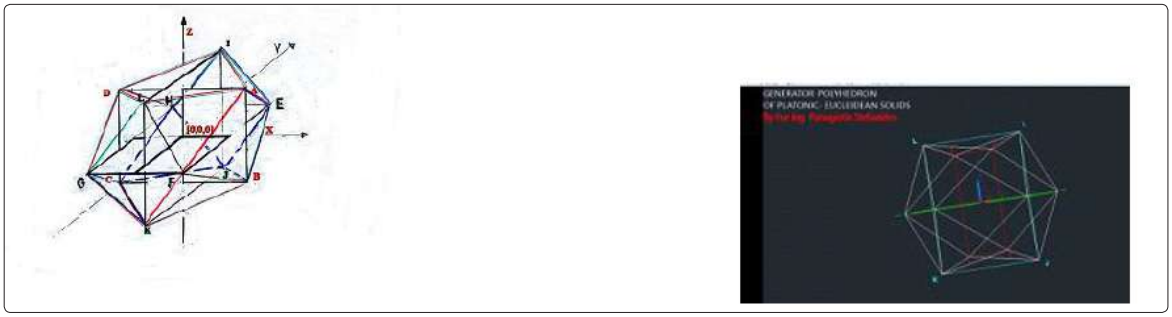

Figure 1: Polyhedron Parallelogramme Planes' Corners' Lines Joined and 3D AutoCAD Design Geometry and Vector Co-ordinates' Definition By Panagiotis Stefanides - AutoCad Computation By Dr. Giannis Kandylas

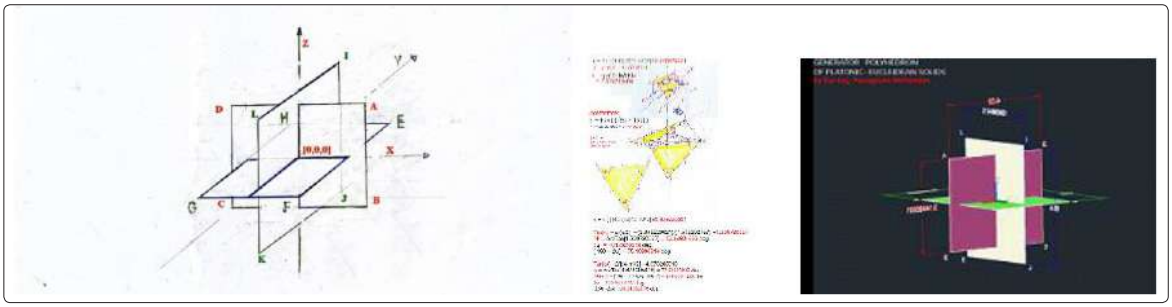

Figure 2: Skeleton Parallelogramme Planes' Co-ordinates' Definition and 3D AutoCAD Design Geometry and Vector Co-ordinates' Definition By Panagiotis Stefanides - AutoCad Computation By Dr. Giannis Kandylas

Figure 3: "Generator Polyhedron" Paper Structure and Mirrors' Invested

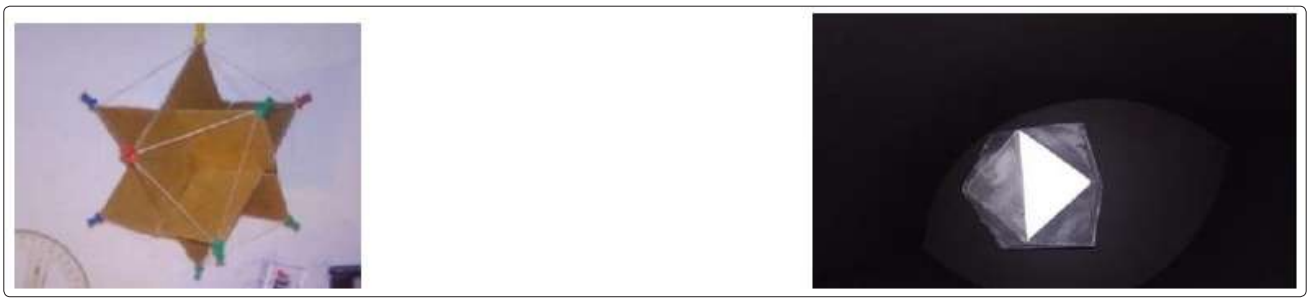

Figure 4: "Generator Polyhedron" Skeleton Paper Structure [left], Dark Chamber Simulation of Polyhedroheliotrope" Satellite Optical Tracking right]

2a: Polyhedron Geometry Based on a Special Triangle Involving the SQUARE ROOT OF THE GOLDEN SECTION [ArcTan (1.27201965..) = 51.8272 9238 Deg].

Triangle Interpretation by Panagiotis Stefanides from Plato's Timaeus.

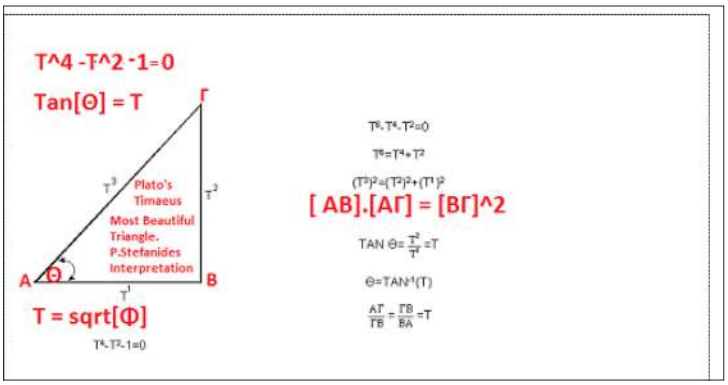

Figure 5a: Plato's Timaeus "Most Beautiful Triangle. Interpretation By Panagiotis Stefanides

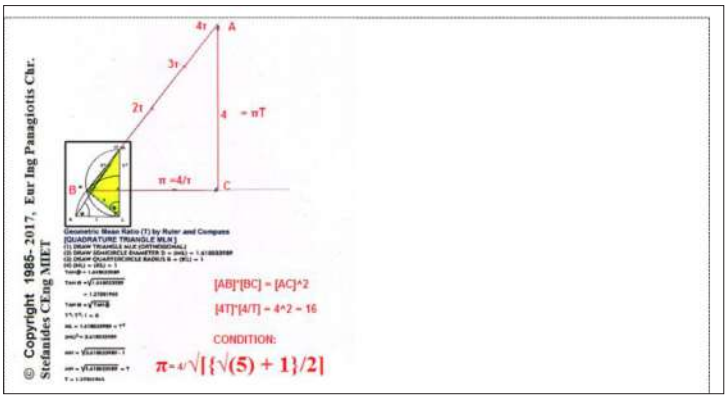

Figure 5b: Triangle Property Product of: [AB] By [BC] EQUALS [AC] SQUARED

2b. Deriving Geometrically Golden Root Triangle from the Golden Number [Φ] Triangle

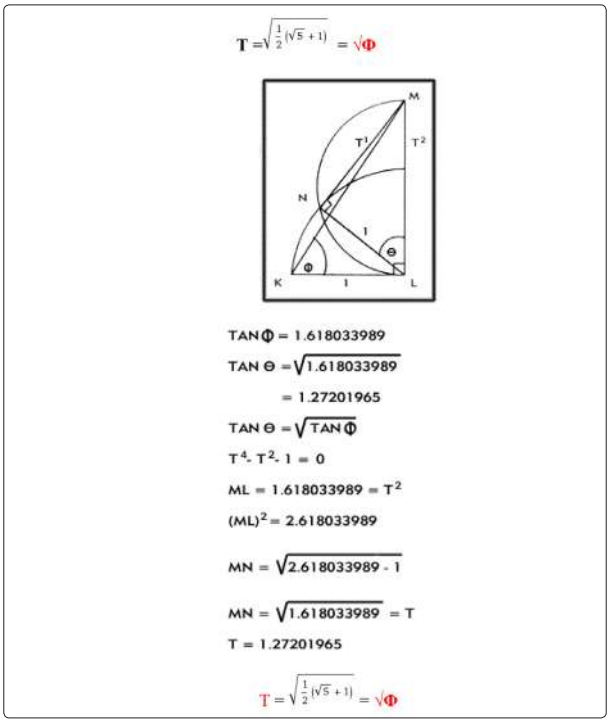

Figure 5c: Drawing by "Ruler and Compass" the Orthogonal Triangle Angle Θ of Tangent [T].

2c. Ruler and Compass Circle Squares Relationships [Quadrature of Circle]

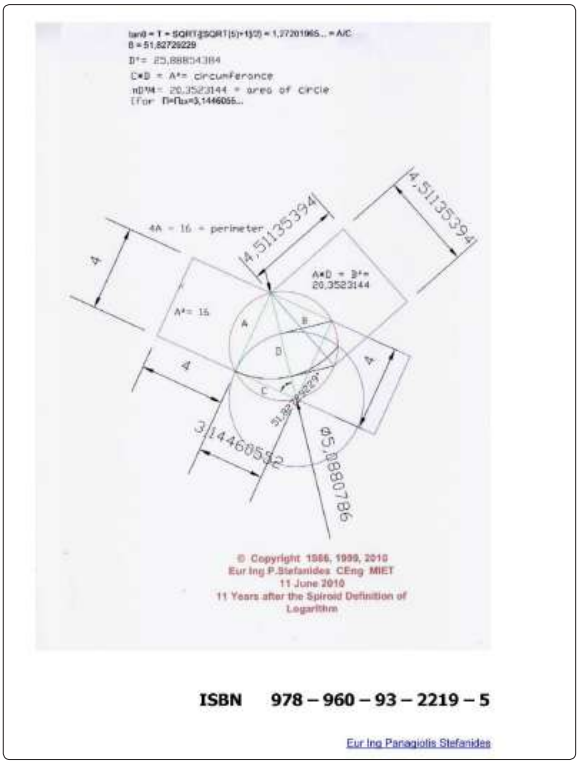

Figure 5d: "Ruler and Compass" Quadrature of Circle.

Sections and Stereometry Calculations

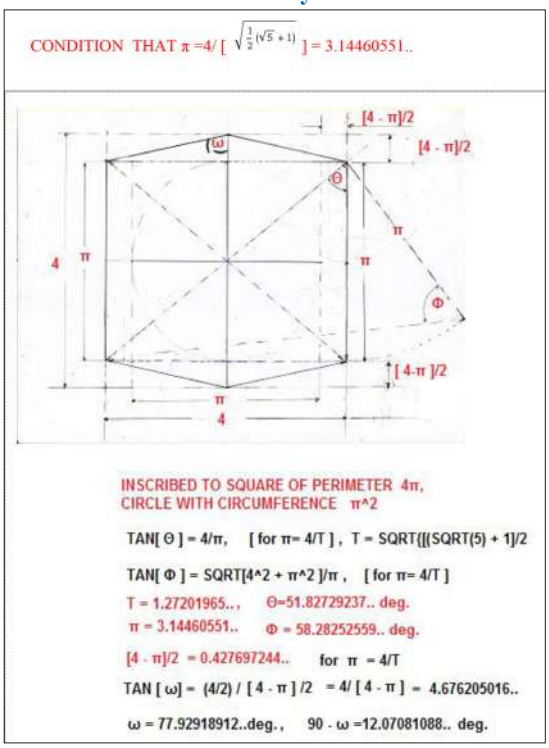

Figure 6: Polyhedron Section

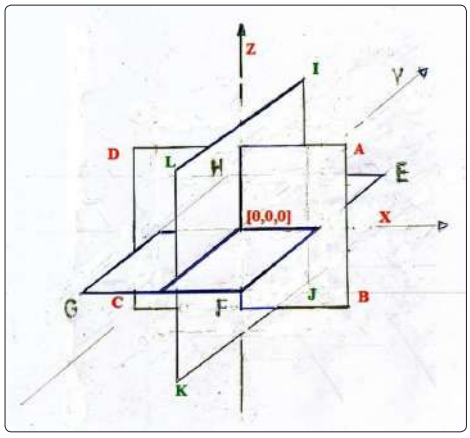

Figure 7a: Skeleton Structure on X, Y, Z Axes of Co-ordinates

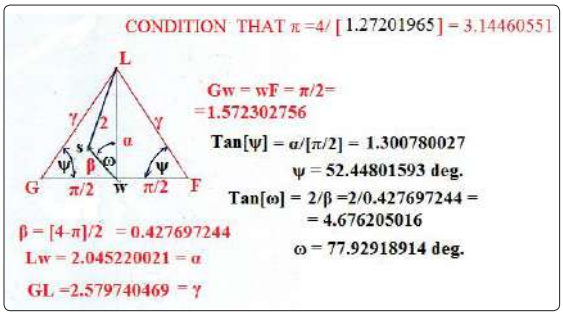

Figure 7b: Stereometry Calculations. Planes involved [EFGH] and [IJKL]. Triangles GLF and Orthogonal LSW with Orthogonal angle LSW. Line LS alongside LK of plane [IJKL]. SW orthogonal to line GF of plain [EFGH]

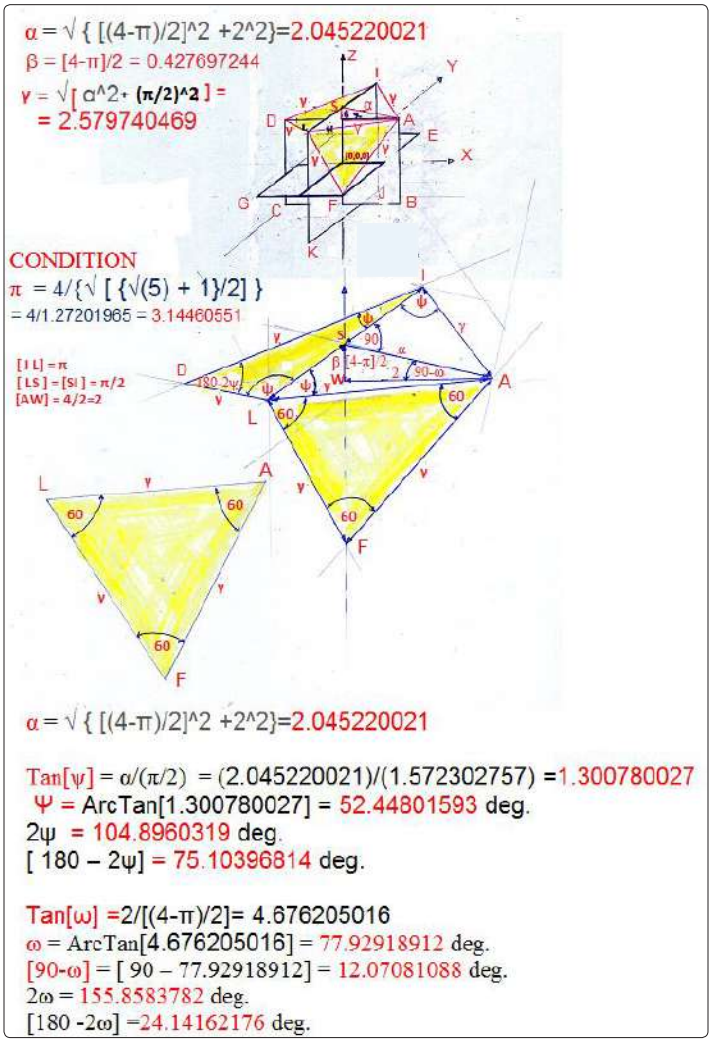

Figure 8: Stereometry Calculations. Planes involved [ABCD] and [IJKL]. Orthogonal triangle AMS with Orthogonal angle AWS. Line AW alongside AD of plane [ABCD]. SW orthogonal to line IL of plane [IJKL].

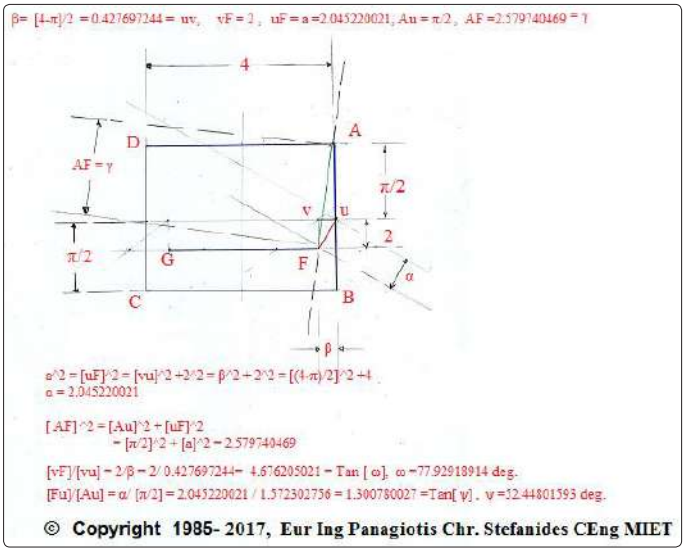

Figure 9: Stereometry Calculations. Planes involved [ABCD] and [EFGH]. Triangles Fvu with orthogonal angle uvF. Triangle side vF alongside EF of plane [EFGH]. Side vu orthogonal to line AB of plane [ABCD].

X, Y, Z Co-ordinates' Definition.

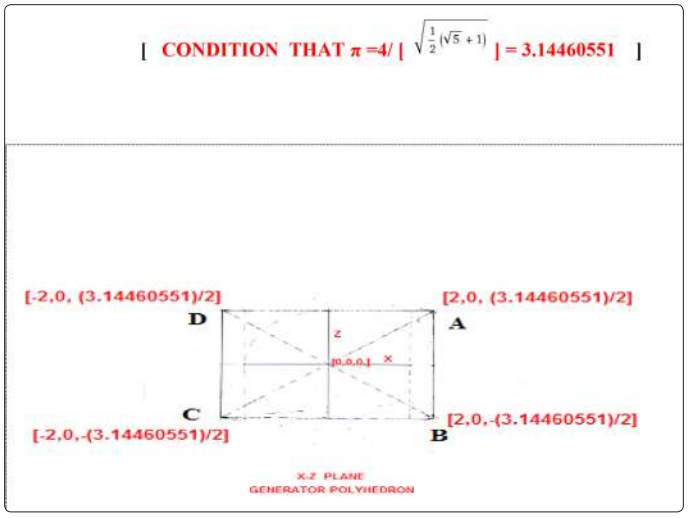

Figure 10: [ABCD] Plane Co-ordinates on X, Y, Z Axes

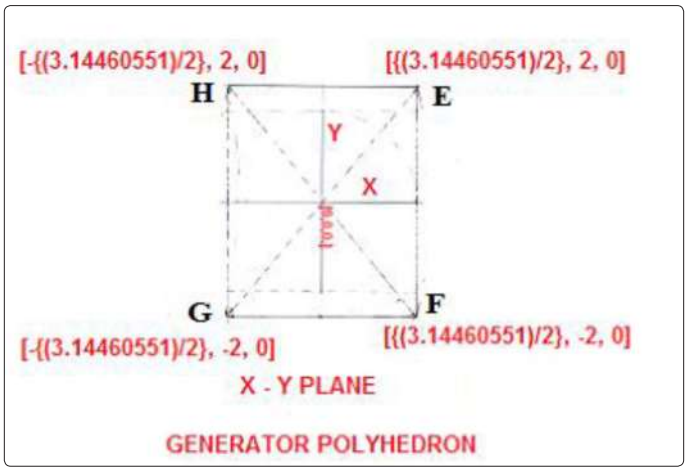

Figure 11: [EFGH] Plane Co-ordinates on X,Y, Z Axes

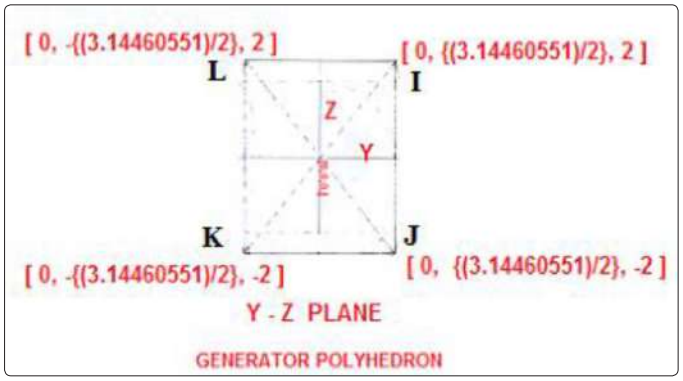

Figure 12: [IJKL] Plane Co-ordinates on X,Y, Z Axes

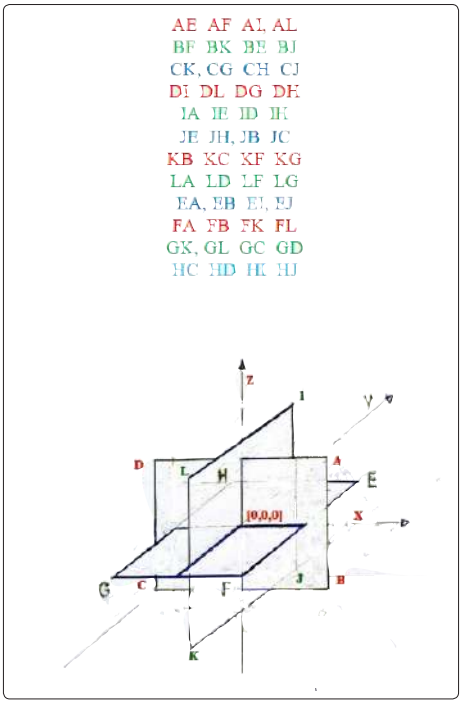

Figure 13: Planes on X, Y, Z Axes

6. Planes' Vertices Line Connections.

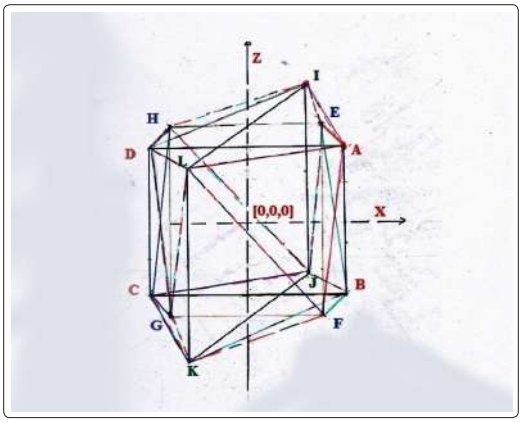

Figure 14: Planes' Vertices Lines' Connections

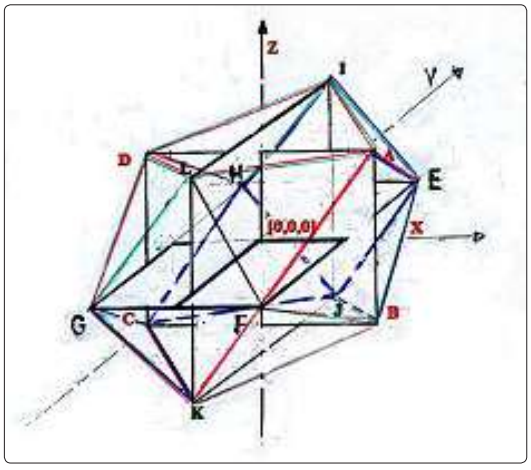

Figure 15: Generator Polyhedron Configuration on X, Y, Z Axes

7. Generator Polyhedron Configuration -. Planes on X,Y, Z Axes

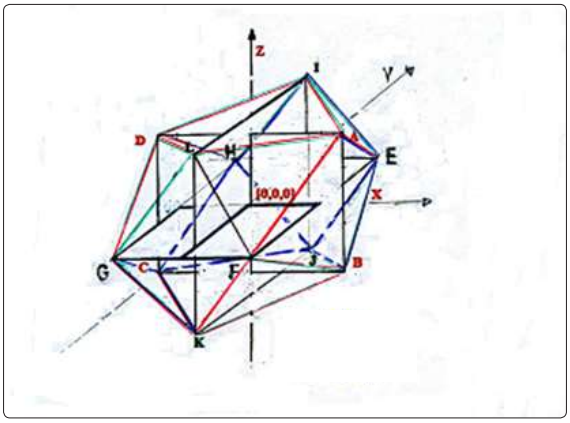

Figure 15: Generator Polyhedron Configuration on X, Y, Z Axes

8. Generator Polyhedron Structure.

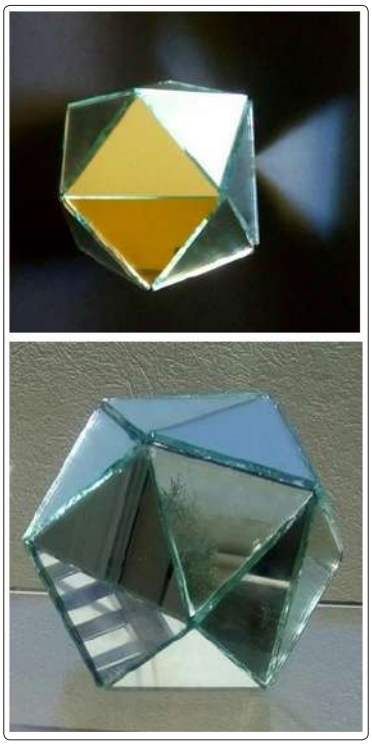

Figure 16: Generator Polyhedron STRUCTURE

8a.Important Discovery [2017].

From the geometry of the "**GENERATOR POLYHEDRON**", we find relationships:

3 parallelegrammes vertical to each-other. Sides' lengths, of each parallelogramme, are in ratio

of $4/\pi = 1.27201965$ [for $\pi = 3.14460551$ i.e.

4/ **SQRT(Golden Ratio)**]. [4/2]/ [π/2] =[π/2]/ x, x = {[π/2]^2}/[4/2] = 2.472135953/2 = 1.236067977 = 1/ [Sin (54)] = x.

Wolfram Alpha Checking Solutions

1/Sin(54) = 1.2360679774997896964091736687312762354406183596115257242708

Sum of angles : 36+36+36+72 = 180 Deg. Angle VGN = 3*36 = 108 Deg. 108/2= 54 Deg

r = [½]/Cos(54) = 0.850650808 , h = rSin(54) = 0.68819096
4/[sqrt{ [sqrt(5) +1]/2}] =
=3.144605511029693144278234343371835718092488231350892950659

{[3.144605511029693144278234343371835718092488231350892950659]^2}/8 =
=1.236067977499789696409173668731276235440618359611525724270

[1/8]*{4/[sqrt{ [sqrt(5) +1]/2}]}^2 = [1/sin(54)]

https://www.wolframalpha.com/t/?i=%5B1%2F8%5D*%7B4%2F%5Bsqrt%7B+%5Bsqrt(5)+%2B1%5D%2F2%7D%5D%7D%5E2+%3D+%5B+1%2Fsin(54)%5D

[1/8]*{4/[sqrt{ [sqrt(5) +1]/2}]}^2 = [3+sqrt(5)] / [2+ sqrt(5)]
https://www.wolframalpha.com/input/?i=%5B1%2F8%5D*%7B4%2F%5Bsqrt%7B+%5Bsqrt(5)+%2B1%5D%2F2%7D%5D%7D%5E2+%3D+%5B3%2Bsqrt(5)%5D+%2F+%5B+2%2B+sqrt(5)%5D

Relationships with the DODECAHEDRON PENTAGON Angular Structuring:

[1/8]*{4/[sqrt{ [sqrt(5) +1]/2}]}^2 = [1/sin(54)]
[1/8]*{4/[sqrt{ [sqrt(5) +1]/2}]}^2 = [3+sqrt(5)] / [2+ sqrt(5)]

236067977 = 1/ [Sin (54)] = x
This is directly Related to the Pentagon Angle of 54 Deg: 1/Sin(54) = 1.236067978
r/h = { [½]/Cos(54)}/ rSin(54) = 0.850650808 / 0.68819096 = 1.236067977
1/Sin(54) = 1.236067978

8b. Generator Polyhedron -Dodecahedron Pendagon Relationship. Figure 17. Generator Polyhedron- **Dodecahedron Pendagon Relationship.**

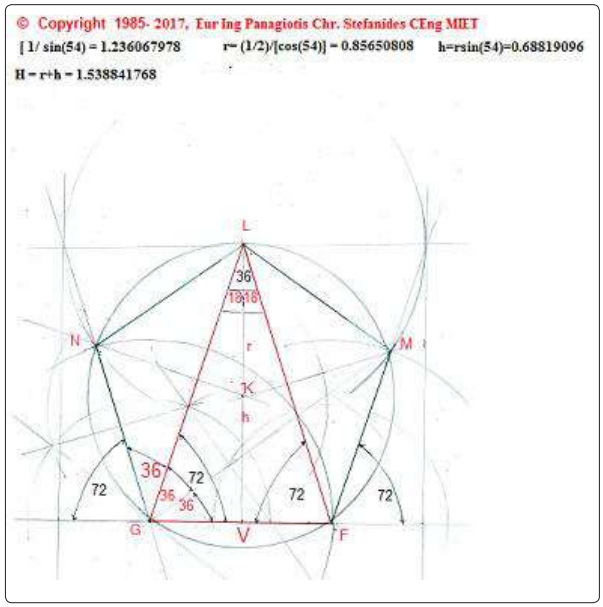

Figure 17: Generator Polyhedron- Dodecahedron Pendagon Relationship

r/h = r/rSin(54) =1/Sin(54) =1.236067978

9. Building Solids Geometry Photo Presentation

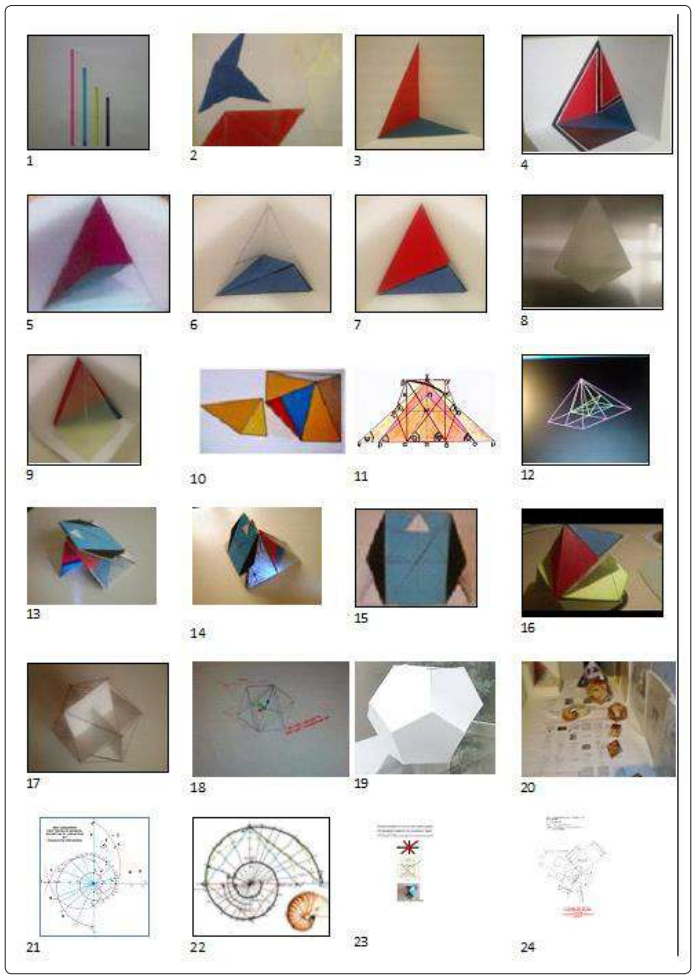

Figure 18: Geometry for, Building Solids Based on Plato's Timaeus Interpreted "Somatoides Most BeautifulBond".https://www.linkedin.com/pulse/blocks-structuring-five-polyhedra-panagiotis-panagiotis-stefanides/

10. Ontology.

Important Discovery from Plato's Epinomis [2018].
INTERPRETATION PROPOSAL of the "other genos" [γένος-genus] in PLATO'S EPINOMIS 981b
Searching, for many years, Plato's Timaeus Work, [and presenting it to conferences nationally and internationally], I searched in the Liddell and Scott reference for the word "γένος " found in Plato's "EPINOMIS" 981b.
There is no reference for this.
As I understand it concerns another genus of Polyhedron, a very Special one Ontologically, and this is very important, I understand :
" ....Στερεὰ δὲ σώματα λέγεσθαι χρὴ κατὰ τὸν εἰκότα λόγον πέντε, ἐξ ὧν κάλλιστα καὶ ἄριστά τις ἂν πλάττοι, τὸ δὲ ἄλλο γένος ἅπαν ἔχει μορφὴν μίαν· .."

Figure 19: THE FIVE SOLIDS and the OTHER GENOS… Plato's Epinomis 981 b.

PLATO'S EPINOMIS 981b
INTERPRETATION PROPOSAL OF THE OTHER GENOS [γένος- genus]
By Panagiotis Stefanides
…. THE FIVE SOLIDS and the OTHER GENOS…
ΕΠΙΝΟΜΙΣ ΠΛΑΤΩΝΟΣ 981 b
…. On the most likely account there are to be reckoned five solid bodies, from which one might fashion things fairest and best; but all the rest of creation has a single shape, for there is nothing that could come to be without a body and never possessing any color at all, except only that really most divine creature, the soul….
PLATOS EPINOMIS 981b…
http://www.perseus.tufts.edu/hopper/text…

Interpretation for γένος [shape - form Proposed By Panagiotis Stefanides is the:
GENERATOR POLYHEDRON -By Panagiotis Stefanides: https://www.linkedin.com/…/generator-polyhedron-platonic-e…/
https://www.linkedin.com/pulse/generator-polyhedron-panagiotis-stefanides-finalist-2017-stefanides/

……Στερεὰ δὲ σώματα λέγεσθαι χρὴ κατὰ τὸν εἰκότα λόγον πέντε, ἐξ ὧν κάλλιστα καὶ ἄριστά τις ἂν πλάττοι, τὸ δὲ ἄλλο γένος ἅπαν ἔχει μορφὴν μίαν· ……. http://remacle.org/…/philoso…/platon/cousin/epinomisgrec.htm "τὸ δὲ ἄλλο γένος ἅπαν ἔχει μορφὴν μίαν" **ΓΙΑ ΤΟ ΓΕΝΟΣ ΑΥΤΟ ΠΡΟΤΕΙΝΕΤΑΙ Η ΠΡΟΣΦΑΤΑ ΑΝΑΚΑΛΥΦΘΕΙΣΑ ΜΟΡΦΗ ΤΟΥ ΜΗ ΚΑΝΟΝΙΚΟΥ ΙΚΟΣΑΕΔΡΟΥ**:

"**GENERATOR POLYHEDRON OF PLATONIC-EUCLEIDEAN SOLIDS**" https://www.linkedin.com/pulse/generator-polyhedron-platonic-eucleidean-solids-panagiotis-stefanides/

Conclusions

Working on relationships of three circles in common ratio [4/π or square root of the golden number] and drawing lines of related tangents, squares and triangles, viewed on the paper plan, a figure having the shape of a section [Hexagonal] similar to that of an Icosahedron or Dodecahedron.

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In fact this Polyhedron was built [4x scale], whose geometry relates to the Icosahedron and the Dodecahedron.

It is a non-regular Icosahedron having 12 Isosceli triangles and 8 Equilateral triangles.

Mirror triangles cut to size, invested the structure for the configuration of a "*Polyhedroheliotrope*" Satellite Optical Tracking application. https://www.youtube.com/watch?v=uh6WyoDYJLk

References and Links

Reference to Related Theory Documentation

[A]. Treatise on Circle – Generator Polyhedron
Harmony and Disharmony
Condition of Three Concentric Circles
ISBN 978 – 618 – 83169 – 0 – 4
A1.http://www.stefanides.gr/pdf/2017/Treatise_on_Circle-Generator_Polyhedron.pdf

[B]. GOLDEN ROOT SYMMETRIES OF GEOMETRIC FORMS
ISBN 978 – 960 – 93 – 2219 – 5
B1. http://www.stefanides.gr/pdf/BOOK%20_GRSOGF.pdf

[C]. GEOMETRIC CONCEPTS IN PLATO
REVIEW PUBLICATION P.C.S. National Library of Athens
No: 5659 – 29 December 1997

C1. http://www.stefanides.gr/pdf/BOOK_1997.pdf

Event 2017 Reference:
Showcase and Finalist Award London 2017
IET INNOVATION AWARDS 2017 LONDON
https://www.linkedin.com/pulse/generator-polyhedron-panagiotis-stefanides-finalist-2017-stefanides/

Figure 20: Competition Finalist, Awarded "Highly Commended" in the 2017 IET Innovation Award, for the **Category "NAVIGATION AND SURVEILLANCE COMMUNICATIONS**", for the entry paper "Generator Polyhedron" .Top Event. Bottom Showcase exposed Photos

Links

1. https://www.linkedin.com/pulse/treatise-circle-harmony-disharmony-condition-3-common-stefanides 2. https://www.

researchgate.net/publication/316582864_IMPORTANT_DISCOVERY_-_PENTAGON_STRUCTURE_-RULER_AND_COMPASS-By_P_Stefanides
2. http://www.stefanides.gr/pdf/DIALOGO_2014_PANAGIOTIS_STEFANIDES.pdf 4. https://communities.theiet.org/files/13919 5. https://www.researchgate.net/publication/292775110_EXHIBITION_OF_MATHEMATICAL_ART_JMM16_by_Panagiotis_Stefanides
3. https://www.youtube.com/watch?v=uh6WyoDYJLk
4. https://www.youtube.com/watch?v=isuKkQM0LuE
5. https://www.linkedin.com/pulse/symmetry-festival-2006-budapest-hungary-paper-panagiotis-stefanides/
6. https://contest.techbriefs.com/2017/entries/sustainable-technologies/7865
7. https://contest.techbriefs.com/2017/entries/aerospace-and-defense/8160-0629-202240-polyhedroheliotrope-satellite-optical-tracking-by-panagiotis-stefanides
8. https://www.researchgate.net/publication/316667593_Treatise_on_Circle-Generator_Polyhedron_Harmony_and_Disharmony_Condition_of_Three_Concentric_Circles_in_Common_Ratio
9. https://www.researchgate.net/publication/315801180_GENERATOR_POLYHEDRON_OF_PLATONIC-EUCLEIDEAN_SOLIDS_By_Panagiotis_Stefanides_1A
10. http://www.stefanides.gr/Html/Proposed_Geometry_of_the_Platonic_Timaeus.html
11. http://www.stefanides.gr