

6837 ^E/m 6865

Stephen M. Phillips

- 6837 Article 26: How the seven musical scales relate to the disdyakis triacontahedron
42 p
- 6838 Article 27: How the disdyakis triacontahedron embodies the structural parameter 1680
of the $E8 \times E8$ heterotic superstring
28 p
- 6839 Article 28: Encoding of the roots of the superstring gauge symmetry group $E8$ in the
inner Tree of Life and the disdyakis triacontahedron
22 p
- 6840 Article 29: The triakis tetrahedron and the disdyakis triacontahedron embody the fine-
structure constant and the structural parameter of the heterotic superstring
15 p
- 6841 Article 30: The equivalence of the triakis tetrahedron, disdyakis triacontahedron and
Plato's 'Lambda tetractys'
15 p
- 6842 Article 31 : The musical nature of the polyhedral Tree of Life
38 p
- 6843 Article 32: Derivation of the bone and classical acupuncture compositions of the human
body and their relationship to the seven musical scales
32 p
- 6844 Article 33: The human axial skeleton is the trunk of the Tree of Life
16 p
- 6845 Article 34: The seven layers of vertices in the disdyakis triacontahedron encode the 206
bones of the human skeleton, the superstring symmetry groups $E8$ and $E8 \times E8$ and the
superstring structural parameters 168, 336, 840 & 1680
35 p
- 6846 Article 35: The Tree of Life nature of the Sri Yantra and some of its scientific meanings
23 p
- 6847 Article 36: The Sri Yantra-like pattern of the 15 layers of vertices in the disdyakis
triacontahedron and its scientific meaning
17 p
- 6848 Article 37: The seven octaves of the seven musical scales are a Tree of life pattern
mirrored in the disdyakis triacontahedron
36 p
- 6849 Article 38: The geometrization of the seven musical scales and its mathematical
implications
15 p
- 6850 Article 39: The correspondence between the inner Tree of Life, the Sri Yantra & the I
Ching diagram and their realization in the seven musical scales
17 p
- 6851 Article 40 (Part 1): The unification of all sacred geometries and its implication for
particle physics 40 p
- Article 40 (Part 2): The unification of all sacred geometries and its implication for
particle physics 45 p
- Article 40 (Part 3): The unification of all sacred geometries and its implication for
particle physics 49 p
- Article 40 (Part 4): The unification of all sacred geometries and its implication for
particle physics 51 p

- 6852 Article 41: The pyramidal form of the inner Tree of Life, its counterparts and its encoding of the human skeleton
18 p
- 6853 Article 42: Comparison of the eight Church musical modes and the human skeleton as holistic systems
22 p
- 6854 Article 43: The Tree of Life nature of the $\{3,7\}$ tessellation of the 168 automorphisms of the Klein quartic on the 3-torus
31 p
- 6855 Article 44: The polyhedral CTOL and its embedding of the 496 roots of the $E8 \times E8$ heterotic superstring gauge symmetry group
16 p
- 6856 Article 45: The 1680 circularly polarized oscillations in the $E8 \times E8$ heterotic superstring as 1680 harmonics of the Pythagorean musical scale
12 p
- 6857 Article 46: How sacred geometries encode the 64 codons of mRNA and the 64 anticodons of tRNA
38 p
- 6858 Article 47 (Part 1): How sacred geometries embody structural/dynamical parameters of the $E8 \times E8'$ heterotic superstring and the codon pattern of DNA
Article 47 (Part 2): How sacred geometries embody structural/dynamical parameters of the $E8 \times E8'$ heterotic superstring and the codon pattern of DNA
35 p + 31 p
- 6859 Article 48: The holistic nature of the first $(4+4)$ regular polygons of the inner Tree of Life
18 p
- 6860 Article 49: How some sacred geometries are equivalent maps of all levels of reality
32 p
- 6861 Article 50 (Part 1): The Golden Ratio, Fibonacci & Lucas numbers in sacred geometries
Article 50 (Part 2): The Golden Ratio, Fibonacci & Lucas numbers in sacred geometries
64 p + 66 p
- 6862 Article 51: The connection between Fibonacci numbers and the Pythagorean musical scale
12 p
- 6863 Article 52: How EHYEH, YAH & YAHWEH prescribe the root structure & dimension of $E8$
A breakthrough in relating sacred geometries to the superstring constituents of quarks
21 p
- 6864 Article 53: The 10-fold division within five sacred geometries & its manifestation in the ten whorls of the UPA, the subquark state of the $E8 \times E8$ heterotic superstring
- 6865 Mathematical meanings of the Names of God
Part 1 (PDF) 26 p
Part 2 (PDF) 53 p

How Sacred Geometries Embody Structural/Dynamical Parameters of the $E_8 \times E_8$ Heterotic Superstring & the Codon Pattern of DNA

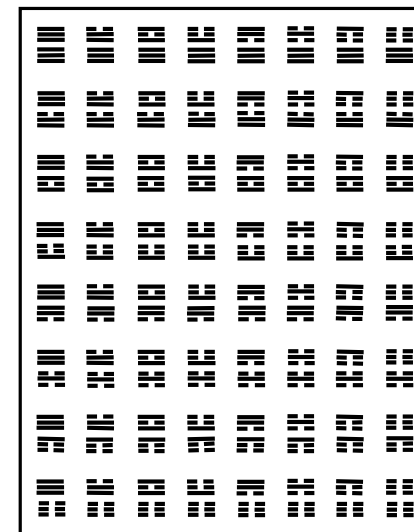
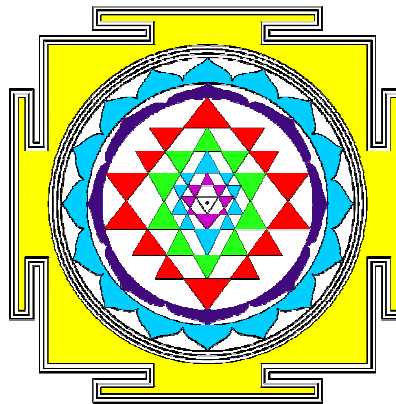
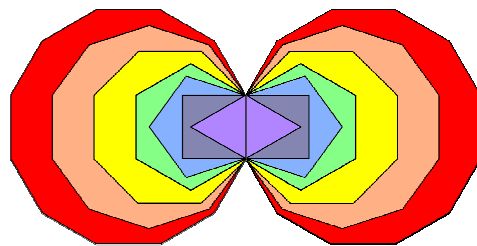
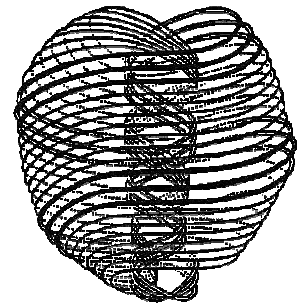
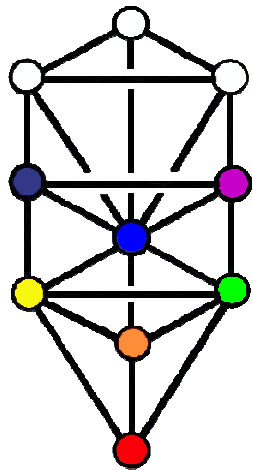
by

Stephen M. Phillips

Flat 3, 32 Surrey Road South. Bournemouth. Dorset BH4 9BP. England.

E-mail: stephen@smphillips.8m.com

Website: <http://smphillips.8m.com>



Page Index

Part 1

	Page
Table of number values of the Sephiroth in the four Worlds	3
The outer & inner forms of the Tree of Life	5
Embodiment of the fine-structure number 137 in the inner Tree of Life . .	7
Tree of Life basis of the $E_8 \times E_8$ ' heterotic superstring	9
Embodiment of the dimension 248 of E_8 in the square	11
The Gosset Polytope 4_{21}	13
Embodiment of the dimension 496 of $E_8 \times E_8$ ' in the octagon	15
Embodiment of the dimension 496 of $E_8 \times E_8$ ' in the inner Tree of Life . . .	17
Embodiment of the dimension 496 of $E_8 \times E_8$ ' in the last four polygons of the inner Tree of Life	19
The 'ultimate physical atom'	21
The 1680 yods in a 10-pointed star	23
1680 yods surround the centres of the 2nd-order tetractys sectors of two joined dodecagons	25
1680 vertices, edges & triangles surround the axis of the disdyakis triacontahedron	27
The dodecagon embodies the structural parameter 168 of the $E_8 \times E_8$ ' heterotic superstring	29
Two joined dodecagons embody the $E_8 \times E_8$ ' superstring structural parameter 336	31
The square embodies the superstring structural parameter 168	33
The Tetrad Principle determines the superstring structural parameter 168	35

Part 2

	Page
Table of number values of the Sephiroth in the four Worlds	1
The inner Tree of Life embodies the superstring structural parameter 3360	3
Equivalence of the inner Tree of Life & the I Ching table of 64 hexagrams	5
Equivalence of the I Ching table of 64 hexagrams & the Sri Yantra	7
Embodiment of the superstring structural parameter 1680 in the outer & inner forms of ten Overlapping Trees of Life.	9
Embodiment of 1680 in the first six polygons enfolded in ten overlapping Trees of Life	11
Table of codons, anticodons & the amino acids for which they code	13
The (192+192) yods in the first (6+6) polygons symbolize the (192+192) instances of the bases of the 64 codons & the 64 anticodons	15
How some sacred geometries embody the 60 non-stop/start codons & their anticodons	17
Equivalence of the lowest seven Trees of Life & the Sri Yantra	19
The Sri Yantra & the lowest seven Trees of Life encode the mRNA codons & the tRNA anticodons.	21
Correspondence between the inner Tree of Life, the I Ching table & the Sri Yantra	23
The sum of the 10 Godname numbers is the number of hexagonal yods in the 2-d Sri Yantra	25
The Sri Yantra embodies the superstring structural parameter 3360	27
The Platonic solids embody the fine-structure number 137 & the superstring parameters 248 & 168	29

	SEPHIRAH	GODNAME	ARCHANGEL	ORDER OF ANGELS	MUNDANE CHAKRA
1	Kether (Crown) 620	EHYEH (I am) 21	Metatron (Angel of the Presence) 314	Chaioth ha Qadesh (Holy Living Creatures) 833	Rashith ha Gilgalim First Swirlings. (Primum Mobile) 636
2	Chokmah (Wisdom) 73	YAHVEH, YAH (The Lord) 26, 15	Raziel (Herald of the Deity) 248	Auphanim (Wheels) 187	Masloth (The Sphere of the Zodiac) 140
3	Binah (Understanding) 67	ELOHIM (God in multiplicity) 50	Tzaphkiel (Contemplation of God) 311	Aralim (Thrones) 282	Shabathai Rest. (Saturn) 317
	Daath (Knowledge) 474				
4	Chesed (Mercy) 72	EL (God) 31	Tzadkiel (Benevolence of God) 62	Chasmalim (Shining Ones) 428	Tzadekh Righteousness. (Jupiter) 194
5	Geburah (Severity) 216	ELOHA (The Almighty) 36	Samael (Severity of God) 131	Seraphim (Fiery Serpents) 630	Madim Vehement Strength. (Mars) 95
6	Tiphareth (Beauty) 1081	YAHVEH ELOHIM (God the Creator) 76	Michael (Like unto God) 101	Malachim (Kings) 140	Shemesh The Solar Light. (Sun) 640
7	Netzach (Victory) 148	YAHVEH SABAOTH (Lord of Hosts) 129	Haniel (Grace of God) 97	Tarshishim or Elohim 1260	Nogah Glittering Splendour. (Venus) 64
8	Hod (Glory) 15	ELOHIM SABAOTH (God of Hosts) 153	Raphael (Divine Physician) 311	Beni Elohim (Sons of God) 112	Kokab The Stellar Light. (Mercury) 48
9	Yesod (Foundation) 80	SHADDAI EL CHAI (Almighty Living God) 49, 363	Gabriel (Strong Man of God) 246	Cherubim (The Strong) 272	Levanah The Lunar Flame. (Moon) 87
10	Malchuth (Kingdom) 496	ADONAI MELEKH (The Lord and King) 65, 155	Sandalphon (Manifest Messiah) 280	Ashim (Souls of Fire) 351	Cholem Yesodeth The Breaker of the Foundations. The Elements. (Earth) 168

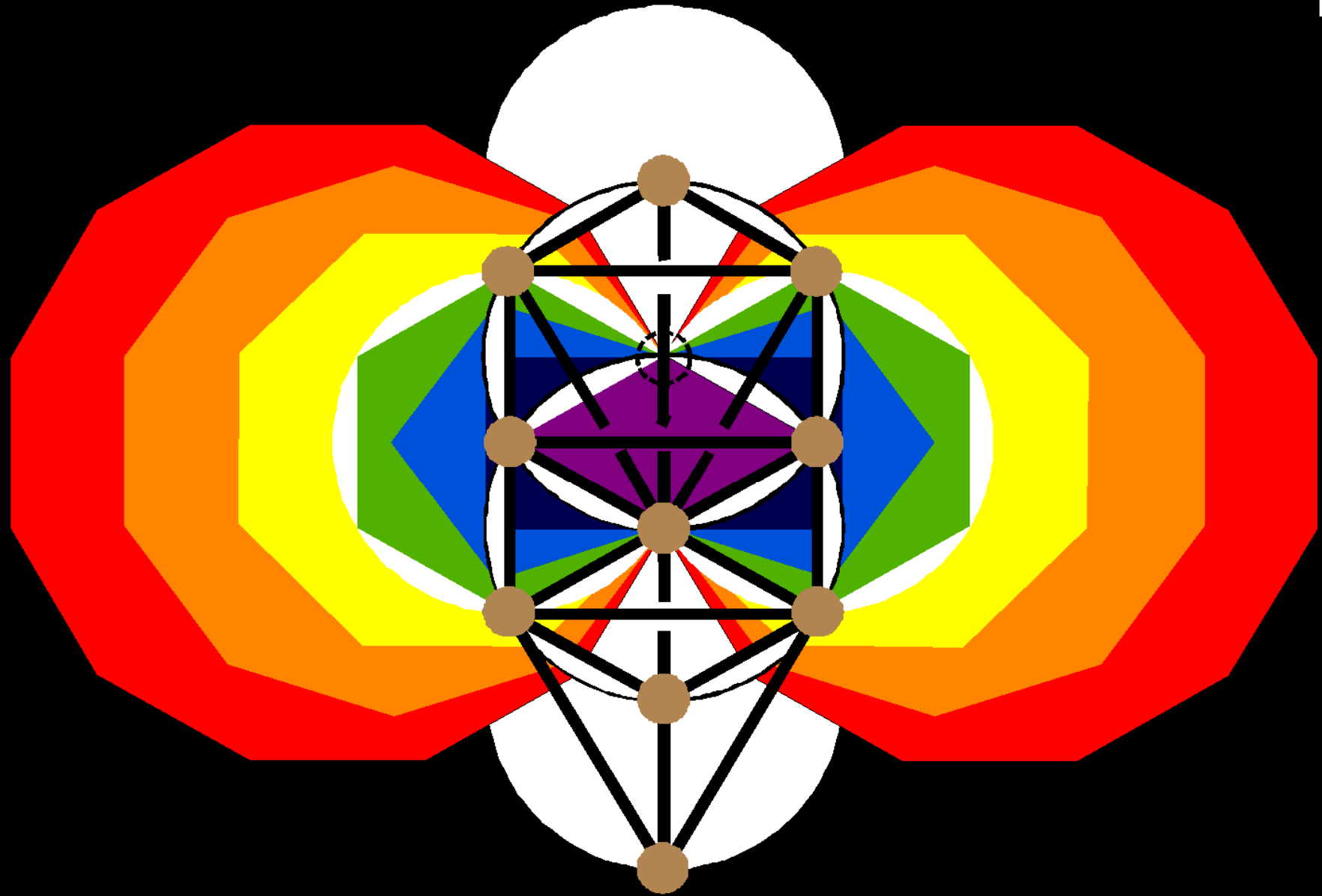
*The Sephiroth exist in the four Worlds of Atziluth, Beriah, Yetzirah and Assiyah. Corresponding to them are the Godnames, Archangels, Order of Angels and Mundane Chakras (their physical manifestation). This table gives their number values obtained by the ancient practice of gematria, wherein a number is assigned to each letter of the alphabet, thereby giving a number value to a word that is the sum of the numbers associated with its letters. When some of these numbers are referred to in the article, they will be written in **boldface**.*

Figure 1

As well as the Tree of Life known to Kabbalists for hundreds of years, which may be called the 'outer form' of this blueprint for holistic systems embodying the divine paradigm, there is an 'inner form' of this geometrical object. It consists of two sets of seven regular polygons:

triangle, square, pentagon, hexagon, octagon, decagon & dodecagon.

One set is the mirror image of the other. They are joined at the 'root edge.' The plane in which they lie passes through the vertical Pillars of Mercy and Severity but not through the central Pillar of Equilibrium, because the outer form of the Tree of Life is really three-dimensional, not two-dimensional, as usually depicted in books on Kabbalah. This means that the Sephiroth Chokmah, Chesed, Netzach, Binah, Geburah & Hod are located at corners of the triangles and hexagons but that Tiphareth and Daath do not coincide with the endpoints of the root edge — only their projections onto the plane of the polygons do.



THE OUTER & INNER FORMS OF THE TREE OF LIFE

Figure 2

The number 137 is embodied in the blueprint of the inner Tree of Life. Its $(7+7)$ enfolded polygons have 94 sectors. When each sector is divided into three tetractyses, 1370 yods are generated, i.e., the number of yods in 137 tetractyses. This proves beyond reasonable doubt that the number 137 is a basic structural parameter of the Tree of Life, in keeping with its central status in physics as a number which determines one of the fundamental constants of nature — the fine-structure constant, whose magnitude sets the scale of the energies of electrons in atoms.

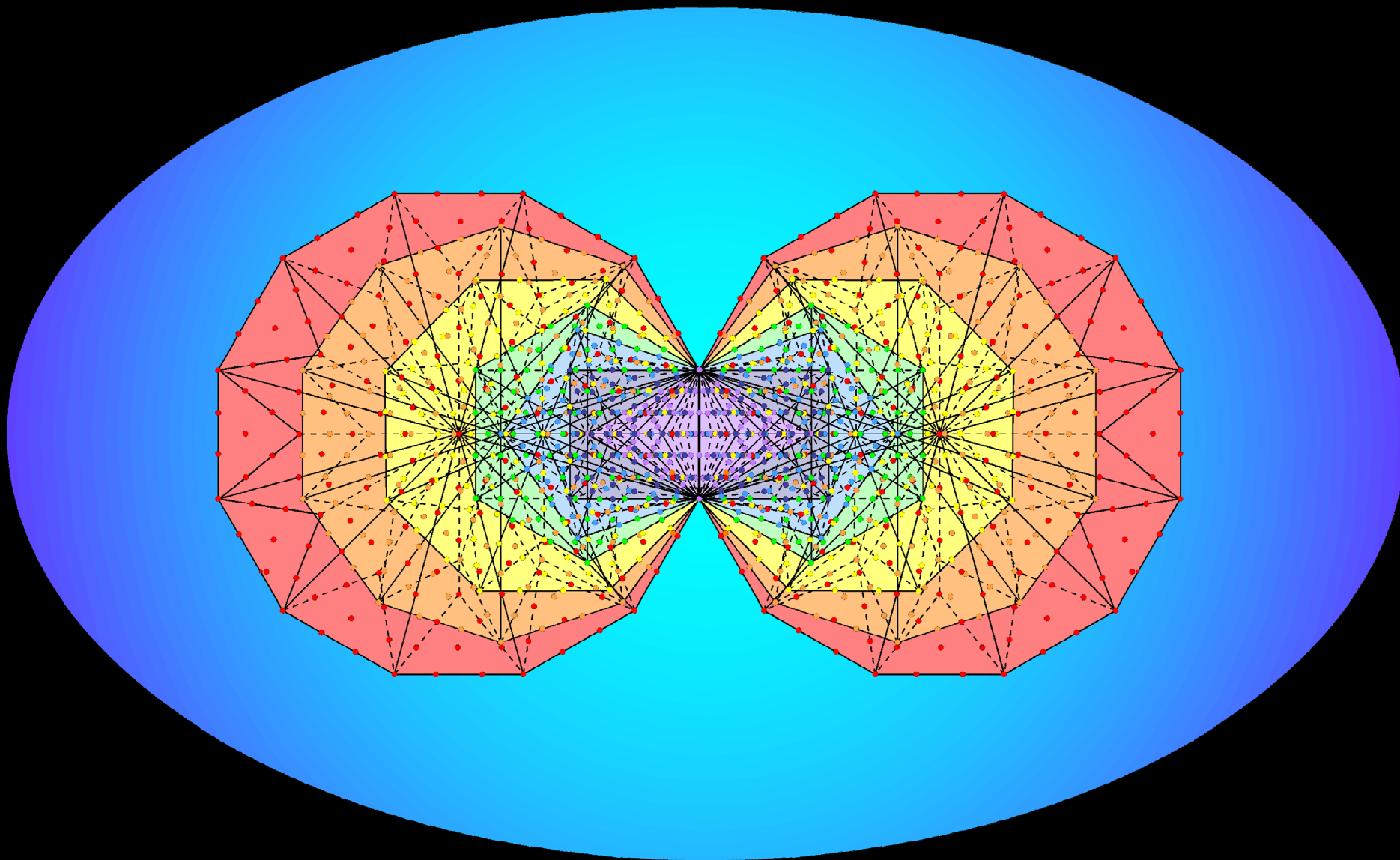
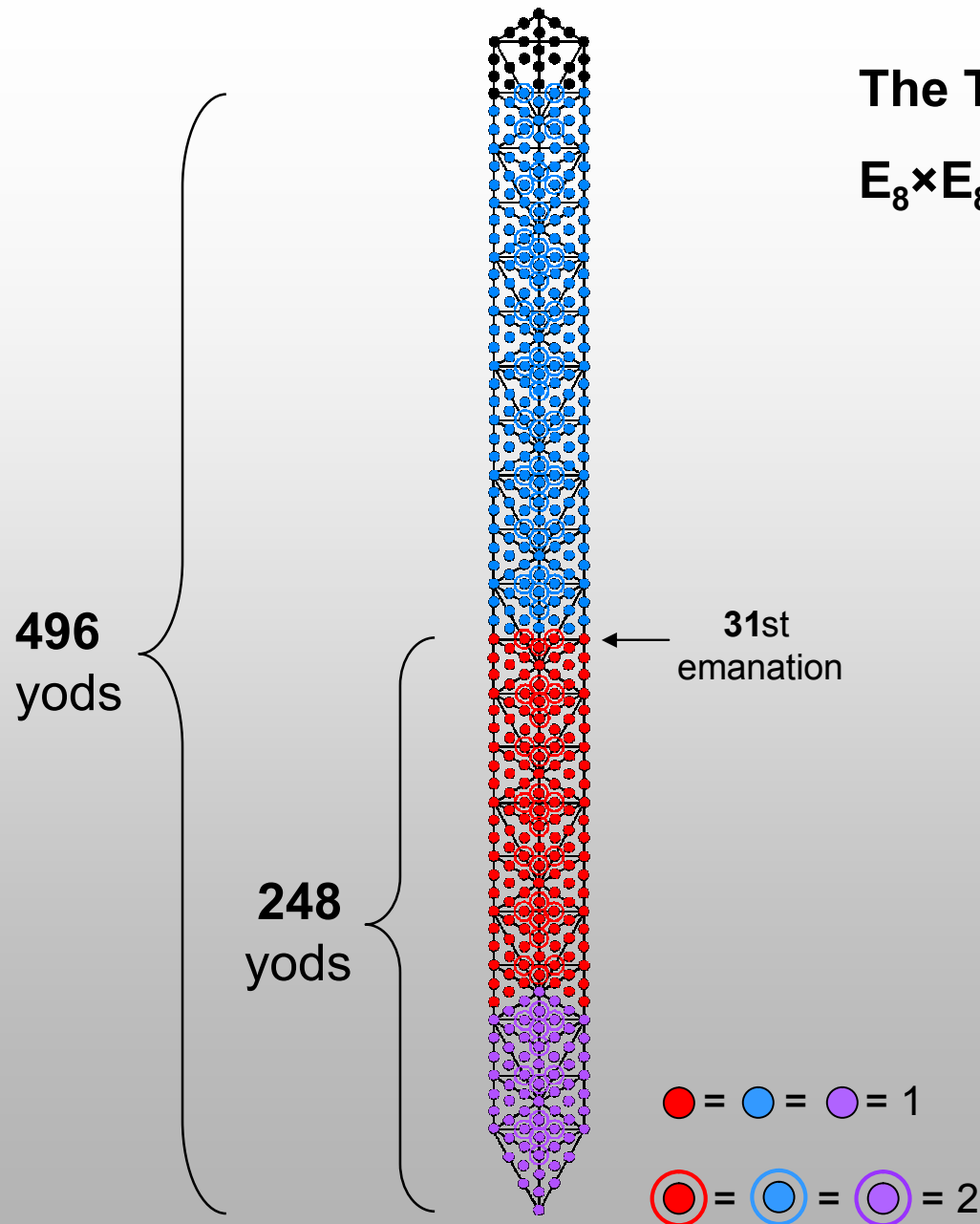


Figure 3

Ten overlapping Trees of Life map the 10-dimensional space-time of superstrings. With their triangles turned into tetractyses, there are **248** (red & violet) yods up to Chesed of the fifth tree — its first Sephirah of Construction. There are a further **248** (blue) yods up to, but not including, Chesed of the tenth tree. Each yod denotes a particle, a gauge field of E_8 or E_8' . The Godname EL of Chesed with number value **31** prescribes the dimension **248** of E_8 because there are **31** emanations up to Chesed of the fifth tree. **248** is the number value of *Raziel*, the Archangel of Chokmah.

The Tree of Life basis of the $E_8 \times E_8'$ heterotic superstring

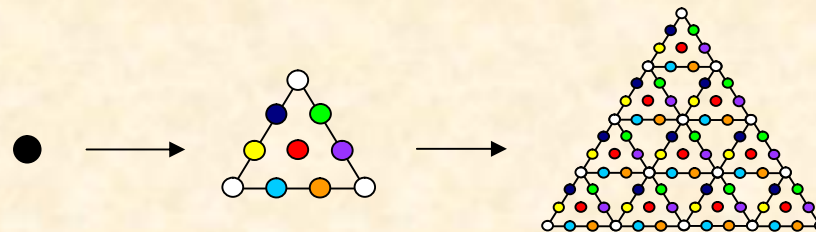


There are **248** yods up to Chesed of the 5th tree (the **31st** Sephirothic emanation) and **248** more yods up to (but not including) Chesed of the 10th tree. **496** yods are needed to construct 10 overlapping Trees of Life, starting from Chesed of the 10th tree. Each yod symbolizes one of the **496** spin-1 particles transmitting the unified force between $E_8 \times E_8'$ heterotic superstrings. Each tree maps a dimension of the 10-d space-time of superstrings.

$$\begin{array}{lcl}
 248 \text{ } \bullet & \longrightarrow & E_8' \\
 168 \text{ } \bullet & \Big\} & \\
 80 \text{ } \bullet & \Big\} 248 & \longrightarrow E_8
 \end{array}$$

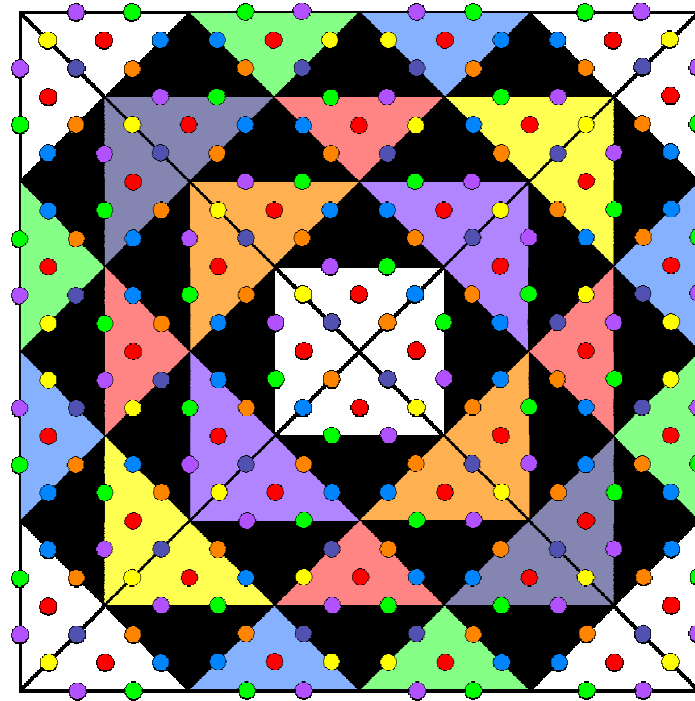
Figure 4

According to $E_8 \times E_8'$ superstring theory (one of the five types of superstrings), the unified force between such superstrings is mediated by virtual exchange of the **248** gauge bosons of E_8 (ordinary matter) and the **248** gauge bosons of E_8' (shadow matter). An ancient symbol of the four elements of Earth, Air, Fire & Water, the square encodes this information. When its sectors are turned into 2nd-order tetractyses, the next higher differentiation of the Pythagorean tetractys:



they contain **248** hexagonal yods (the yods at the corners are omitted so as to make clear which yods are being counted). Each one symbolises a Sephirah of Construction as well as a possible quantum state of the spin-1 particle that transmits the force between this type of superstring.

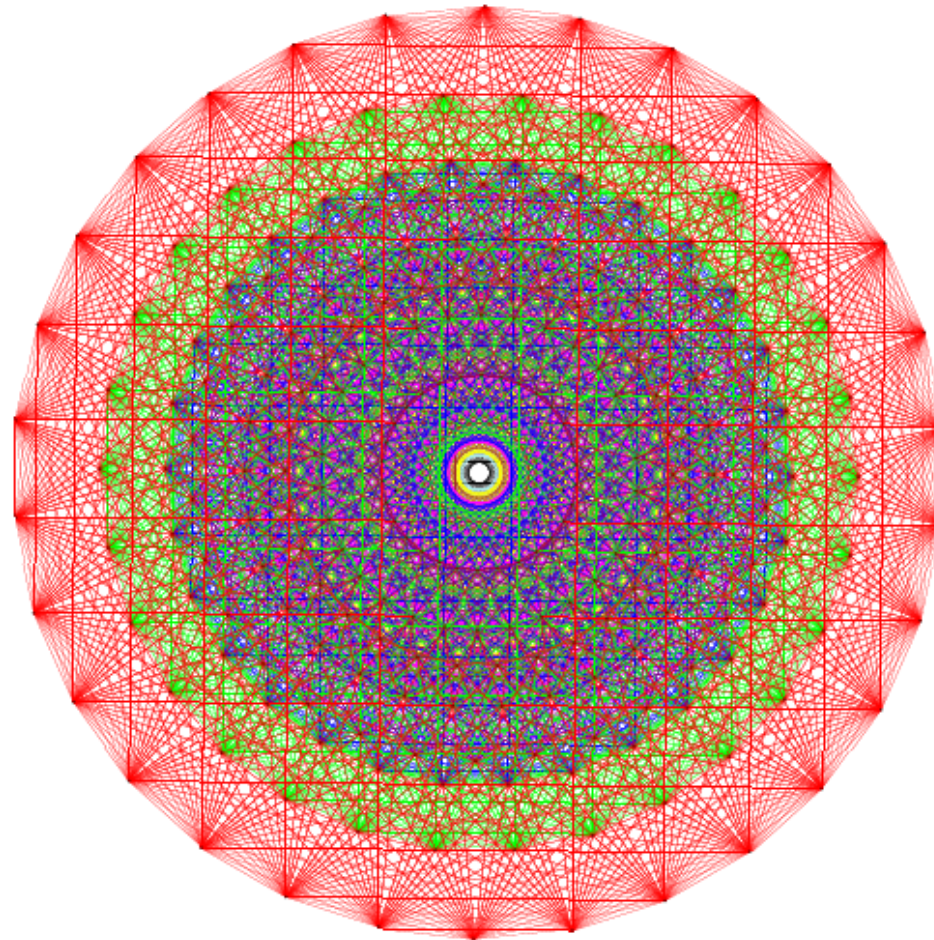
248 =



The **248** hexagonal yods in the square denote the **248** gauge bosons of the superstring gauge symmetry group E_8

Figure 5

The E_8 root system consists of 240 vectors in an eight-dimensional space. Those vectors are the vertices (corners) of an eight-dimensional object called the Gosset polytope 4_{21} . In the 1960s, Peter McMullen drew (by hand) a 2-dimensional representation of 4_{21} . In 2007, a four-year collaboration between mathematicians from Europe and the USA announced the results of their calculations of the mathematical structure of E_8 , using a supercomputer. The image shown here was computer-generated by John Stembridge, based on McMullen's drawing. (Credit: Image courtesy of American Institute of Mathematics)



The Gosset polytope 4_{21}

Figure 6

An octagon whose sectors are transformed into 2nd-order tetractyses has **496** hexagonal yods. Each yod symbolizes a particle involved in the transmission of the superstring force with the symmetry of $E_8 \times E_8'$. The number of tetractyses is **80**. This is the number value of Yesod, the Sephirah immediately above Malkuth in the Tree of Life. This archetypal pattern is prescribed by the Godnames. For example, it is prescribed by the Godname YAH with number value **15** because each sector of the octagon has 10 tetractyses with **15** corners. There are 576 yods surrounding the centre of the octagon, where $576 = 24^2 = 1^2 \times 2^2 \times 3^2 \times 4^2$. 33 yods are corners of 1st-order tetractyses, where $33 = 1! + 2! + 3! + 4!$. These are examples of how the integers 1, 2, 3 & 4 symbolized by the four rows of the Pythagorean tetractys express the properties of archetypal patterns and holistic systems possessing sacred geometry.

496 =

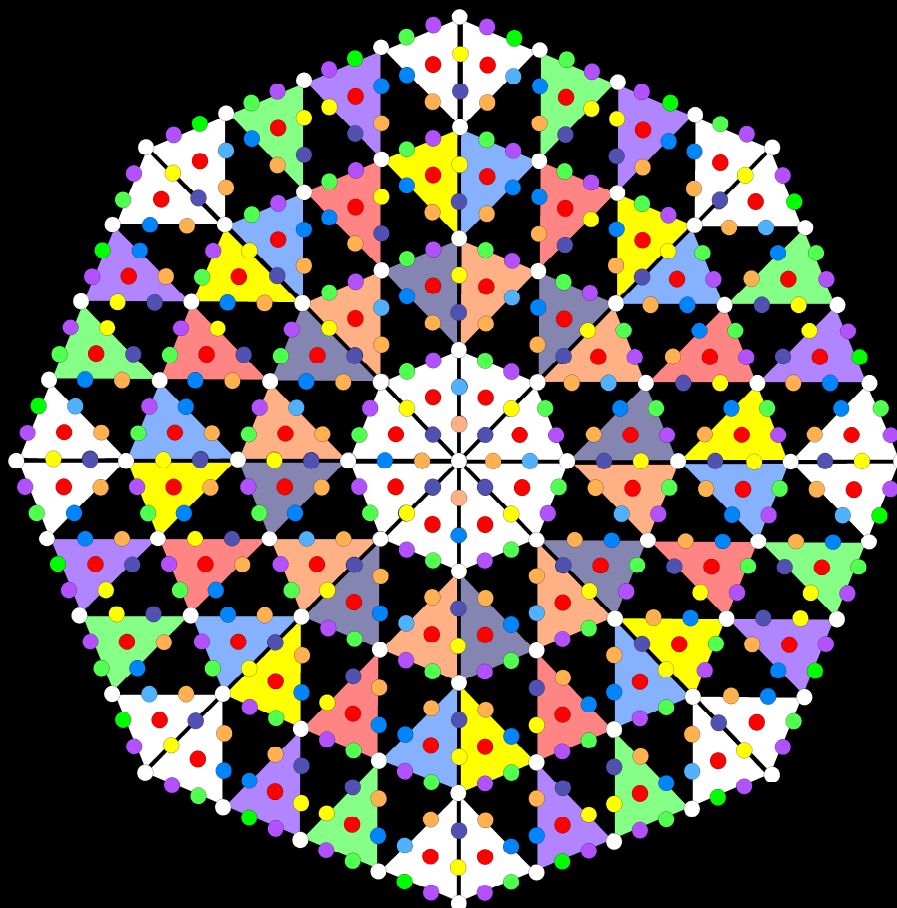


Figure 7

The number value **428** of *Chasmalim*, the Order of Angels assigned to Chesed, is the number of yods lying on edges of the 94 tetractyses in the (7+7) enfolded polygons that are intrinsic to it, i.e., not shared with the polygons enfolded in the next higher tree. Separately, these polygons have (**248+248**) intrinsic yods lying on edges of tetractyses that symbolise the (**248+248**) roots/gauge bosons of $E_8 \times E_8'$.

This is a striking example of how the Godnames, Archangels, Angelic Orders & Mundane Chakras of the Sephiroth mathematically define sacred geometrical structures that embody parameters of scientific significance, in this case the **496** gauge bosons of $E_8 \times E_8'$ that mediate the unified interactions between $E_8 \times E_8'$ heterotic superstrings. That this particular conjunction of the numbers **496** & **428** is highly unlikely to be a coincidence is indicated by the fact that there are **194** hexagonal yods either in the root edge or on the edges of the **48** tetractyses in the seven *separate* polygons, where **194** is the number value of *Tzadekh*, the Mundane Chakra of Chesed — the Sephirah to which the *Chasmalim* are assigned.

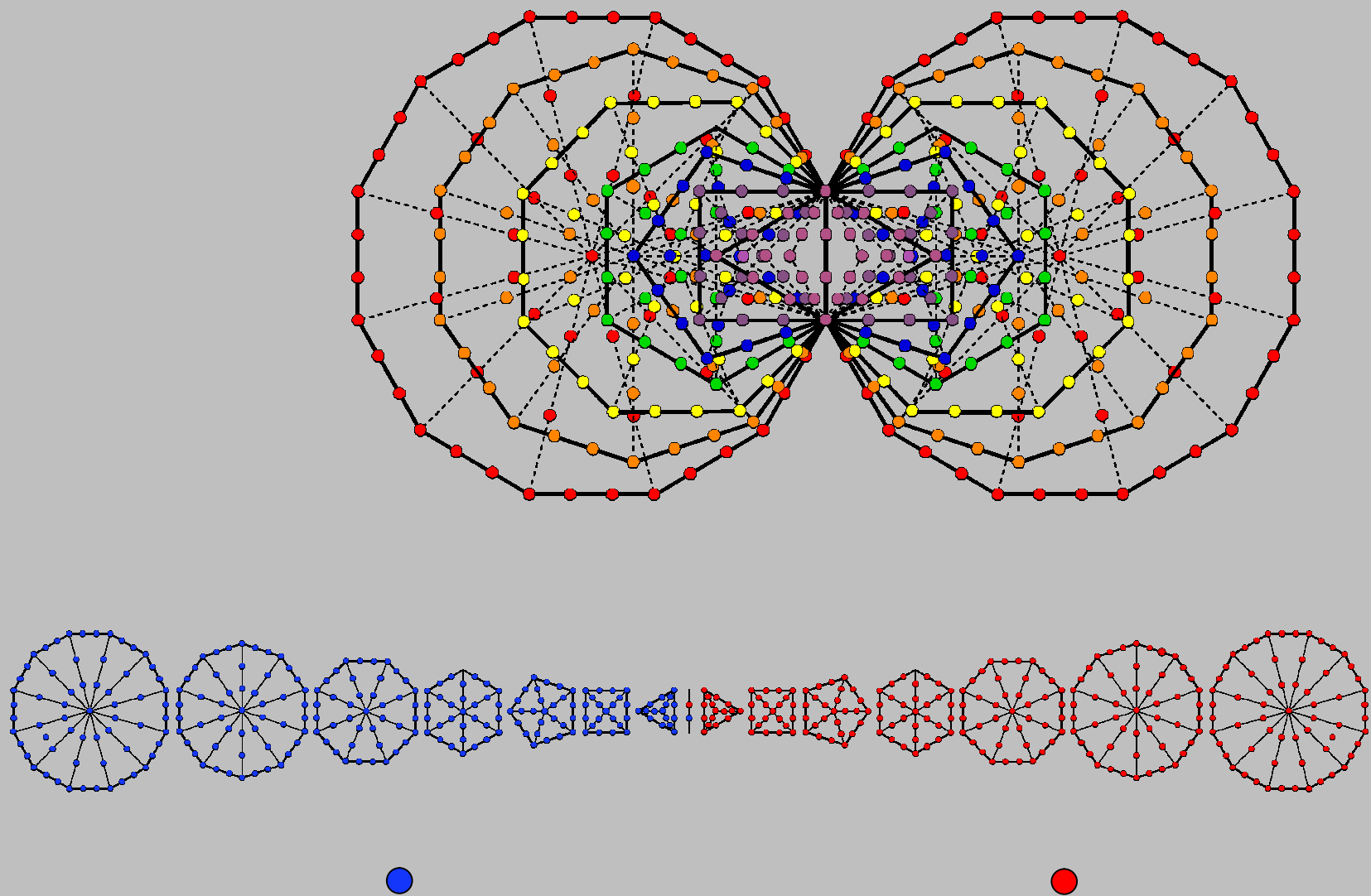


Figure 8

Outside the root edge of the last four polygons of the inner Tree of Life whose sectors are divided into three tetractyses are **496** yods other than their corners and centres:

Polygon	Number of yods	number of yods outside root edge	number of external yods not corners or centres	
Hexagon	91	$91 - 4 = 87$	$87 - 4 - 1 = 82$	$\left. \begin{array}{l} 82 \\ 110 \\ 138 \\ 166 \end{array} \right\} 248$
Octagon	121	$121 - 4 = 117$	$117 - 6 - 1 = 110$	
Decagon	151	$151 - 4 = 147$	$147 - 8 - 1 = 138$	
Dodecagon	181	$181 - 4 = 177$	$177 - 10 - 1 = 166$	

This property might be dismissed as a coincidence were it not for the fact that the hexagon & dodecagon have **248** yods and the octagon & decagon have **248** yods. In other words, the yod population **496** splits into two identical numbers (**248**), in conformity with the prediction by $E_8 \times E_8'$ heterotic superstring theory. Even supposing that it were mere coincidence that the last four polygons have **496** such yods, it is highly improbable that the polygons would have yod populations that *separately* add up to **248**. It is therefore to discount chance. Instead, this property demonstrates how the universal blueprint of the inner Tree of Life embodies the dynamics of the $E_8 \times E_8'$ heterotic superstring.

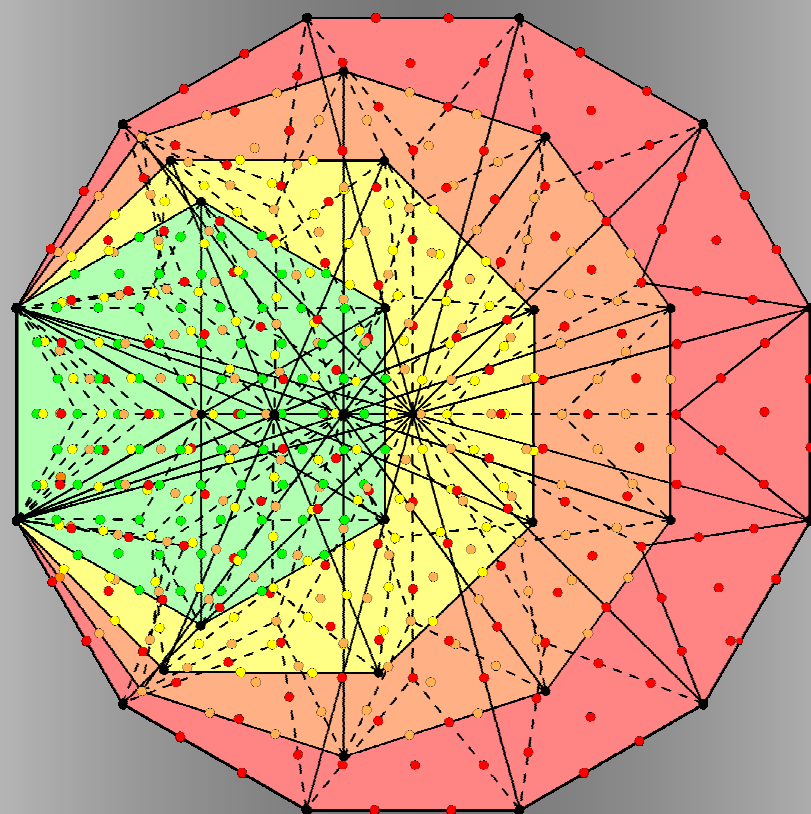
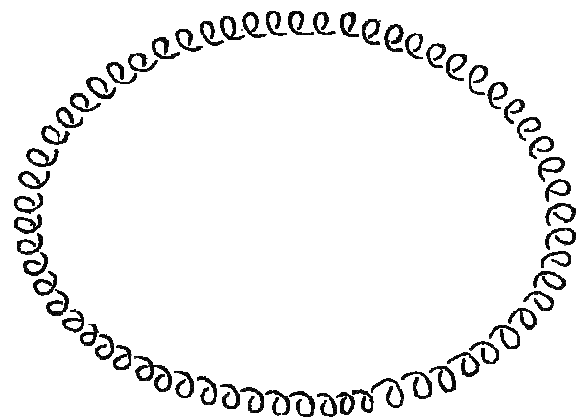


Figure 9



A helical whorl
has 1680 turns

The basic unit of matter, as depicted in 1878 by an American pioneer of colour therapy, Dr. Edwin D. Babbitt, and in 1952 in the 3rd edition of the book *Occult Chemistry*, written by the Theosophists, Annie Besant and Charles W. Leadbeater, who called it the 'ultimate physical atom,' or UPA. Two types of particles were noticed by the Theosophists, one the mirror image of the other. It consist of ten closed curves, each of which revolves five times around the axis of spin of the particle. Each curve is a helix with 1680 circular turns. Three curves ('major whorls') are thicker and brighter than the other seven ('minor whorls'). They are the microscopic manifestation of the ten Sephiroth of the Tree of Life. The ten whorls have 16800 helical turns (3360 turns per revolution).

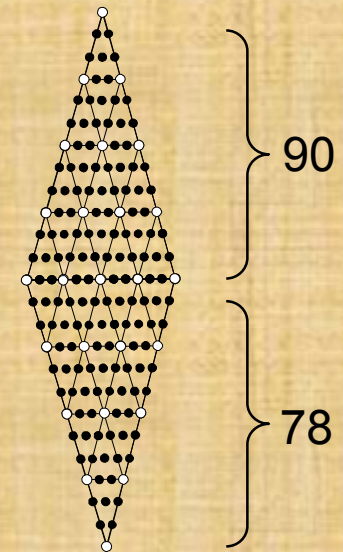
Figure 10

As $13^2 - 1 = 168$ and a parallelogram constructed from two 2nd-order tetractyses has 13 yods along each side, a 10-pointed array of 10 parallelograms has 1680 yods surrounding its centre. They comprise 90 yods in each inner 2nd-order tetractys and 78 yods in the remainder of a parallelogram. This reproduces the gematria number values of the two Hebrew words in *Cholem Yesodeth*, the Kabbalistic name of the Mundane Chakra of Malkuth:

יסודות TUDUSY $4 \leftarrow 400 \quad 1 \quad 4 \quad 6 \quad 6 \quad 0 \quad 10$ └──────────┘ 90	חלם MLCh $40 \quad 30 \quad 8$ └──┘ 78
168 =	

The Pythagorean measure of perfection — the number 10 and its tetractys symbol — expresses the number (1680) of circularly polarised waves in a whorl of a superstring in a subquark. The 840 yods in each pentagram denote the 840 such waves in an inner or outer half of a whorl. A point of a pentagram contains 24 ($=1 \times 2 \times 3 \times 4$) ○ yods and

144 =	1^0	2^0	3^0	4^0
	1^1	2^1	3^1	4^1
	1^2	2^2	3^2	4^2
	1^3	2^3	3^3	4^3



● yods.

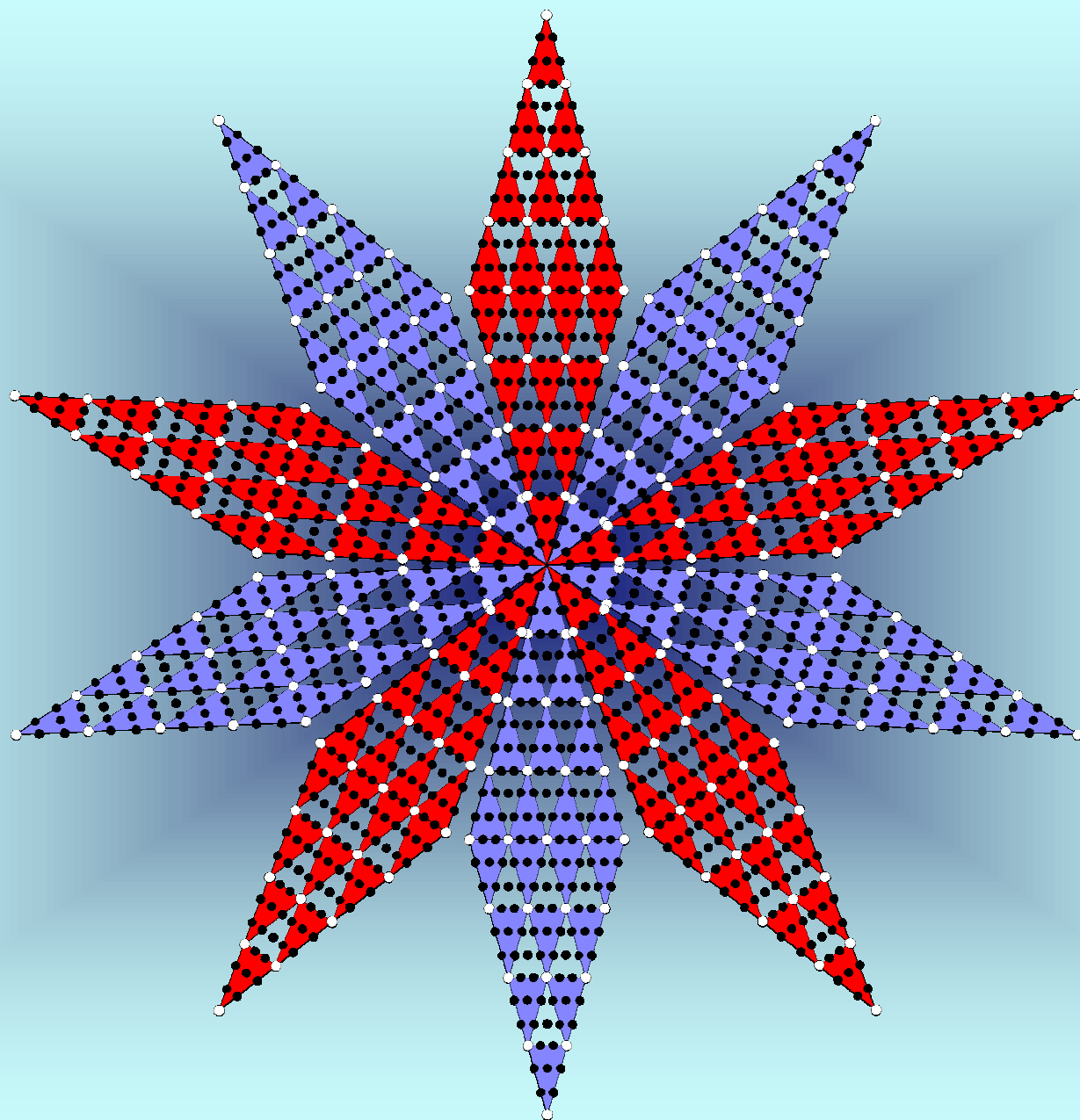
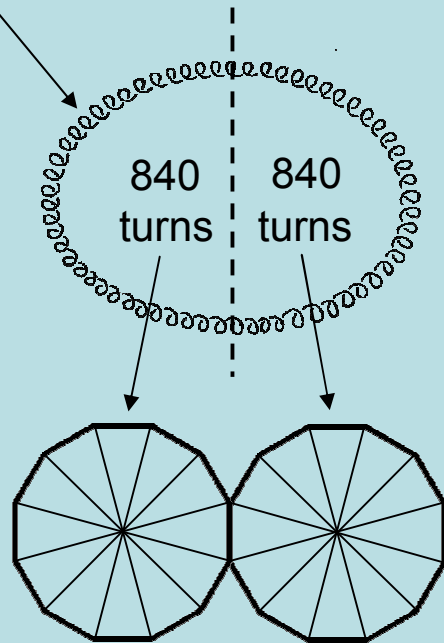


Figure 11

24 E_8 gauge
charges are
spread along
a whorl



12 sectors $\rightarrow$ 12
 E_8 gauge charges

12 sectors $\rightarrow$ 12
 E_8 gauge charges

When their 24 sectors are turned into 2nd-order tetractyses, there are 1680 yods outside the shared edge of the pair of joined dodecagons in the inner Tree of Life that surround centres of sectors (black yods). They symbolise the 1680 turns of each helical whorl of the $E_8 \times E_8$ heterotic superstring described with micro-psi by Besant & Leadbeater. The 840 yods surrounding the centres of the 12 sectors in each polygon denote the 840 turns in the inner or outer halves of a whorl. The 1680 circularly polarised oscillations in each standing wave are the manifestation of the 24 E_8 gauge charges that are spread along each whorl and denoted by these centres. The ten whorls of the superstring carry the 240 E_8 gauge charges. They manifestation as 16800 helical turns symbolised by the 16800 yods outside the root edges of the dodecagons enfolded in 10 overlapping Trees of Life that surround the centres of their 240 sectors.

The pair of dodecagons embodies the superstring structural parameter 1680

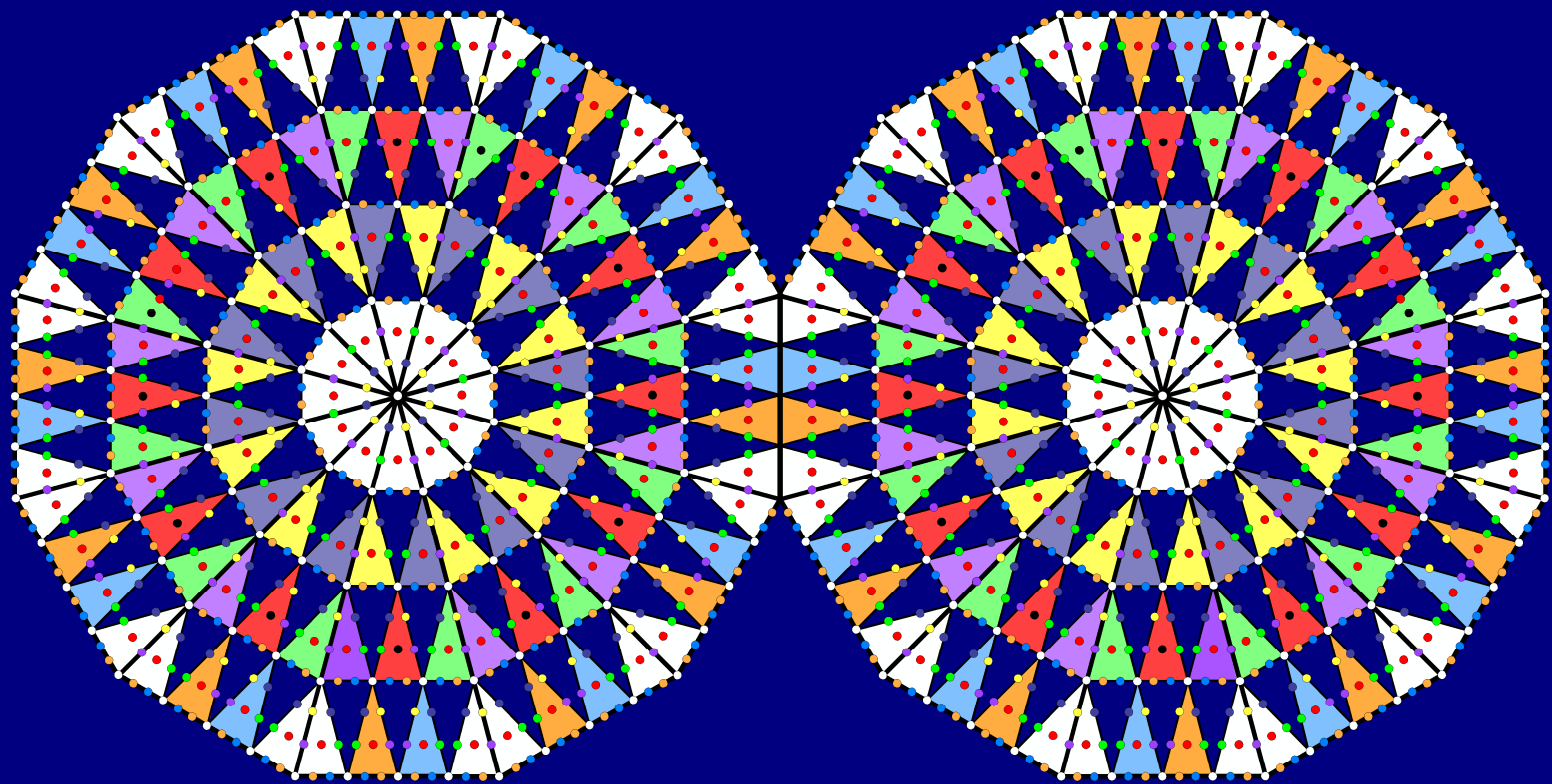


Figure 12

The semi-regular polyhedra are divided into two groups of 13 (**15**, if enantiomorphs are included). They are called the Archimedean solids and the Catalan solids (their duals, in which vertices & faces are interchanged). The Catalan solid with the most faces is the disdyakis triacontahedron. It has **62** vertices, 180 edges & 120 triangular faces. Each edge can be thought of as the base of an interior triangle with a corner at the centre of the polyhedron. If these triangles are divided into their sectors, it can be calculated that 1680 vertices, edges & triangles surround an axis passing through any two diametrically opposite vertices. This is the number of turns made in each helical whorl of the $E_8 \times E_8$ heterotic superstring as it revolves five time around its axis of spin. It is an indication that the disdyakis triacontahedron is the polyhedral version of the Tree of Life, which encodes the same structural parameter of superstrings.

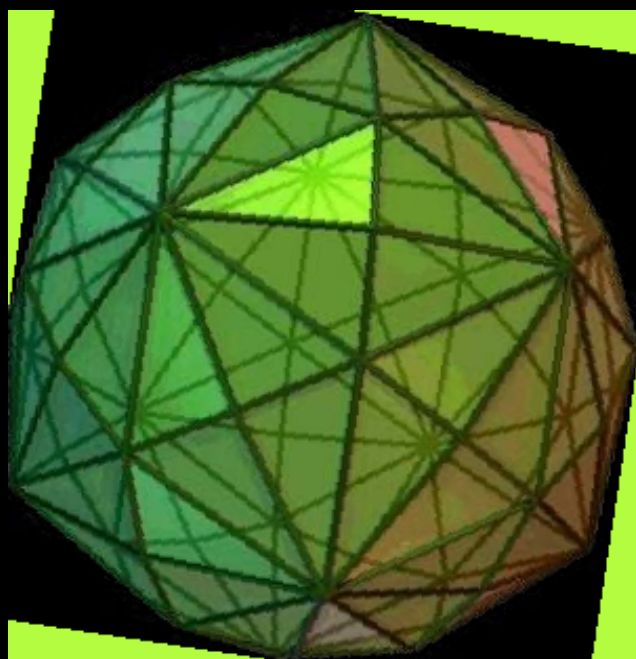


Figure 13

The Decad specifies the dodecagon as the *tenth* regular polygon. Construction of each of its sectors from three tetractyses requires **168** more yods. 84 yods lie on edges of tetractyses inside sectors and 84 yods either lie on edges of sectors or are centres of tetractyses. This 84:84 division of the structural parameter **168** of the $E_8 \times E_8$ heterotic superstring is characteristic of holistic systems embodying the universal patterns of sacred geometry. A dodecagon has 156 hexagonal yods. **155** hexagonal yods are associated with each of the two joined dodecagons. **155** is the number value of ADONAI MELEKH, the Godname of Malkuth, and **168** is the number value of *Cholem Yesodeth*, its Mundane Chakra. This demonstrates how the Godname of the Sephirah signifying the material universe determines the form of the basic units of matter.

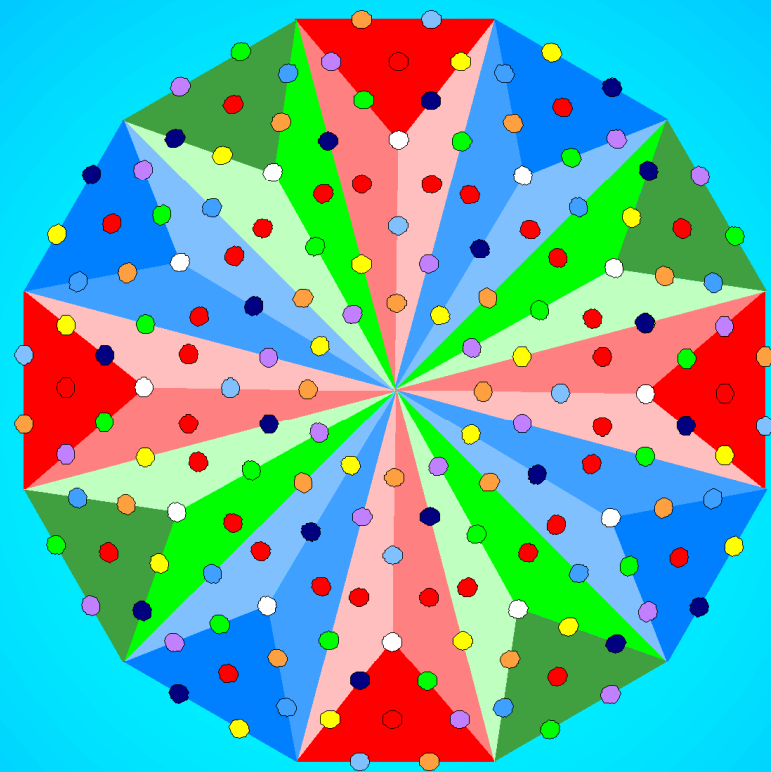


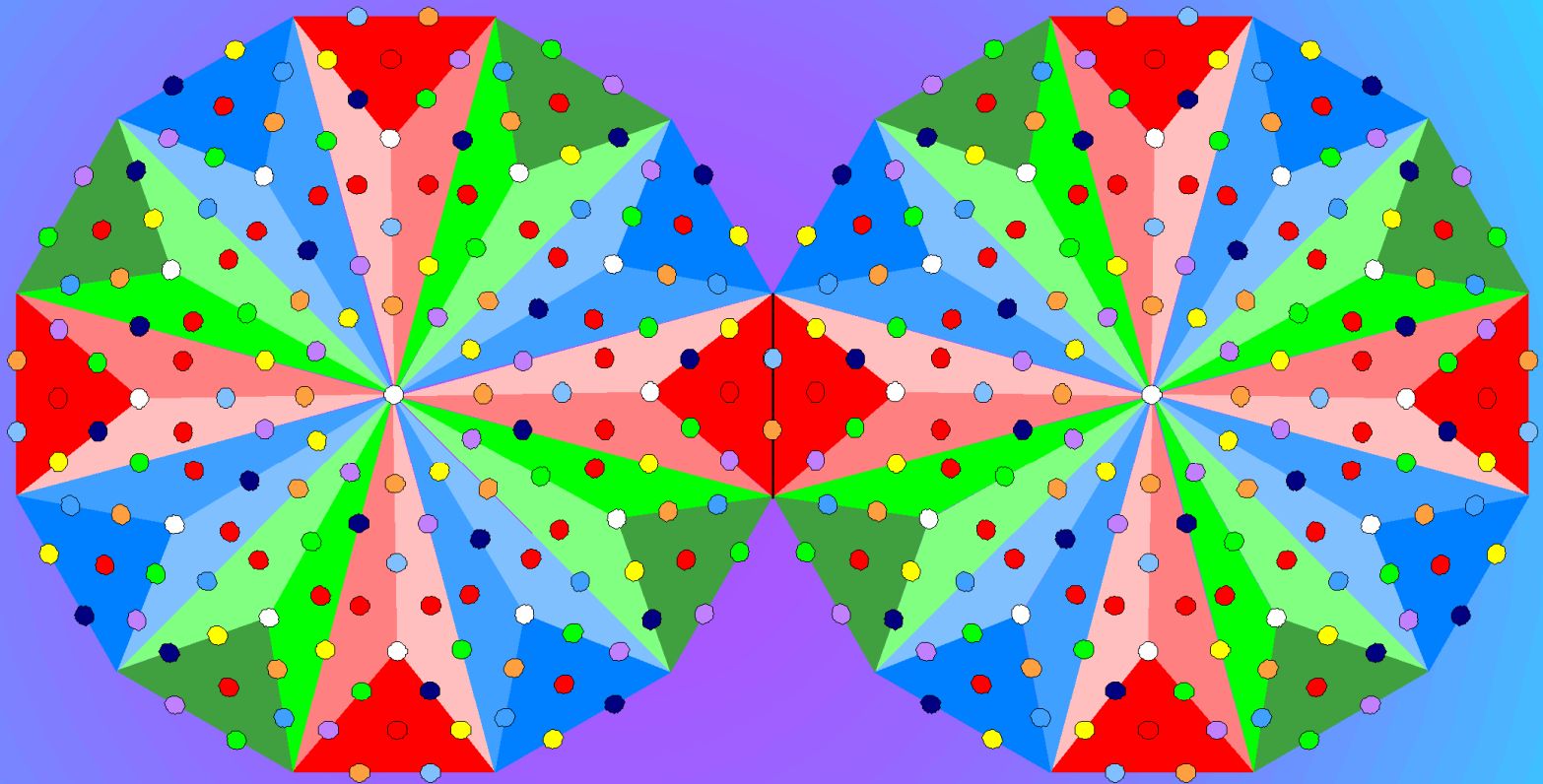
Figure 14

When the 24 sectors in a pair of joined dodecagons are each constructed from three tetractyses, there are 336 yods other than the 22 original corners, where

$$336 = \begin{array}{cc} 2^2 & 6^2 \\ \square & \\ 14^2 & 10^2 \end{array}$$

168 yods are associated with each polygon. They symbolise the **168** helical turns in an outer or inner half-revolution of each whorl of the $E_8 \times E_8$ heterotic superstring.

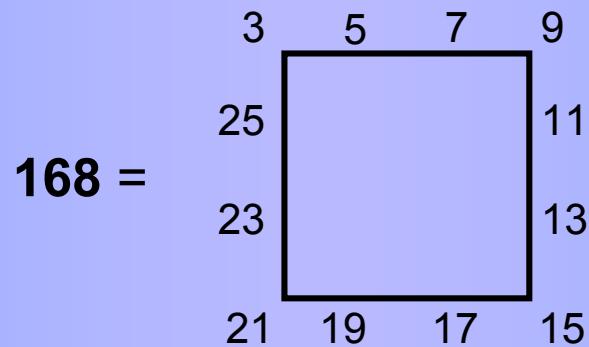
336 =



TWO JOINED DODECAGONS CONTAIN 336
YODS OTHER THAN THEIR 22 CORNERS

Figure 15

A square is the symbol of the Tetrad. When each sector is divided into three triangles and each triangle constructed from three tetractyses, there are **168** yods surrounding the centre of the square. As **168** = $13^2 - 1 = 3 + 5 + \dots + 25$, this number is the sum of the 12 odd integers after 1 that can be arranged along the sides of a square, four to a side:



This exemplifies the beautiful harmony between number and geometry when the latter is sacred.

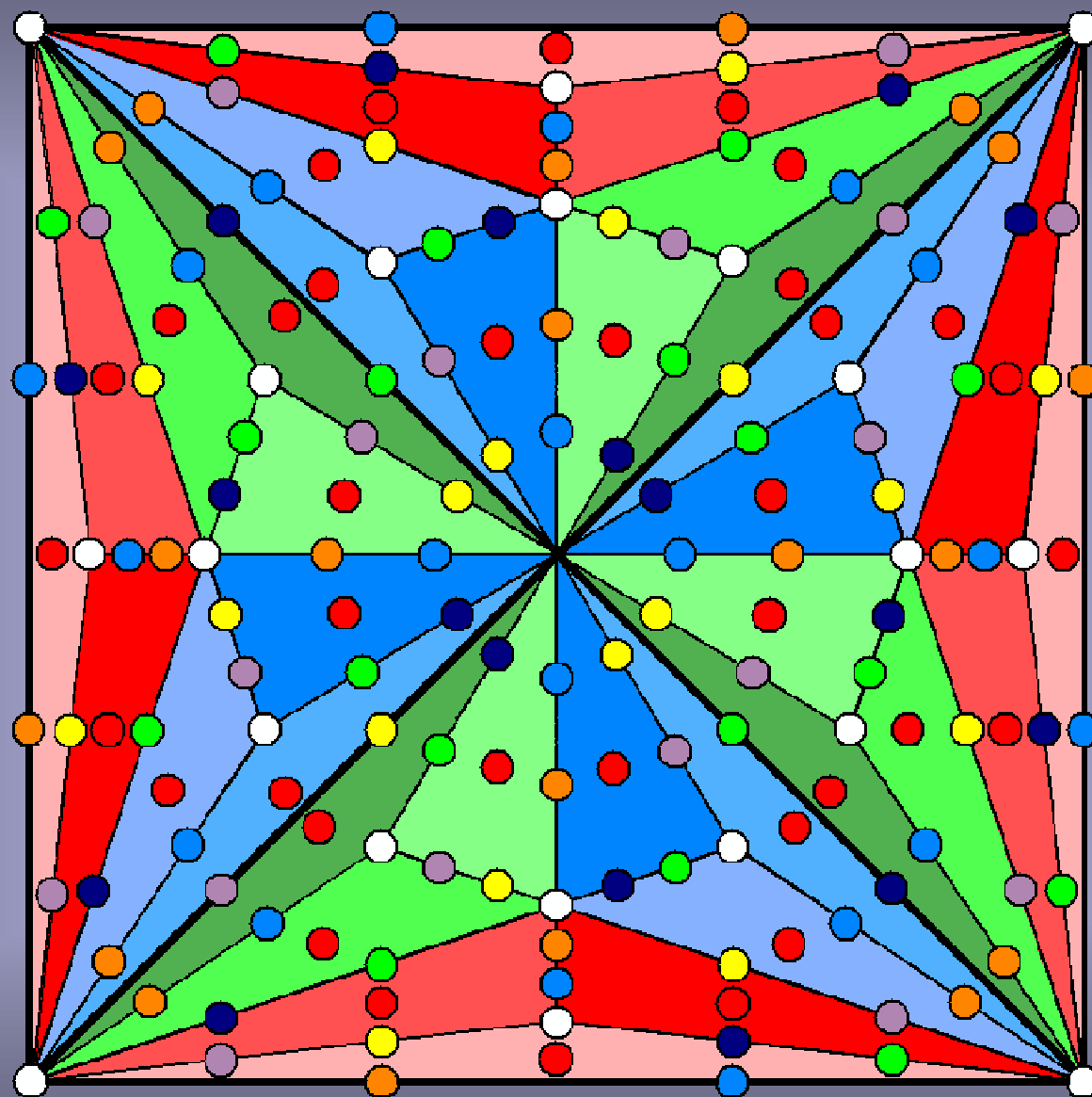


Figure 16

The fact that **168** yods surround the centre of a square whose sectors are each divided into triangles which are then constructed from tetractyses is an illustration of the Tetrad Principle, whereby the fourth member of a class of mathematical objects, or the fourth stage in its construction from tetractyses, always represents a parameter of the Tree of Life. In this case, the square is the *fourth* stage in the sequence:

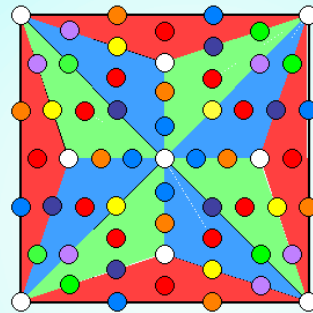
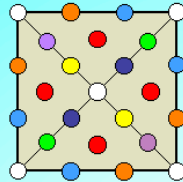
point-line-triangle-square-pentagon, etc

and the superstring structural parameter **168** is the number of yods needed for its *fourth* stage of construction from tetractyses.

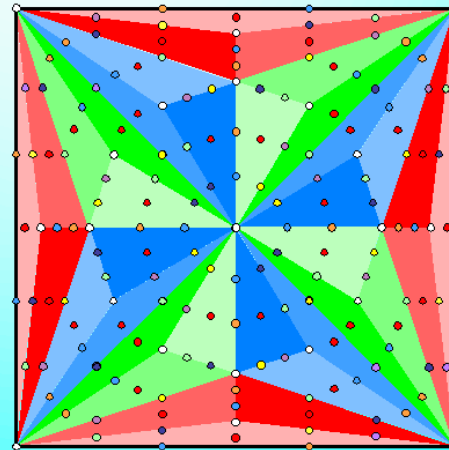


TETRAD PRINCIPLE

The 4th member of the
sequence of squares
embodies the superstring
parameter 168



168 yods surround
the centre of the
square



How Sacred Geometries Embody Structural/Dynamical Parameters of the $E_8 \times E_8$ Heterotic Superstring & the Codon Pattern of DNA

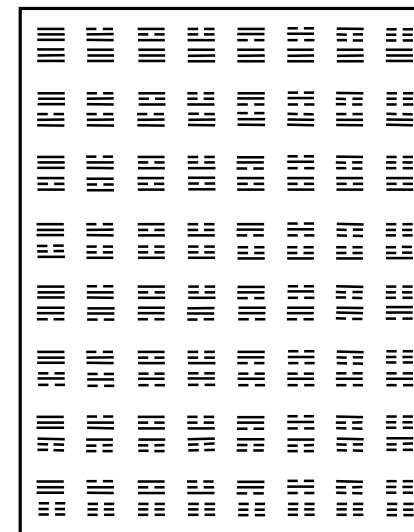
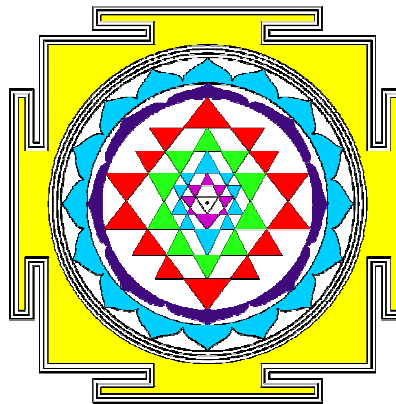
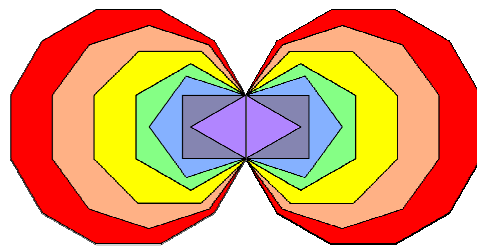
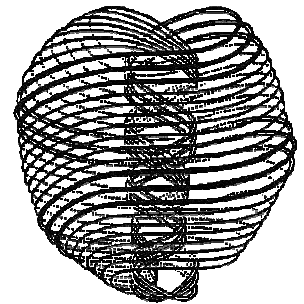
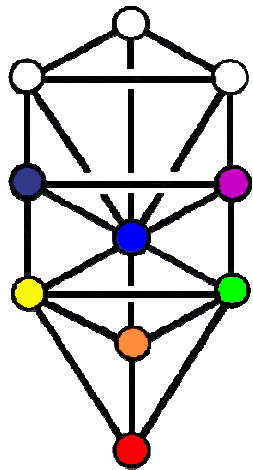
by

Stephen M. Phillips

Flat 3, 32 Surrey Road South. Bournemouth. Dorset BH4 9BP. England.

E-mail: stephen@smphillips.8m.com

Website: <http://smphillips.8m.com>



Page Index

Part 1

	Page
Table of number values of the Sephiroth in the four Worlds	3
The outer & inner forms of the Tree of Life	5
Embodiment of the fine-structure number 137 in the inner Tree of Life . .	7
Tree of Life basis of the $E_8 \times E_8$ 'heterotic superstring'	9
Embodiment of the dimension 248 of E_8 in the square	11
The Gosset Polytope 4_{21}	13
Embodiment of the dimension 496 of $E_8 \times E_8$ 'in the octagon'	15
Embodiment of the dimension 496 of $E_8 \times E_8$ 'in the inner Tree of Life' . .	17
Embodiment of the dimension 496 of $E_8 \times E_8$ 'in the last four polygons of the inner Tree of Life'	19
The 'ultimate physical atom'	21
The 1680 yods in a 10-pointed star	23
1680 yods surround the centres of the 2nd-order tetractys sectors of two joined dodecagons	25
1680 vertices, edges & triangles surround the axis of the disdyakis triacontahedron	27
The dodecagon embodies the structural parameter 168 of the $E_8 \times E_8$ ' heterotic superstring'	29
Two joined dodecagons embody the $E_8 \times E_8$ 'superstring structural parameter 336'	31
The square embodies the superstring structural parameter 168	33
The Tetrad Principle determines the superstring structural parameter 168	35

Part 2

	Page
Table of number values of the Sephiroth in the four Worlds	3
The inner Tree of Life embodies the superstring structural parameter 3360	5
Equivalence of the inner Tree of Life & the I Ching table of 64 hexagrams	7
Equivalence of the I Ching table of 64 hexagrams & the Sri Yantra	9
Embodiment of the superstring structural parameter 1680 in the outer & inner forms of ten Overlapping Trees of Life.	11
Embodiment of 1680 in the first six polygons enfolded in ten overlapping Trees of Life	13
Table of codons, anticodons & the amino acids for which they code	15
The (192+192) yods in the first (6+6) polygons symbolize the (192+192) instances of the bases of the 64 codons & the 64 anticodons	17
How some sacred geometries embody the 60 non-stop/start codons & their anticodons	19
Equivalence of the lowest seven Trees of Life & the Sri Yantra	21
The Sri Yantra & the lowest seven Trees of Life encode the mRNA codons & the tRNA anticodons.	23
Correspondence between the inner Tree of Life, the I Ching table & the Sri Yantra	25
The sum of the 10 Godname numbers is the number of hexagonal yods in the 2-d Sri Yantra	27
The Sri Yantra embodies the superstring structural parameter 3360	29
The Platonic solids embody the fine-structure number 137 & the superstring parameters 248 & 168	31

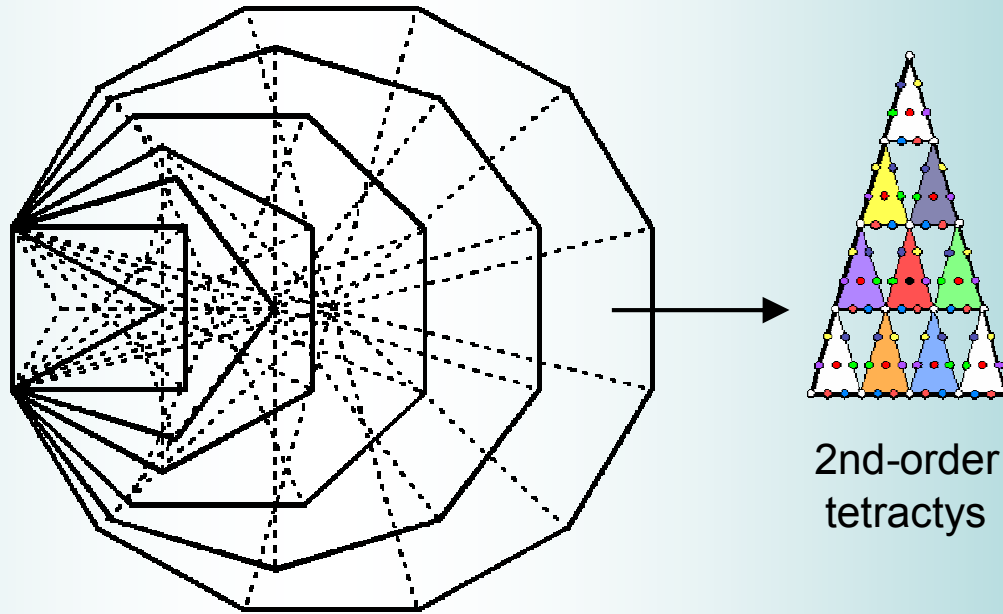
	SEPHIRAH	GODNAME	ARCHANGEL	ORDER OF ANGELS	MUNDANE CHAKRA
1	Kether (Crown) 620	EHYEH (I am) 21	Metatron (Angel of the Presence) 314	Chaioth ha Qadesh (Holy Living Creatures) 833	Rashith ha Gilgalim First Swirlings. (Primum Mobile) 636
2	Chokmah (Wisdom) 73	YAHVEH, YAH (The Lord) 26, 15	Raziel (Herald of the Deity) 248	Auphanim (Wheels) 187	Masloth (The Sphere of the Zodiac) 140
3	Binah (Understanding) 67	ELOHIM (God in multiplicity) 50	Tzaphkiel (Contemplation of God) 311	Aralim (Thrones) 282	Shabathai Rest. (Saturn) 317
	Daath (Knowledge) 474				
4	Chesed (Mercy) 72	EL (God) 31	Tzadkiel (Benevolence of God) 62	Chasmalim (Shining Ones) 428	Tzadekh Righteousness. (Jupiter) 194
5	Geburah (Severity) 216	ELOHA (The Almighty) 36	Samael (Severity of God) 131	Seraphim (Fiery Serpents) 630	Madim Vehement Strength. (Mars) 95
6	Tiphareth (Beauty) 1081	YAHVEH ELOHIM (God the Creator) 76	Michael (Like unto God) 101	Malachim (Kings) 140	Shemesh The Solar Light. (Sun) 640
7	Netzach (Victory) 148	YAHVEH SABAOTH (Lord of Hosts) 129	Haniel (Grace of God) 97	Tarshishim or Elohim 1260	Nogah Glittering Splendour. (Venus) 64
8	Hod (Glory) 15	ELOHIM SABAOTH (God of Hosts) 153	Raphael (Divine Physician) 311	Beni Elohim (Sons of God) 112	Kokab The Stellar Light. (Mercury) 48
9	Yesod (Foundation) 80	SHADDAI EL CHAI (Almighty Living God) 49, 363	Gabriel (Strong Man of God) 246	Cherubim (The Strong) 272	Levanah The Lunar Flame. (Moon) 87
10	Malkuth (Kingdom) 496	ADONAI MELEKH (The Lord and King) 65, 155	Sandalphon (Manifest Messiah) 280	Ashim (Souls of Fire) 351	Cholem Yesodeth The Breaker of the Foundations. The Elements. (Earth) 168

The Sephiroth exist in the four Worlds of Atziluth, Beriah, Yetzirah and Assiyah. Corresponding to them are the Godnames, Archangels, Order of Angels and Mundane Chakras (their physical manifestation). This table gives their number values obtained by the ancient practice of gematria, wherein a number is assigned to each letter of the alphabet, thereby giving a number value to a word that is the sum of the numbers associated with its letters. Some of these numbers will be referred to in the article.

Figure 1

When the 47 sectors of the seven enfolded polygons are transformed into 2nd-order tetractyses (the next order above the tetractys in which yods are replaced by tetractyses), they contain 3360 yods. This is the number of helical turns in all ten closed curves of the $E_8 \times E_8'$ heterotic superstring when they revolve once around the spin axis of the spin- $\frac{1}{2}$ particle. Each yod denotes a turn. Physically, it is an oscillation of the circularly polarized standing wave running around the curve. The Godname ELOHIM with number value 50 prescribes the fundamental constituent of quarks because its ten whorls make 50 revolutions, each of 336 turns, about its spin axis. Assigning this number to each of the 336 yods in the first (6+6) enfolded of the inner Tree of Life generates the number 16800 as the number of circularly polarized oscillations in all ten closed curves of the heterotic superstring.

3360 =

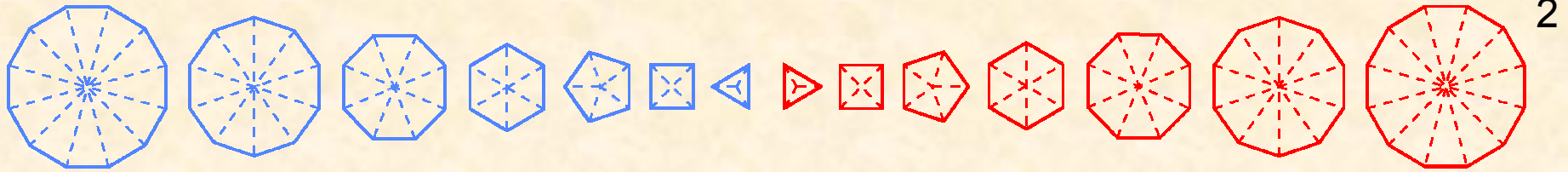


2nd-order
tetractys

All ten closed curves of the $E_8 \times E_8'$ heterotic superstring wind 3360 times in one revolution around its spin axis. This is the number of yods in the seven enfolded polygons of the inner form of the Tree of Life when their 48 sectors are each turned into 2nd-order tetractyses. It is astounding evidence that the superstring is the microscopic manifestation of the universal Tree of Life blueprint.

Figure 2

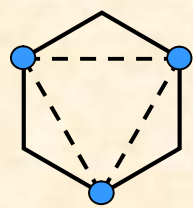
The seven separate regular polygons of the inner Tree of Life have 192 vertices, edges & triangles. They correspond to the 192 lines & broken lines of the 64 trigrams in one half of the I Ching table. The 192 geometrical elements in the second, identical set of seven polygons correspond to the 192 lines & broken lines in the other half of the table. The 24 lines & broken lines in the upper trigrams of the eight diagonal hexagrams correspond to the 24 vertices, edges & triangles in the hexagon, which is the halfway stage in the sequence of seven polygons. The 24 lines & broken lines in the lower trigrams of the eight diagonal hexagrams correspond to the 24 vertices, edges & triangles in the hexagon in the second set of polygons. Each of the 384 lines & broken lines of the I Ching table therefore symbolises a geometrical element composing the two sets of polygons of the inner Tree of Life. This is compelling evidence that the I Ching table is — like the inner Tree of Life — a representation of the same universal blueprint. The counterpart of the yin/yang polarities of lines and broken lines is the distinction between geometrical elements defining the boundaries of polygons and their internal elements, in each case there being 192 in each class.



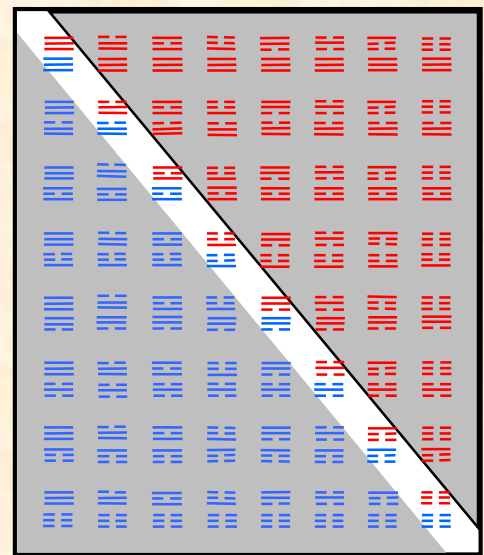
Number of corners = 48
 Number of edges = 96
 Number of triangles = 48
 Total = 192

Number of corners = 48
 Number of edges = 96
 Number of triangles = 48
 Total = 192

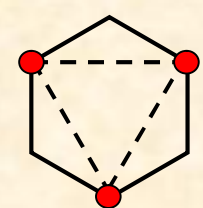
96 —
 96 - -
 Total = 192



3 vertices + 21
 geometrical elements



96 —
 96 - -
 Total = 192

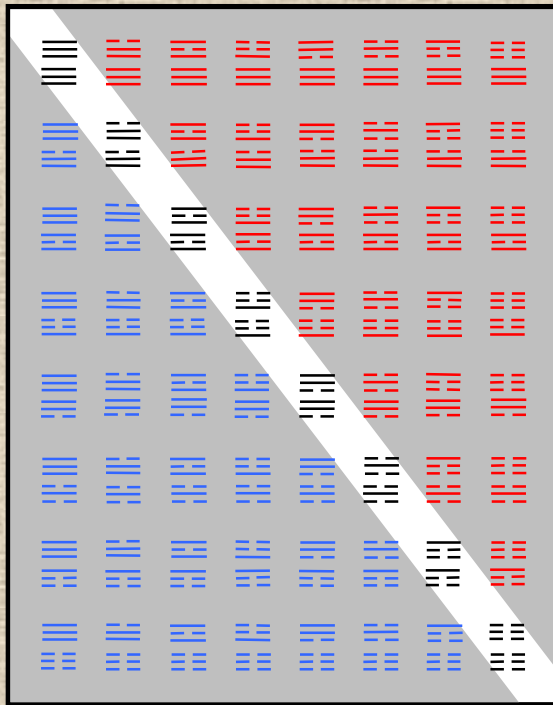


3 vertices + 21
 geometrical elements

**The 384 lines & broken lines of the I Ching table denote the 384
 geometrical elements composing the inner Tree of Life**

Figure 3

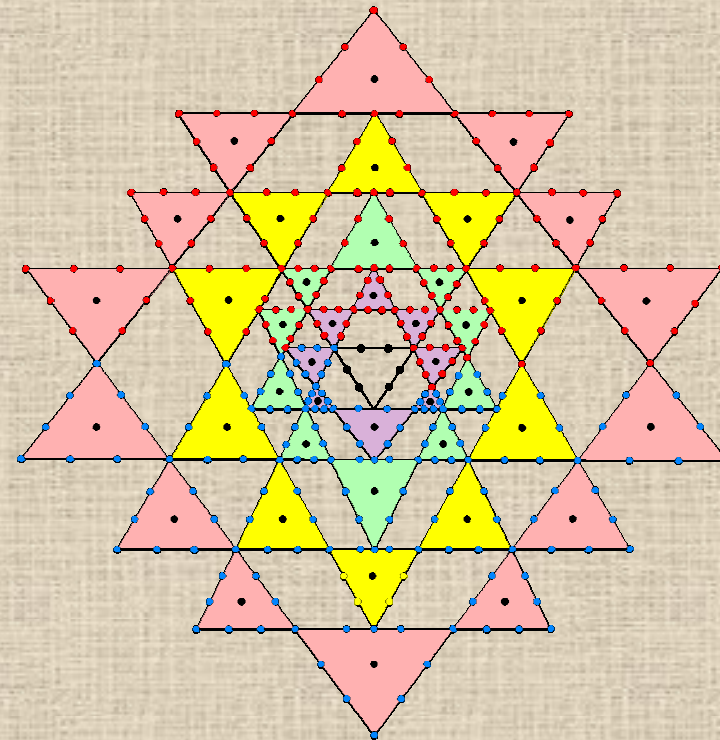
The 384 yin/yang lines of the 64 hexagrams of the I Ching table correspond to the 384 yods in the 42 triangles of the 3-dimensional Sri Yantra. The (24+24) yin/yang lines in the eight diagonal hexagrams correspond to the (24+24) yods that are either hexagonal yods in the central tetractys or centres of the 42 tetractyses surrounding it. The six hexagonal yods in the former are the counterpart of the six lines in the pair of heaven trigrams in the upper left-hand corner of the table. The 168 yods on the 63 edges of the 21 tetractyses in each half of the Sri Yantra are the counterpart of the 168 yin/yang lines in the 28 hexagrams on each side of the diagonal. Their physical manifestation are the 168 circularly polarised oscillations in half a revolution of each whorl of the $E_8 \times E_8'$ heterotic superstring.



168 — & - -

48 — & - -

168 — & - -



168 ●

48 ●

168 ●

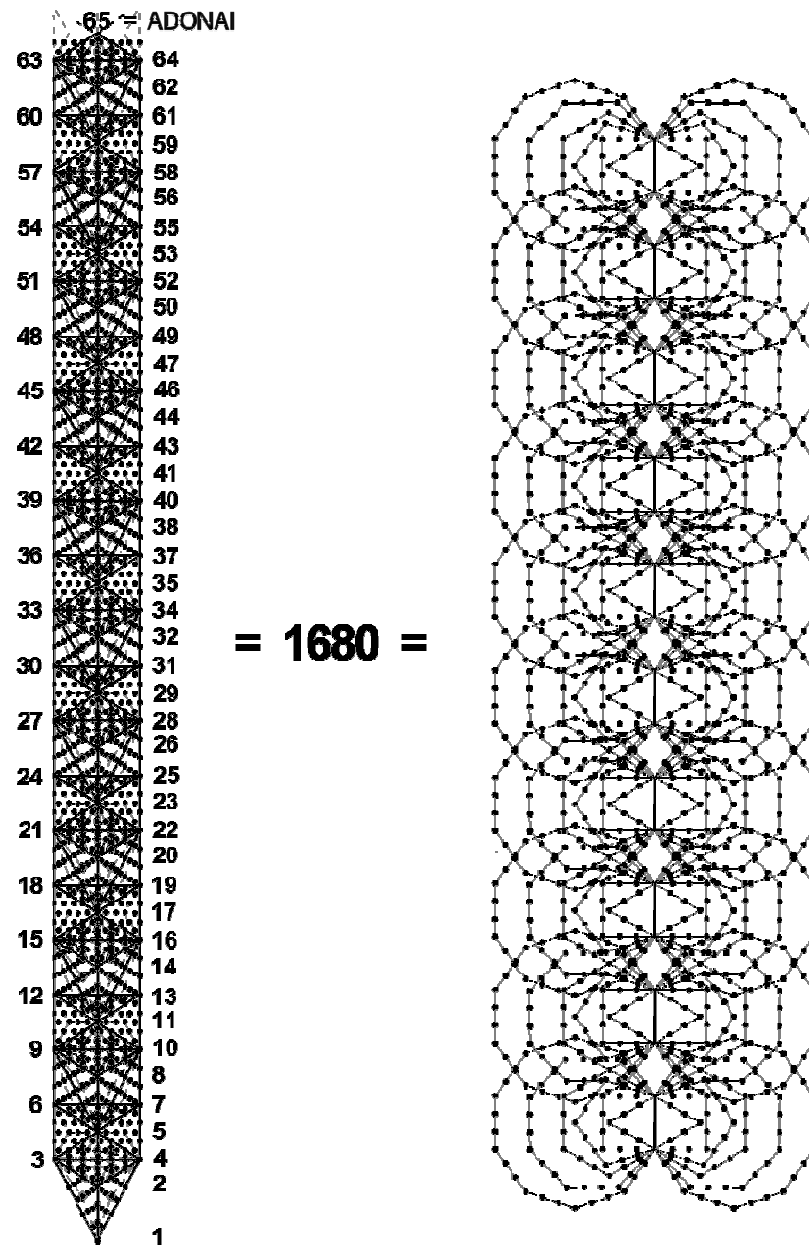
The correspondence between the I Ching table and the Sri Yantra

Figure 4

ADONAI, the Godname of Malkuth with number value 65, defines the lowest ten Trees of Life because they have 65 Sephirothic emanations. EL, Godname of Chesed with number value 31, prescribes them because they have 127 triangles, where 127 is the 31st prime number. When their sectors are turned into tetractyses, there are 1680 yods below the top of the tenth tree (the 65th emanation). This is how ADONAI determines the superstring structural parameter 1680. They belong to 131 tetractyses, where 131 is the number value of *Samael*, the Archangel of Geburah.

The first (6+6) polygons enfolded in each tree constitute a holistic system because their properties are prescribed by the Godnames of the ten Sephiroth, e.g., ELOHIM, the Godname of Binah, prescribes them because they have 50 corners. When each of their 70 sectors is turned into a tetractys, there are 1680 yods lining the 600 edges of the (60+60) polygons enfolded in the 10 trees that are intrinsic to them in the sense that none of them belong to polygons enfolded in the next higher tree.

Just as the 1680 helical turns of each whorl in the heterotic superstring define its form, so the 1680 yods on edges of the polygons determine their shape. A whorl is a Tree of Life in itself, being the microscopic manifestation of a Sephirah, and therefore can be represented by ten Trees of Life.



Below the top of the 10th Tree of Life prescribed by ADONAI are as many yods as there are on the boundaries of the first (6+6) regular polygons enfolded in each of the 10 trees.

Figure 5

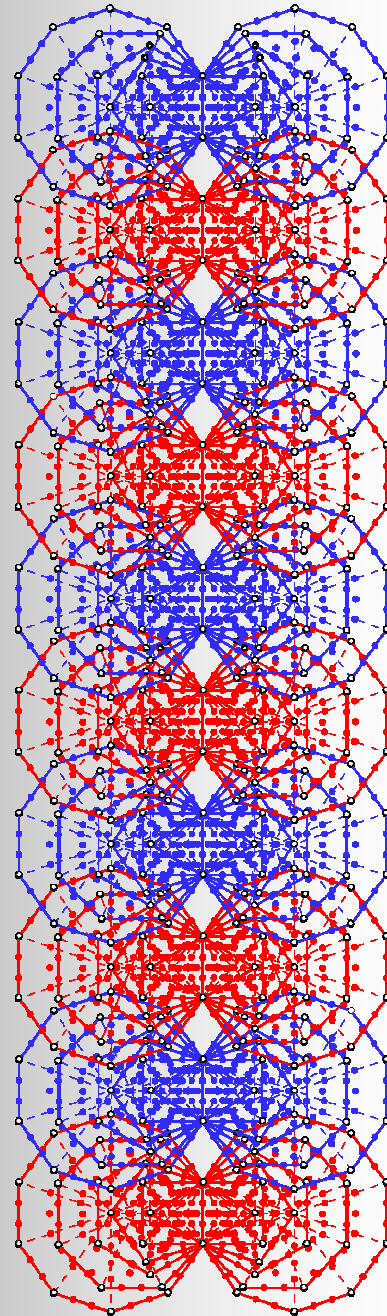
With their $(35+35)$ sectors constructed from tetractyses, there are $(192+192)$ yods in the first $(6+6)$ enfolded polygons that are intrinsic to them, i.e., unshared with polygons enfolded in adjacent trees. Of, these, $(24+24)$ are intrinsic corners (white circles) of polygons, leaving $(168+168)$ red and blue yods other than corners. The $(60+60)$ polygons of the first six types enfolded in 10 overlapping Trees of Life have $(240+240)$ corners and $(1680+1680)$ yods other than corners. The superstring structural parameter 1680 is embodied not only by the boundaries of the polygons but also by their yod populations. The 3360 yods other than corners symbolise the 3360 turns in one revolution of the ten helical whorls of the $E_8 \times E_8'$ heterotic superstring.

A circularly polarised wave comprises two plane waves oscillating 90° out of phase with each other. The $(240+240)$ corners denote the $(240+240)$ plane waves associated with the 240 gauge charges of E_8 , which are spread over the 10 whorls of the $E_8 \times E_8'$ heterotic superstring, 24 to a whorl.

240 ○

840 ●

840 ●



240 ○

840 ●

840 ●

The (1680+1680) yods other than the (240+240) corners in the (60+60) polygons of the first 6 types enfolded in 10 Trees of Life symbolise the 1680 turns in an outer & an inner half-revolution of the 10 whorls of the UPA/superstring.

Figure 6

DNA is made of chemical building blocks called nucleotides. These building blocks are made of three parts: a phosphate group, a sugar group (2-deoxyribose, which is a pentose (five carbon) sugar) and one of four types of nitrogen bases. To form a strand of DNA, nucleotides are linked into chains, with the phosphate and sugar groups alternating along the sides of the 'ladder' of DNA's double helix. The four types of nitrogen bases found in nucleotides are: adenine (A), thymine (T), guanine (G) and cytosine (C). The two strands of the molecule are held together by hydrogen bonding between pairs of complementary nitrogen bases, base A always with base T and base C always with base G.

RNA is a single strand molecule with a much shorter chain of nucleotides than DNA. Whereas DNA contains deoxyribose, RNA contains ribose, whose OH group makes it less stable than DNA. The complementary base to adenine is not thymine but uracil (U). Messenger RNA carries information about a protein sequence to the ribosomes, which synthesize protein in the cell. Transfer RNA is a small RNA chain of about 80 nucleotides that transfer a specific amino acid to a growing polypeptide chain at the ribosomal site of protein synthesis. Groups of three bases (codons) in mRNA hydrogen bond to their complementary anticodons in tRNA. This reads the sequence of the messenger RNA and is attached to the amino acids. Each type of tRNA can be attached to only one type of amino acid. Each codon encodes for a specific amino acid, although a given amino acid may be encoded by several codons. The table lists the 64 base triplets in DNA, the 64 mRNA codons and their complementary tRNA anticodons, together with the amino acid for which they code.

Codons & anticodons for the amino acids

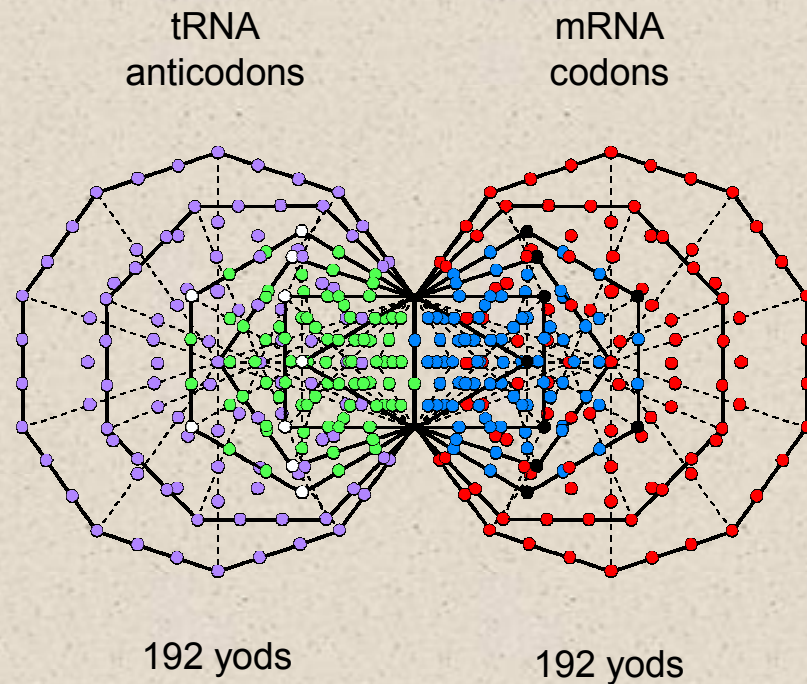
6

Amino Acid	DNA Base Triplets	mRNA Base Codons	tRNA Base Anticodons
alanine	CGA, CGG, CGT, CGC	GCU, GCC, GCA, GCG	CGA, CGG, CGU, CGC
arginine	GCA, GCG, GCT, GCC, TCT, TCC	CGU, CGC, CGA, CGG, AGA, AGG	GCA, GCG, GCU, GCC, UCU, UCC
asparagine	TTA, TTG	AAU, AAC	UUA, UUG
aspartate	CTA, CTG	GAU, GAC	CUA, CUG
cysteine	ACA, ACG	UGA, UGC	ACA, ACG
glutamate	CTT, CTC	GAA, GAG	CUU, CUC
glutamine	GTT, GTC	CAA, CAG	GUU, GUC
glycine	CCA, CCG, CCT, CCC	GGU, GGC, GGA, GGG	CCA, CCG, CCU, CCC
histidine	GTA, GTG	CAU, CAC	GUA, GUG
isoleucine	TAA, TAG, TAT	AUU, AUC, AUA	UAA, UAG, UAU
leucine	AAT, AAC, GAA, GAG, GAT, GAC	UUA, UUG, CUU, CUC, CUA, CUG	AAU, AAC, GAA, GAG, GAU, GAC
lysine	TTT, TTC	AAA, AAG	UUU, UUC
methionine	TAC	AUG	UAC
phenylalanine	AAA, AAG	UUU, UUC	AAA, AAG
proline	GGA, GGG, GGT, GGC	CCU, CCC, CCA, CCG	GGA, GGG, GGU, GGC
serine	AGA, AGG, AGT, AGC, TCA, TCG	UCU, UCC, UCA, UCG, AGU, AGC	AGA, AGG, AGU, AGC, UCA, UCG
stop	ATG, ATT, ACT	UAA, UAG, UGA	AUU, AUC, ACU
threonine	TGA, TGG, TGT, TGC	ACU, ACC, ACA, ACG	UGA, UGG, UGU, UGC
tryptophan	ACC	UGG	ACC
tyrosine	ATA, ATG	UAU, UAC	AUA, AUG
valine	CAA, CAG, CAT, CAC	GUU, GUC, GUA, GUG	CAA, CAG, CAU, CAC

Figure 7

The 384 instances of the nitrogen bases in the 64 codons of mRNA and the 64 anticodons of tRNA are symbolised by the 384 yods in the (6+6) enfolded polygons other than the endpoints of their shared root edge. The Godname ELOHIM with number value 50 and the Godname YAHWEH with number value 26 prescribe the 384 instances because the (6+6) enfolded polygons have 50 corners, each set of six polygons having 26 corners.

There are $(27 \times 3 = 81)$ instances of A, C & G bases in the $(3^3 = 27)$ bases that contain only them. There are $(37 \times 3 = 111)$ instances for the 37 codons that contain at least one U base. These codons include the three stop codons UAA, UAG & UGA. There are $(34 \times 3 = 102)$ instances of bases in codons that include the U base and which encode solely for amino acids. Hence, the 192 instances of bases consist of 81 instances of A, C & G bases in the 27 codons containing only them, nine instances of bases in the three stop codons and 102 instances of bases in the 34 other codons. This 81:9:102 division compares with the pattern of yods associated with each set of six polygons. The 90 yods associated with the first four polygons symbolise the 90 instances of either A, C & G bases in the 27 codons or the bases in the stop codons. The 102 yods of the octagon and decagon symbolise the 102 instances of bases in the 34 codons containing a U base. Similarly for the anticodons. A yod and its mirror image in the other set of polygons denotes an instance of a base and an instance of its complement. The two sets of polygons are the sacred geometrical basis of human mRNA and tRNA.



- $9 = 3 \times 3 \rightarrow$ 9 instances of bases in 3 stop mRNA codons
- $81 = 3 \times 27 \rightarrow$ 81 instances of bases in 27 mRNA codons containing only G, C & A
- $102 = 3 \times 34 \rightarrow$ 102 instances of bases in 34 non-stop mRNA codons containing U
- $9 = 3 \times 3 \rightarrow$ 9 instances of bases in 3 stop tRNA anticodons
- $81 = 3 \times 27 \rightarrow$ 81 instances of bases in 27 tRNA anticodons containing only C, G & U
- $102 = 3 \times 34 \rightarrow$ 102 instances of bases in 34 non-stop tRNA anticodons containing A

The 384 yods in the first (6+6) enfolded polygons other than the endpoints of the root edge symbolize the 384 times the four bases appear in the 64 mRNA codons and in the 64 tRNA anticodons

Figure 8

The 60 mRNA codons and their 60 anticodons have their counterparts in:

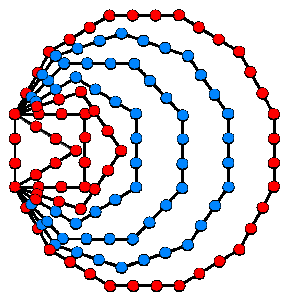
1. the inner Tree of Life as the 60 red yods lining the boundaries of the enfolded triangle, square, pentagon & dodecagon and as the 60 blue yods lining the boundaries of the hexagon, octagon & decagon;
2. the pair of dodecagons as the 60 hexagonal yods in either one;
3. the disdyakis triacontahedron as the 60 faces in each half of the polyhedron.

When its 12 sectors are each constructed from three tetractyses, the dodecagon has 180 yods surrounding its centre. They represent the 180 instances of the four nitrogen bases C, G, U & A. The three groups of four sectors arranged in a cross each contain 60 yods. A yod from each group denotes an instance of a base in the 60 non-stop/start codons.

The 60 non-stop/start codons & their anticodons embodied in sacred geometries

8

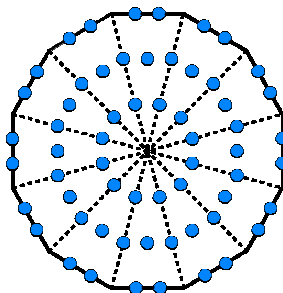
Inner Tree of Life



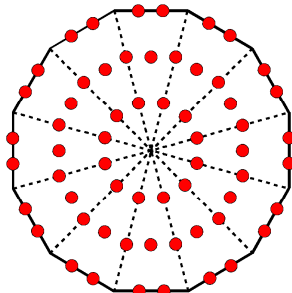
60 ● → 60 mRNA codons

60 ● → 60 tRNA anticodons

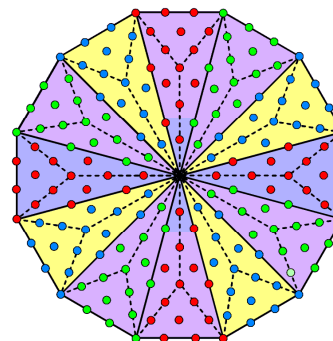
Dodecagon



60 ●



60 ●

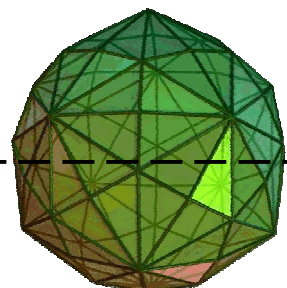


60 ● 60 ● 60 ●



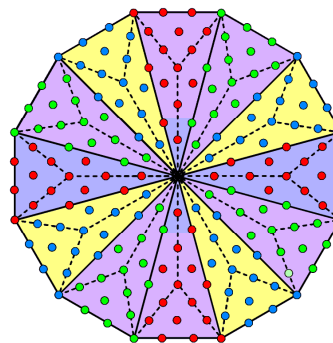
60 mRNA codons other than start or stop codons

Disdyakis triacontahedron



60 faces

60 faces



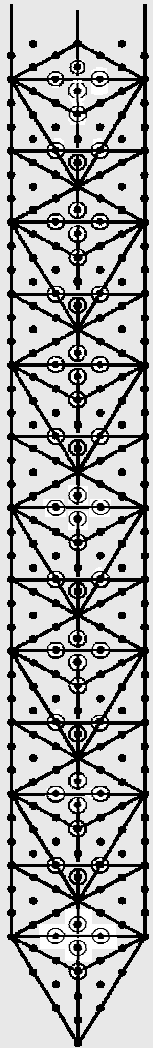
60 ● 60 ● 60 ●



60 tRNA anticodons

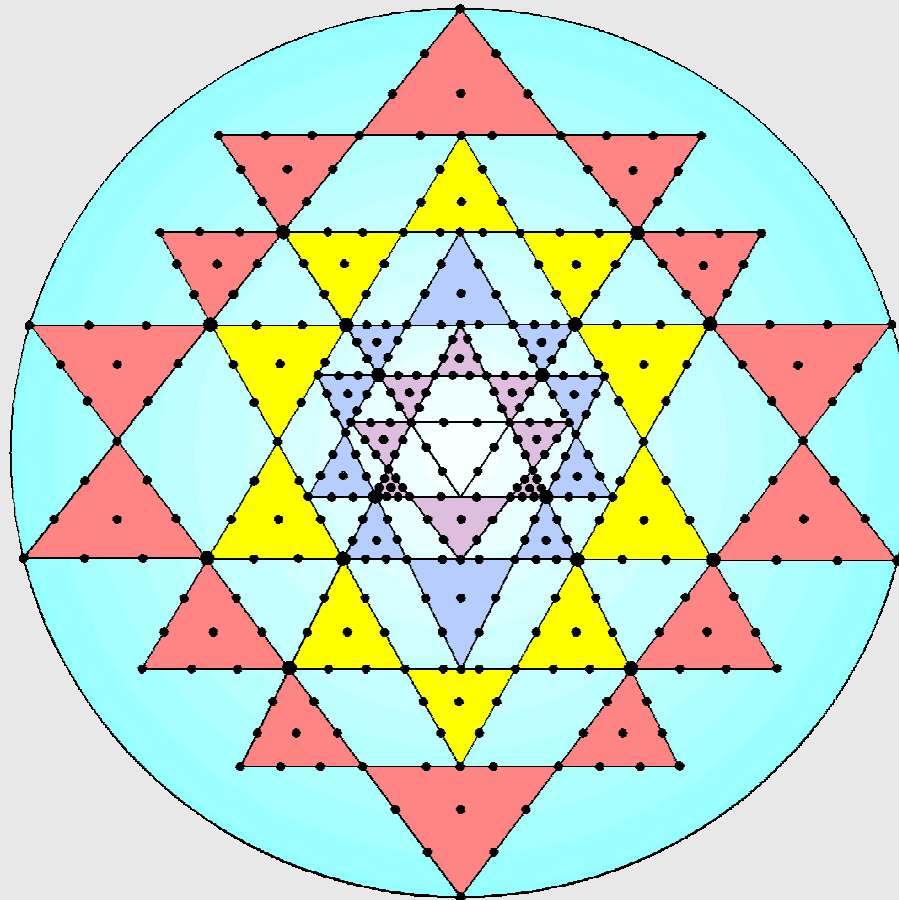
Figure 9

There are 384 yods up to the top of the seventh, overlapping Tree of Life. The 42 triangles of the Sri Yantra have 378 yods, whilst the central triangle has six hexagonal yods on its edges, a total of 384 yods. Both sacred geometries express the seven-fold nature of holistic systems, the seven trees representing the seven Sephiroth of Construction. Their equivalence is further demonstrated by the fact that there are 259 corners, edges & triangles up to the top of the seventh tree, whilst the 43 triangles in the Sri Yantra are composed of 259 corners, edges & triangles.



= 384 =

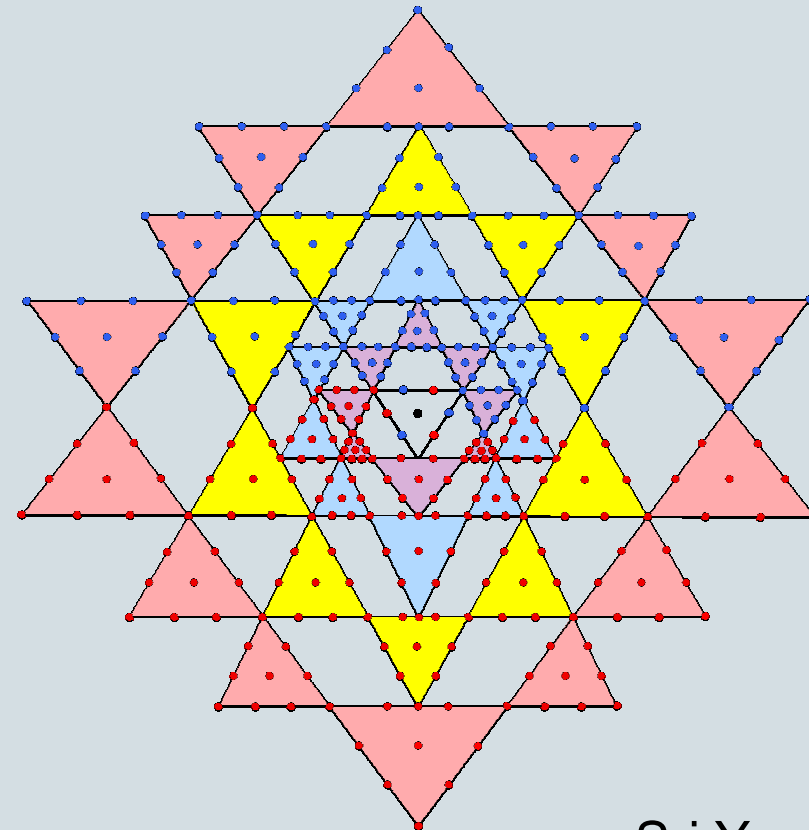
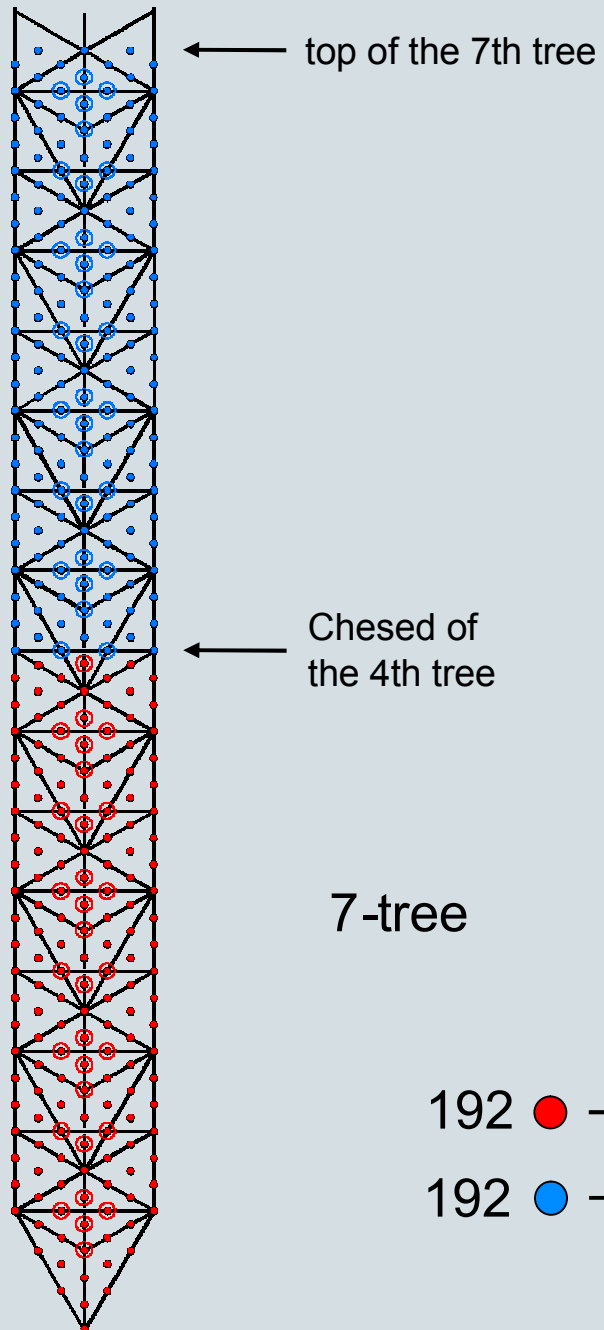
⊙ = 2



**The Sri Yantra is equivalent to the lowest 7 Trees of Life because
it has as many yods as there are yods up to their apex**

Figure 10

When its triangles are turned into tetractyses, there are 384 yods up to the top of the seventh Tree of Life. They correspond to the 384 yods in the 3-dimensional Sri Yantra whose 43 triangles are turned into tetractyses. They also denote the 384 instances of the four nitrogen bases in the 64 codons of messenger RNA and in the 64 anticodons of transfer RNA. This is the Kabbalistic and Sri Yantra basis for the DNA molecule. There are 192 blue yods from the top of the seventh tree down to the Path joining Chesed and Geburah of the fourth tree and 192 red yods below it. They denote the 192 instances of the bases in tRNA and mRNA.



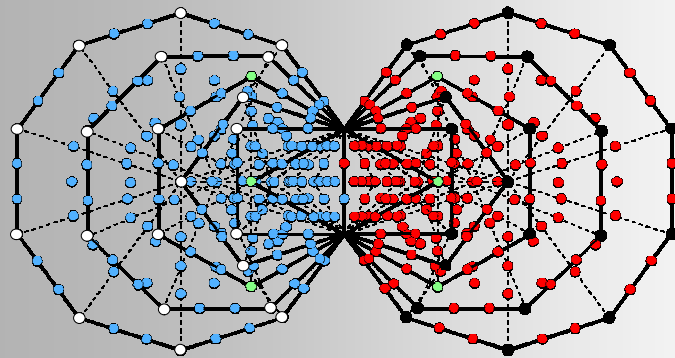
Sri Yantra

192 ● → 192 instances of bases in mRNA codons

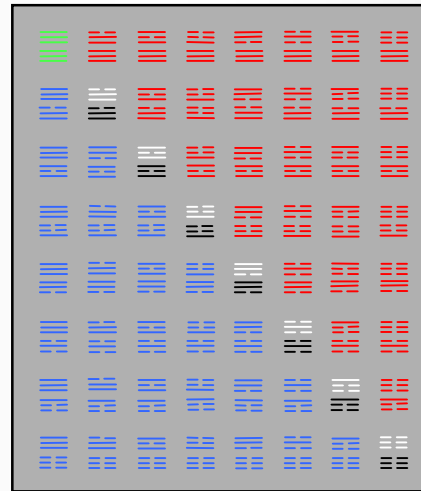
192 ● → 192 instances of bases in tRNA anticodons

Figure 11

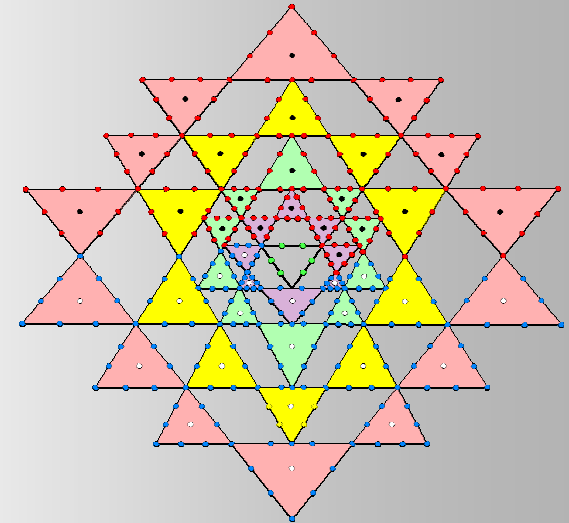
Constructed from tetractyses, the first (6+6) enfolded polygons of the inner Tree of Life have 384 yods other than the endpoint of their shared root edge. They are the counterpart of the 384 yin/yang lines in the table of 64 hexagrams used in I Ching, the ancient Chinese system of divination. They are also the counterpart of the 384 yods in the 43 triangles of the 3-dimensional Sri Yantra. The six green yods at the centre, top & lowest corners of the two hexagons that coincide with the positions of Sephiroth correspond to the six yang lines in the two 'Heaven' trigrams of the hexagram in the top left-hand corner of the table and to the six hexagonal yods in the central triangle that are arranged at the corners of a hexagon. The two sets of 21 corners of the (6+6) polygons are the counterpart of the two sets of 21 yin/yang lines in the seven other hexagrams forming the diagonal of the table and to the centres of the 21 tetractyses in each half of the Sri Yantra. The (168+168) yods other than corners of polygons are the counterpart of the (168+168) yin/yang lines in the (28+28) off-diagonal hexagrams and to the (168+168) yods on the edges of the (21+21) tetractyses.



≡



≡



6 ●
168 ○ 21 ● 168 ●
21 ○

6 —
168 —& — 21 —& — 168 —& —
21 —& —

6 ●
168 ○ 21 ● 168 ●
21 ○

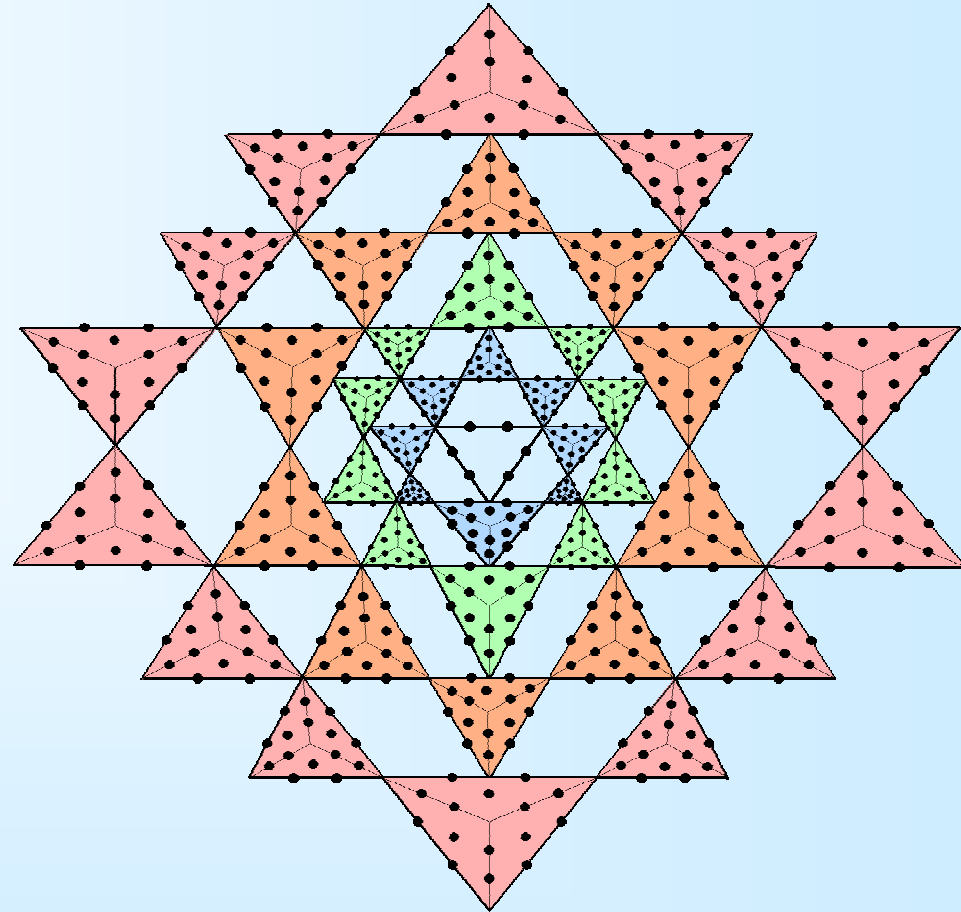
Total number of degrees of freedom = 384

The correspondence between the inner Tree of Life, the I Ching table & the Sri Yantra

Figure 12

When each of the 42 triangles in the Sri Yantra is divided into its three sectors and each sector then turned into a tetractys, 636 hexagonal yods are generated. This is the sum of the number values of the Godnames of the ten Sephiroth.

$$636 = \begin{array}{r} 21 \\ 26 \ 50 \\ 31 \ 36 \ 76 \\ 129 \ 153 \ 49 \ 65 \end{array} =$$

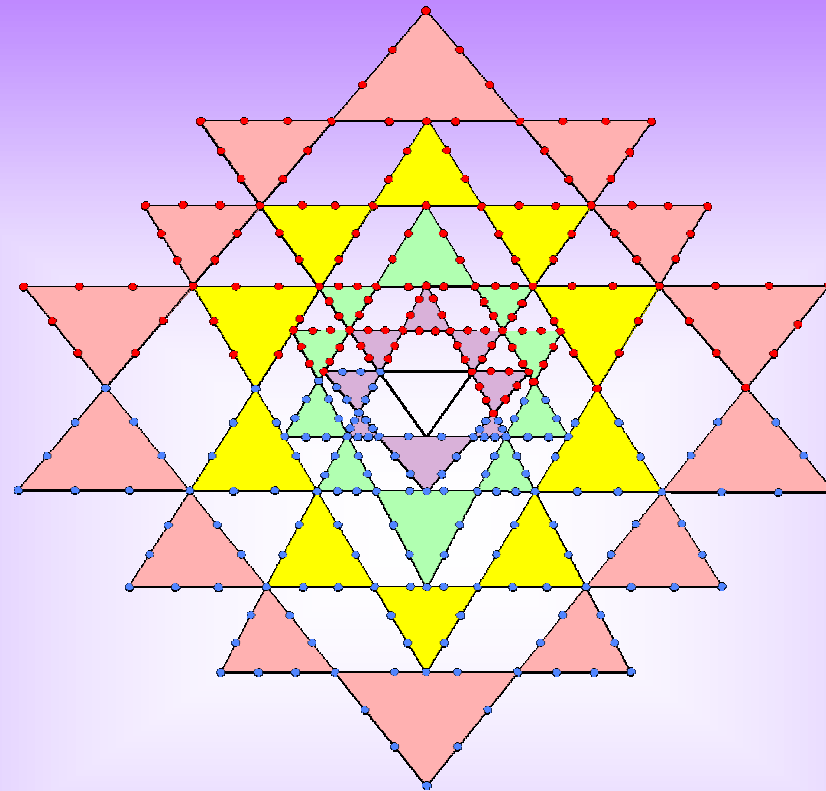


**The sum of the 10 Godname numbers is the number
of hexagonal yods in the 2-d Sri Yantra**

Figure 13

Assigning the number 10 (the Pythagorean Decad) to the 336 yods on the 126 edges of the 42 triangles of the 3-dimensional Sri Yantra generates the number 3360 — the number of turns in one revolution of the ten whorls of the $E_8 \times E_8$ heterotic superstring. This demonstrates how the Sri Yantra and the inner Tree of Life are equivalent representations of holistic systems like the heterotic superstring. Each half of the Sri Yantra with 168 yods defines the number (1680) of circularly polarized oscillations made by all ten closed curves of the superstring during half of a revolution around its spin axis. The inner and outer halves of the superstring correspond to the two halves of the Sri Yantra. They are prescribed by the Godname EHYEH with number value 21 because 21 triangles in each half surround its central triangle.

3360 =



● = ● = 10

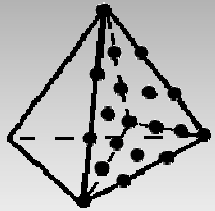
3360 is the sum of the number 10 (Decad) assigned to each of the 336 yods on the 126 edges of the 42 triangles of the 3-d Sri Yantra

Figure 14

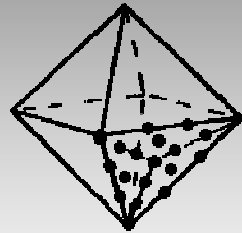
Consider the faces of the Platonic solids divided into their sectors. Each polyhedral edge is the side of an internal triangle with a corner at the centre of the solid. When the sectors in the faces and their internal triangles are turned into tetractyses, the average number of yods in the first four Platonic solids is 168. This is how these regular polyhedra, which the ancient Greeks believed were the shapes of the particles of the elements Earth, Water, Air & Fire, determine the structural parameter 168 of the superstrings making up atoms.

The average number of yods in their faces is 137. This is the integer that approximately determines the magnitude of the fine-structure constant, which in turn determines some of the properties of atoms.

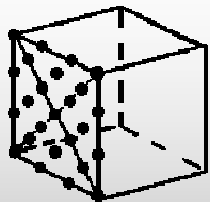
The first four Platonic solids have 38 faces. Their 120 sectors have 248 vertices & edges. They embody the dimension 248 of the superstring gauge symmetry group E_8 .



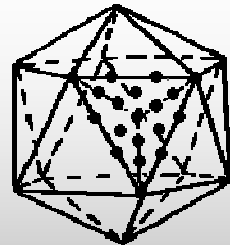
tetrahedron



octahedron



cube



icosahedron

The faces of the tetrahedron, octahedron, cube & icosahedron have 120 sectors with 248 corners & sides.

The average number of yods in faces of the first four Platonic solids is 137.

The average number of yods (including centres) in the faces and interiors of the first four Platonic solids is 168.