

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

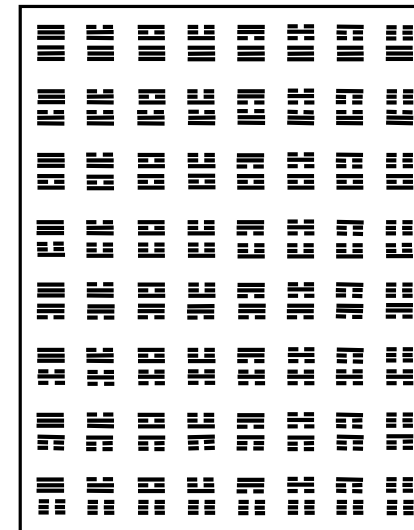
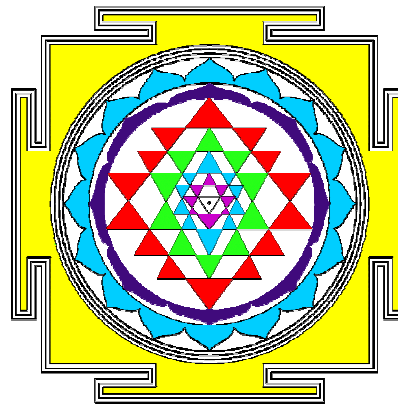
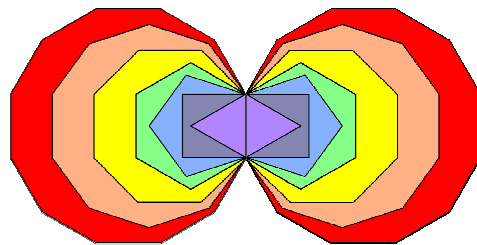
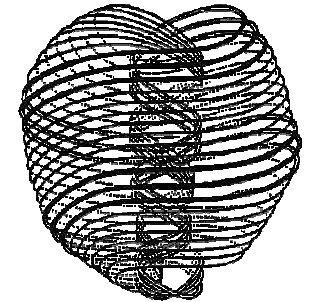
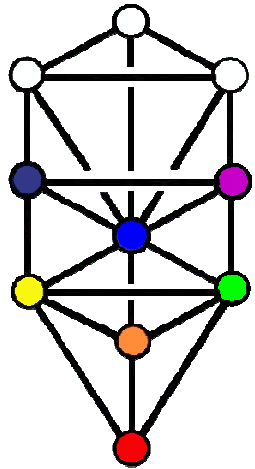
by

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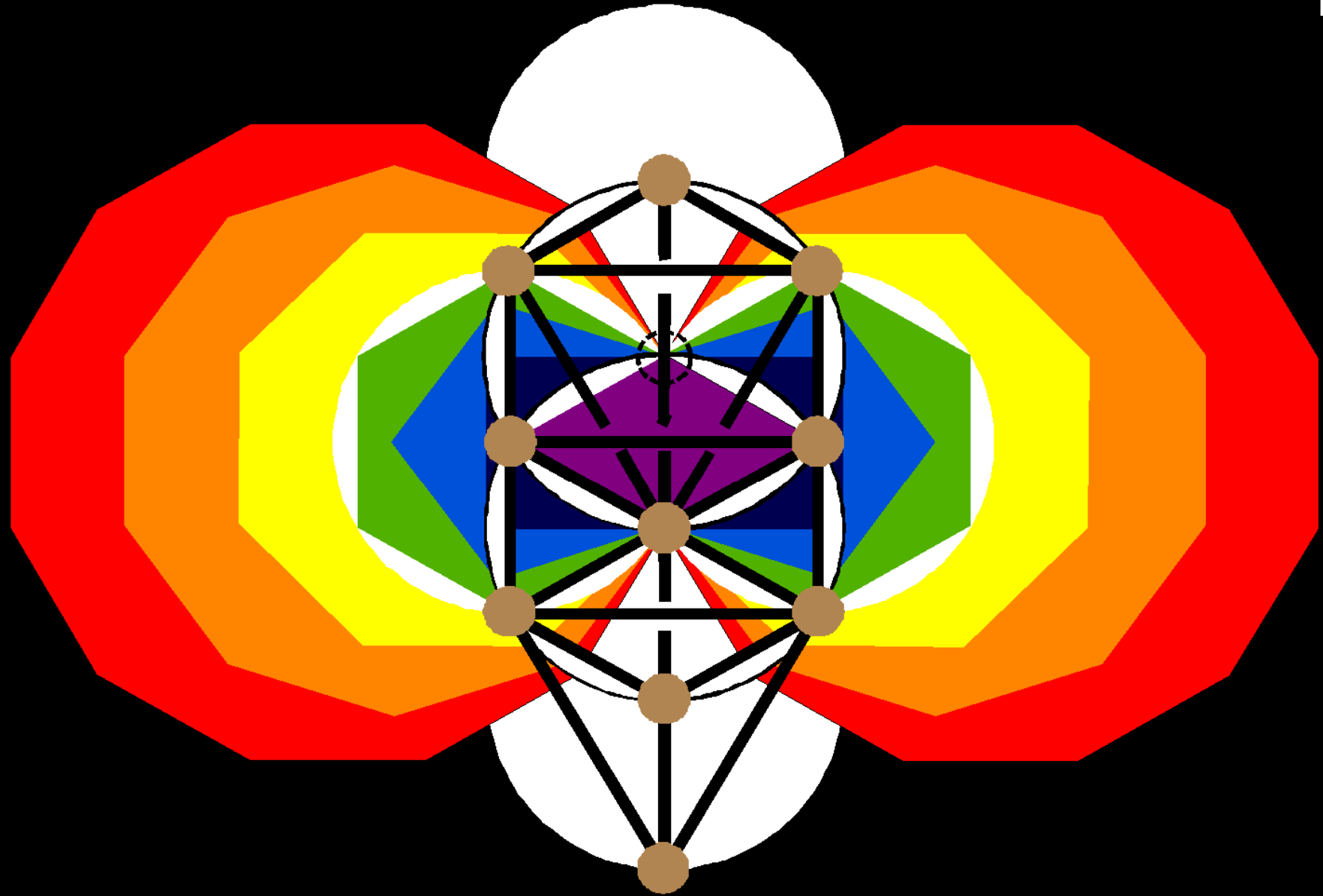
	SEPHIRAH	GODNAME	ARCHANGEL	ORDER OF ANGELS	MUNDANE CHAKRA
1	Kether (Crown) 620	EHYEH (I am) 21	Metatron (Angel of the Presence) 314	Chaioth ha Qadesh (Holy Living Creatures) 833	Rashith ha Gilgalim First Swirlings. (Primum Mobile) 636
2	Chokmah (Wisdom) 73	YAHVEH, YAH (The Lord) 26, 15	Raziel (Herald 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. 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.

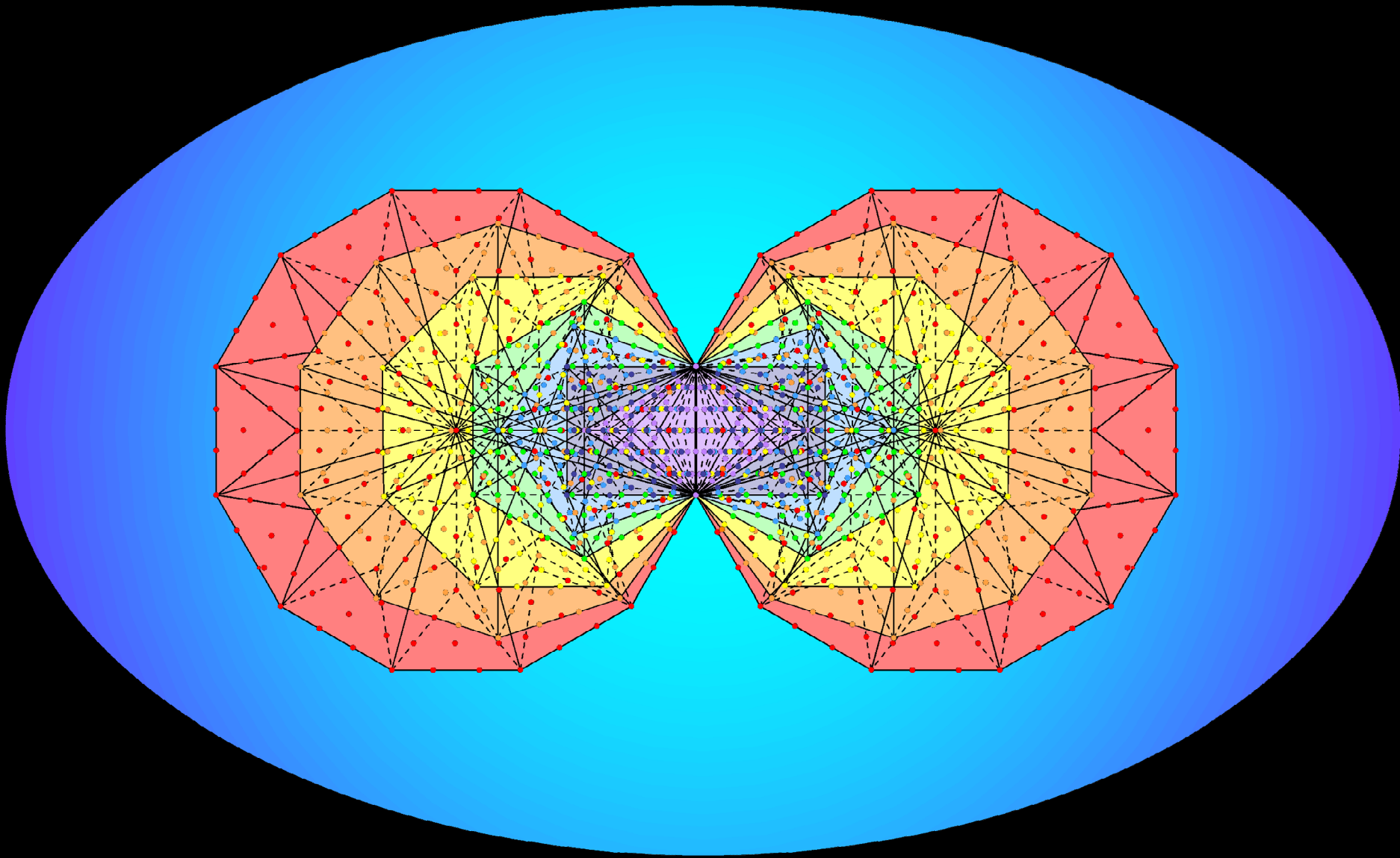
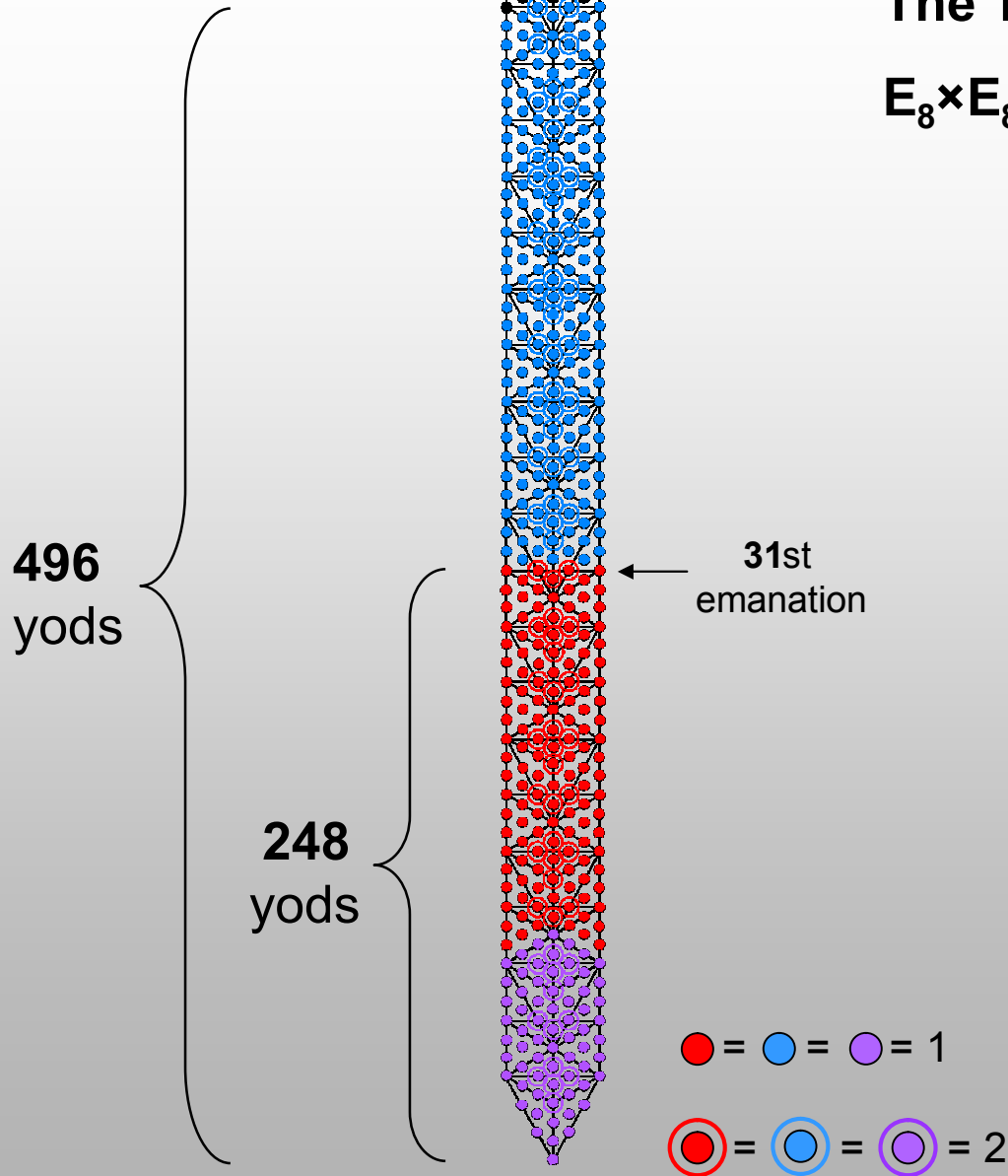


Figure 3

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



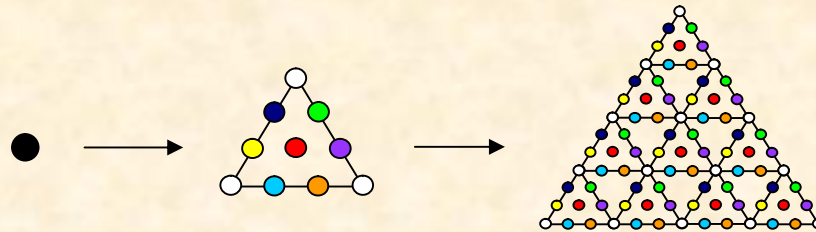
There are **248** yods up to Chesed of the 5th tree (the **31st** Sephirothic emanation) and **248** more yods up to (but not including) Chesed of the 10th tree. **496** yods are needed to construct 10 overlapping Trees of Life, starting from Chesed of the 10th tree. Each yod symbolizes one of the **496** 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.

248 ● \longrightarrow E_8'
 168 ● } **248** \longrightarrow E_8
 80 ● }

● = ● = ● = 1
● = ● = ● = 2

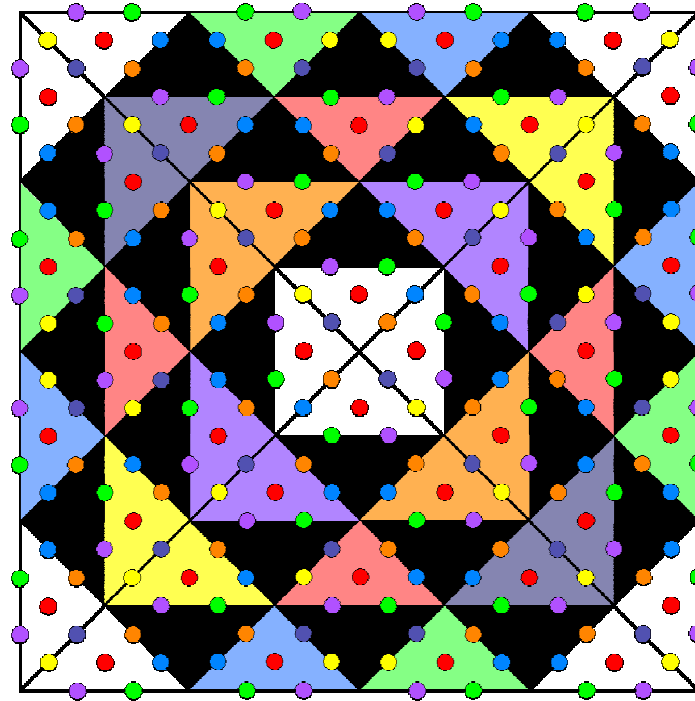
Figure 4

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.

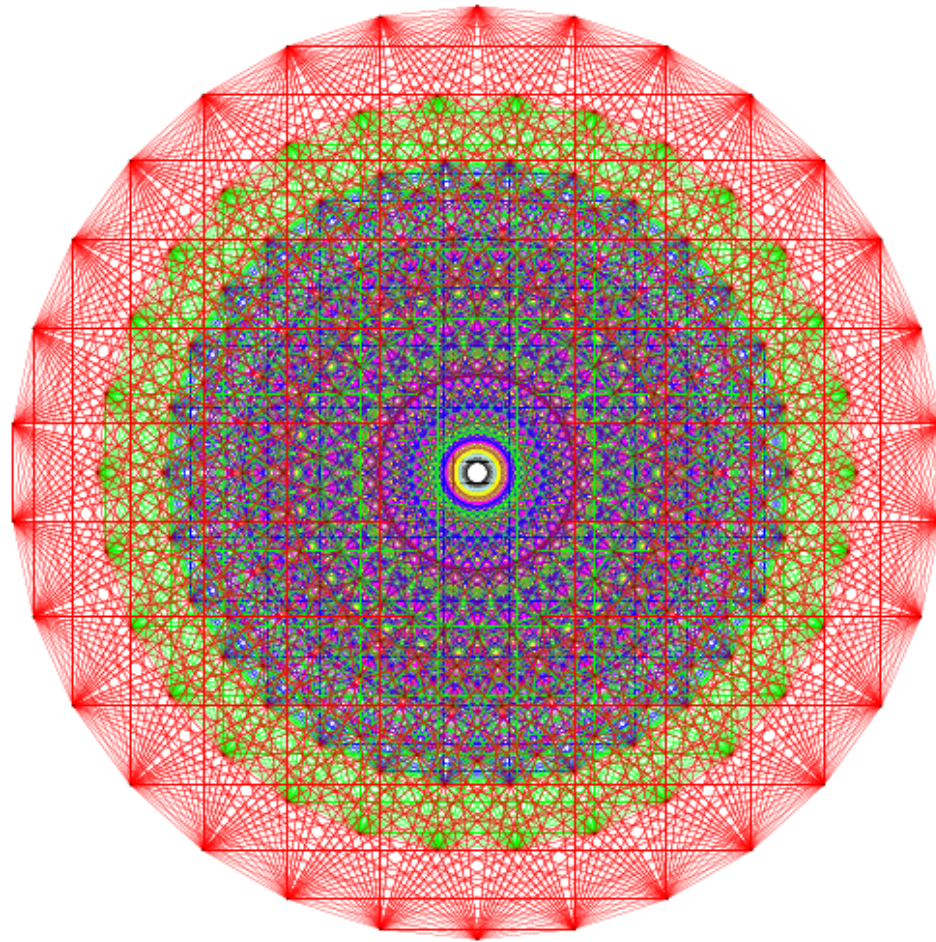
248 =



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)

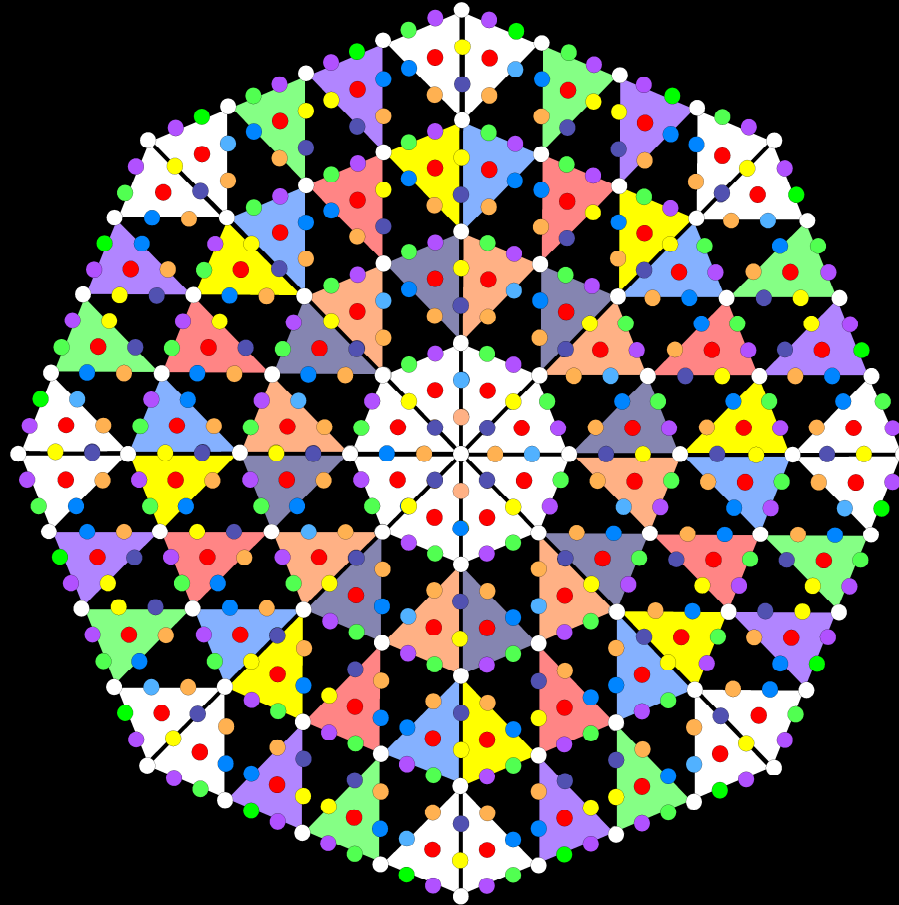


The Gosset polytope 4_{21}

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 Sefirah 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 =



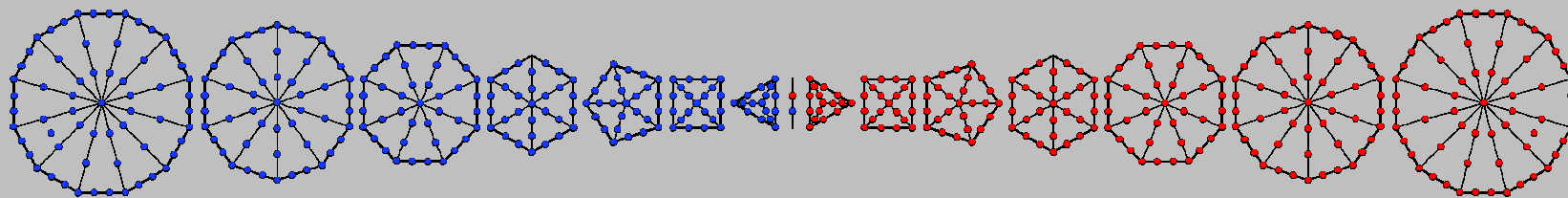
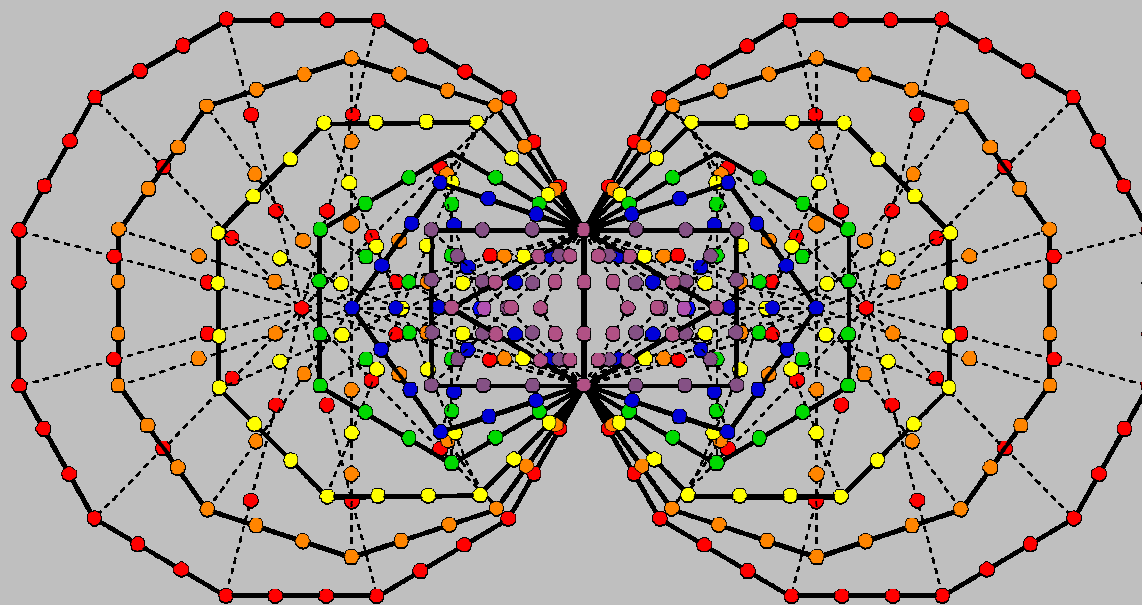
The 496 hexagonal yods in the octagon denote the 496 spin-1 particles that transmit the unified force between superstrings

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.

428 =



248 ●

248 ●

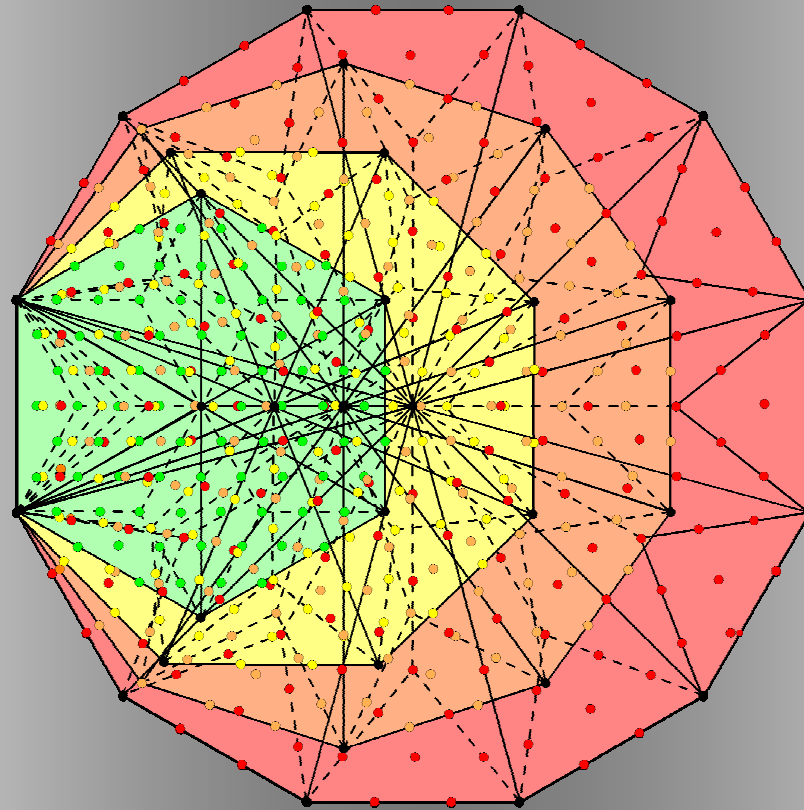
Figure 8

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	$91 - 4 = 87$	$87 - 4 - 1 = 82$	$\left. \begin{array}{l} \\ \\ \\ \end{array} \right\} \mathbf{248}$
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.

496 =

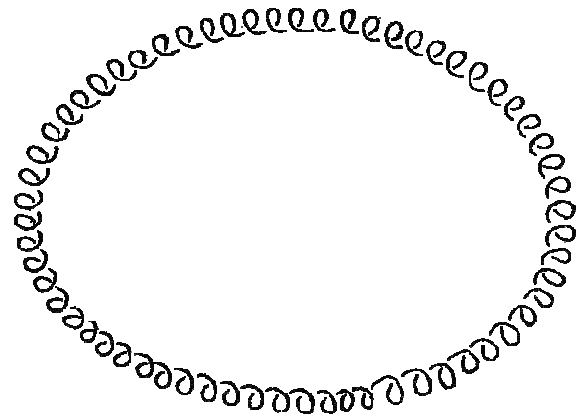


248 yods in the
hexagon & dodecagon
→ dimension of E_8

248 yods in the
octagon & decagon
→ dimension of E_8'

The last four enfolded polygons of the inner Tree of Life have 496 yods other than their centres and corners. They denote the (248+248) gauge fields of the $E_8 \times E_8'$ heterotic superstring symmetry group.

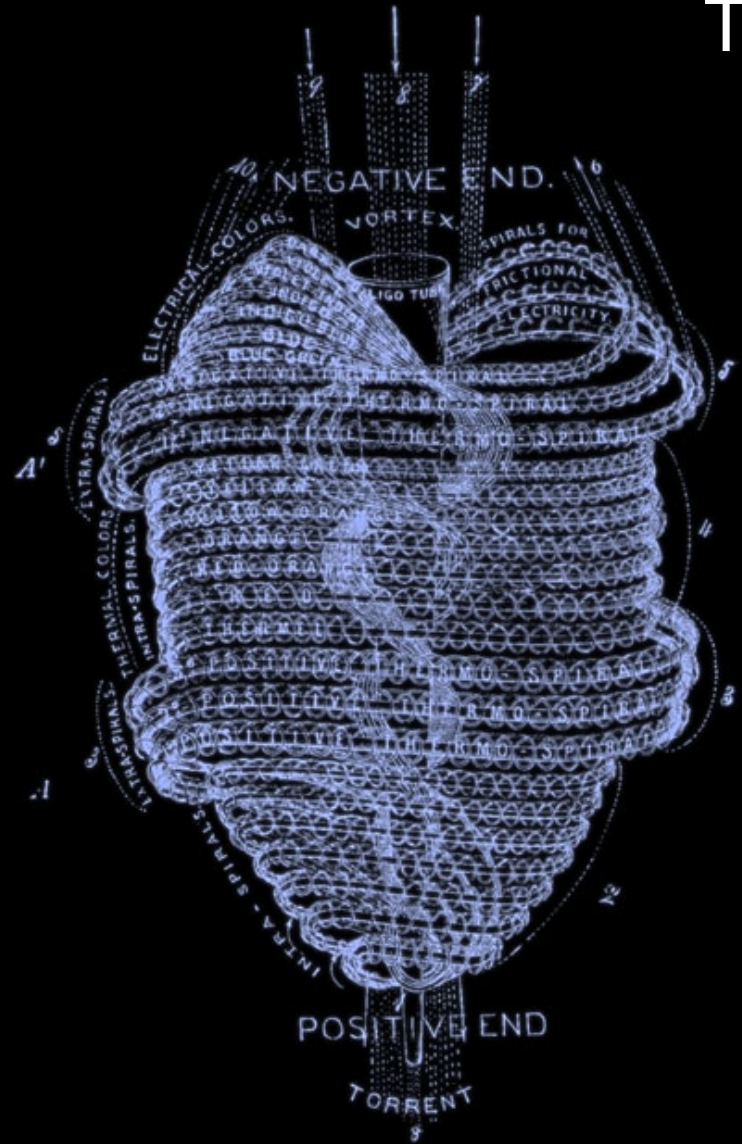
Figure 9



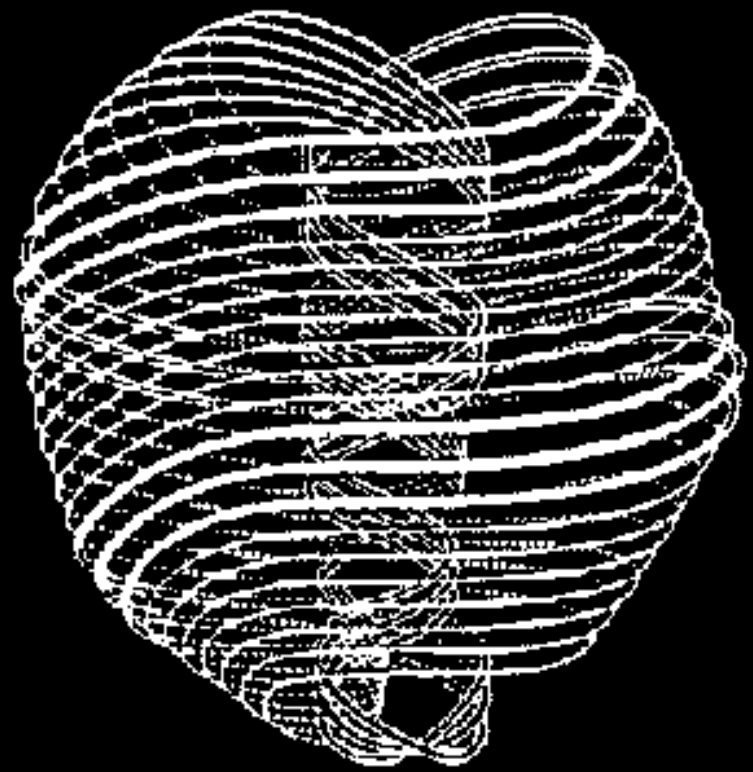
A helical whorl
has 1680 turns

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).

The UPA



Babbitt

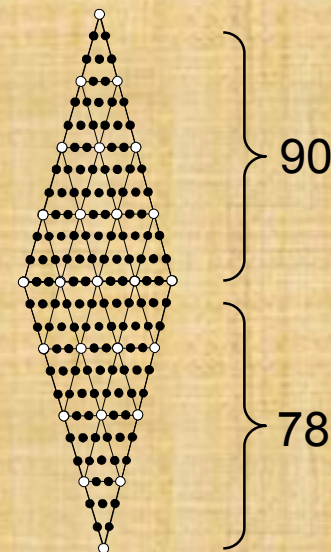


Besant & Leadbeater

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:

<p>יְסוּדוֹת</p> <p>TUDUSY</p> <p>4 ← 400 1 4 6 6 0 10</p> <p>—————</p> <p>90</p>	<p>חֵלֶם</p> <p>MLCh</p> <p>40 30 8</p> <p>—————</p> <p>78</p>
<p>168 =</p>	



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 =	$1^0 \quad 2^0 \quad 3^0 \quad 4^0$ $1^1 \quad 2^1 \quad 3^1 \quad 4^1$ $1^2 \quad 2^2 \quad 3^2 \quad 4^2$ $1^3 \quad 2^3 \quad 3^3 \quad 4^3$
-------	--

● yods.

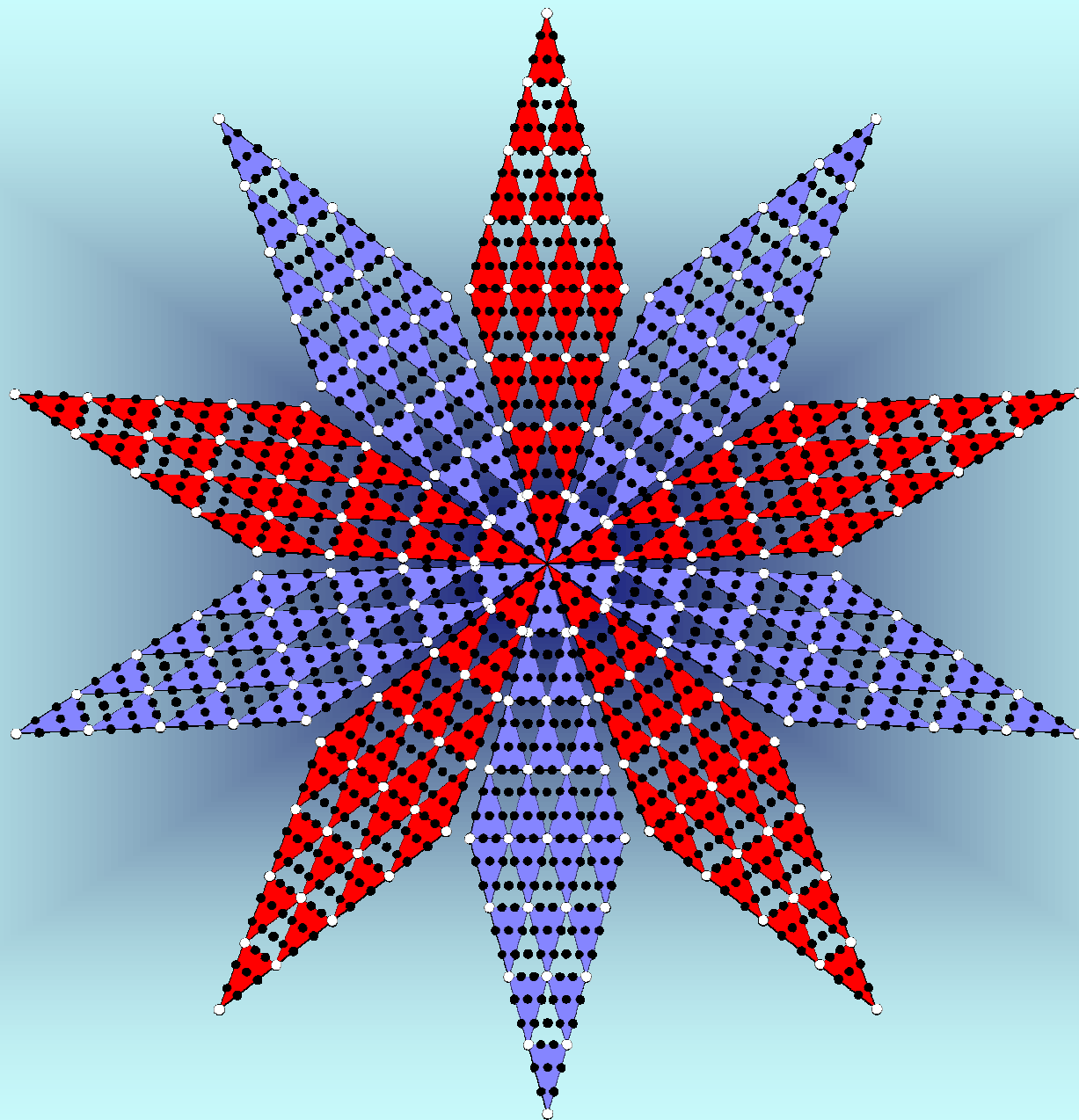
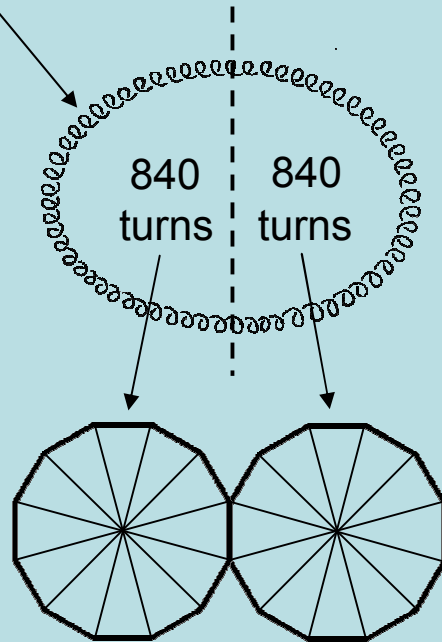


Figure 11

24 E_8 gauge charges are spread along a whorl

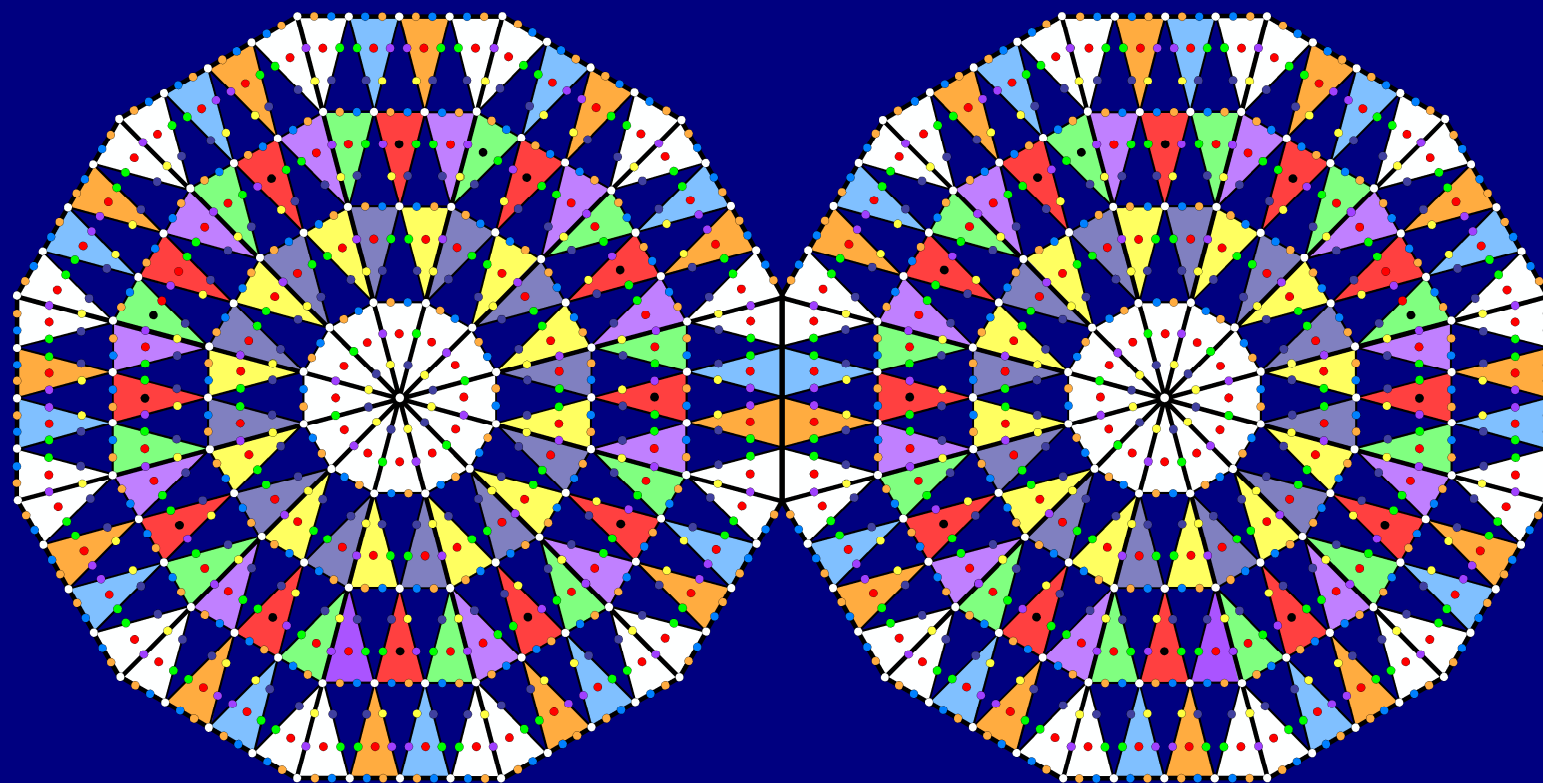


12 sectors → 12 E_8 gauge charges

12 sectors → 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. Their 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

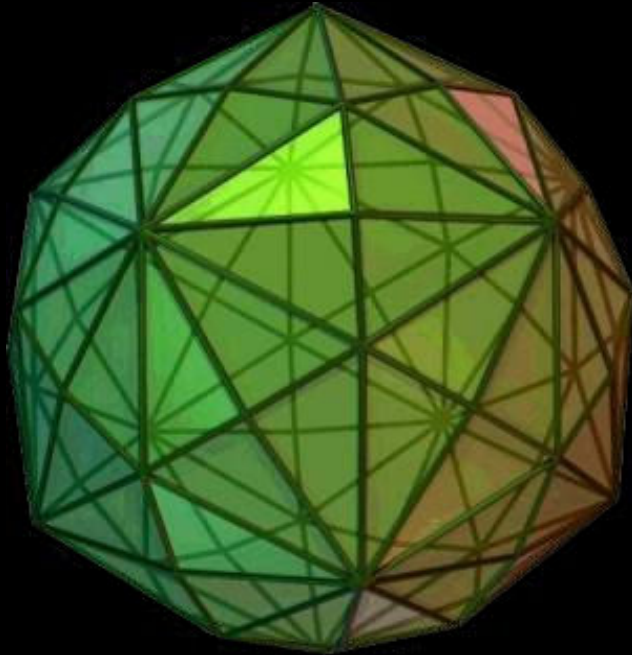


840 yods

840 yods

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 times 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.

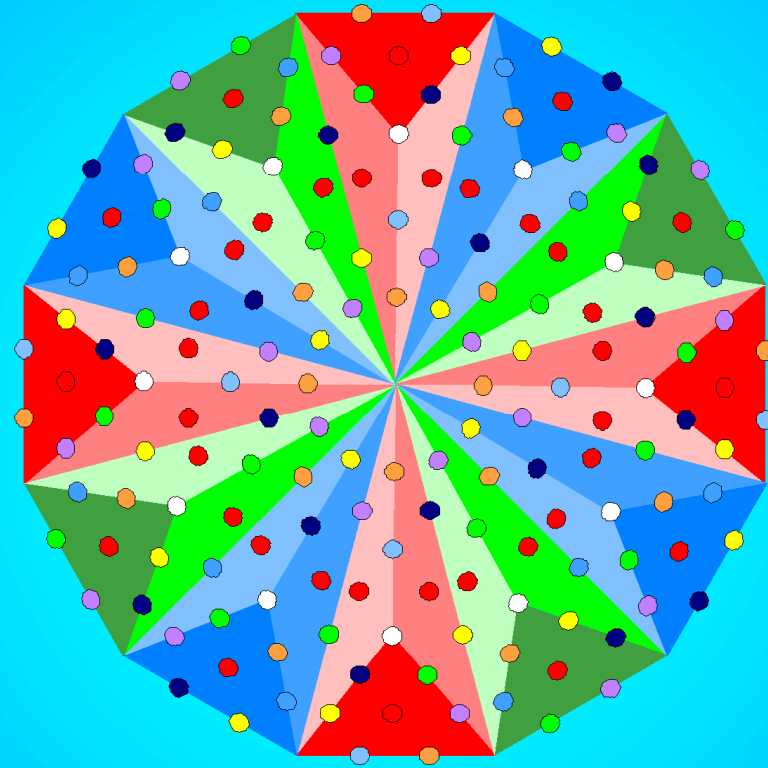


1680 vertices, edges & triangles surround an axis joining any two diametrically opposite vertices. Every geometrical element corresponds to a turn in each of the 10 helical whorls of the UPA/superstring.

The disdyakis triacontahedron is the polyhedral Tree of Life

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 Sefirah signifying the material universe determines the form of the basic units of matter.



The **168** yods in a dodecagon other than corners of sectors symbolise the **168** turns in a half-revolution of each whorl of the heterotic superstring

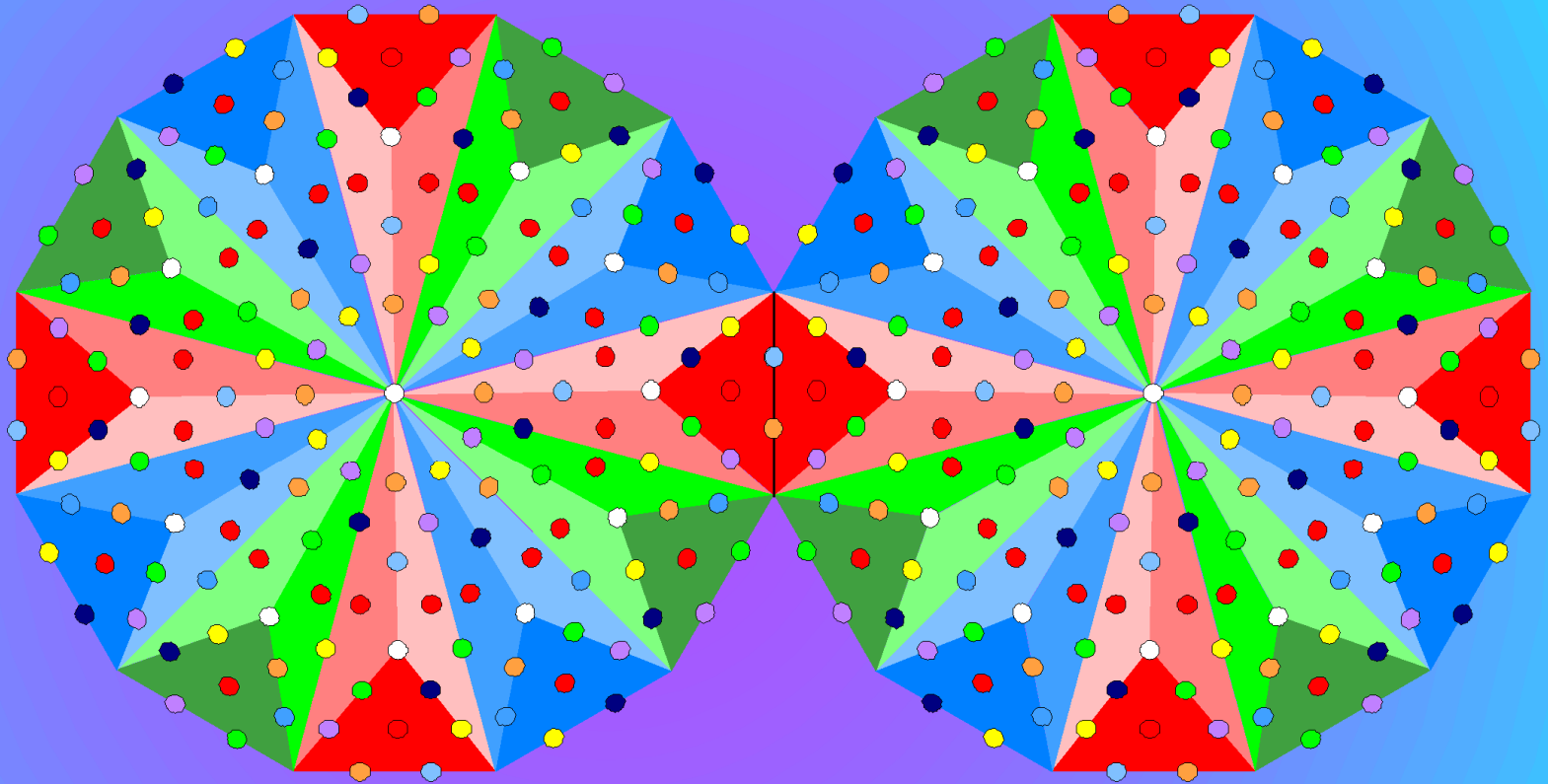
Figure 14

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.

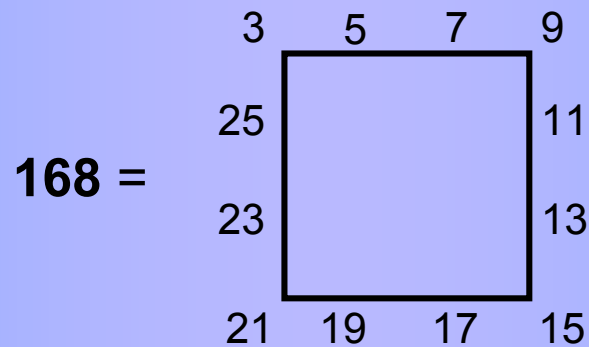
336 =



TWO JOINED DODECAGONS CONTAIN 336
YODS OTHER THAN THEIR 22 CORNERS

Figure 15

A square is the symbol of the Tetrads. 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.

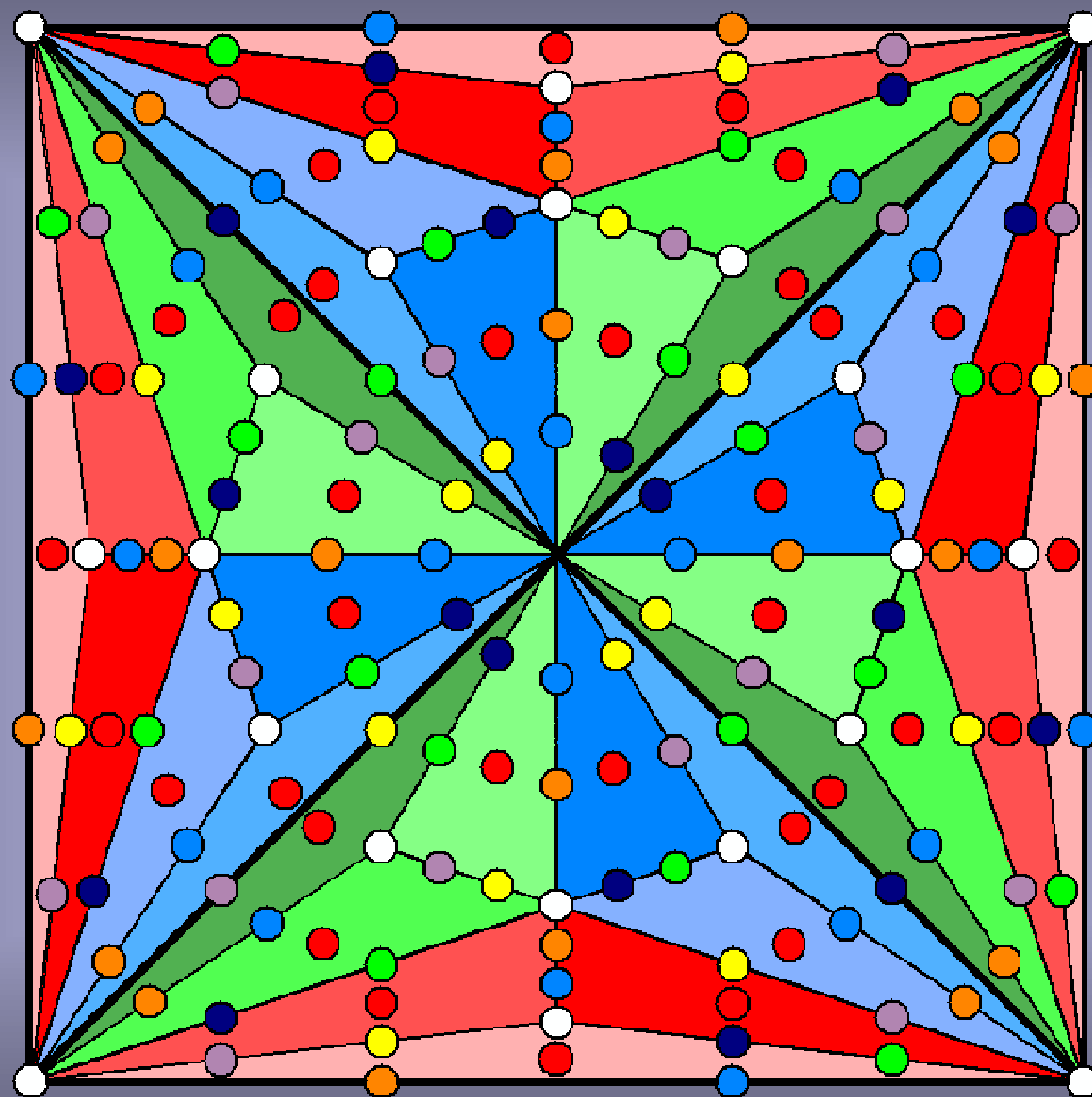


Figure 16

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:

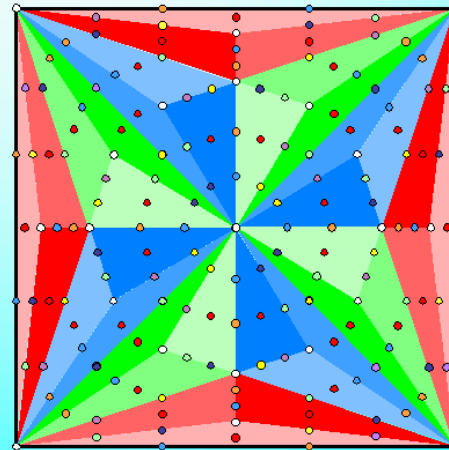
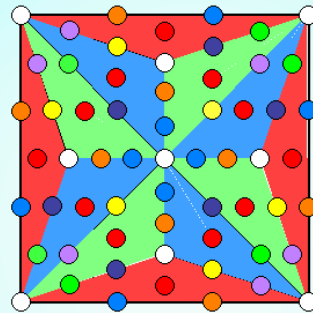
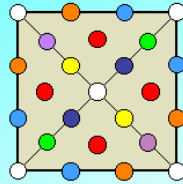
point-line-triangle-square-pentagon, etc

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