<u>The meta architecture of Team Syntegrity and participatory democracy</u>

1 - on architecture and meta architecture

2 - the coherent architecture of Team Syntegrity / Syntegration for participatory democracy - expanded

3 - From the X, Y, Z organized world, to the Tetraverse and the 7 axes of Omniverse - from necessary to necessary and sufficient

4 - take aways and take forwards… Insights and Outsights

5 - Questions and comments

J & C Truss
2023

Read the slide with commentary.

1 - on architecture and meta architecture

What is architecture?

It is the smallest instruction set from which Structure, Form and Function can be designed and built.

…the complex or carefully designed structure of something :"the neurophysical architecture of the human brain"
"the cybernetic architecture of the Viable System Model" - "the architecture of self organizing systems"

Principles that encompass an interesting design.

- Symmetry. As we know, symmetry is the reflection of shared forms, shapes or angles across a central line or point called the axis. Emmy Noether conservations.
- Order, sequence.
- Arrangement, connection, placement.
- Balance, equivalence, aesthetic.
- Rhythm, cycles, iterations, flow, timings.
- Emphasis, amplification, reverberation.
- Proportion, scale.
- Movement, navigation, speed.
- Contrast, member / critic, scratch or stroke.
- Unity, cohesion, togetherness, consciousness, identity, resonance

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2023

Read slide…
What is architecture?
It is the smallest instruction set from which Structure, Form and Function can be designed and built.
e=mc^2 is the most efficient expression of equations that fill many pages - the Big Bang is the smallest instruction set from which the universe self constructed.

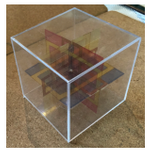
1 - on architecture and meta architecture

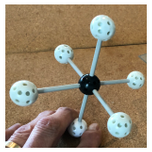
Because this talk is about architecture, let us first orient ourselves to each other:

Universal directions are: UP / DOWN; RIGHT / LEFT; FORWARD / BACKWARD based on three axes, called X, Y, Z. Any single point within an X,Y,Z cube can represent the positions on these three axes and vice versa.

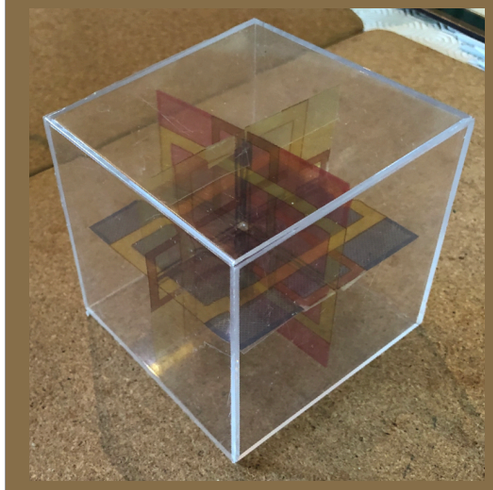
The axis lines are the ones around which the object spins. Eg. Earth's axis of rotation. Axis lines can be centre face or vertex oriented.

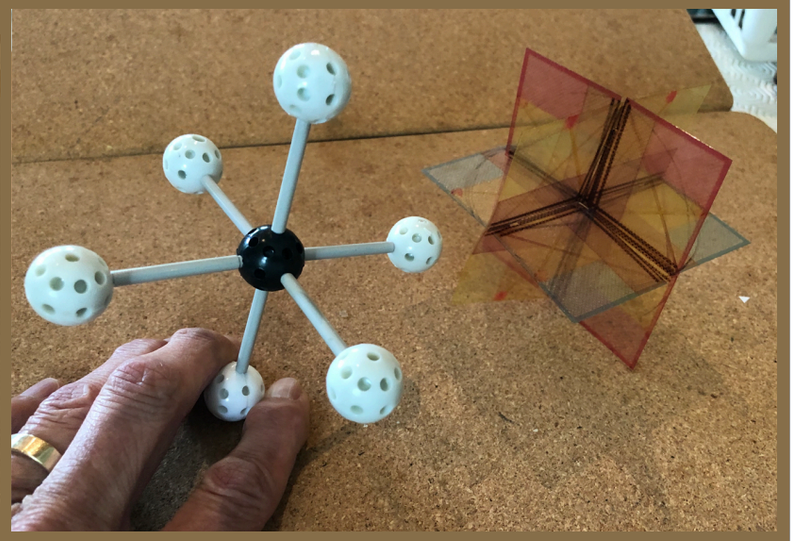
The cube is formed because the three axes are perpendicular to each other, ie at 90 degrees as the model shows. In the case of the cube, the axes along the centre are the same as the axes along the edges.





Read slide:
1 - Models: X,Y,Z axes - six pointed star & cube container with internal lines depicting 8 cubes.





A blow up of the previous models:
Show how the X,Y,Z axes align to the centre of the cube and are the same for the edges.

The octahedron sits inside the cube with each of its vertices touching the centre of the cube face

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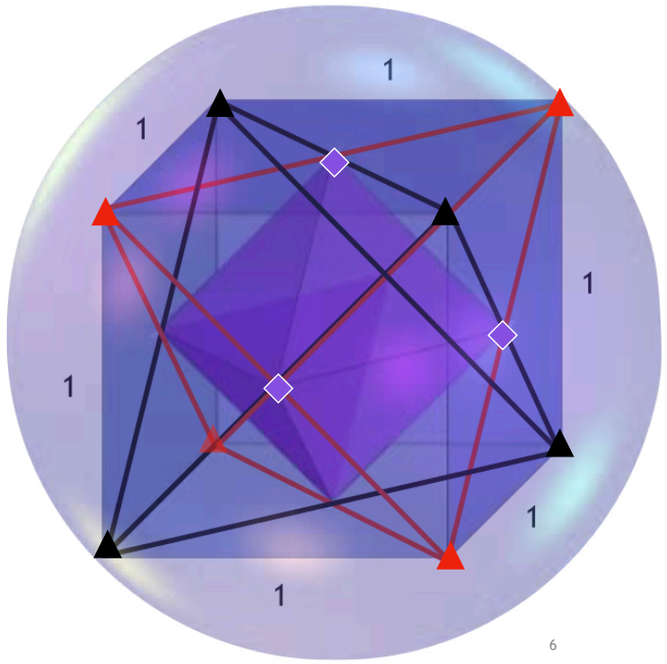
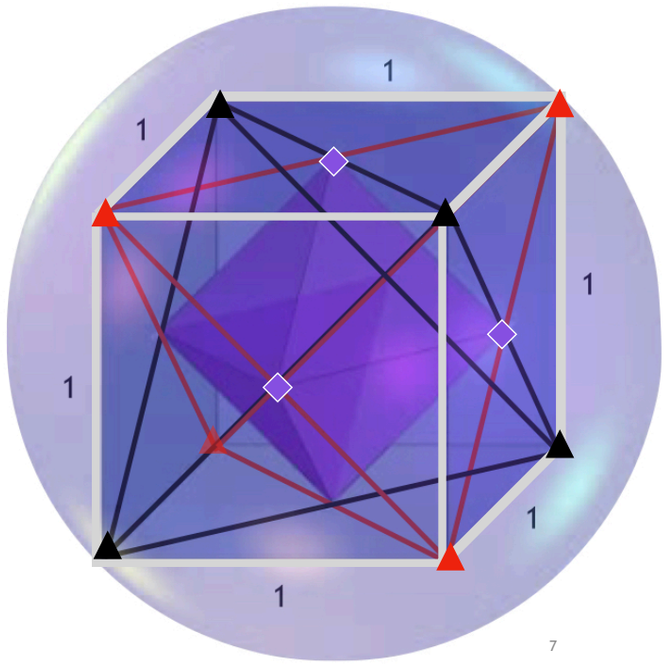
Here is an example of a cube inside which is an octahedron. Point out the vertices or tips of the octahedron that meet at the centre of each cube face.

This octahedron is formed by the two intersecting tetrahedra (red and black) the four vertices of each which make up the eight vertices of the cube.

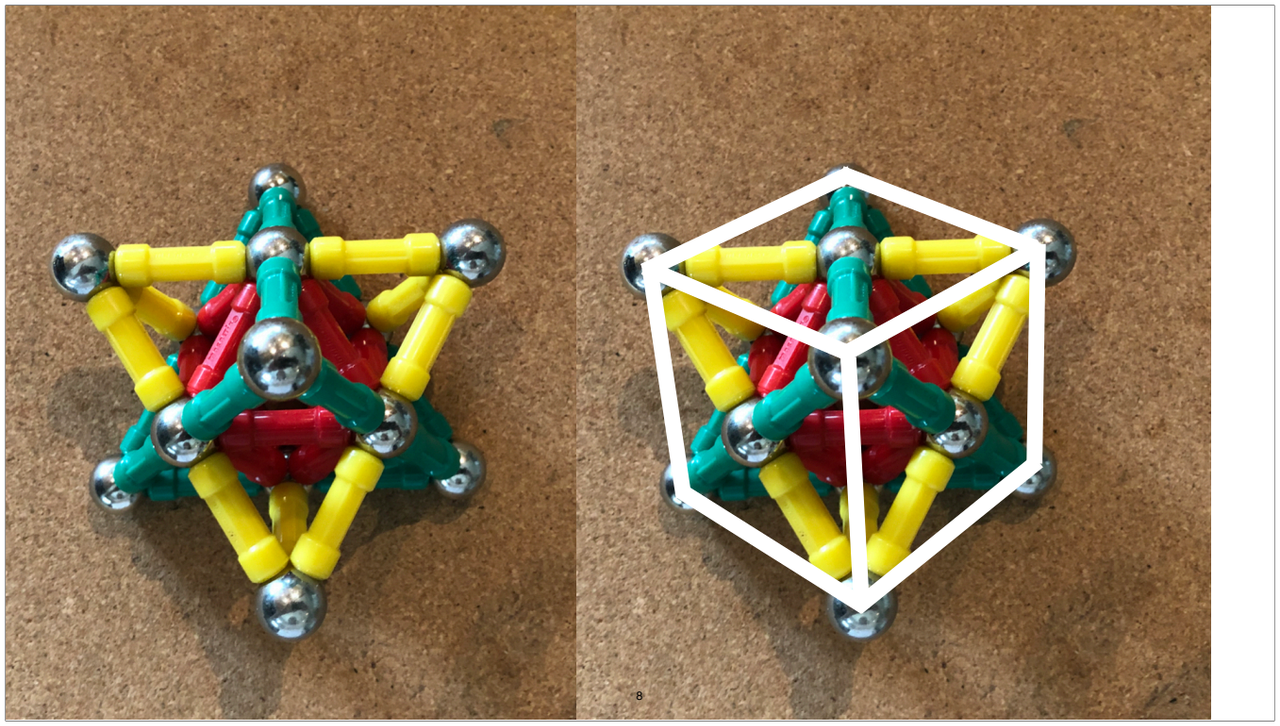


Point out the red and black tetrahedra and their vertices meeting at the corners of the cube faces.

This octahedron is formed by the two intersecting tetrahedra (red and black) the four vertices of each which make up the eight vertices of the cube.

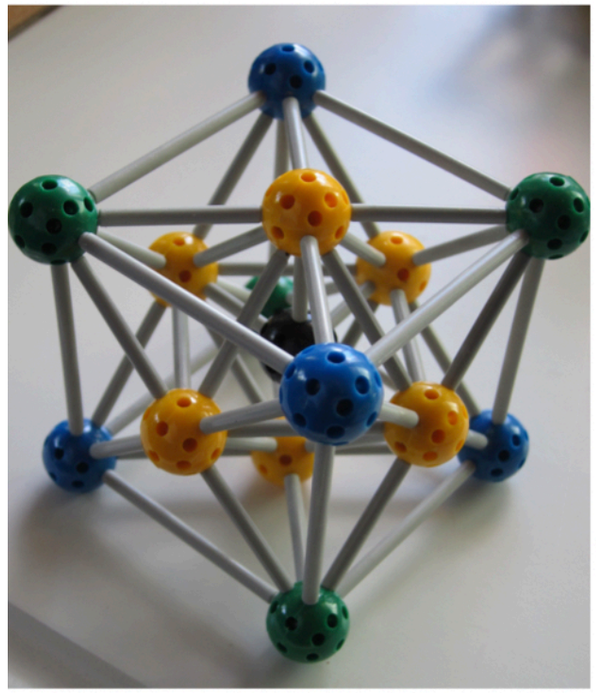


The octahedron is the inside space formed by the intersecting 2-F tetrahedra which nodes configure the 8 nodes of the surrounding cube that supports the embedding sphere. The term frequency simply means the number of the established unit 1 multiples.
The tetrahedron edges are the diagonals of the square faces of the cube. If the cube is made the unit 1 reference, then the tetrahedral edge is the square root of 2, which is an irrational number that has no end.
We will demonstrate in coming segments why we think it is the tetrahedral edge that is the primordial reference unit 1, aka the Planck constant, why that might make a difference to our perceptual frames, to mathematics and science and to the construction of our own coherent meaning structures and metaphors.



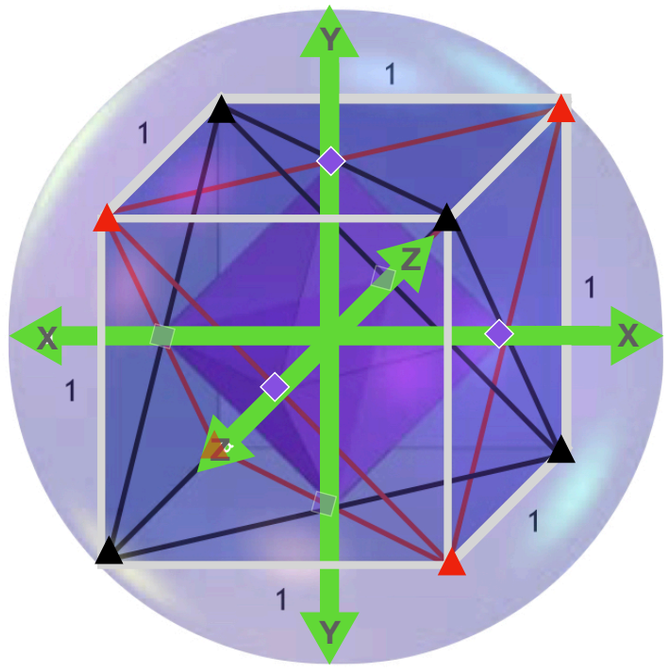
Show the intersecting tetras and octahedron by colour on left.
The dimensions of the Real Cube come out of the intersection of 2 X 2-F Tetrahedra as shown by the white lines above Right. The simplest geometry will explain why each white edge of the Cube must be larger then the 1-F edge of the primary Tetrahedron.

Two 2-Frequency tetrahedra - blue vertices and green vertices, when intersected, create the eight vertices of the cube. The central octahedron shown with yellow vertices is the shared open space within the two tetrahedra.



Read slide - point out details.

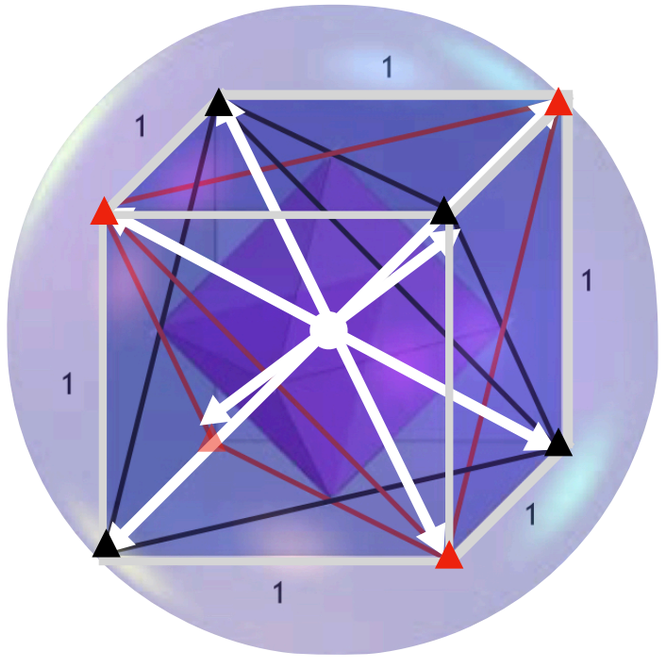
Cube inscribed in its sphere with radii through the centre of each face. These axes correspond to the vertices of the enclosed octahedron and are the X,Y,Z coordinates.



2 - Cube inscribed in its sphere with radii through the centre of each face. These axes correspond to the vertices of the enclosed octahedron.

The axes of the cube are the lines through the centre around which the object can spin. The green are the X,Y,Z 90 degree axes used as the 3 dimensional frame which constitute the Cartesian coordinate system used in science and mathematics.

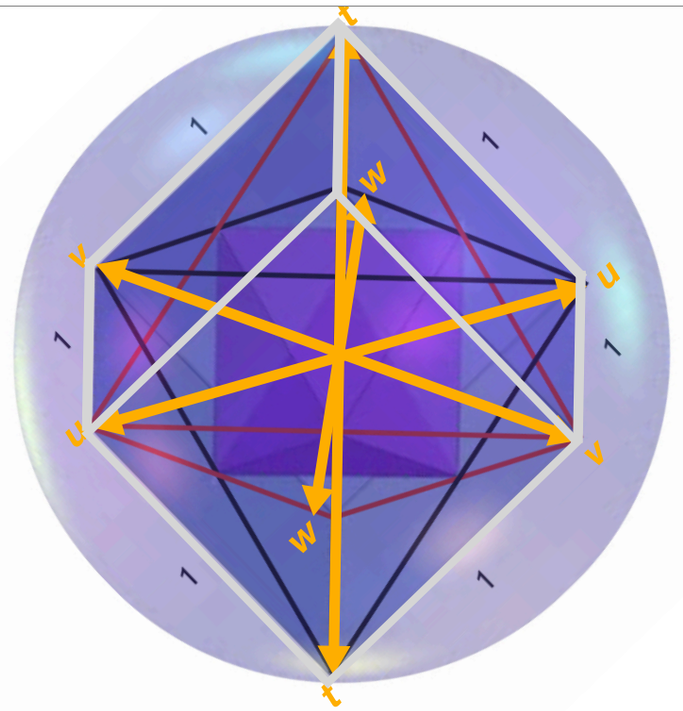
Cube inscribed in its sphere with radii to vertices
These axes correspond to the interlaced tetrahedra that form the 8 vertices of the enfolding cube.



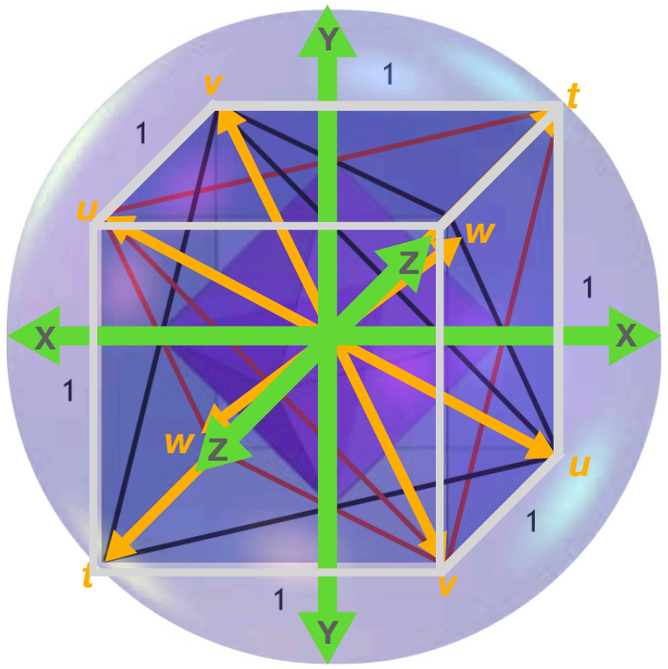
2 - Cube inscribed in sphere with radii to vertices. These axes correspond to the interlaced tetrahedra that form the 8 vertices of the enfolding cube.

Show tetrahedron, octahedron and intersecting tetras.

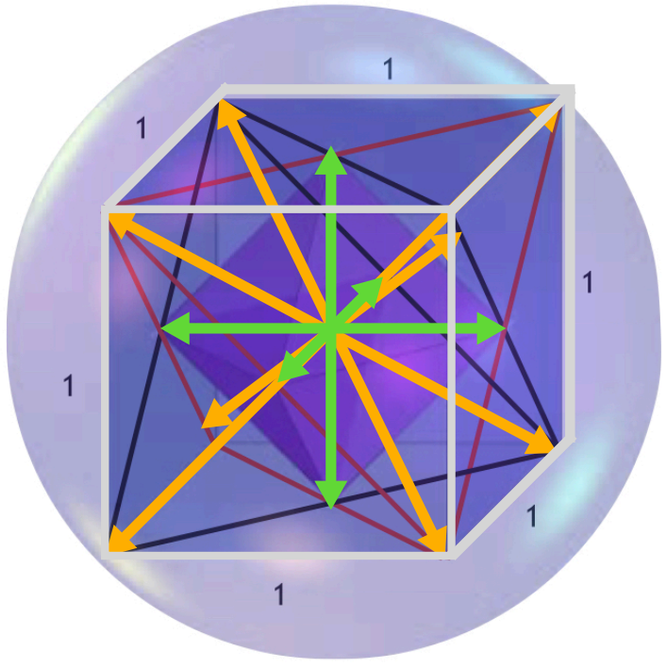
The vertexial axes of the cube are the lines through the centre around which the object can spin. These are the same as the axes in previous diagram.



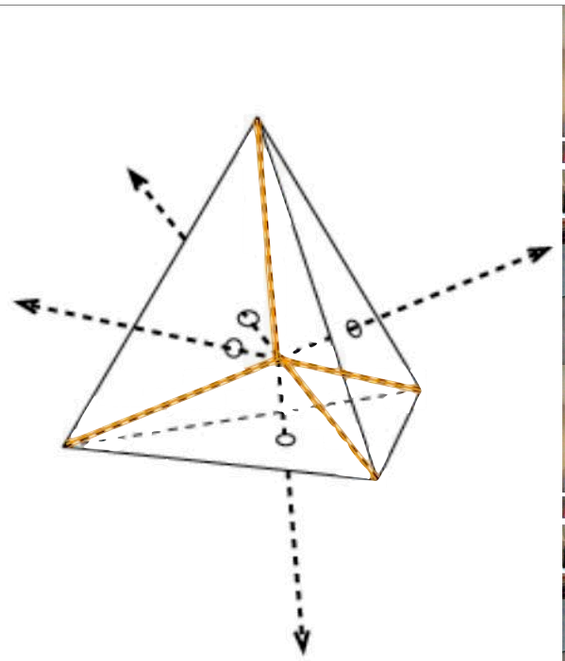
The vertexial axes of the cube are the lines through the centre around which the object can spin. The orange are the named “lambda t,u,v,w” 60 degree axes when the cube is rotated about opposite vertices.



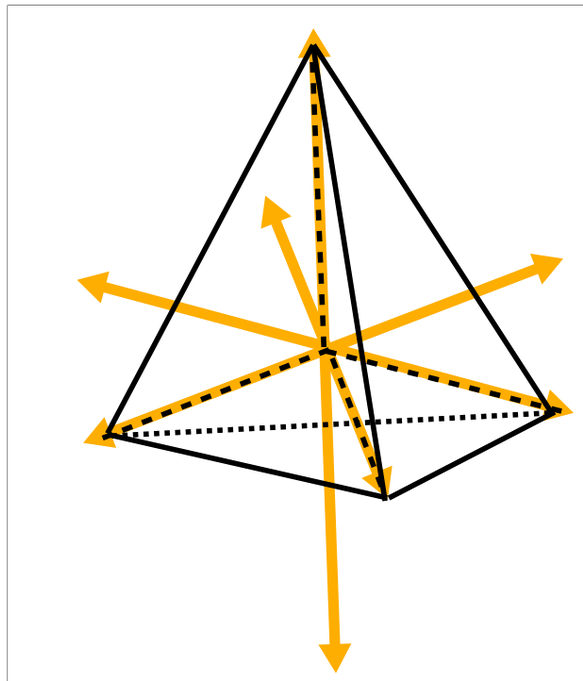
The vertexial axes of the cube are the lines through the centre around which the object can spin. The orange are the lambda t,u,v,w 60 degree axes when the cube is rotated about a vertex. The green are the X,Y,Z axes when the cube spins about a face.

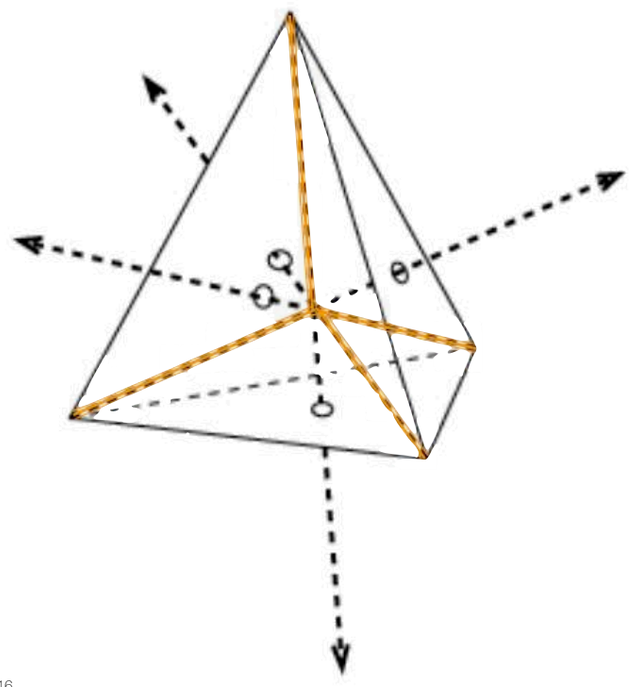


The green and orange axes combine into 7 axes of rotation, 4 along the tetrahedral gravitational plane and 3 along the cube gravitational plane which is the same as along the vertexial octahedral axes.



Internal architecture of Tetrahedron is formed along the lines that connect the four vertices to the centre of the figure. By connecting up the four red balls on the outside of the model the tetrahedron is formed as shown bottom right.





Above left and right: The lines of the internal architecture of tetrahedron are in fact not 2-D lines but 3-D structures that cannot be reduced to a 2-D line. (See tetra/octa/tetra configuration)

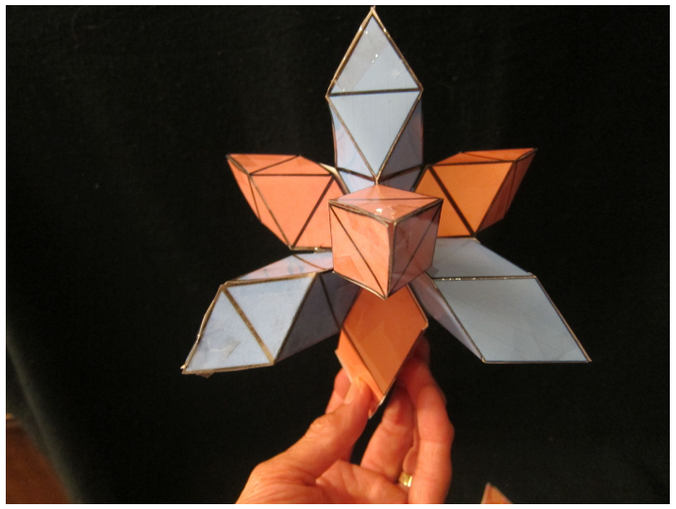
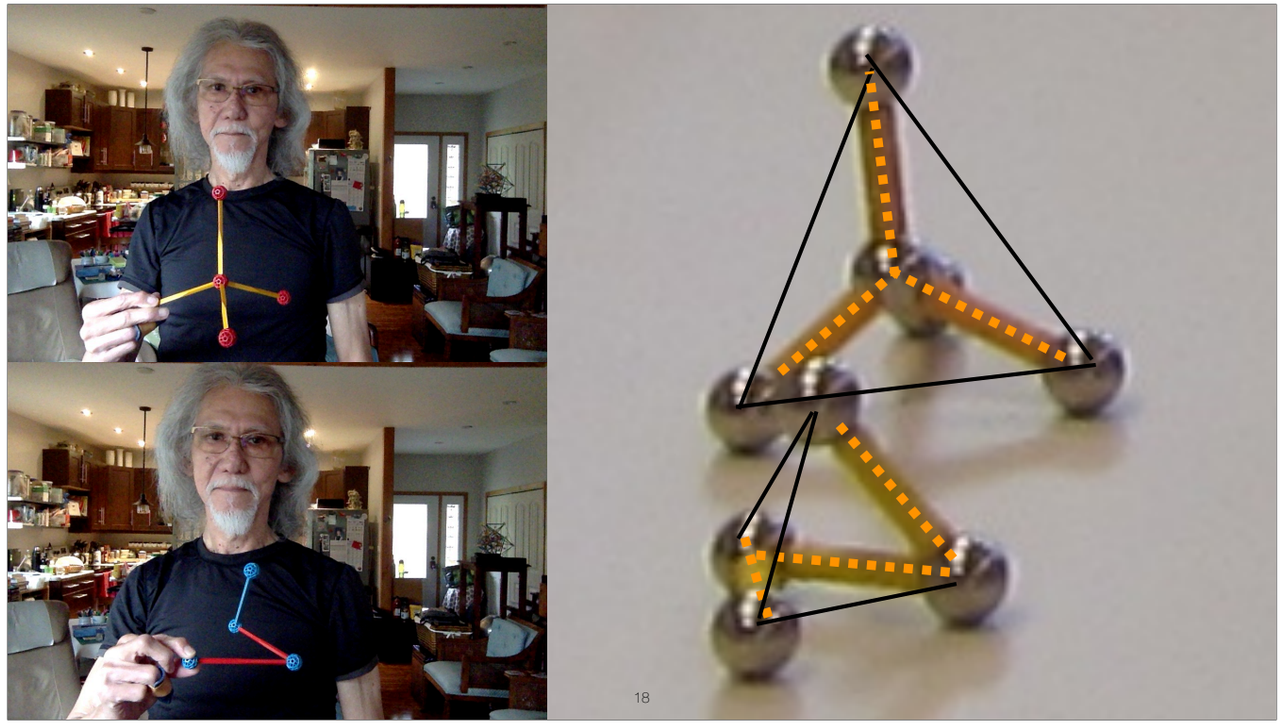


Figure top left is the internal representation of an up tetrahedron which would sit on one of the triangular bases. The figure below is an inverted or down tetrahedron which would be balanced on a vertex. When combined, or intersected, the figure at right is formed. This is the smallest irreducible structure that can be built according to the Planck quantum. The 2-D lines shown at left are the internal lines of the figure at right and must be constructed with the actual structures of the diamond shaped forms, eight of which are needed to make a model of the smallest wave form. Each unit is a compound of a tetrahedron sitting on an octahedron with a rotated tetrahedron on the opposite face of the octahedron. This form I call “tetra/octa/tetra” which is one ‘ray’ of the 8 ‘rays’ of the wave form.

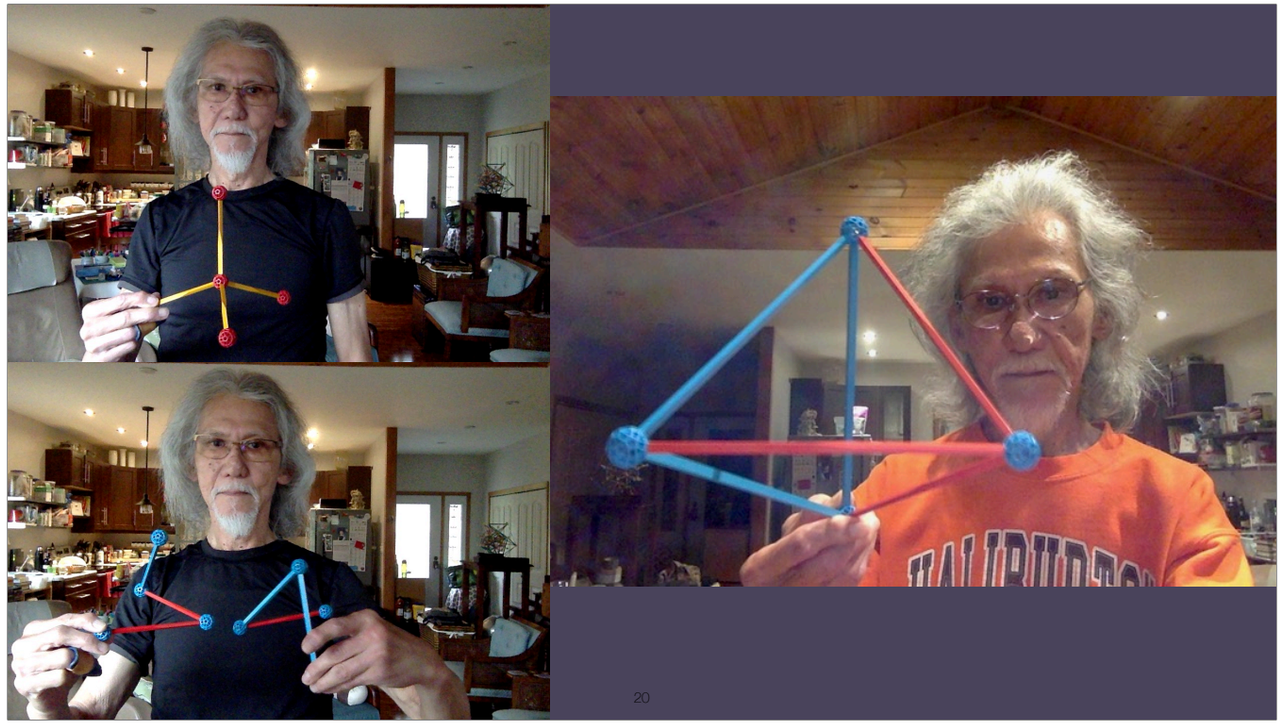


Right: two different architectures of tetrahedron. Which one is the ‘smallest instruction set’?

TOP: 4 internal lines run from the centre of the sphere to the 4 vertices - a vertex is added to the centre giving 9 ‘pieces’. Connecting the vertices with 6 external edges makes the tetrahedron.

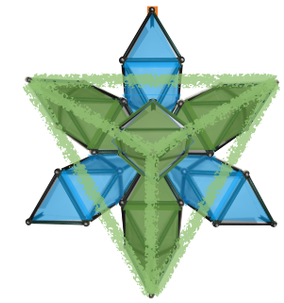
BOTTOM: 3 external lines run along 3 edges that connect the 4 vertices giving 7 ‘pieces’. 2 of these, 1 left-handed and the other right-handed fit together to make a tetrahedron.

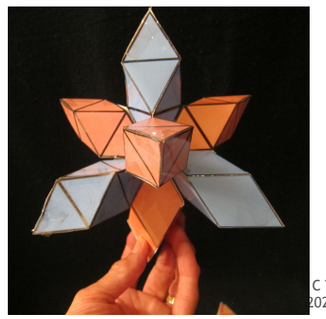
Right: two different architectures of tetrahedron. Which one is the ‘smallest instruction set’?



The internal architecture through the centre of the tetrahedron, yellow at top, does not display chirality. The edge based structure is handed.

The Meta architecture of participatory democracy.





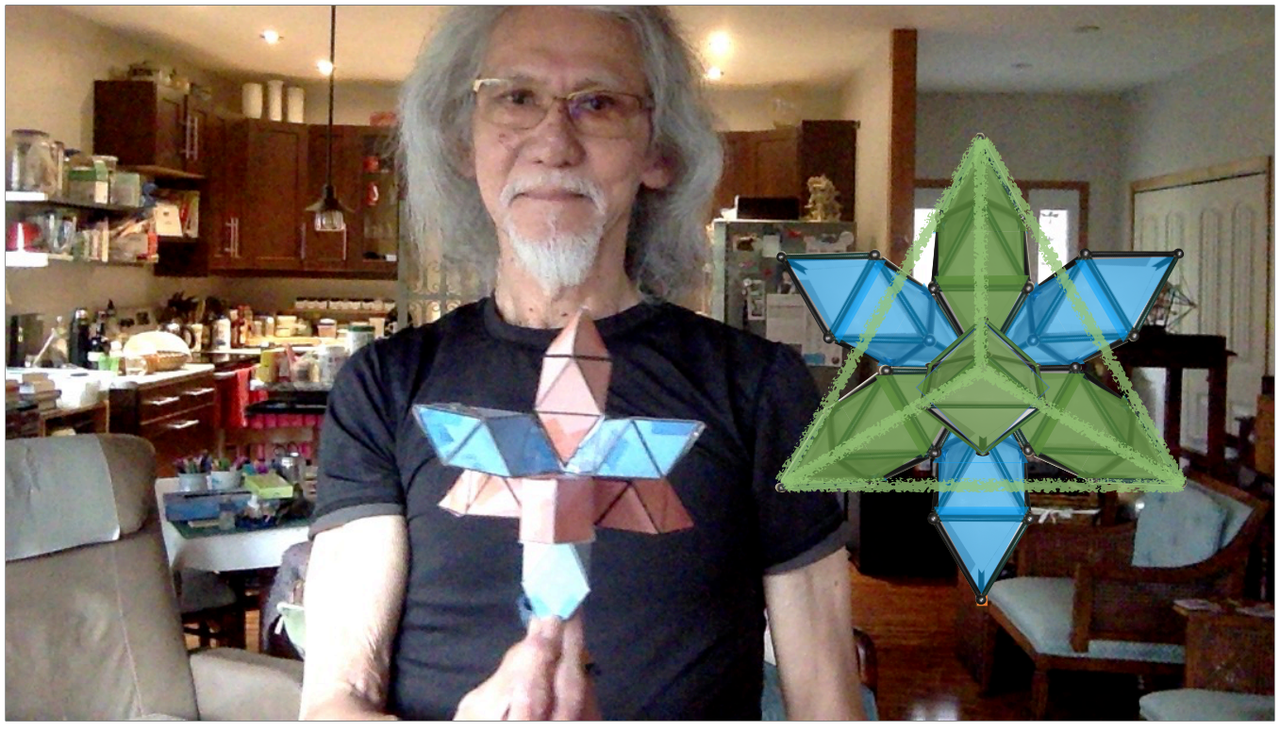
C Truss
2023

What is architecture?
Architecture is the smallest instruction set from which Structure Form and Function can be realized.

What is tetrahedron?
Tetrahedron is minimum structure polyhedron,
or minimum system. *Bucky Fuller - all systems are polyhedra.*

Shown at right is the minimum structure that can be built around the internal architecture of the tetrahedron based on the Planck limit. This is the meta architecture from which all structure unfolds.

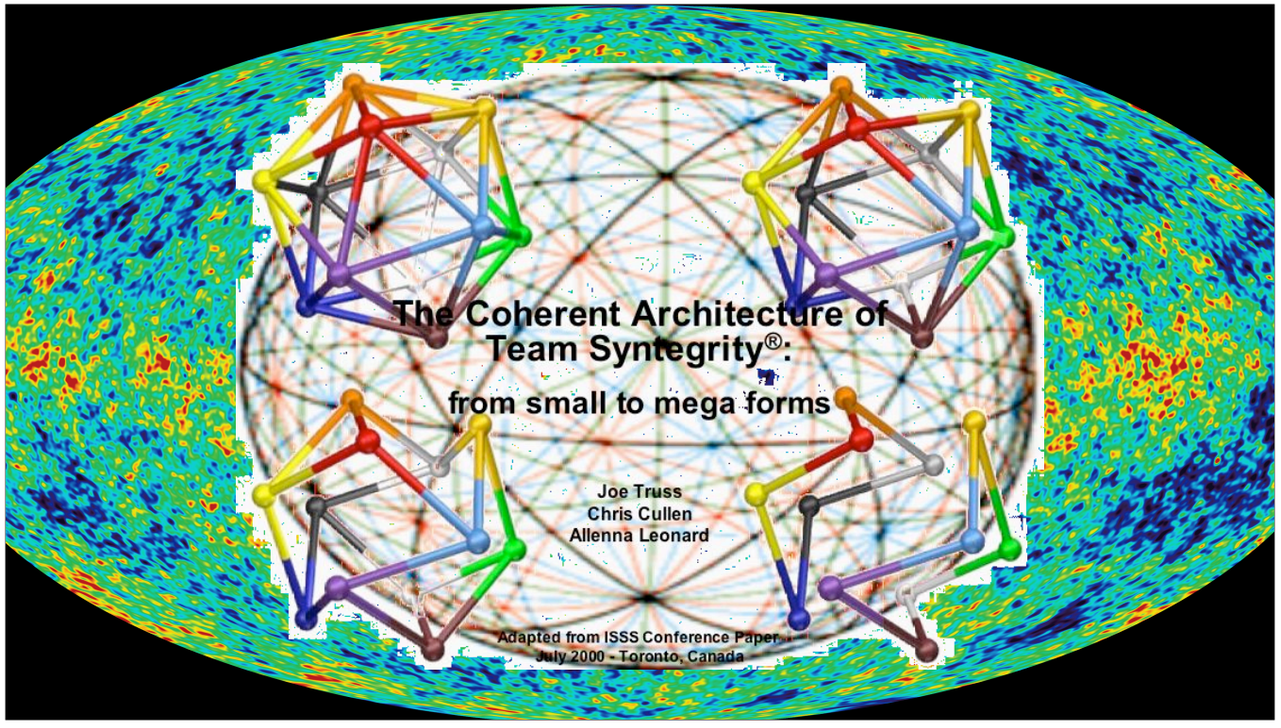
Read slide:
The Meta architecture of participatory democracy.



1 - on architecture and meta architecture
The omni-directional wave…

- Architecture (Function, Structure, Form)
- Function - *"The purpose of a system is what it does."*
  - Syntegration as Participatory Democracy - in self-correcting form.
    - Promotes self-organizing, self-facilitating, self-governing.
  - Designing for system viability with viable models.
- Structure -
  - Has to do with the elements (or parts) and their syntax of connectivity, proportionality and interdependency
    - TS - (Stafford Beer) People, ideas and connections (channels)
  - Architecture & Design Science - (Bucky Fuller - Synergetics, Tensegrity)
    - ***"All systems are polyhedral"***
    - ***Tetrahedron is minimum structure*** (Truss Quantahedra)
    - ***Regular polyhedra - the natural constraints of equivalence and choice***
    - ***Icosahedron - geodesic expansion is scale independent***

2 - the coherent architecture of Team Syntegrity Syntegration



Link to paper.

Core elements of TS formats

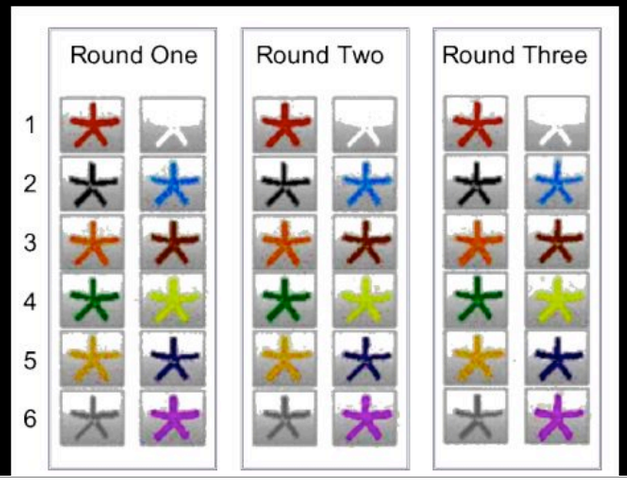
- An Opening Question that sets the pretext for the TS session
- An “infoset” (group of participants) that falls within the documented allowable size for the format selected
- Use of an authorized Syntegrity polyhedral geometric form as the basis for allocating topics and positions (i.e., icosahedron, cuboctahedron, octahedron, diagonal cube, tetrahedron)
- Full in-person participation by the infoset in deciding the topics that will form the agenda for discussion (e.g., Importance Filter)
- Use of the Topic Algorithm or other authorized means to allocate topics to colours (nodes) and people to positions (struts)

Core elements of TS formats

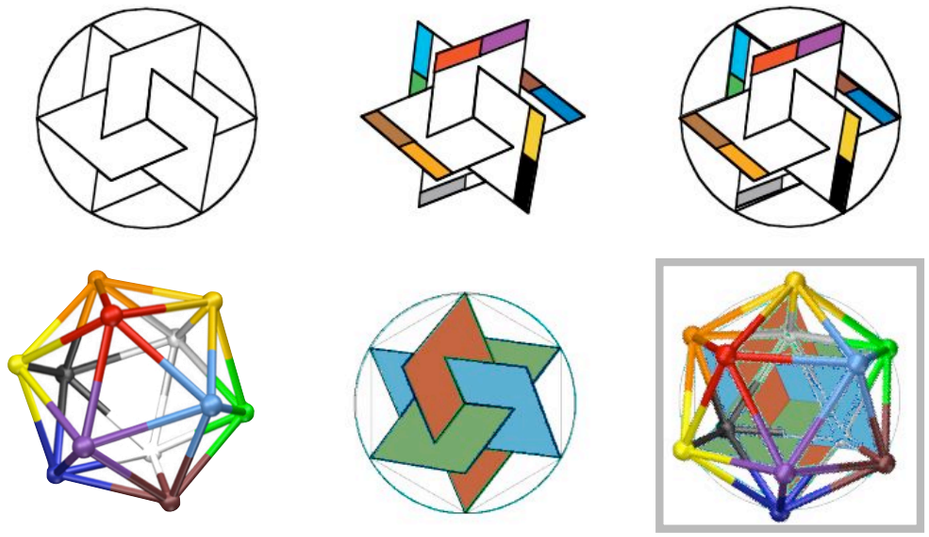
- Use of the TS Colour System to uniquely identify each topic and each position and to develop the Outcome Resolve team meeting schedule
- Use of Member, Critic and Observer roles during Outcome Resolve team meetings
- One to three contiguous iterations of Outcome Resolve meetings, depending on requirements for the format selected (changed to accommodate on-line hybrids)
- Delivery by a certified TS delivery team (according to policies and guidelines outlined in the Licensee Kit), over 2-5 contiguous days, ideally in-residence.

Icosa-Coherent Architecture

The 6 polar opposite pairs of simultaneous activity, progressing in sequence through 3 rounds, makes about 90% of the essence of the interactions of 30 self-directed, inter-acting transducers, available to themselves.

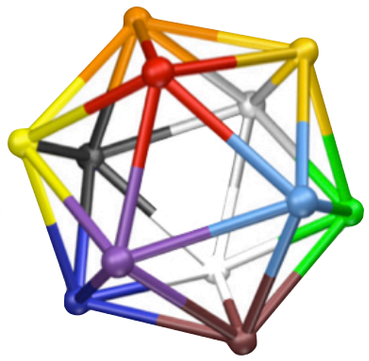


Icosahedral deconstruction by orthogonal sets

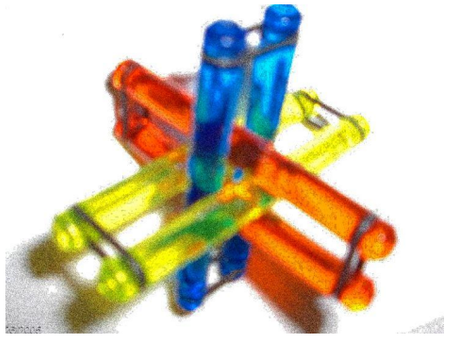


The orthogonal sets are the sets of 6 edges (players) that touch all 12 of the vertices (topics) of the icosahedron. There are 30 edges and thus 5 different sets of 6 players each that touch all 12 topics. The rectangles formed by connecting up the opposite edges are Golden and they intersect with a common centre of the icosahedron at 90 degrees or X,Y,Z coordinates. Notice that the icosahedron itself is constructed only with 60 degree triangles that come together in a pentagonal frame. There are no 90 degree angles on the surface.

One Orthogonal Set of Polar Opposite Edges

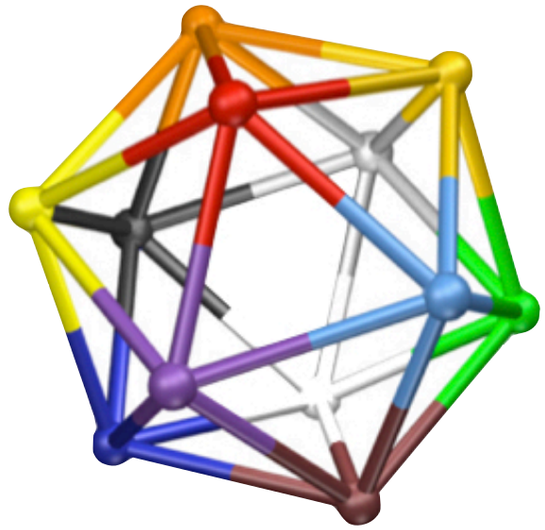


Polar Opposite Edges shown in Borromean Ring configuration



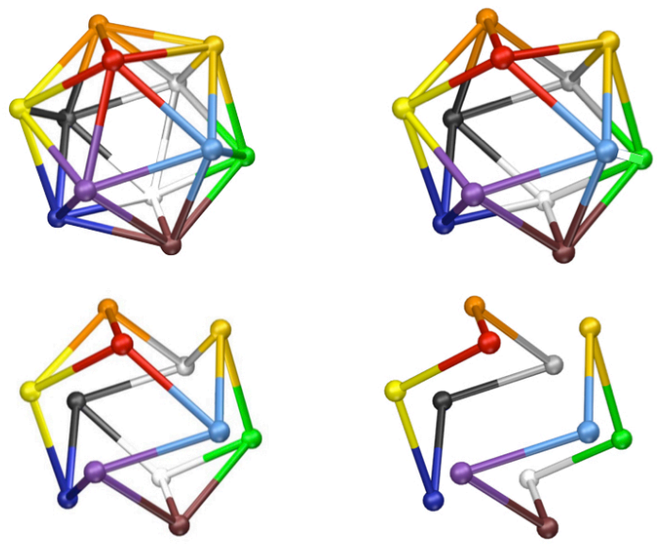
Showing the relative positions of the edges of the orthogonal set to the icosahedron. Also notice that the way in which the Golden rectangles are intersecting is in a Borromean Ring configuration.

The TS Icosahedron - Staffordian Graph
30-person form



The TS icosahedron – the Staffordian Graph. 30 Participants, 12 Topics, 20 Faces.

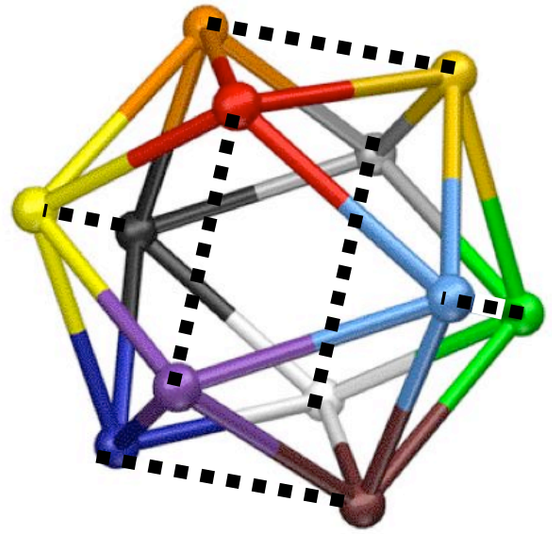
Icosahedral deconstruction by removing orthogonal sets



Add numbers of people, topics for each structure. Notice disconnection of two halves so we don’t use this structure, instead we would use an octahedron, 12 people and 6 topics, or the cube 12 people and 8 topics. This is how we maximize the connectivity of the participants without undermining the aspects of equal participation and democracy.

The TS cubeoctahedron - removal of one orthogonal set

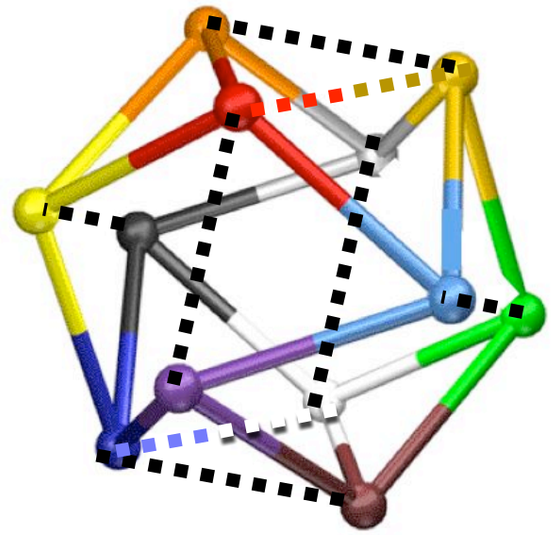
24-Person form



The TS cubeoctahedron - Truss Small Forms. 24 Participants, 12 Topics, 8 Triangular Faces.

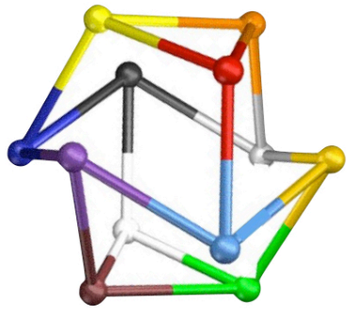
The TS strange polyhedron - removal of two orthogonal set

18-Person form

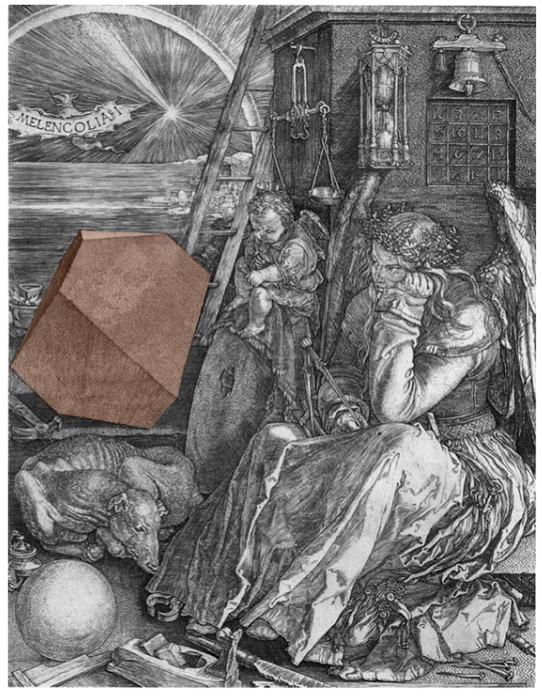


Add detailed numbers.

The coherent architecture of Team Syntegrity 18-person form*

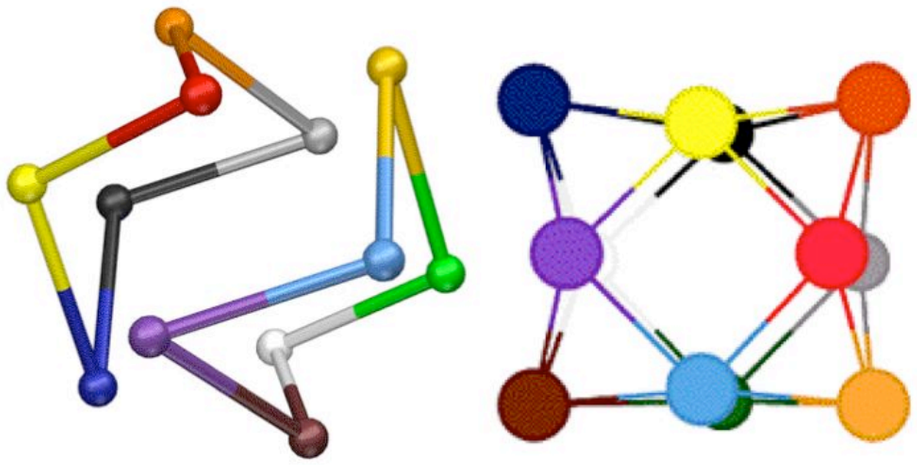


** This 'strange polyhedron' featured in Durer's 'Melencoliah' is the equivalent to an icosahedron with two orthogonal sets removed. A previously unknown or unreported connection to the icosahedron.*



On removal of the third
orthogonal set, the figure becomes disconnected.

12-Person form

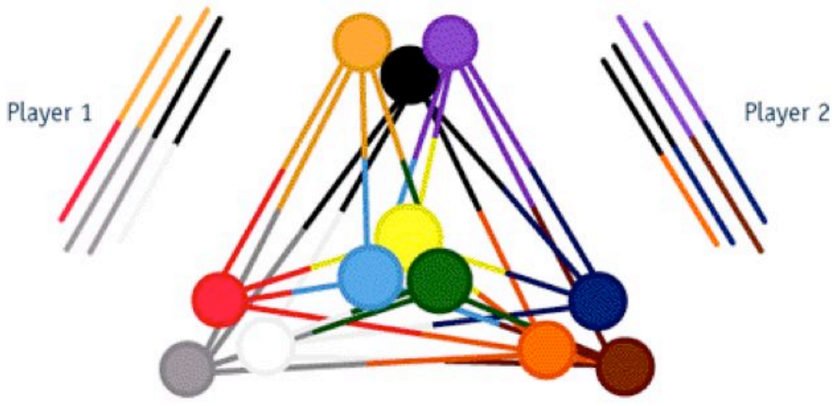


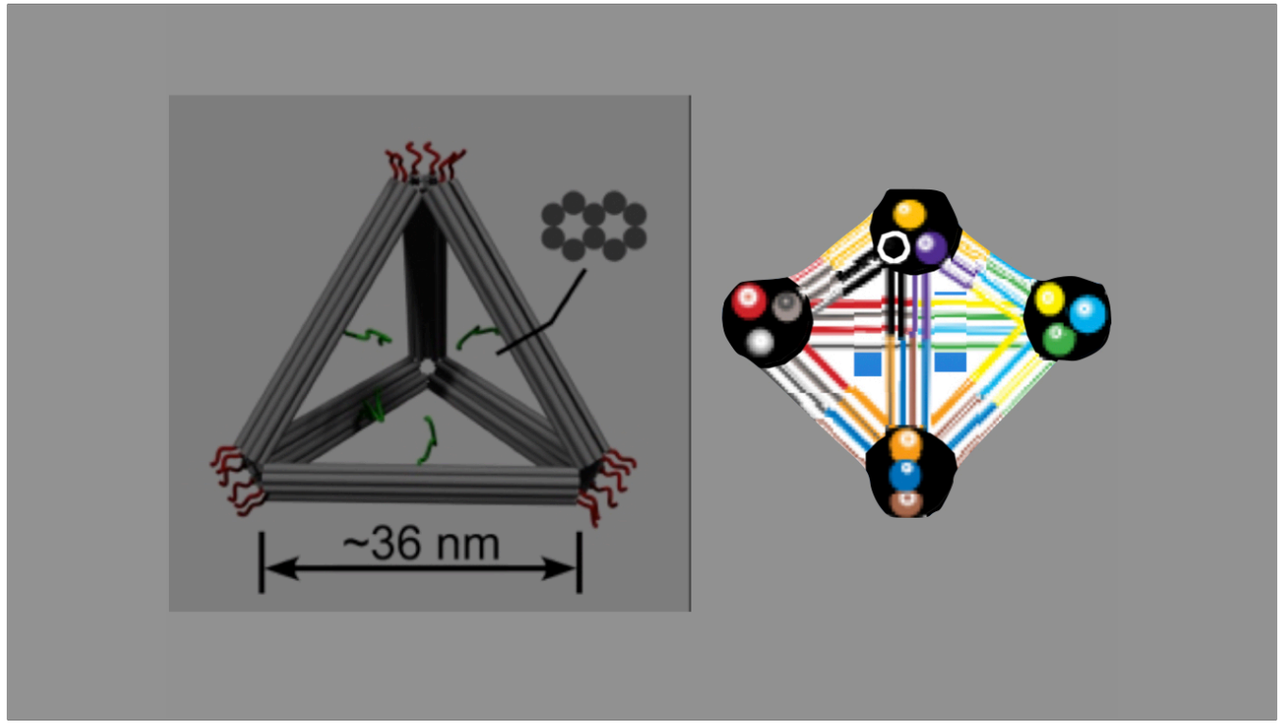
This form is not used. For 12 people we use the Octahedron or cube.

The TS Tetrahedron

6-Person form

Folded into the tetrahedron
six players each play four edge positions



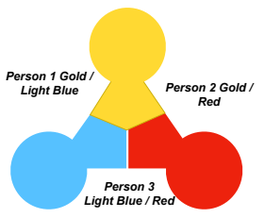


The real form of the enfolded Tetrahedron. Left: a cage that holds a single gold atom. Right: the enfolded cube octahedron with Syntegrity colour connectivity.

On the left is the first scientific / engineering representation of a multi-edge tetrahedron i have seen. In this image, the tetrahedron is a cage to capture a single gold atom inside.

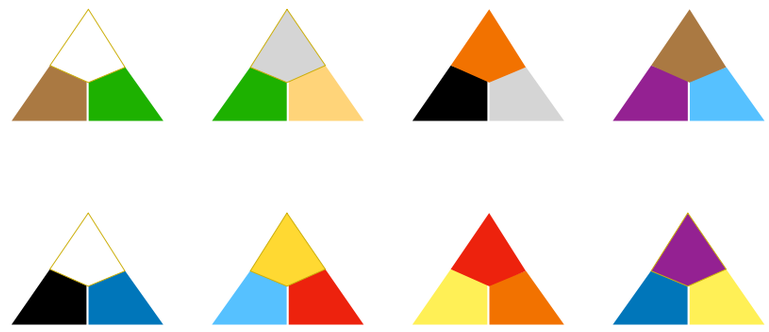
On the right is the BoC representation of a Planck tetrahedron, folded down from a cube octahedron, showing the four edges that result from the folding with correct cross connections to allow coherent unfolding.

FACE planning



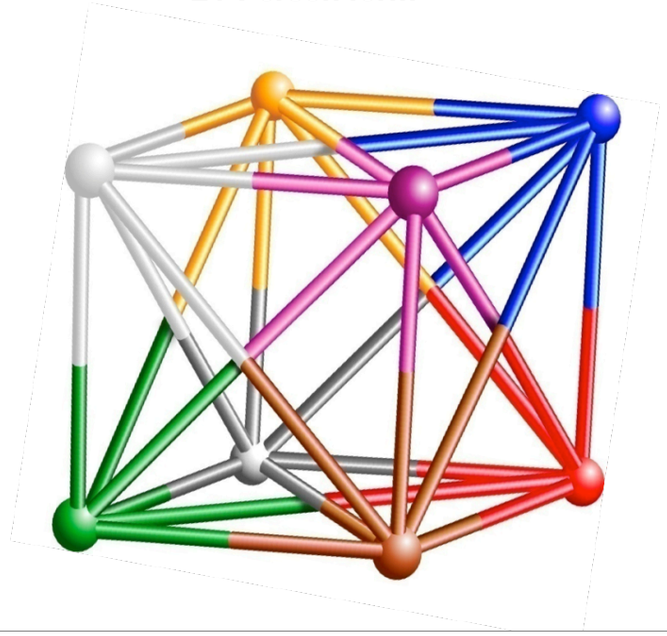
Icosa-Coherent Architecture

A minimum of 8 triangulations makes one set that equally balances 12 distinctions (shown as colours), as represented by 24 two-way connections, each having 2 unique colours so that each colour is represented twice in the set.



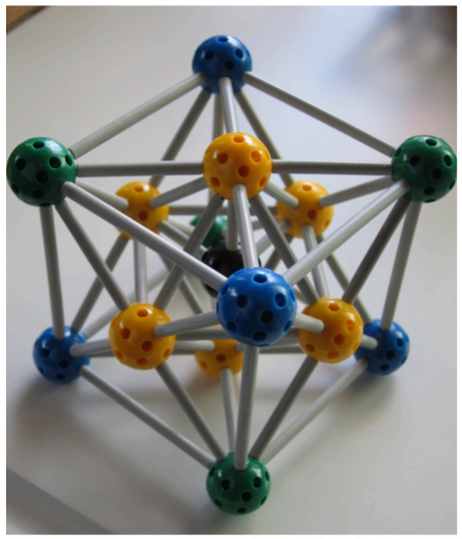
Ref: Beyond Dispute - collaborator surplus chapter FACE planning by J. Truss

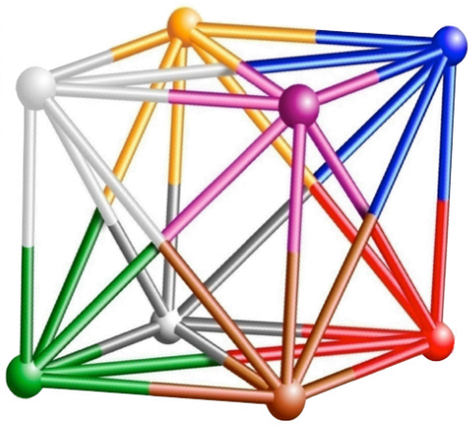
The TS diagonal cube
24-Person form

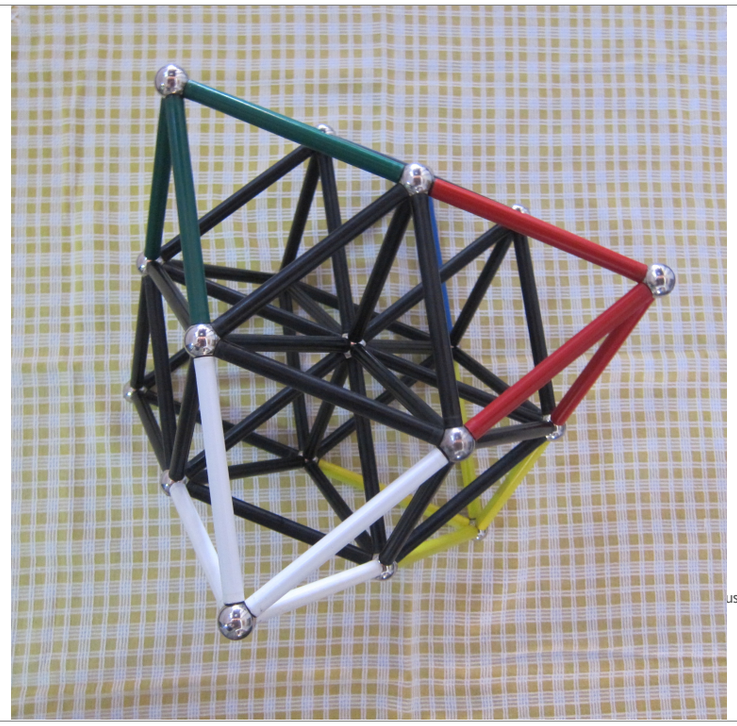


Forms after publication of Beyond Dispute.
TS diagonal cube - 8 topics, 24 players.
What happens to reverberation? 2-away from on each Face is reduced to 1-away from.
Show the 2-away from route.

Intersecting 2-F tetrahedra establish the 8 vertices of the cube.





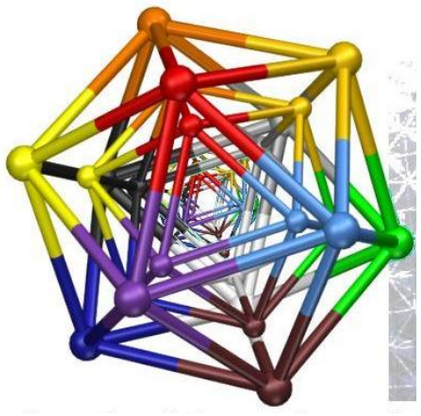


uss

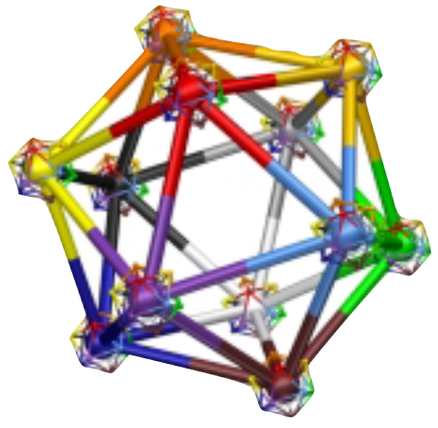
Octahedral Syntegration 12 person - 6 topic. Notice the black cube octahedron which is the supporting structure of the 2-frequency octahedron. This structure sits at the centre of a 4-Frequency tetrahedron.

The TS expanded forms

The Russian dolls recursion



Node recursion



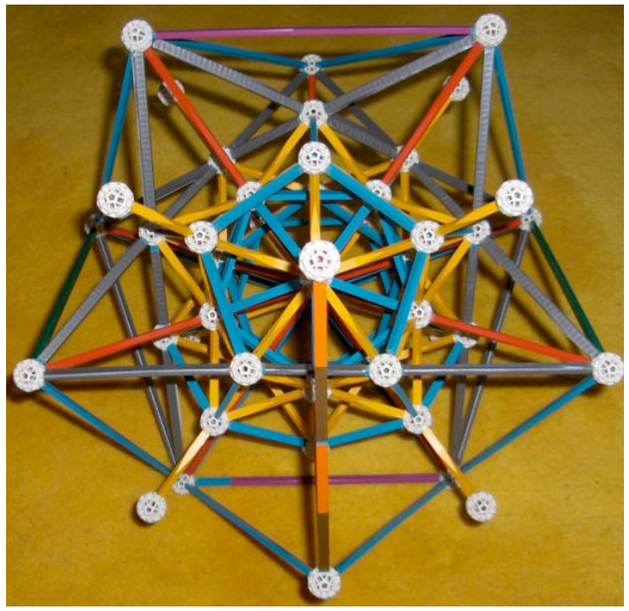
The TS expanded forms

The Russian dolls recursion
Node recursion

The TS expanded forms
Recursed nodes and duals supported by critic lines
One dominant Enneagram shown

The TS expanded forms - node recursions and dual recursions using critic lines.
The discovery of the 3-D enneagram inside the icosahedron made by Truss as reported in Beyond Dispute by Stafford.

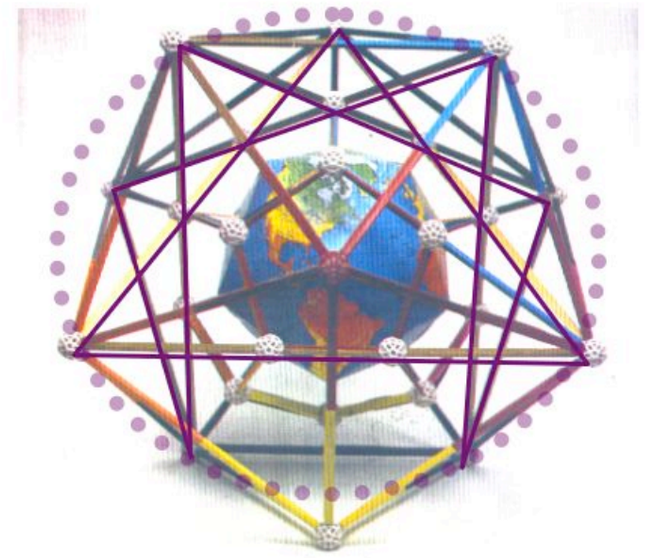
The built enneagram in icosahedron



2 - the coherent architecture of Team Syntegrity Syntegration

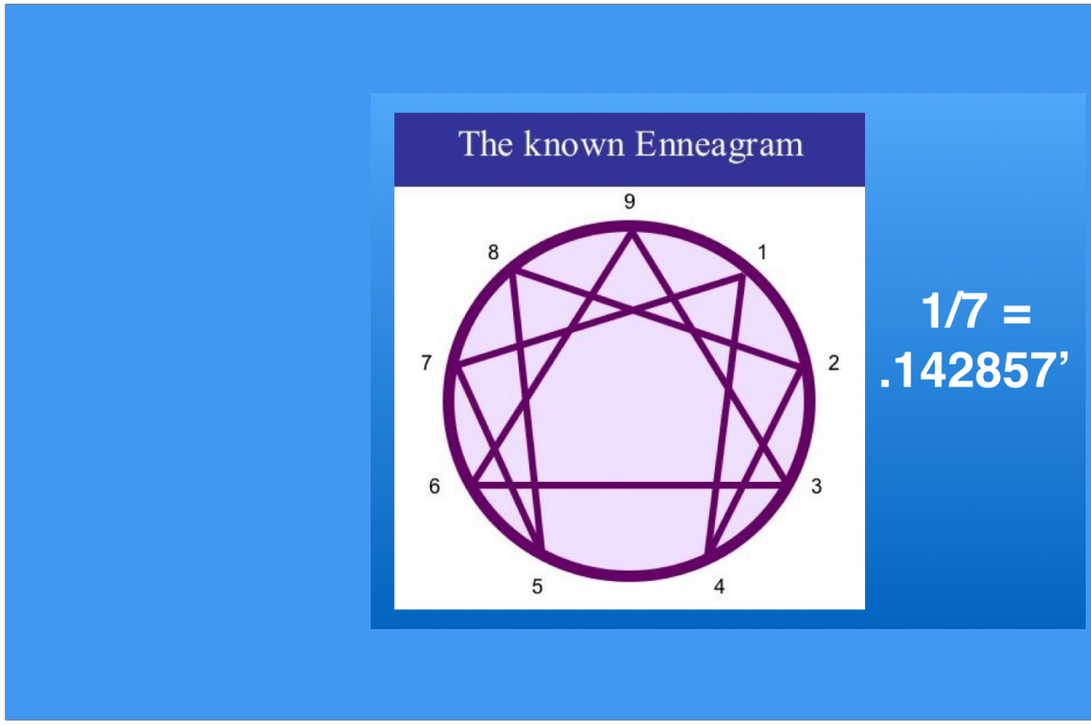
The built enneagram in icosahedron

The built enneagram in TS icosahedron



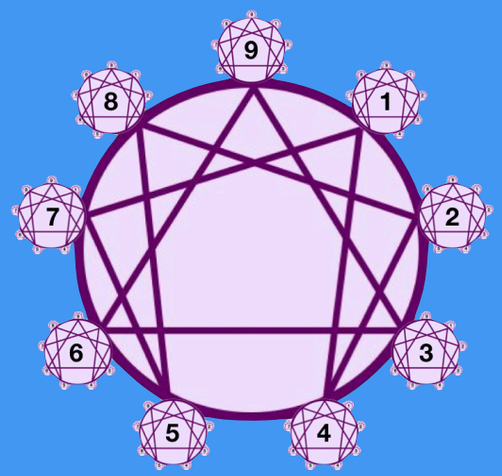
2 - the coherent architecture of Team Syntegrity Syntegration

The built enneagram in TS icosahedron with Fuller's Dymaxion Earth.



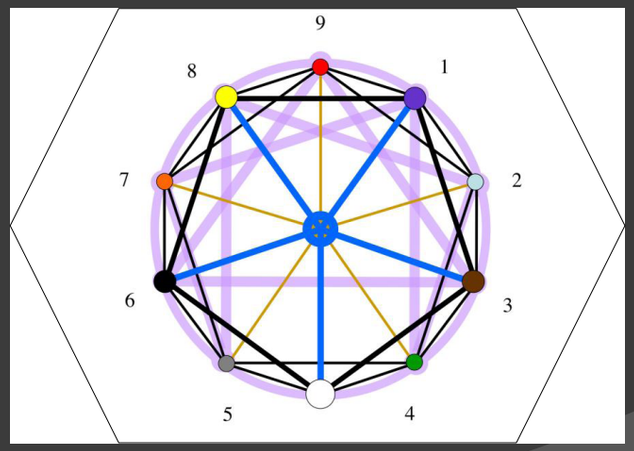
My story with Stafford Beer starts here…
There was a three section macrame mandala that was sent to Stafford by a Buddhist monk from the Arica Foundation in Chile which hung in the cottage at Cwarel Isaf. It had this symbol in the top section on which Stafford meditated for over 20 years. Joe had been working with Chris’ help on developing an organizational model that combined the enneagram psychological system and a management ‘molecule’.
The magic number 7. The six-pointed star - a sequence of perpetual motion based on division by 7.
The known enneagram is as shown above, a 2-dimensional figure, the authors believe that it is a flattened image of a 3-dimensional object and in this form can be found nestled within the equatorial region of the icosahedron.

The iconographic enneagram ~ a recursive organizational net

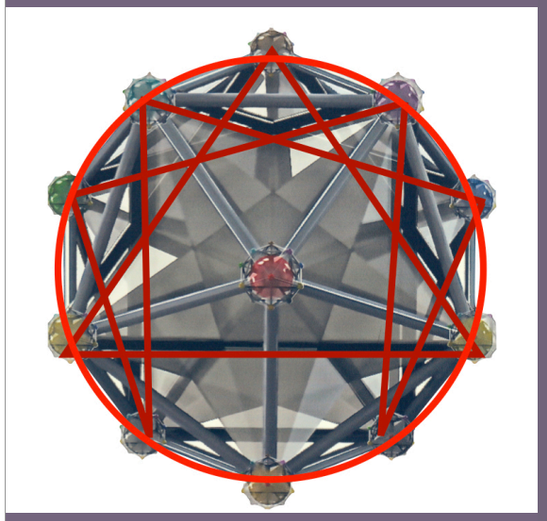


My first meeting with Stafford in Fall of 1990 where I presented him with my design of a flattened, joined-up organization based on recursive enneagrams. “I’ve meditated on this symbol for 20 years”, Stafford declared when he saw it, “and I’ve never met anyone who knew what it was, far less to design organizations wth it!” He then pulled out his coloured icosahedron model and introduced me to Team Syntegrity and the first 4 manuscript chapters of Beyond Dispute - the Invention of Team Syntegrity - (Beer - Wiley, 1994). This began our partnership and twelve year relationship.

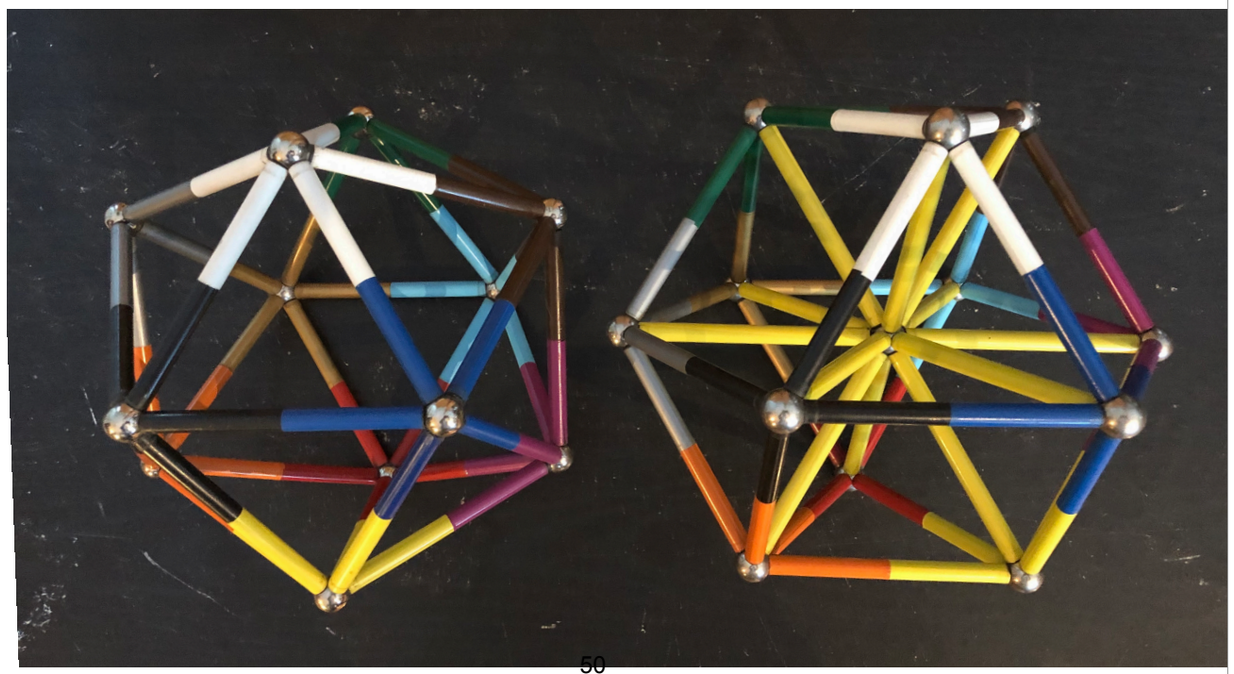
- Enneagram in the Icosahedron



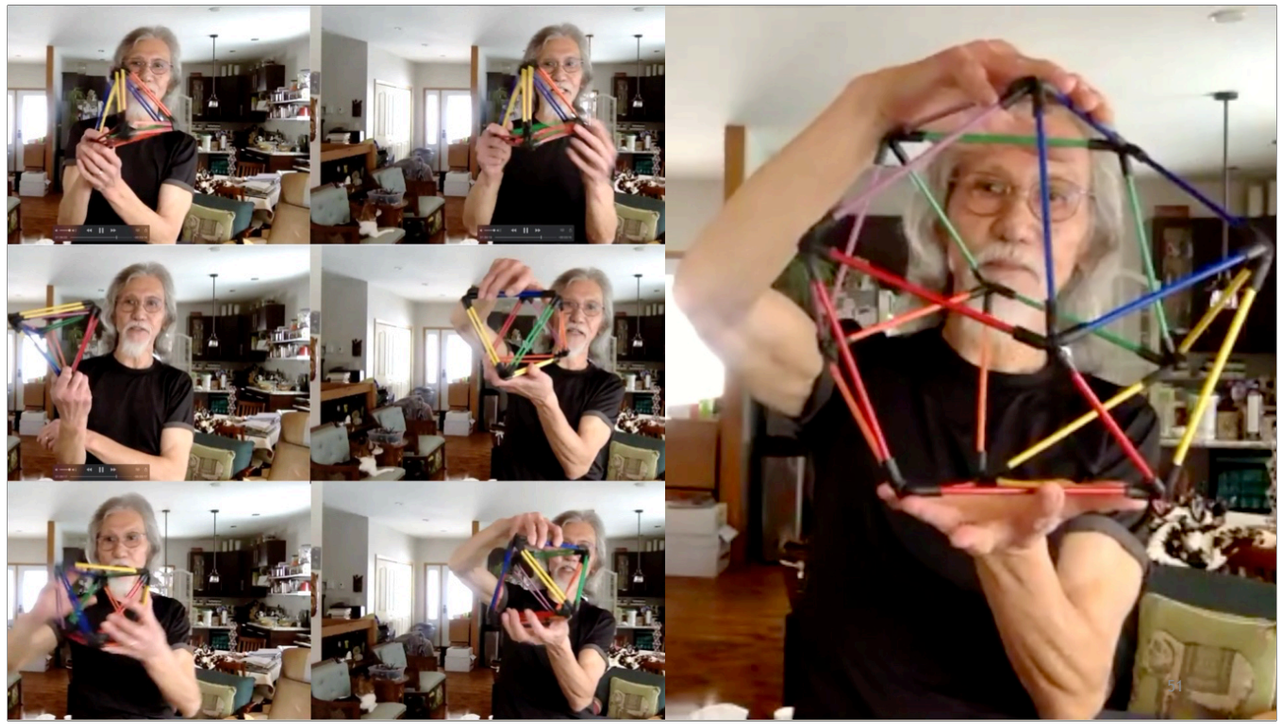
- There are 60 such enneagrams in the icosahedron, 2 enneagrams emanating from each of the 30 strut edges. Each player has 2 unique enneagrammatic circuits.
- Exploratory draft paper available by request from Truss.



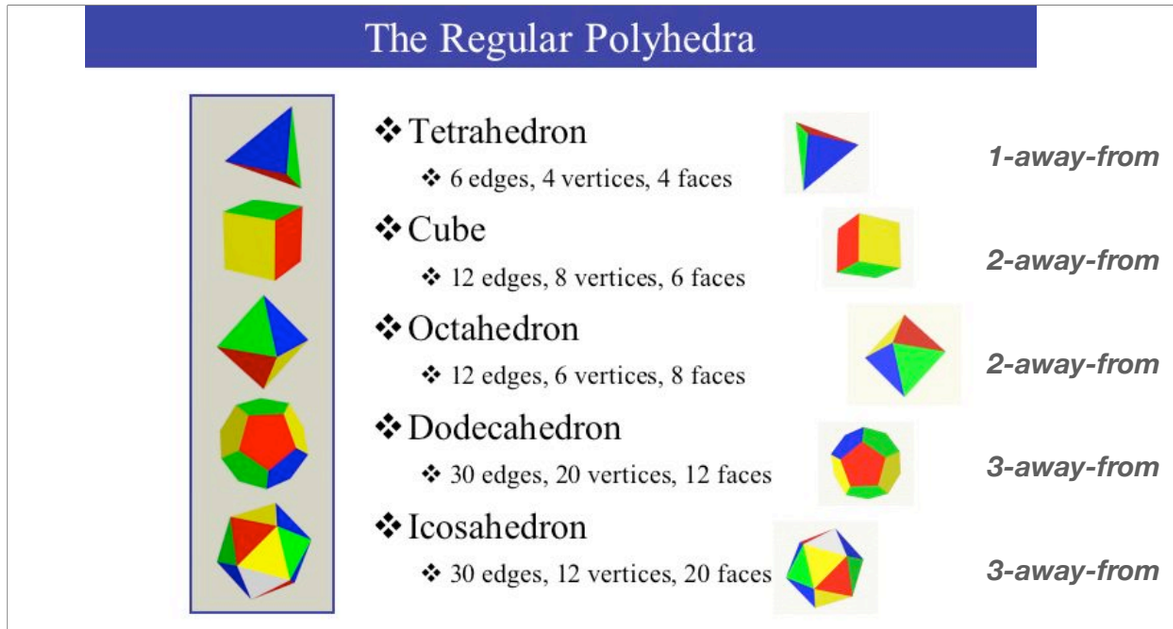
3-D Enneagram in Icosahedron. A prototype for 3-D printing.



Icosahedron and Cubeoctahedron each have 2 of 3 ‘regularities’.
Icosahedron has regular edges and faces, but not radius to edge equality.
Cubeoctahedron has regular edges and radial equality but 2 different faces.
There is no single object that can have all three.
Nature’s switch - three constraints that cannot be met by any single object but shared by two.



The cube octahedron as Vector Flexor. With internal radii removed, the figure deforms into 1) the Icosahedron by adding 6 edges to the collapsed square faces, 2) the Octahedron with 2 struts per edge, and 3) the Tetrahedron with 4 struts per edge.



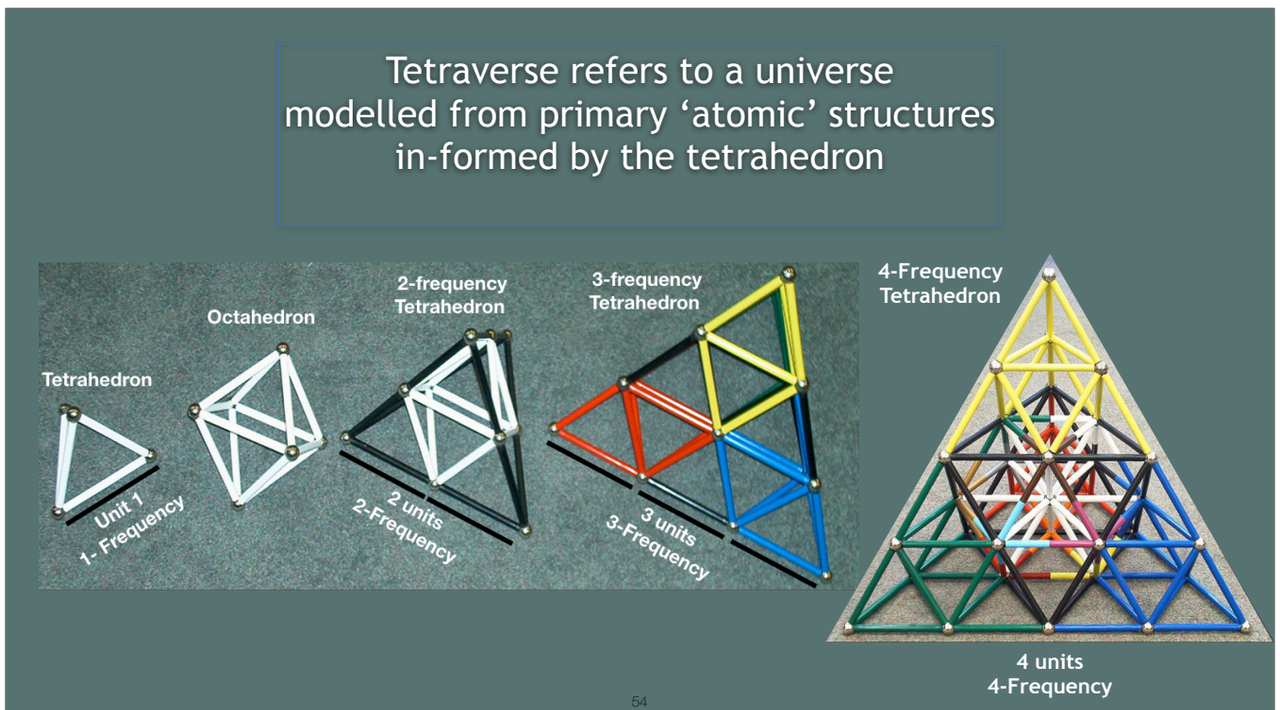
Degrees of freedom in structure.

The emergence of life depended on the formation of viable, physical structures that now make up all living and non-living things. Eg. If nature did not provide a degree of freedom beyond ‘minimum structure’ there would be no formation of tubes through which fluids could pass and there would be no life as we know it.

From the X, Y, Z organized world to the Tetraverse and the 7 axes of the Omniverse

J & C Truss
2023

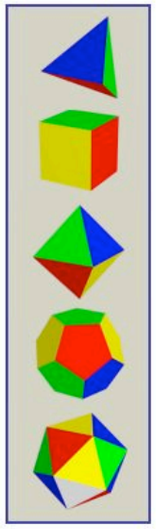
3 - the X, Y, Z organized world, the Tetraverse and the 7 axes of the Omniverse



3 - the X, Y, Z organized world, the Tetraverse and the 7 axes of the Omniverse

‘Tetraverse’ refers to a universe modelled from primary ‘atomic’ structures in-formed by the tetrahedron.
The Tetra-verse grid is fundamental and creates the cubicle grid of X,Y,Z Cartesian Coordinates through its dynamic 60 degree architecture.

The Regular Polyhedra



- Tetrahedron
  - 6 edges, 4 vertices, 4 faces

- Cube
  - 12 edges, 8 vertices, 6 faces

- Octahedron
  - 12 edges, 6 vertices, 8 faces

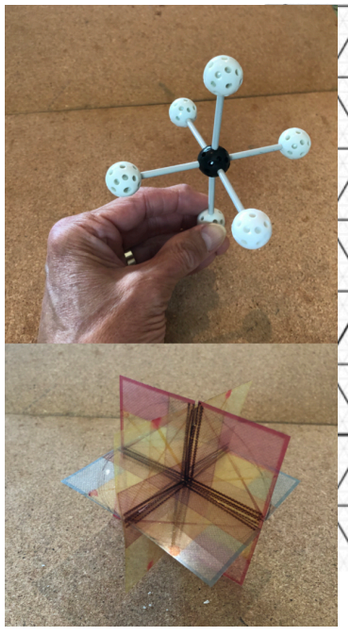
- Dodecahedron
  - 30 edges, 20 vertices, 12 faces

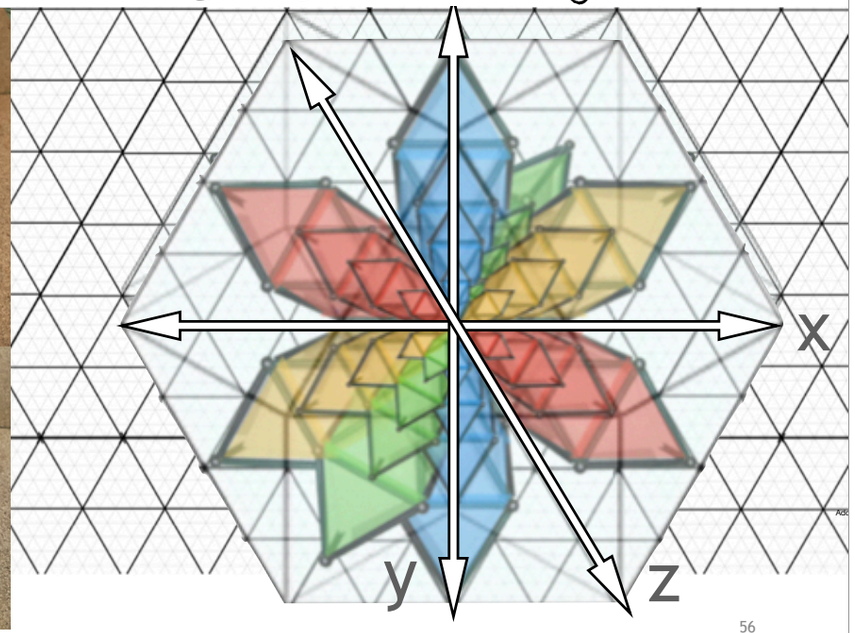
- Icosahedron
  - 30 edges, 12 vertices, 20 faces

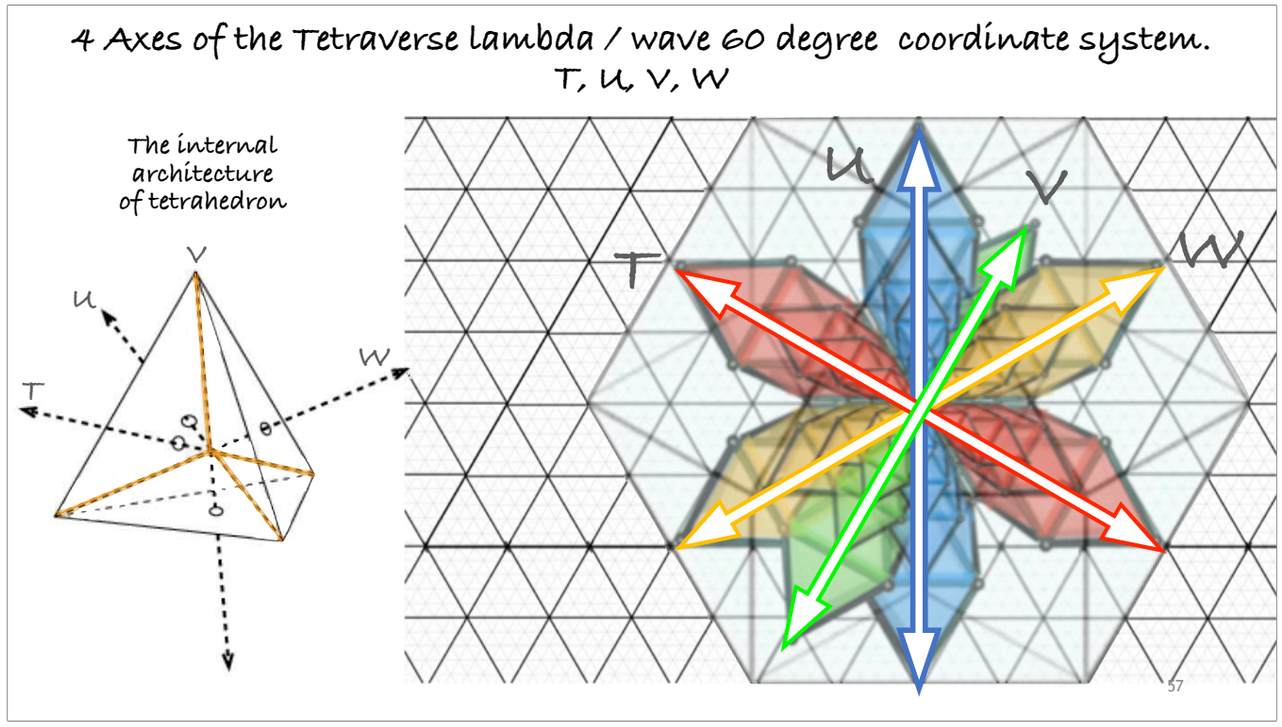
Where is Phi, Waldo? Until nature gets to the pentagonal dodecahedron, the Golden Ratio where it is an Angle does not appear. In the icosahedron, not only does the Golden Ratio appear, but it appears in three intersecting Golden Rectangles. The coming of this Divine Proportion in nature, heralds the limits requisite to life. In the growth of plants, etc.

The movement between the cube octahedron and the icosahedron is the movement necessary to constrain unlimited omnidirectional expansion to requisite limits of life.

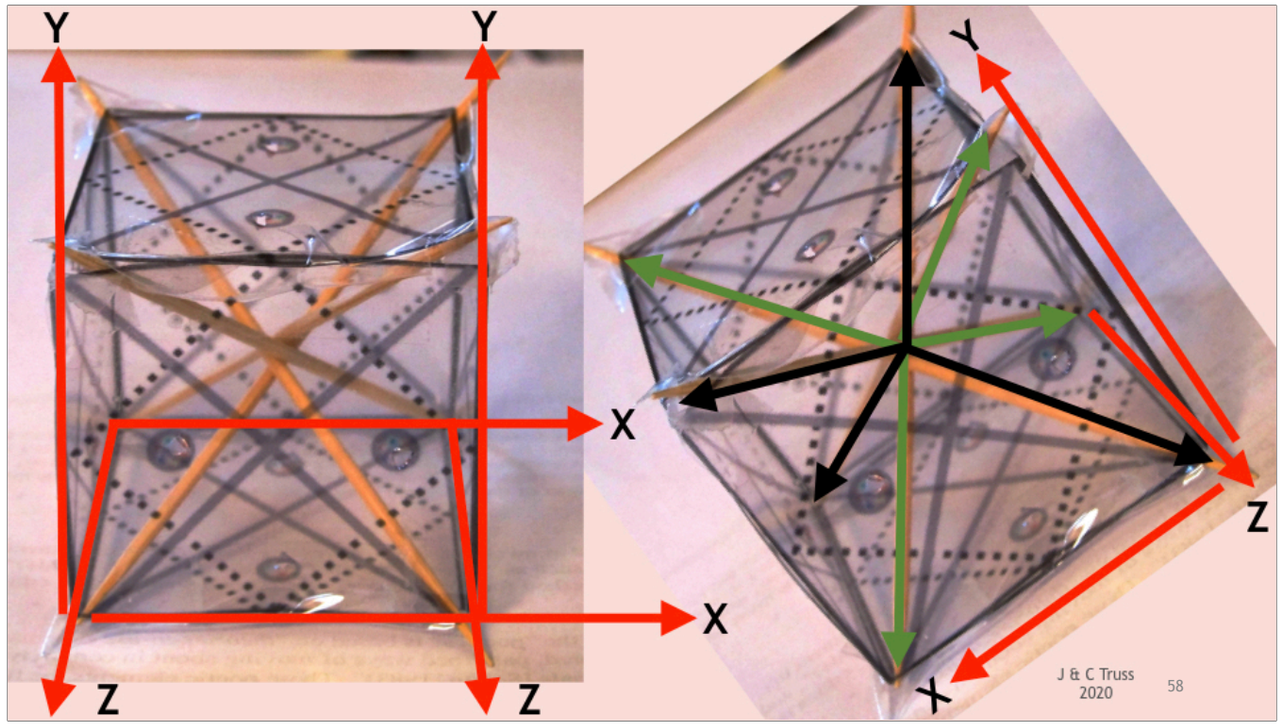
The 3 Axes of the Cartesian 90 degree coordinate system.



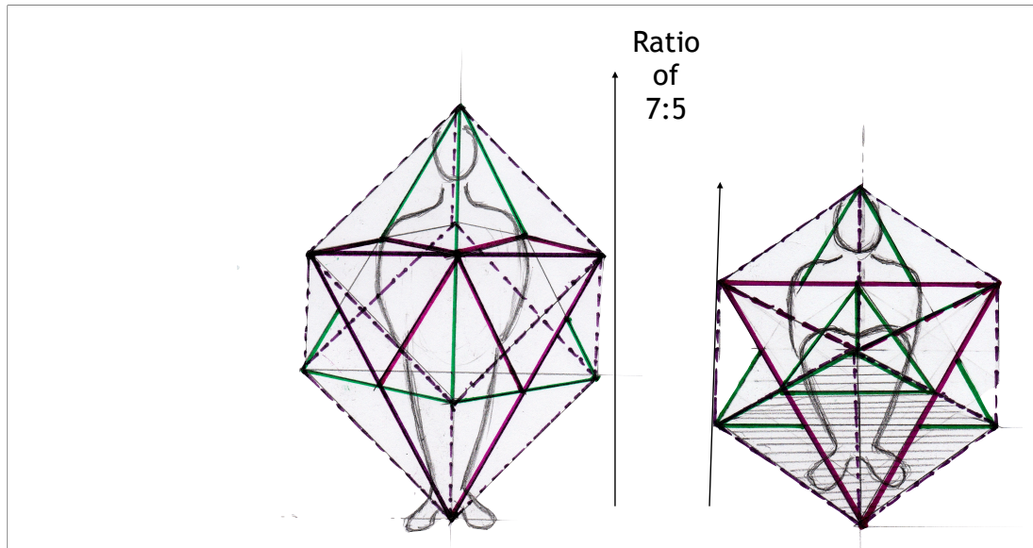




The recursive structure of the central 60 degree coordinate system of TETRAVERSE.



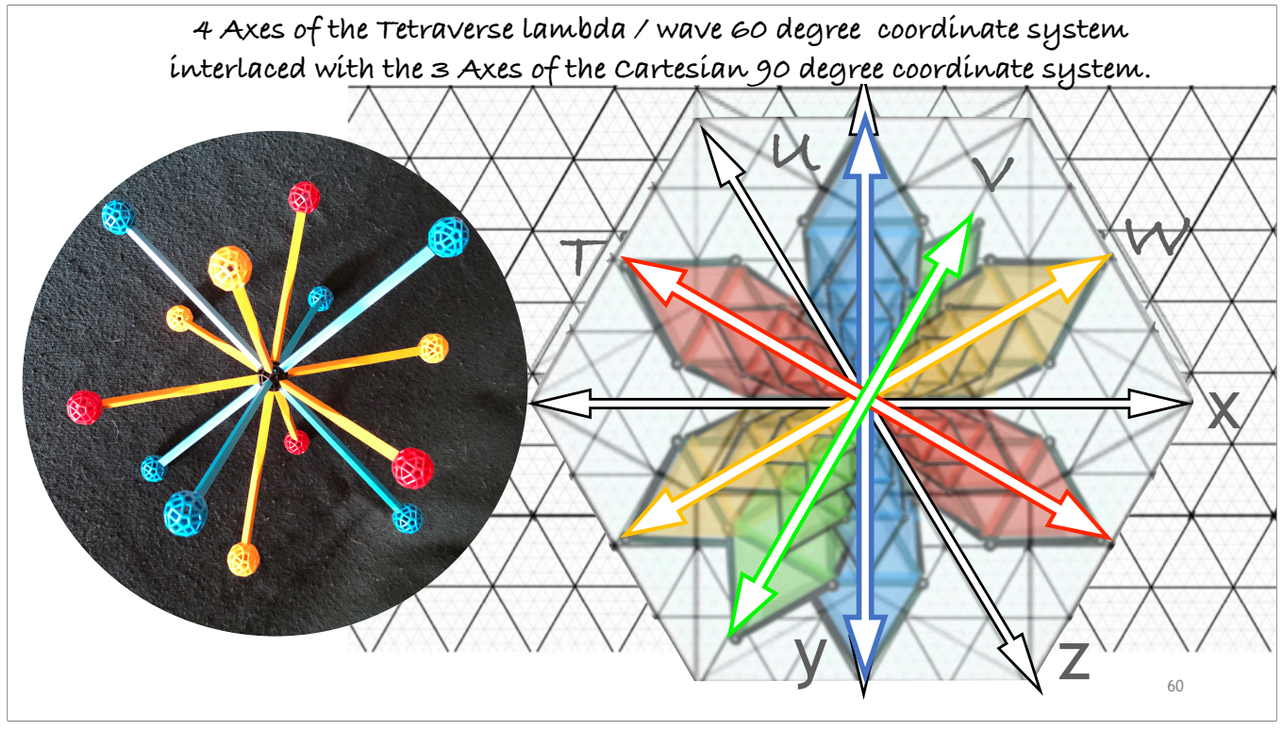
Comparing the XYZ coordinates for a cube on its base and the 4-axis tetrahedral coordinates with tetrahedron as its base.



The difference between the internal diagonal
of the cube and its edge length is approx. 7:5

The difference between me standing and sitting
is approx. 7:5

I walk when I am tetrahedron; I sit when I am cube.
The difference between the internal diagonal of the cube and its edge length is approx. 7:5
The difference between me standing and sitting is approx. 7:5



On the left - the blue rods with blue connectors are X, Y, Z. The yellow rods have four yellow connectors for the up tetrahedron and four red for the down tetrahedron.

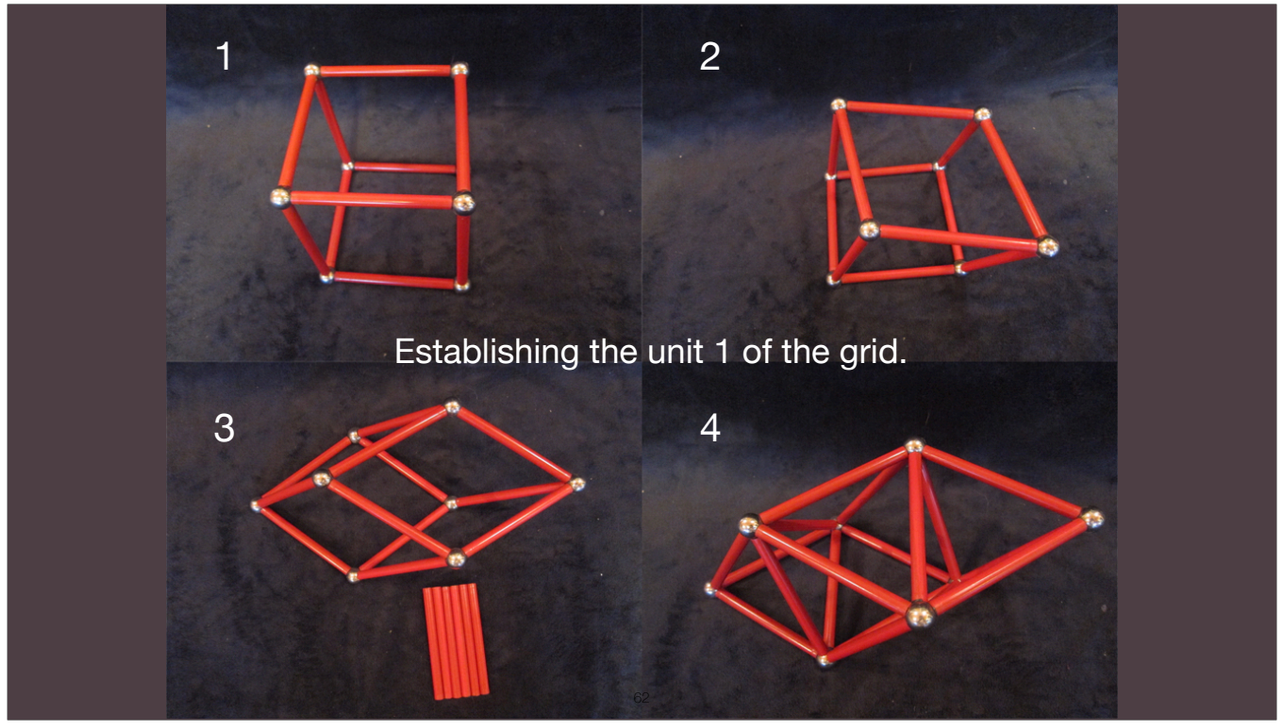
On the right - notice that even though the Blue Arrow ‘U’ Axis of Tetraverse seems to line up with the vertical Y Axis of X,Y,Z, the Y Axis is perpendicular to the X Axis, both laying flat on the plane of the screen while the Blue ‘U’ Axis along the same sight would be penetrating the screen from outside front, through the centre, and protruding through the back.

Insights and Outsights:

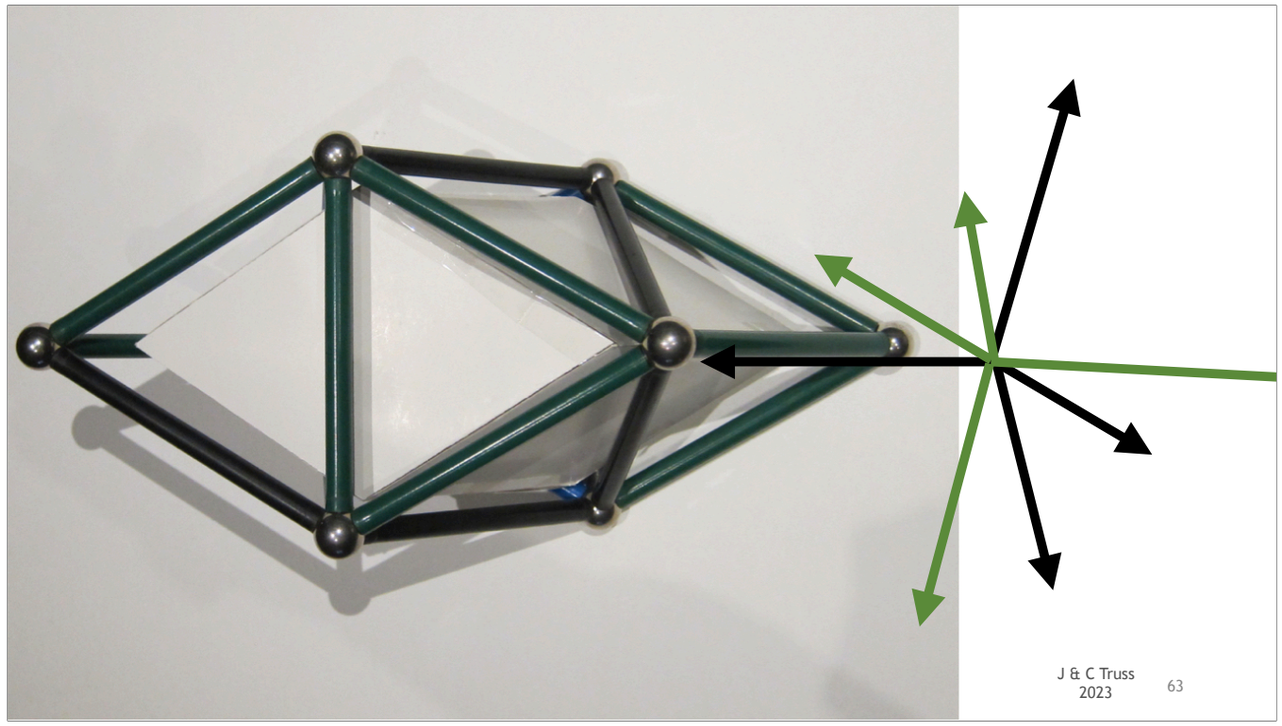
Participatory democracy implies equivalence of access and egress, fair participation and time allowed, no preferential influence; democracy implies all participants cannot get everything they want all the time, the majority rules.

4 - Insights and Outsights:

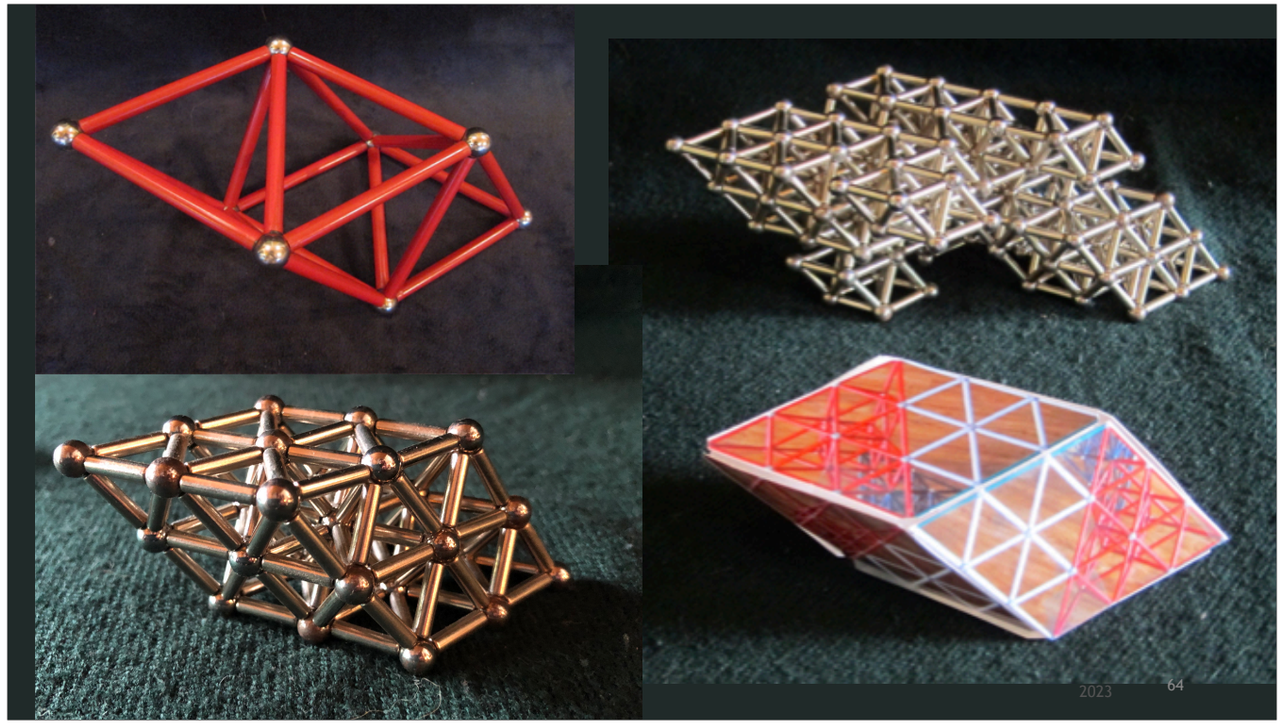
Participatory democracy implies equivalence of access and egress, fair participation and time allowed, no preferential influence; democracy implies all participants cannot get everything they want all the time, the majority rules.



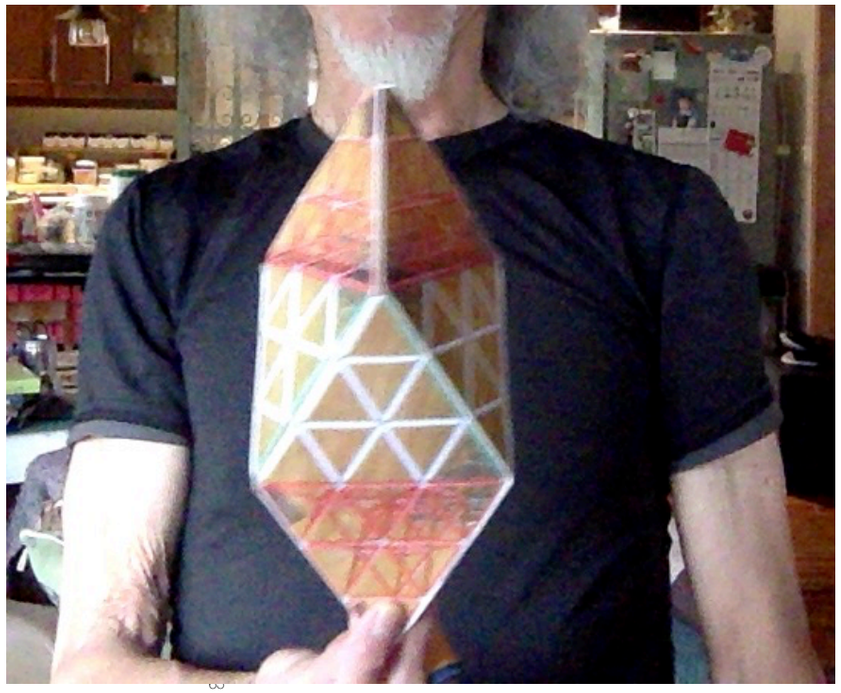
The cube without diagonals has no rigidity and will naturally fall under its own gravity onto the underlying tetrahedral grid (1 & 2 above). Because no two vertexes can be closer than the Planck distance, established as the edge length of the Tetrahedron, the collapse will stop when the distance between diagonal vertexes of the Cube is equal to the edge length of the Tetrahedron edge, creating a diamond of two equilateral triangles out of each face of the Cube.
By adding the 6 diagonal edges to the 6 faces of the cube (3), a configuration of tetrahedron / octahedron / tetrahedron is formed (4). As can be seen, the new object has not changed the area or volume of the original cube. However, if the cube were to retain its original shape and diagonals are added to the square faces then those diagonals would have to be sq.rt 2 compared to the length of the unit 1 of the cube and since these are the tetrahedral edges of the intersecting tetrahedra within the cube, this would not be the same as the tetrahedron being the defining unit 1. This is a major clue to the difference between using the unit-1 of the cube edge length and using the unit-1 of the tetrahedron edge length and speaks to the limitations of the Cartesian X,Y,Z coordinates which are most easily used because of the simplicity of applying Pythagorean right angle triangles to a cubic grid.



Deriving the 90 degree gravitational plane from the 60 degree orientation of the tetra-octa-tetra ‘rays’.



To show the 60 degree angle from front tip to back tip that creates the flat gravitational plane or X axis.

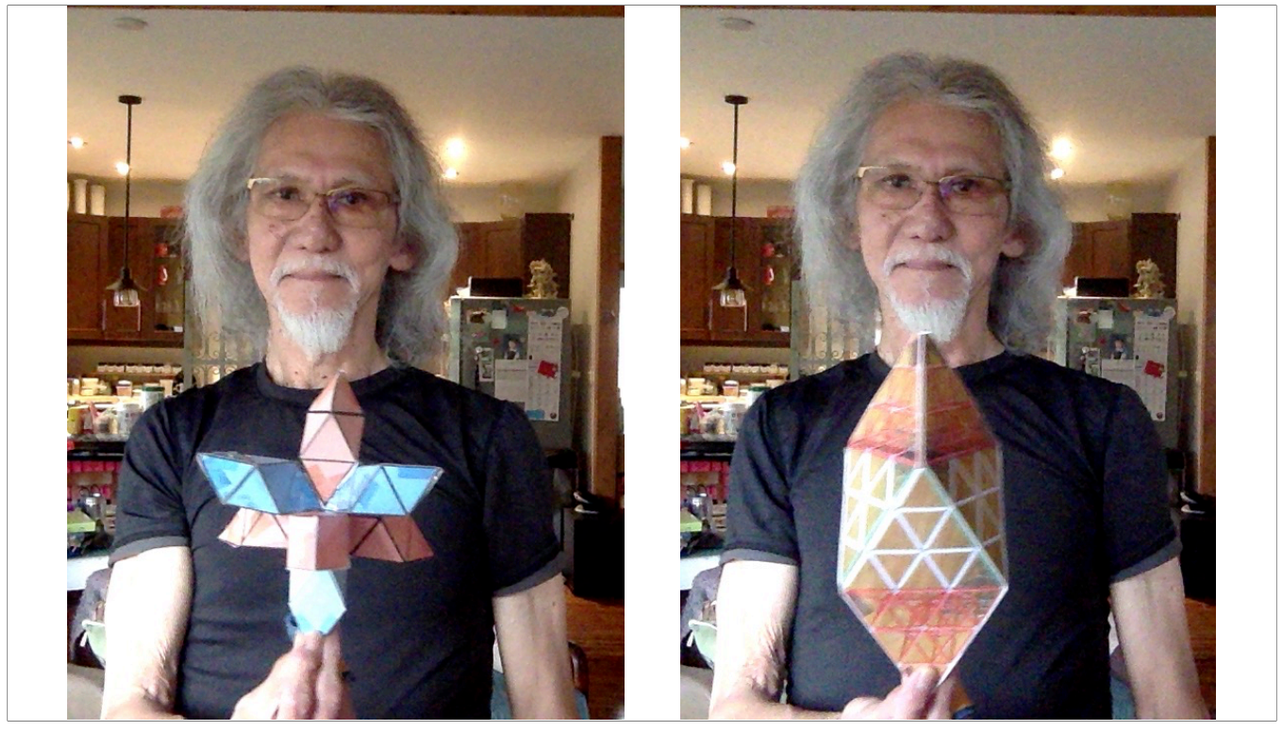


Tetra/Octa/Tetra configuration

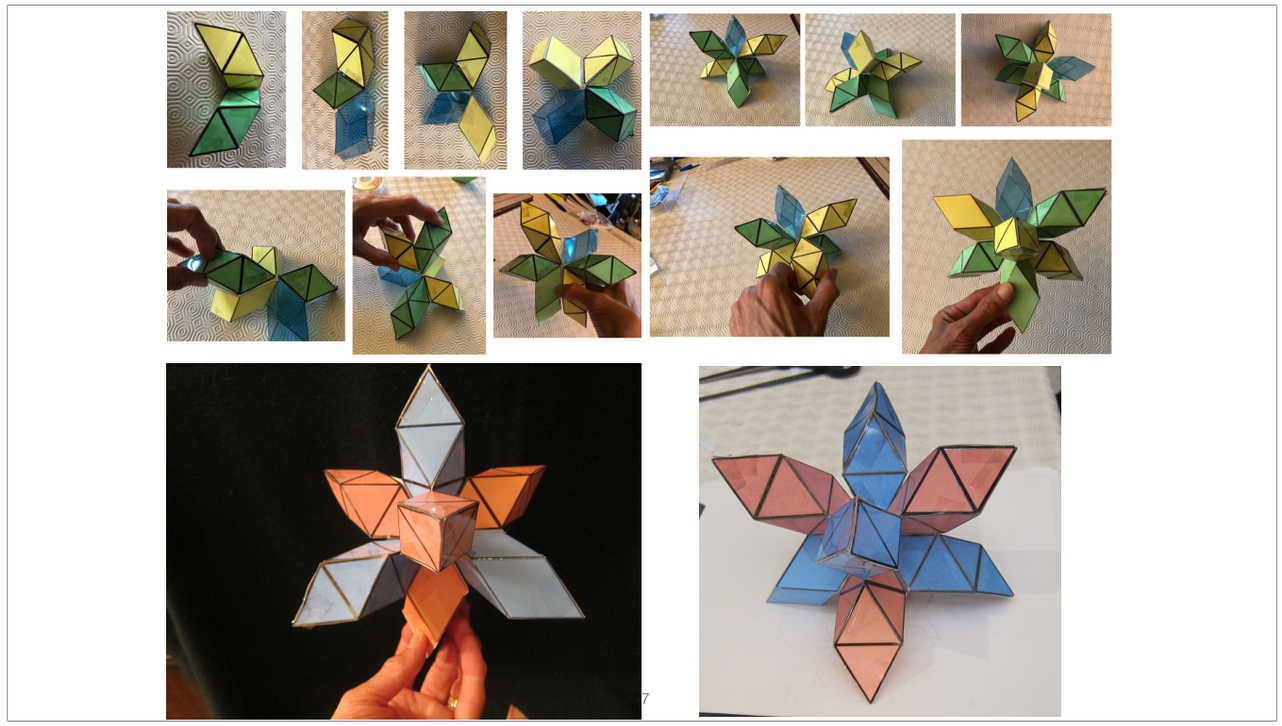
4 - take aways and take forwards…

Expansion and return / radiation and gravity - omnidirectional expansion of universe.

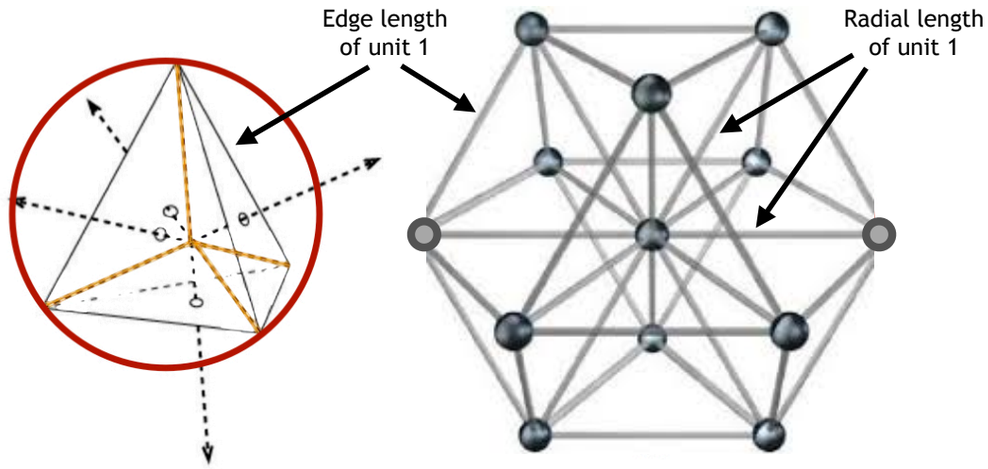
Tetra/Octa/Tetra configuration - the central ray of the wave. Left 1-F, right 3-F.



Left: a complete wave form made from tetra/octa/tetra ‘rays’.
Right: a 3-Frequency ‘tetra/octa/tetra ray’ which would build into a 3-F fractal wave that can expand omni-directionally, endlessly without distortion. This form emanates from the cube octahedron. The minimum structure is derived from 1 4-F tetrahedron.



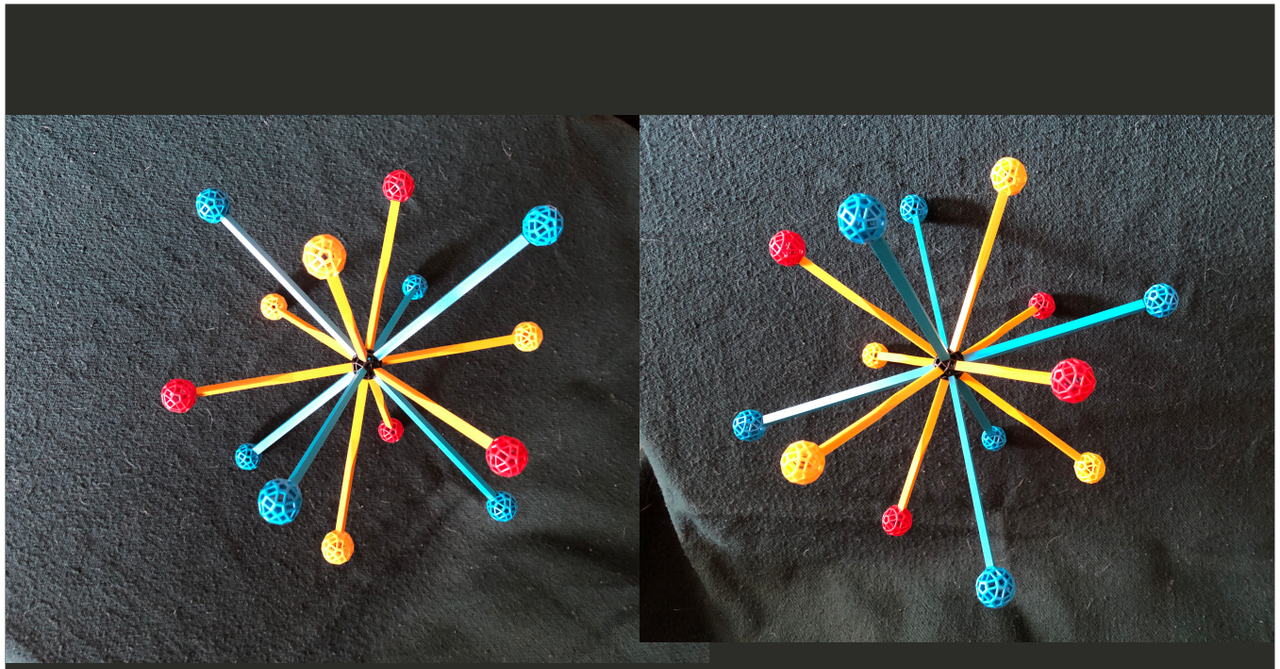
8 rays make 1 omni-directional wave form.



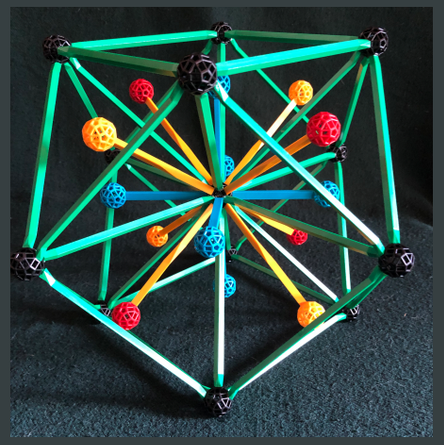
Tetrahedron with edge length of unit 1 has a radius R= (sqrt[6]/4)a = 0.6123724356958

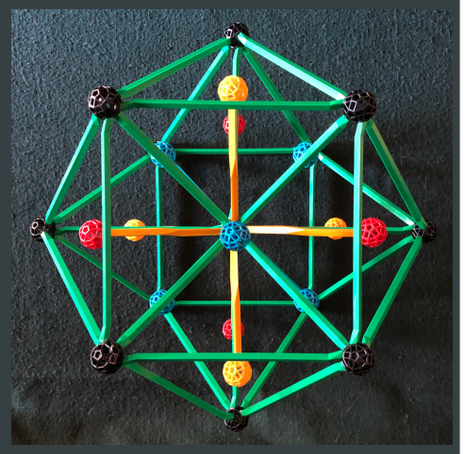
Cube octahedron with edge length of unit 1 has a radius R= 1; with both set to the Planck length = 1 this is the only internally consistent Planck object.

Tetrahedron: Edge a = 1, Radius of sphere to vertices R= (sqrt[6]/4)a = 0.6123724356958.
Since this is the smallest possible object as defined by the Planck length of an edge, then the smallest possible sphere is one that has a radius of 0.612372435695 X Planck constant. However, since the Planck constant establishes the minimum distance possible, then the Radius must be the same as the edge length in order to not violate its own internal consistency. In this case, the cube octahedron must be the Planck object, since it is the only polyhedron with equal radius and edge length to the Planck constant.

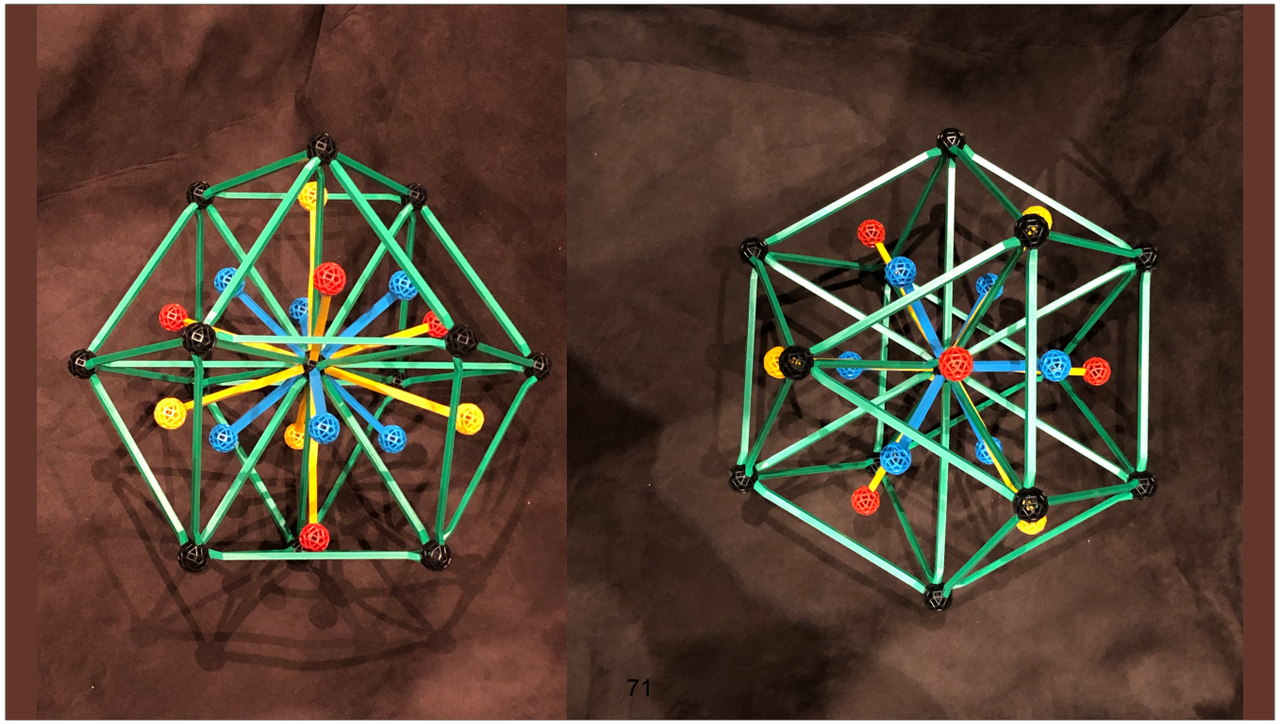


The 14 pointed star of the interlaced, omni-directional 7 axes of the universal grid - the Matrix





All 7 Axes have unique positions with their 14 directions emanating from a common centre of the Cubeoctahedron - the 8 arrow heads (directions) of the ‘lambda’ T, U,V, W Axes (the yellow rods) all align to the centre of the 8 triangular faces of the Cubeoctahedron while the 6 directions of the X,Y,Z Axis (the blue rods) all align to the 6 square faces of the Cubeoctahedron.



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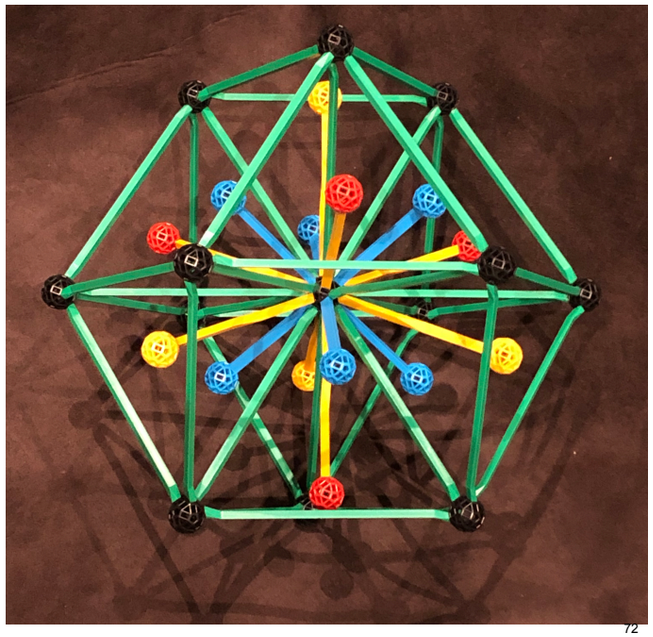
…the meta architecture that underlies Syntegration, participatory democracy and the cosmological grid matrix is:

the 7 axes of Cube Octahedron…

from which all structure, from nature to buildings to organizations can be built

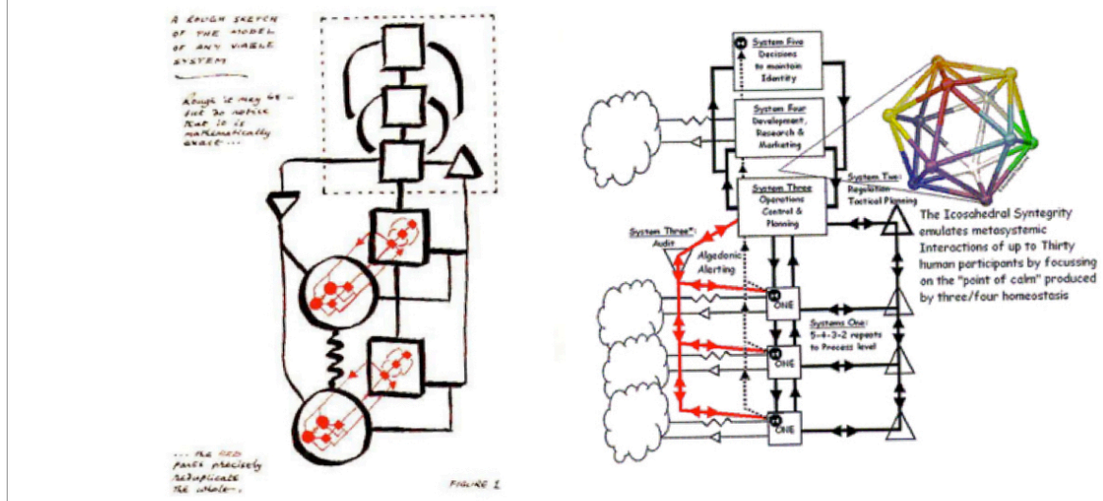
This is nature's most efficient, least energy form

This is the only geometry that meets the requirement of the Planck distance equivalence to the edge of a tetrahedron, which is minimum structure.



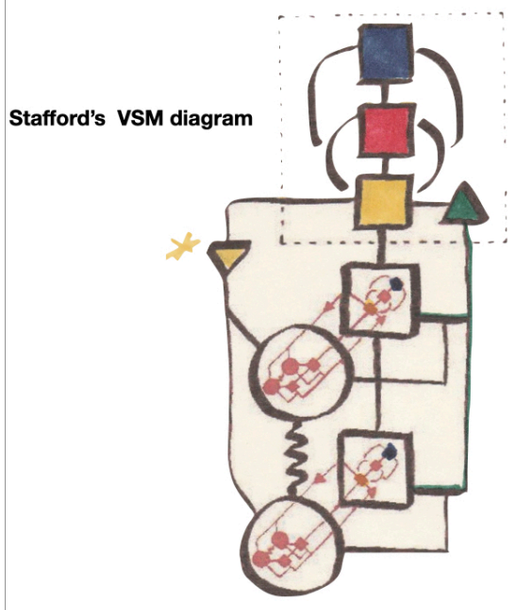
Read slide and add:
It balances radiation and return, expansion and gravity without distortion at cosmic scale - it is the only known structure that can do so.

Left: the Platonic tower as minimum structure.
Right: the central spine of the Tetraverse in fractal form.

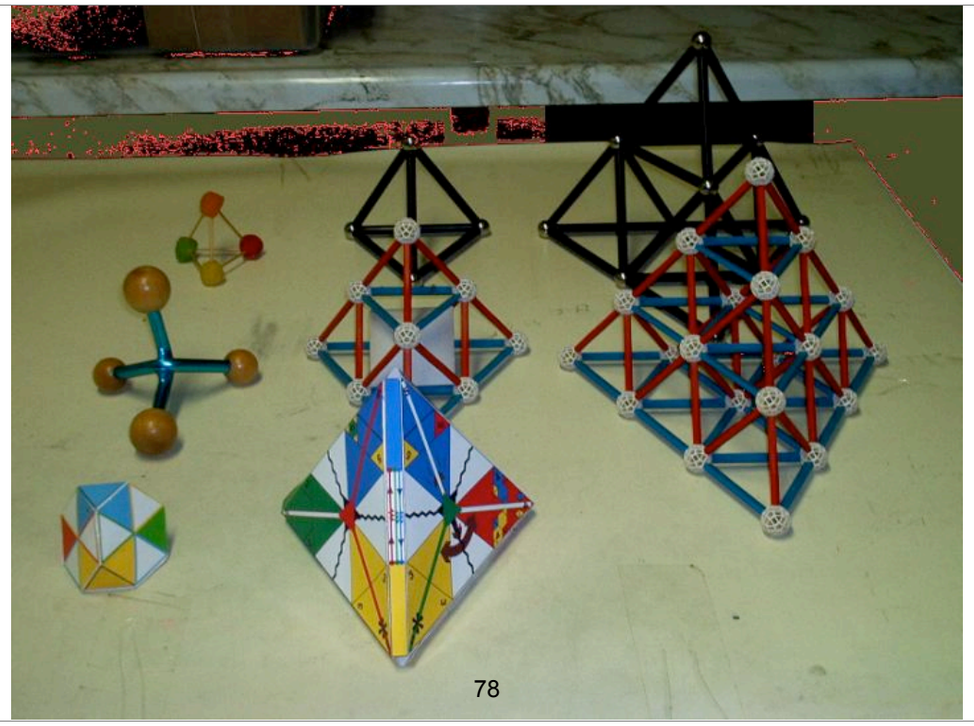


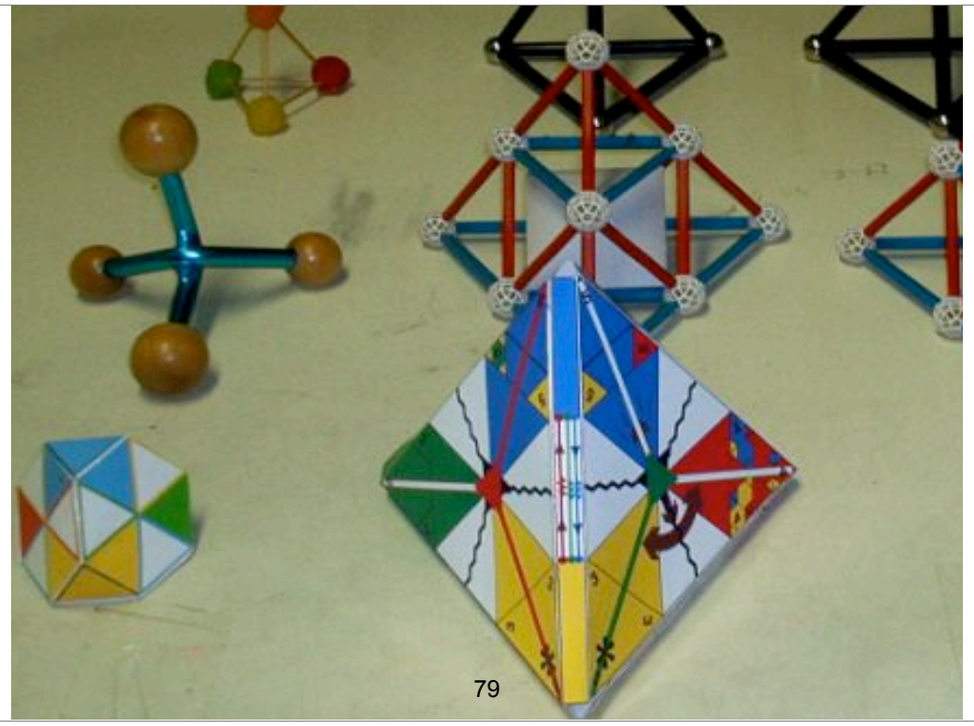
The internal architecture of Stafford Beer through his VSM.

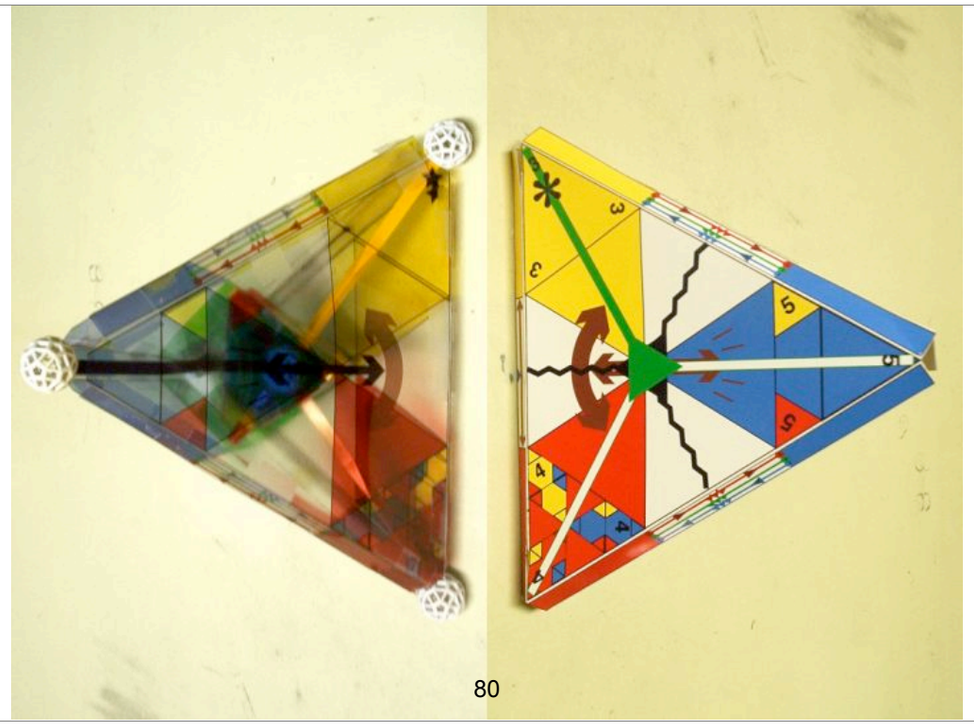
Viasystant - the only 3-D model of VSM approved by SB.



4 vertices of the external tetrahedron (multiples of 3-F) are the S5, S4, S3 and S2. The systems One are recursed inside the tetrahedron around its spherical centre and connect by regular polyhedral expansion.







Unlike Syntegration which was mapped onto the icosahedron,
SB did not design the VSM to ‘fit’ any 3-D shape but to most efficiently map human neurophysiology. The ‘fit’ is a natural outcome of structural viability expressed in VSM terms. Necessary and sufficient conditions of viability…

The meta architecture of Team Syntegrity and participatory democracy

1 - on architecture and meta architecture

2 - the coherent architecture of Team Syntegrity / Syntegration for participatory democracy - expanded

3 - From the X, Y, Z organized world, to the Tetraverse and the 7 axes of Omniverse - from necessary to necessary and sufficient

4 - take aways and take forwards… Insights and Outsights

Questions and comments

J & C Truss
2023