**Introduction**

The argument developed here derives from an exploration of the creativity of Nikola Tesla (*Reimagining Tesla's Creativity through Technomimicry: psychosocial empowerment by imagining charged conditions otherwise*, 2014). There it took the form of a separate section (*Insight into global dynamics through Tesla's focus on the sphere*, 2014). The focus and scope of that section, with its speculative animations, justified its separate development in this document into which the contents have been transferred.

The concern here is with the learnings to be derived from spherical representation of cognitive dynamics -- especially in contrast to their representation framed in some way by a circle, as with mandalas, the zodiac or the enneagram.

Missing from the separate discussion of Tesla's creativity was his considerable interest in the sphere -- both in relation to his energy experiments, and to his understanding of the terrestrial globe. There is a case for relating these to the later explorations of Buckminster Fuller (*Synergetics: explorations in the geometry of thinking*, 1975), as separately discussed (*Geometry of Thinking for Sustainable Global Governance: cognitive implication of synergetics*, 2009).

With respect to Tesla, it was suggested that his creativity might be fruitfully explored in the light of technomimicry, as illustrated by that of Arthur M. Young, designer of the Bell helicopter, and as separately discussed (*Engendering a Psychotyper through Biomimicry and Technomimicry: insights from the process of helicopter development*, 2011). Young envisaged the possibilities of applying the principles of helicopter control -- notably involving challenges of rotation -- to the development of a "psychotyper", or "winged self" (*Geometry of Meaning*, 1976; *The Bell Notes: A Journey from Physics to Metaphysics*, 1979). Possible understandings are discussed separately (*Characteristics of phases in 12-phase learning-action cycle*, 1998; *Typology of 12 complementary strategies essential to sustainable development*, 1998). If creativity through "biomimicry" has now been seen as an instance of "bio-inspiration", the possibilities of "technomimicry" might be better recognized through "techno-inspiration", in the light of the arguments of Jeff Karp (Kayt Sukel, *What I'd ask Spider-Man, mascot of bio-inspiration*, New Scientist, 14 October 2014).

From a cybernetic perspective, both are complemented by the work on syntegrity of Stafford Beer (*Beyond Dispute: the invention of team syntegrity*, 1994) as variously summarized (Allenna D. Leonard, *Team Syntegrity Background*, 2002; J. Truss, et al., *The Coherent Architecture of Team Syntegrity: from small to mega forms*, 2003). Beer focused his cybernetic argument on the icosidodecahedron with 32 faces (of two types), 60 edges, and 30 vertices -- emphasizing the variety that could be associated with the vertices, with which distinct stakeholders could be associated in any discourse.

The following argument explores a degree of confluence in the arguments of Young, Fuller and Beer when their implications in three dimensions are considered, especially when understood dynamically. This had been stressed with respect to Tesla's innovative capacity with regard to electromagnetism, more particularly in handling the polarity of positive and negative.

**Global insight implied by circular representation**
Maps of the world typically depict it as being flat, although the projections used may imply a global form that can remain difficult to imagine meaningfully. For many, including scientists, the “sun rises”, even though the dynamics may be understood otherwise. The first edition of Thomas L. Friedman's *The World Is Flat* (2005) was given the first *Financial Times* and Goldman Sachs Business Book of the Year Award in 2005. The award recognizes one business book that provides ‘the most compelling and enjoyable insight into modern business issues, including management, finance and economics.’ Does this suggest a dependence on a fundamentally misleading perspective -- or one which is widely reinforced, as argued separately (Irresponsible Dependence on a Flat Earth Mentality -- in response to global governance challenges, 2008)?

8-foldness: There is extensive commentary on the *BaGua* circular configuration of trigrams according to the understandings of Chinese philosophy. These can be presented in animated form, as portrayed previously with regard to Tesla (Imagining a method for adapting Tesla's insights to a psychosocial context, 2014). Those circular animations were reproduced from *Animation of Classical BaGua Arrangements; a dynamic representation of Neti Neti* (2011) where they were presented with alternative configurations, also discussed otherwise (Unknown Undoing: challenge of incomprehensibility of systemic neglect, 2008).

12-foldness: With respect to Arthur Young's exploration of learning-action cycles in *Geometry of Meaning* (1976), it is appropriate to note his courageous attempt to relate these to the far more widely memorable understanding of zodiacal cycles (Zodiac: An Analysis of Symbolic Degrees by Eric Schroeder, 1982). Such bridging exercises are rare. Why is that?

A disposition of 12 complementary qualities in a circle has long been a feature of civilization and of integrative understanding, as can be variously explored, notably with regard to the enthusiasm for "round tables" (Checklist of 12-fold Principles, Plans, Symbols and Concepts: web resources, 2011; Implication of the 12 Knights in any Strategic Round Table, 2014). This proclivity can be explored with respect to global governance (Eliciting a 12-fold Pattern of Generic Operational Insights: Recognition of memory constraints on collective strategic comprehension, 2011; Imagining Attractive Global Governance: questioning possibilities and constraints of well-boundedness, 2013; Enabling a 12-fold Pattern of Systemic Dialogue for Governance, 2011).

**Navigation in three dimensions:** It is curiously appropriate that Young's primary inspiration was navigation in three dimensions, as exemplified by his pioneering work on helicopter design. However, in endeavouring to generalize his learnings from that domain, he chose to associate his insights with the traditional circular representation of the zodiac. This raises the question of how that understanding might be augmented with respect to cognitive navigation by a representation of the zodiac in three dimensions as explored below. This is of course consistent with the original inspiration of the spherical disposition of the constellations around the celestial sphere.

**Integrative animation:** The following experimental animation -- in circular form -- integrates points made by Arthur Young, as variously described and discussed separately (Geometry of Meaning: Examples of Integrated, Multi-set Concept Schemes, Annex 1, 1984; Functional Complementarity of Higher Order Questions: psycho-social sustainability modelled by coordinated movement, 2004). Prior to its association with the zodiac, Young used a simpler circular representation in the light of the physics of controlled navigation from which his insights derived (Configuration of states, acts and relationships). Relating creativity of such as Tesla to widespread understanding of the zodiac is especially valuable as an aid to comprehension and reflection on the navigation of the conceptual universe - - of the noosphere.

Use of the symbolic language associated with the zodiac has long been deprecated by science and religion despite its popular appeal as a meaningful framework. It is appropriate to note the care with which Young develops his argument from the abstractions of the physics of movement required in the control of a vehicle such as a helicopter. The terms from the zodiacal framework are only then attributed to offer a degree of qualitative comprehensibility to the distinctions he makes for which he repeatedly notes the inadequacy of words -- given the manner in which they can be variously interpreted and understood. Emergence of deeper understanding is of course characteristic of any learning process -- which may last many years.

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**Animation suggestive of the experiential system of interwoven creative processes** -- creativity embodied in alchemical processes encoded by the forms of zodiacal signs

(adapted from Eliciting a Universe of Meaning: within a global information society of fragmenting knowledge and relationships, 2013)
Positive and Negative: The animation above includes indication of the conditions traditionally considered "positive" or "negative". These are fundamental to the innovative developments of Tesla with respect to electromagnetism -- and the possible implications for corresponding handling of positively and negatively charged psychosocial conditions, as discussed in the preceding paper. As noted by Wikipedia with respect to "negative signs": No value judgment is attached to the terms negative or positive. They may be likened to polarities in a magnet: one side is positive and one side is negative. Neither side is "good" nor "bad" -- they are merely different. Signs associated with the negative are Taurus, Cancer, Virgo, Scorpio, Capricorn, and Pisces; those associated with the positive are Aries, Gemini, Leo, Libra, Sagittarius, and Aquarius.

Complementarity of complexity and simplexity: Use of the zodiac by Young as an explanatory metaphor highlights the complementarity inherent in the struggle between:

- ensuring the integrity of the formal, irrespective of whether this is readily comprehensible to many
- ensuring meaningful coherence of what can be understood, irrespective of whether this is supported and justified by standards of evidence (notably as preferred by science)

The complexity explored by science could well be "held" conceptually through rotational dynamics -- incorporating it into integrative models and mappings of a particular form. The necessary simplicity for its comprehension as a whole could well be addressed through a complementary preoccupation with simplexity -- remarkably exemplified by the sphere, with its global associations and implications.

Complexity is of course a focus by science on complex systems, most notably through the discipline of cybernetics. Of particular concern to the development of global civilization is the developing understanding of complex adaptive systems. The interest in "simplicity" is as yet far less well developed, although it could be assumed that it is through such insights that policy makers and the voting public could get a more adequate "handle" on the strategic issues of a global civilization currently subject to a crisis of crises (Miguel Pina e Cunha and Arménio Rego, Complexity -- Simplicity -- Simplexity, 2008; Jeffrey Kluger, Simplexity: the simple rules of a complex world, 2007). Relevant literature is partially summarized by Mark Pharoah (Looking to systems theory for a reductive explanation of phenomenal experience and evolutionary foundations for higher order thought, Phronesis, 2008).

As noted in the discussion of Tesla, his exploration of the implications of rotation of the magnetic field have combined the complex and the simple in extremely valuable ways. These have proven to be of global relevance in practice, most notably with respect to alternating current -- with potential implications for psychosocial systems. With regard to comprehension, of relevance are the early suggestions that simplicial complexes could be used to model relations in social systems, as made by Ronald Atkin (Multidimensional Man: can man live in 3-dimensional space? 1981). This is indicative of a means of reframing the problematic complementarity evident in the widespread need for simplicity in an increasingly complex global context.

Acceptance of the complexity of emerging insights into complex systems has been consecrated by the Law of Requisite Variety of cybernetics. Arguably there is a case for a complementary "Law of Requisite Simplicity" -- or perhaps a "Law of Requisite Simplexity" -- with their challenging complementarity understood as follows:

- **Law of Requisite Complexity**: The larger the variety of actions available to a control system, the larger the variety of perturbations it is able to compensate. (Principia Cybernetica, 2001)
- **Law of Requisite Simplexity**: The greater the disordered connectivity of disparate phenomena to be taken into account in the process of governance, the greater the constraint on their comprehension and the lower the probability of effective action.

This would recognize the constraints on governance of complex systems by human groups with cognitive limitations, as argued separately (Dynamics of Symmetry Group Theorizing: comprehension of psycho-social implication, 2008; Comprehension of Numbers Challenging Global Civilization: number games people play for survival, 2014). One form of such a law was first proposed by Jeffrey Pfeffer (Four Laws of Organizational Research, 1981). The widespread enthusiasm for the framework offered by the zodiac merits consideration in this light -- given the relatively incomprehensible complexity of explanation with which science is now widely associated.

How indeed is who to be able to engage with the hypernetworks of complex systems -- as currently proposed as the basis of adequate
explanation, notably by Jeffrey Johnson (Hypernetworks of Complex Systems, 2009; Hypernetworks for the Science of Complex Systems, 2010; Hypernetworks in the Science of Complex Systems, 2013)? How does the issue of comprehension relate to that of creativity and hypercomputing, as separately discussed (Imagining Order as Hypercomputing: operating an information engine through meta-analogy, 2014)?

It is therefore not a question of whether individuals (or groups) are mysteriously influenced by particular "external" astral configurations. Rather it is how cognitive engagement with particular modalities of belief -- in preference to others -- engenders subtle "internal" influences indistinguishable from the "external". The objective and subjective explanations are entangled in ways which it is a challenge to comprehend and communicate through current mindsets, as discussed separately (¡¿ Defining the objective ∞ Refining the subjective ??: Explaining reality ∞ Embodying realization, 2011).

**Spherical mapping of conditions traditionally associated with the zodiac**

The 12 conditions which Young associated with the zodiac can be usefully mapped into an icosahedron (given its 12 vertices) as shown below -- as one significant approximation to a sphere. This could then be considered both as a 3D presentation of the zodiac and as an indication of the distinct control functions envisaged by Young with respect to any "psychopter". Given his helicopter inspiration, the animations are reminiscent of requirements of aircraft control in 3D (yaw, pitch, and roll). As in the above animation, a distinction is made below between 4 sets of contrasting threefold quality ("triplicities") and 3 sets of contrasting fourfold modality ("quadruplicities"). In the right hand animation, the rectangles have long been recognized as having the proportion of golden rectangles.

### Animations of mappings of selected sets into an icosahedron

(Generated from the Stella Polyhedron Navigator software by its developer Robert Webb, from a great icosahedron augmented by an icosahedron, then hiding selected faces)

<table>
<thead>
<tr>
<th>Triplicities</th>
<th>Modalities / Quadruplicities</th>
</tr>
</thead>
<tbody>
<tr>
<td><img src="image1.png" alt="Triplicities Animation" /></td>
<td><img src="image2.png" alt="Modalities / Quadruplicities Animation" /></td>
</tr>
</tbody>
</table>

The "negative" signs are clustered by two of the traditional triplicities (termed earth and water); the "positive" by the two other triplicities ("fire" and "air"). The two types are combined in the following animation (again the work of Robert Webb) -- but with addition of a circumsphere and attribution of labels to the 12 vertices (not to be attributed to Robert Webb).

Each triplicity or quadruplicity is a distinct configuration of "positive" and "negative" -- as otherwise represented in the preceding 2D circular animation. As argued here, these are indicative more generally of contrasting values -- dualities, polarities, binaries. The vertices are then distinguished in terms of a 4-fold pattern (of 3 quadruplicies), a 3-fold pattern (of 4 triplicities), a 2-fold pattern (of positive and negative). For mnemonic purposes the singular quality of each vertex is also labelled with the zodiac sign -- given widespread familiarity with each.

### Experimental animation of 3D zodiac of triplicities (E, A, F, W) + quadruplicities (C, F, M)

(with indication of positive and negative)

The following images are screen shots from the above animation. They distinguish the four individual triplicities and the 3 individual...
Quadruplicities/modalities as they were combined in the earlier animations. A yellow circle has been added linking the points of the triangle or rectangle -- suggestive of a feedback loop relating the conditions indicated by the vertices. The directions of the associated arrows suggest 2-way feedback. Note that the triangle or rectangle of each figure would appear differently in relation to the other forms if viewed from its other side. The characteristics by which the vertices are labelled include those associated with the work of Arthur Young, as indicated with the earlier circular animation above.

**Quadruplicities/Modalities commonly denoted as Cardinal, Fixed and Mutable**

*(screen shots of respective rectangles from rotations of the above animation)*

**Cardinal** (Young’s four acts)

![Cardinal Rectangle Animation](image1.png)

**Fixed** (Young’s four states)

![Fixed Rectangle Animation](image2.png)

**mutable** (Young's four relationships)

![mutable Triangle Animation](image3.png)

**Triuplicities commonly denoted as Earth, Air, Fire and Water**

*(screen shots of respective triangles from rotations of the above animation)*

**Earth**

![Earth Triangle Animation](image4.png)

**Water**

![Water Triangle Animation](image5.png)

**Air**

![Air Triangle Animation](image6.png)

**Fire**

![Fire Triangle Animation](image7.png)
Although not explicitly associated with the 12 positions of the zodiac, it is appropriate to consider how the 6 polarities could be understood in terms of the arguments of Edward de Bono (Six Frames For Thinking About Information, 2008).

Relevance to change, learning and creativity

Cognitive control of a vehicle: The animations and images above indicate the measure formulae of science which Young uses to distinguish knowledge processes associated with controlling a vehicle. These are discussed separately with respect to Functional Complementarity of Higher Order Questions: psycho-social sustainability modelled by coordinated movement (2004), notably in sections on:

- Semantic interrelationships between WH-questions
- Engaging with tendencies to twisting movement -- insights from helicopter control
- Measure formulae as the basis for a semantic template
- Qualitative operational relationships associated with learning cycle
- Cognitive instruction set for a semantic vehicle
- Set of measure formulae as a template for WH-questions
- Challenge of interpretation and comprehension
- Transformational questioning
- "Pathology" of Q&A: problematic answers to single-mode questions
- Existential dynamic in a "cognitive helicopter"
- Challenge of closure
- Reframing possibilities of closure

With respect to the measure formulae, Young notes that of the twelve, 10 (recognized by physics) are used to analyze the dynamics of a moving body, whilst 2 are "not presently recognized in physics textbooks, but used in engineering". These form a pattern as follows (Generation of Measure Formulae, according to Arthur Young)

<table>
<thead>
<tr>
<th>Basis of Rosetta Stone of Meaning</th>
<th>(according to Arthur Young)</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Group I</strong></td>
<td><strong>Group II</strong></td>
</tr>
<tr>
<td>Formula</td>
<td>Acts</td>
</tr>
<tr>
<td>L (position)</td>
<td>observation</td>
</tr>
<tr>
<td>L/T (velocity)</td>
<td>change (reaction)</td>
</tr>
<tr>
<td>L/T² (acceleration)</td>
<td>spontaneous act</td>
</tr>
<tr>
<td>L/T³ (control)</td>
<td>control</td>
</tr>
</tbody>
</table>

Learning/Action cycles: This pattern is the basis for the labelling in the above images and animations. There is however a very significant difference which Young emphasizes in a footnote (1976, p. 102) to the effect that the last column is displaced by one position (vertically) within the pattern of formulae -- as he then represents the set (notably in the circular animation above).

<table>
<thead>
<tr>
<th>Learning/Action cycle</th>
</tr>
</thead>
<tbody>
<tr>
<td>Group I: Acts (Cardinal)</td>
</tr>
<tr>
<td>Before</td>
</tr>
<tr>
<td><strong>Air</strong> (Zeigeist, timeliness)</td>
</tr>
<tr>
<td><strong>Water</strong> (flow, development)</td>
</tr>
<tr>
<td><strong>Fire</strong> (instigation of change)</td>
</tr>
<tr>
<td><strong>Earth</strong> (implication, embodiment)</td>
</tr>
</tbody>
</table>

Learning and "re-cognition": The shift from the logical pattern -- through the displacement within the relationship set -- merits careful consideration. Young is specifically concerned with learning/action cycles. This exploration developed from the major discovery of the rotation of a magnetic field by Nikola Tesla, as discussed separately with respect to its psychosocial implications (Reimagining Tesla's Creativity through Technomimicry: psychosocial empowerment by imagining charged conditions otherwise, 2014). The consequent focus on rotation and cycles in the animations above suggest that the process of learning involves a particular form of shift of perception -- effectively a rotation within the fourfold modality.

Young's use of "stone" as a metaphor, as in Rosetta Stone, could be usefully called into question as suggesting an excessive emphasis on the static when a dynamic merits recognition to a higher degree -- as may be the case with Philosopher's Stone (Transforming and
Interweaving the Ways of Being Stoned: imagination, promise, rocks, memorials, petrifaction, 2012). Such stones should imply a process of learning about their own adequacy as vehicles of meaning -- rather than exemplifying unquestionable description and premature closure.

This shift can be usefully exemplified by the stanza from the poet T. S. Eliot (in Little Gidding, 1942):

We shall not cease from exploration
And the end of all our exploring
Will be to arrive where we started
And know the place for the first time.

It is the sense of "knowing the place for the first time" which implies that the meanings attributed to the relationships prior to learning get reframed by that process. The sense of "faith" (in the table above) is then transformed into a sense of "knowledge"; "impulse" into "faith"; "work" into "impulse"; and "knowledge" into "work". The depiction above of the cycles within which the fourfold modalities are embedded suggests that reinterpretation of conventional terms may be a two-way process through learning and feedback.

The role of time, as indicated in the measure formulae, is then of particular significance. The shift from recognition based on timelessness ($1/T^0$), through $1/T$ and $1/T^2$, to one characterized by $1/T^3$, suggests an increasing integration of past experience and implication in it. Consideration can be given to the learning consequent on associating $1/T^3$ symbolically with Earth (as in the sense of groundedness or embodiment), or with Air (as with knowledge and wisdom). The stages of "re-cognition" can then be framed in terms of forgetting and "re-membering": conventional remembering, remembering past remembering, and remembering the remembering of the past. Understood in terms of environmental processes, this could be: creative production cycle, selective recycling, and systematic recycling. The comprehensive nature of the latter could be recognized as the "encycling" separately explored (Encycling Problematic Wickedness for Potential Humanity, 2014).

Orders of cybernetics: The shift, through learning, from observing to "knowing one knows" suggests exploring the fourfold distinction in terms of different orders of cybernetics, as discussed separately (Cybernetics of cybernetics: complex adaptive systems? 2007):

- first order cybernetics: characterized by simple feedback loops
- second order cybernetics: understood as the cybernetics of cybernetics
- third order cybernetics: in which the observer is understood to be part of a coevolving system
- fourth order cybernetics: as may be variously understood, possibly with multiple realities shaped by, and impinge upon, power relationships within society. As proposed, for example, by M. Zangeneh and E. Haydon (The Psycho-Structural Cybernetic Model, Feedback, and Problem Gambling: a new theoretical approach, International Journal of Mental Health and Addiction, 1, 2, 2004):

> Central to this effort is the application of a unique, critical theory inspired by the works of Anthony Giddens (1971, 1990; see discussion on modernity and reflexivity) and John Francois Lyotard (1979; see discussion on postmodernity) to the cybernetic theoretical framework. The epistemological orientation of the theory proposed here is that of multiple realities shaped by social, cultural, economic, ethnic, gender and disability values, which centralize on the asymmetric power relations in society

The distinction between the "orders" of cybernetics is currently a matter of controversy, most recently addressed by Maurice Yolles and Gerhard Fink (Generic Agency Theory, Cybernetic Orders and New Paradigms, 2014) in the light of their earlier reflections. Russell Clemens (The Cybernetics of Foresight: futures thinking for the 21st Century, Asia-Pacific Foresight Conference, 2012) discusses the merits of relating the approach of cybernetics (including the implications of the icosahedron and enneagram) to the causal layered analysis methodology of Sohail Inayatullah (Causal Layered Analysis: poststructuralism as method, Futures, 30, 1998, pp. 815-829).

Higher orders of learning: Irrespective of the academic controversy, learning can be suggestively understood as associated with higher orders of questioning, increasing degrees of self-reflexivity, implication in what is observed, and forms of cognitive embodiment, as argued by various authors (Henryk Skolimowski, The Participatory Mind: a new theory of knowledge and of the universe, 1995) and discussed separately, notably with respect to constructivism and enaction (Existential Embodiment of Externalities: radical cognitive engagement with environmental categories and disciplines, 2009; David Abram, The Spell of the Sensuous: perception and language in a more-than-human world, 1997; George Lakoff and Mark Johnson, Philosophy In The Flesh: the embodied mind and its challenge to western thought, 1999).

There is a case for recognizing that the cybernetic "orders" above could be associated with distinct topological surfaces whether for representation, mapping or symbolic purposes:

- first order cybernetics with the circle (as suggested by the interlocking loops depicted on systems diagrams)
- second order with the sphere (as suggested by integrative global interlocking of great circles around a sphere)
- third order with paradoxical forms (as with the Klein bottle)
- fourth order with yet more complex forms.

The relevance of Klein bottle geometry is notably argued by Steven M. Rosen (Topologies of the Flesh: a multidimensional exploration of the lifeworld, 2006; Dreams, Death, Rebirth: a topological odyssey into alchemy's hidden dimensions, 2014).

**Cognitive "glass ceilings":** These threads could be framed as follows.
The pattern serves to highlight the increasing degree of difficulty in representation of what can only be meaningfully comprehended in practice through the experiences by which it is embodied. At best this comprehension can be indicated by symbols with whose form the intuition may resonate.

The suggestion in the table of cognitive "glass ceiling" effects serves to highlight the current strategic challenge of achieving "buy in" to action on any strategic problem. The associated subjective engagement is beyond the scope of conventional articulation, whether by science or politics. It is partially addressed by "public relations" and "image management" techniques -- despite the lack of credibility of such modalities to "people of the earth", grounded in experience of the broken promises offered by the "people of the air".

**Transcending polar preoccupation**

**Patterns of higher order**: Such mapping shifts attention beyond simple polarity to threefold and fourfold patterns -- and to the challenges these may imply (Triangulation of Incommensurable Concepts for Global Configuration, 2011; Noonautics: Four modes of travelling and navigating the knowledge "universe"? 2006). Rather than being understood as triangular or rectangular "lines", they can be more fruitfully explored as distinct cybernetic feedback loops -- information flows -- or "learning-action" cycles in Young's terms. These suggest the need for recognition of a cognitive analogue to *metabolic pathways*, as discussed with respect to Engaging with Globality through Cognitive Circlets (2009).

The value of an icosahedral mapping is also evident through the manner in which it also holds fivefold and sixfold patterns, as indicated by the schematics below. Such patterns are potentially of a greater challenge to comprehension in cognitive terms. Related psychosocial implications can also be explored (Middle East Peace Potential through Dynamics in Spherical Geometry: engendering connectivity from incommensurable 5-fold and 6-fold conceptual frameworks, 2012).

**Rotation of icosahedron into positions highlighting contrasting patterns**

5-fold flow pattern

6-fold flow pattern

**Cognitive implication in patterns**: As noted in the introduction, the potential of those patterns -- as articulated and tested with respect to patterns in "external" material form -- thus derives from "internal" patterns of thinking. This perspective has been extensively argued, from a cognitive psychological perspective with respect to mathematics more generally, by George Lakoff and Rafael Nuñez (Where Mathematics Comes From: how the embodied mind brings mathematics into being, 2001). This suggests consideration of the cognitive locus from which Tesla's mathematically informed creativity emerged -- usefully to be understood as at the centre of a sphere whose geometry sustained his inspiration.

The nature of this cognitive locus -- potentially a self-reflexive locus of identity -- can be partially suggested by representing the fourfold modality (indicated above by three golden rectangles) as the set of entangled 3 *Borromean rings* below. This can be contrasted with recognition of the challenge of interrelating their objective depiction with the subjective identification with them as cognitive feedback loops (¡¿ Defining the objective ∞ Refining the subjective <![if !supportLists]>1.][endif] Explaining reality ∞ Embodying realization, 2011). The entangled rings frame the locus of identity in relation to globality.
Framing the source of creativity? The challenge of emergence and comprehension of creativity "through" configurations of such cognitive functions recalls the so-called "puzzle balls" or "mystery balls" -- nested spheres carved in ivory, as separately described and illustrated (Chinese Puzzle Balls: the Rubik's Cube of the Ancient World, Oddity Central, July 2012; Stina Björkell, Chinese Puzzle Balls: a dazzling example of superior craftsmanship, gbtimes, 20 November 2013). Typically with 7 nested spheres, examples with 42 spheres are known (see the many images on the web).

Significance -- potentially of relevance to insight and creativity -- is attached to aligning the holes in the spheres (namely the holes through which the inner spheres are creatively and extensively carved, progressively). Suggestive with respect to the shifting pattern of charged polar conditions is the interplay of mythical dragons -- typically two -- carved symbolically on the external sphere. This recalls the widespread Chinese tradition of a dragon dance in quest of a precious pearl (Ernest Ingersoll, Dragons and Dragon Lore, 1928). Their interplay is indicative of the relation between any polarity and the emergence of transcendent insight, most obviously evident in the production of electric light, but with its subtler symbolic associations.

The following image (on the left), constructed using virtual reality techniques, offers a suggestion of the contexts from which creativity emanates -- as it is traditionally associated with the Sun. It is a form of emulation of the Chinese puzzle balls. The average distance from the Sun has been used to distinguish the radius of the sphere associated with each of the 8 planets. Many (interactive) animation features could be added to improve this preliminary version and increase the insight it might offer into creativity through the "alignment of holes" between "planetary spheres" (as suggested by the animation on the right generated with the Stella Polyhedron Navigator software).

**Copyright and creativity**: It is of some relevance to this argument to note that there are currently no images of such mystery balls that are free of copyright, and that the objects themselves would constitute a major challenge to copy -- even with 3D printing. Given the creative insight potentially associated with the innermost sphere of such mystery balls, it might then be asserted that: if it can be copyrighted, it is essentially wrong -- especially if its use is constrained as a commercial product.

Copyright as intellectual property may indeed imply an adequately detailed description of water and the possibility of communicating it. It is however completely meaningless with regard to the experience of drowning in it. The distinction was succinctly articulated by Jack Nicholson in the movie in As Good as it Gets (1997): Here I am drowning and you are describing the water. Is it global civilization that can now be said to be "drowning"? Higher orders of cybernetics address such existential sentiments.

**Existential cognitive reality**: As a cognitive modality, conventional science is unable to elicit or engage collective action amongst those existentially preoccupied otherwise -- and is fundamentally indifferent to their concerns. Conventional modelling only "describes the water". It is for this reason that conventional "first-order" cybernetics has so far proven to be irrelevant to addressing the global problematic, as separately discussed (Consciously Self-reflexive Global Initiatives: Renaissance zones, complex adaptive systems, and third order organizations, 2007).

The handicap is evident in the inability to determine from what cognitive context emerged Martin Luther King's influential phrase I have a dream (1963) -- despite the adequacy of the explanations of conventional science as to why this ensured his assassination. Which could be said to offer the greater sense of coherent meaning to the greatest number? Why is popular appreciation of the zodiac an embarrassment to science? Does science have any fruitful framework for understanding embarrassment? What are the cognitive processes avoided by science (Knowledge Processes Neglected by Science: insights from the crisis of science and belief, 2012)?

This strange inability to "re-cognize" the contrast between theory and practice, and to integrate them fruitfully, is evident with respect to theoretical explanation regarding the control of any vehicle -- whether a bicycle, a skateboard, a helicopter, or a space module. The need
for "experience" is however well recognized, whatever that may be held to mean. Driving licences are not issued without evidence of the capacity to drive -- even though that understanding cannot be explained scientifically. The argument can be speculatively explored (The-O ring: Theory, Theorem, Theology, Theosophy? a playful intercultural quest for fruitful complementarity, 2014). How does science recognize its capacity to "encompass experience" -- whatever that might be held to mean?

Curiously this point is made otherwise through the evident imaginative engagement with movies exploring "special effects" -- defying the laws of physics as consecrated by conventional science -- in a period in which science is responding defensively to evident popular indifference to the focus it advocates. This raises the question as to why the imagination is engaged to such a degree by iconic figures like Batman and Spider-Man -- and of how their skills may resonate with intuitive understanding of a wider range of cognitive modalities (Kayt Sukel, What I'd ask Spider-Man, mascot of bio-inspiration, New Scientist, 14 October 2014). What indeed is to be understood by Arthur Young's "winged self"? How might it relate to the cognitive capacity and creativity of such as Nikola Tesla?

**Imagining the nature of cognitive "flight" in terms of the enneagram**

Further insight is also to be derived from Stafford Beer's recognition of the association between the enneagram and the icosahedron, which he describes as emerging from collaboration with Joseph Truss -- in a chapter on The Dynamics of Icosahedral Space (Beyond Dispute, 1994, pp. 196-209). For Beer:

> But it is a matter of great interest that in the whole of the literature... the enneagram occurs as a plane figure. Nowhere had there been the slightest hint that a three-dimensional manifestation existed... No wonder the search took so long, given that the diagram was discovered spread across four vertical planes... The icosahedron is the actual origin of the enneagram... (p. 206)

Various efforts have been made to depict the enneagram in 3D -- readily available on You Tube (Francisco Meana, Enneagram from 3d perspective, 2007; Francisco Meana, Sufi Enneagram, 2009; Chuck Middaugh, 3D Enneagram MOD 9, 2013), The degree of relationship to the icosahedron is not especially evident.

Beer provided no depiction, but this is offered in subsequent documents (J. Truss, et al, The Coherent Architecture of Team Syntegrity: from small to mega forms, 2003; J. Baldwin, BuckyWorks: Buckminster Fuller's Ideas for Today, 1996, p. 220). The Beer/Truss argument is also discussed by Andrew Pickering (The Cybernetic Brain: sketches of another future, 2010). Since those promoting syntegrity are especially sensitive to copyright issues, a different depiction is offered in the following generated with virtual reality software..

<table>
<thead>
<tr>
<th>9-fold enneagram embedded within an icosahedron</th>
</tr>
</thead>
<tbody>
<tr>
<td>with addition of an indicative central sphere</td>
</tr>
<tr>
<td>(constructed by manual modification of a virtual reality model of the icosahedron generated by Stella Polyhedron Navigator software)</td>
</tr>
</tbody>
</table>

| View of enneagram associated with only one pattern of vertices of icosahedron (view in 3D with virtual reality plugin) | View of enneagram from left image with the icosahedron framework hidden (view in 3D with virtual reality plugin) |
|-------------------------------------------------------------------------------------------------------------------|
| ![Image](image1.png)                                                                                                 | ![Image](image2.png)                                                                                   |

Note the colour coding and positioning of the icosahedral vertices -- which offer guidance when rotating the above models in virtual reality in order to render visible the enneagram pattern. Green-Magenta links of the enneagram are the only links embodied within icosahedral edges (on the left), where they are invisible. Three of the 12 vertices, positioned on the vertical axis (of the image on the right), do not form part of the 9-fold enneagram pattern (Red, Cyan and Black). The various possibilities for rotating the models in three dimensions affect the proportions of the enneagram as portrayed and the relative visibility of the Cyan and Black vertices.

Rotation of the above icosahedral images offers insights into the complex relationship between the elements of the enneagram. Of particular interest is any sense in which the Green vertices are to be considered as generative polarities of relevance to the more general argument here. The added central sphere offers a sense of the locus of the controller of the cognitive vehicle in relation to the dynamic suggested by the significance commonly associated with the lines of the enneagram. (see Susan Rhodes, Enneagram Overview, Enneagram Dimensions)
Note that the image on the left (above) offers edge-on images of some planes of the enneagram, whereas the image on the right (rotated to a lesser degree) makes apparent those planes. The separate triangular form can be understood as traversed by an axis through the unconnected Cyan and Black vertices -- and passing through the added central sphere.

As remarked by Beer with respect to detection of the enneagram "hanging" within the icosahedron:

Consider: if it can be detected when the icosahedron stands on one vertex, it must be detectable when the model stands on any vertex. Moreover, if it is present when these two poles are aligned, it must be present when any two poles are aligned. Thus it comes about that points 4 and 5 on the enneagram refer to any side [meaning edge] of the icosahedron -- which therefore enfolds 30 three-dimensional, four planar, enneagrams... The icosahedral model conceived as a spinning sphere could be regarded as "an interpenetration of phi-ness"... an interpenetration of three-dimensional four-planar enneagrams... (p. 206-207).

The images displayed statically above are totally inadequate as depictions of a single four-planar embedding -- especially when the lines are indicative of information flow patterns and loops (vital to control processes). To the extent that the depiction of the enneagram, from a conventional 2D perspective, can be interpreted as pillars and an archway, of particular interest is the implication that the symbolism valued so highly with respect to passing between pillars (and under archways) merits reconsideration. In Freemasonry, for example, the pillars are named Jachin and Boaz and represent one of the group's most prominently featured symbols. The complexity of the enneagram in 3D is indicative of the counter-intuitive cognitive complexity of such a passage. This is especially highlighted by the collection of Zen koans -- known as The Gateless Gate.

An animation is required to offer a better understanding -- and the manner in which the 3D enneagram is associated with each of the 30 edges of the icosahedron. However it is appropriate to note that representations are available otherwise in that the final stellation of the icosahedron (the 17th) is an irregular star (self-intersecting) polyhedron with 20 identical self-intersecting enneagrammic faces, 90 edges, and 60 vertices. The 20 faces correspond to the 20 faces of the underlying icosahedron with each face being an irregular 9/4 star polygon, namely an enneagram.

A contrasting depiction of the stellations of the icoahedron is given separately in a discussion of Systemic comprehensiveness of sets in (Harmony-Comprehension and Wholeness-Engendering:...
Beer remarks with respect to mentation, both in individuals and groups, and the role of an information set (an "infoset"):  

It is at least possible that the multiple enneagrammatic structure, reverberating as it does, provides a complex of linkages to constitute such a "corporate brain" that would then give rise to its own [infosetic] consciousness. (p. 208)

Given the inspiration that Beer drew from the work of Arthur Young -- and the latter's preoccupation with "flight" (as more generally understood) -- it is appropriate to note the use of "wings" in enneagram personality type theories (Anthony Blake, The Intelligent Enneagram, 1996). The basic type associated with any one point of the enneagram is understood to be modified by the personality dynamics of the two adjacent types as indicated on the enneagram figure.

Use of "wing" in a 3D context suggests that it might be more appropriately extended to the eight paired portions of the enneagram -- recalling the distinctions of the BaGua dynamic (noted above). As wings, the 3D enneagram might also be understood in terms of a membrane stretched (and twisted) in some way over the lines between the points (as is familiar in topology). At one extreme this recalls the concern of theoretical physics with branes (and brane cosmology), as separately discussed (Global Brane Comprehension Enabling a Higher Dimensional Big Tent? 2011). The latter referred to another extreme represented by the intuitions of the polymath Omar Khayyám -- derived from sails and tent-making.

With respect to "flight", how might the psychosocial implications of "beating" wings be understood in relation to sustainable governance (Enabling a 12-fold Pattern of Systemic Dialogue for Governance, 2011). Could the wing dynamics be related to the set of archetypal morphologies of René Thom?

Meaningful cognitive navigation?

Sustainability in spherical terms: The challenge of psychosocial sustainability, in "global" spherical terms, is also suggestively indicated by the navigational stability achieved through gimbals, as illustrated in the following animations from Wikipedia. Integral to the operation of governors, gimbals are essential to the stability of any magnetic compass, most notably for the navigation of ships at sea. Metaphorical use of "strategic compass" lends itself to speculative exploration with respect to strategic governance (Global Governance via a Double-breasted Strange Attractor: cognitive implication in a dynamic sexual metaphor, 2009). The dial of such a compass typically indicates a range of intermediate directions between the poles of North and South.

<table>
<thead>
<tr>
<th>Illustration of a simple two-axis gimbal set; the center ring can be vertically fixed</th>
<th>In a set of three gimbals mounted together, each offers a degree of freedom: roll, pitch and yaw</th>
</tr>
</thead>
<tbody>
<tr>
<td><img src="image1.png" alt="Illustration of a simple two-axis gimbal set" /></td>
<td><img src="image2.png" alt="In a set of three gimbals mounted together" /></td>
</tr>
</tbody>
</table>

Such animations recall the design of the time machine which featured so significantly in the science fiction film Contact (1997) based on the novel by Carl Sagan. The early conceptual design of the device was based on one of the primary shapes in geometry, namely a dodecahedron. This was eventually modified to a spherical capsule that encased the traveller -- a "pod" implied by addition of a central sphere in the images above. Does this suggest how the sustainable cognitive navigation of such as Nikola Tesla might be imagined -- somehow "encased" within such a rotational dynamic? Given the relevance of the thinking of Buckminster Fuller to this argument, it is appropriate to note the inspiration he found (when at the US Naval Academy) in the challenge of gunnery targetting in a vessel in turbulent sea -- and the dependence on gimbals of ship gun fire control. This again recalls the framing of policy science by Geoffrey Vickers (Freedom in a Rocking Boat: t: changing values in an unstable society, 1972).

"Constellation language" as pattern language: Such suggestive experiments call for further investigation of how spherical rotation is to be understood in terms of engaging with "constellations" of concepts as meme complexes (Spherical Configuration of Categories to Reflect Systemic Patterns of Environmental Checks and Balances, 1994). As explored by Beer, this would have implications for enabling discourse (Spherical Configuration of Interlocking Roundtables: internet enhancement of global self-organization through patterns of dialogue, 1998). Could Tesla's preoccupations be fruitfully understood in terms of constellations of concepts he perceived -- and engendered -- from within his universe of knowledge?

The recognition of constellations as a form of pattern language can be used to relate the above argument to the much-cited work of Christopher Alexander (A Pattern Language, 1977; The Nature of Order: an essay on the art of building and the nature of the universe, 2003-4). The former can itself be used experimental as a template for the detection of "constellations" of memes, as separately explored (3-fold Pattern Language, 1984). With respect to conceptual order, Alexander's work resulted in his articulation of New Concepts in
Complexity Theory (2003). He has developed this in an unusual manner (Harmony-Seeking Computations: a science of non-classical dynamics based on the progressive evolution of the larger whole. International Journal for Unconventional Computing (IJUC), 5, 2009). Through his recognition of 15 patterns of transformation, his work suggests the possibility of adapting these from a cognitive perspective, as separately explored (Tentative adaptation of Alexander's 15 transformations to the psychosocial realm, 2010; Harmony-Comprehension and Wholeness-Engendering: eliciting psychosocial transformational principles from design, 2010; In Quest of a Dynamic Pattern of Transformations, 2012).

As noted in that respect, given the discussion above of the icosahedron for mapping purposes, it is intriguing to note that the simplest polyhedron with the geometric properties that could "hold" these 15 transformations is the icosahedron through its 15 great circles -- as indicated in the Wolfram Demonstration Project of a dynamic variant by Sándor Kabai (Fifteen Great Circles on a Sphere). The intimate cognitive relationship between "constellations" and "patterns" call for further investigation. The preoccupation of this argument is however the challenge to comprehensibility of configurations of patterns as the number increases beyond George Miller's Magic Number Seven, Plus or Minus Two (1956), through 12, to 15 and beyond. This is especially challenging if the number of cognitive "metabolic pathways" for sustainability is of higher order, as discussed separately (Comprehension of Numbers Challenging Global Civilization, 2014).

Meaningful cognitive navigation: There is no conventionally acceptable reason why patterns of a particular configuration are held to be meaningful and to "work" -- as exemplified by golden rectangles favoured in design. This is further exemplified in the case of 12-foldness (Checklist of 12-fold Principles, Plans, Symbols and Concepts: web resources, 2011). However, from the mathematical perspective appreciated by Tesla, these are each recognized to have distinctively valuable properties -- as with 12, 9, 8, 7, 6, 5, etc. Sets of concepts are typically clustered assertively in such patterns (Patterns of N-foldness: comparison of integrated multi-set concept schemes as forms of presentation, 1980).

The "missing link" is between how a given pattern is believed to be meaningful in a particular case and any formalism offered by mathematics -- typically completely indifferent to the cognitive and psychosocial implications. It is this link which is vital to transcending widespread reliance on the default pattern of polarity -- with all the dysfunctional us-and-them consequences. This is especially disastrous when simplistic patterns are reinforced by simplistic theological considerations with regard to necessary belief. Hence the potential role of mathematical theology (Mathematical Theology: Future Science of Confidence in Belief, 2011)

With respect to this argument, it is the manner in which "charged" conditions derive from various polarities -- most obviously "positive" or "negative" -- can be reframed by such metaphors. These then constitute vehicles to "carry" comprehension (Metaphors as Transdisciplinary Vehicles of the Future, 1991; Discovering Richer Patterns of Comprehension to Reframe Polarization, 1998). Especially intriguing, given Tesla's preoccupation with the sphere in relation to energy, is how spherically symmetrical polyhedra (like the icosahedron) then function as approximations to a sphere. The simplest such polyhedra are the most readily comprehensible, but are far from the approximation to a sphere offered by the more complex forms (necessarily far less comprehensible), whereas -- paradoxically - - a sphere is readily held to be inherently comprehensible, even a symbol of simplicity.

Such considerations frame possibilities for exploration in relation to global governance, constrained as it is by the "energy" of polarizing mindsets (Towards Polyhedral Global Governance: complexifying oversimplistic strategic metaphors, 2008; Polyhedral Pattern Language: software facilitation of emergence, representation and transformation of psycho-social organization, 2008).

An argument has been made for seeking to benefit from the wisdom of non-western cultures (Susantha Goonatilake, Toward a Global Science: mining civilizational knowledge, 1999). In the case of Chinese culture, consideration could be given to mapping a more complex set of insights, as systematically articulated in the I Ching, onto polyhedra of relevant complexity, as argued separately (Toroidal mappings of wisdom questions and answers, 2012). One example is reproduced below. Of relevance to the theme of creativity here is its explicit encoding within that pattern and recognition of the manner in which it variously plays out through the dynamics of change and associated decisions. The mapping below suggests the possibility of a cognitive compromise between "complexity" and "simplicity" from the perspective of the controller of the "vehicle".

| Drilled truncated cube of 64 edges with I Ching hexagram names |
| (some faces rendered transparent) |
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