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21 November 2022 | Draft

Imagining Partnership of the SDG Goals as Phases of the Cross

Correspondence between cognitive internalization and collective strategic articulation

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Introduction

[Eightfold prelude to a 16-fold configuration](#)

[Towards a configuration of 16 SDGs in 3D](#)

[Comprehension of SDG systemic complexity through minimizing visual constraint](#)

[Enriching comprehension of "goals" as the "external" focus of the 16 SDGs](#)

[Contrasting engagement with "goals" by the Inner Development Goals initiative](#)

[Goals as the comprehensible confluence of embodied values?](#)

[Comprehension of requisite symbolic coherence of viable development goals](#)

[Correspondence between individual cognitive embodiment and collective strategic articulation](#)

[Relevance of the classical travelling salesman problem of operations research](#)

[Partnership for the Goals as "Phases of the Cross"?](#)

[References](#)

Introduction

As the current culminating reflection on coherent global governance, the 17 [Sustainable Development Goals](#) formulated by the United Nations merit continuing reflection as the upgrade of the earlier 8 [Millennium Development Goals](#). A particular mystery relates to assumptions regarding Goal 17, namely the [Partnership for the Goals](#), and how this might be understood, as previously discussed ([Eliciting Potential Patterns of Governance from 16 Sustainable Development Goals](#), 2022). This explored Goal 17 through a polyhedral compound of 16 tetrahedra in 3D, notably presented as an interactive virtual reality model ([Experimental interactive animation of a 16-tetrahedra complex of UN SDGs in 3D](#), 2022)

Whether the set of goals is indeed systemically coherent in a recognizable manner, it could also be understood as implying a form of coherence emerging from the collective unconscious -- even as a collective dream ([Systemic Coherence of the UN's 17 SDGs as a Global Dream](#), 2021). The organization of the set of goals, and the 169 tasks associated with them, therefore invites continuing consideration of how that degree of complexity can be comprehended and rendered memorable.

The nature of that challenge has been explored separately ([Cognitive Embodiment of Patterns of Governance of Higher Order](#), 2022). As engendered by a set of values, their nature and organization also merits consideration ([Values, Virtues and Sins of a Viable Democratic Civilization](#), 2022).

The cognitive challenge of a poorly recognized 16-fold organization of global governance contrasts strangely with the radical simplification favoured by the promotion of a US-led [Rules Based International Order](#) (R BIO) ([The United Nations and the Rules-Based International Order](#), *United Nations Association of Australia*, July 2015; [Challenges to the Rules-Based International Order](#), *Chatham House*, 2015; Mark Leonard, [Who will rule the rules-based order?](#) *The Strategist*, 14 Jan 2022). The R BIO is now contrasted with the promotion of a [Law Based International Order](#) (L BIO) through the alliance of Russia and China. The dynamics of this binary competition are explored by Scott Ritter ([A 'Dangerous, Bloody and Dirty Game'](#), *Consortium News*, 3 November 2022). The nations primarily involved in both "sides" of this primitive game are of course the Permanent Members of the UN Security Council -- a body eternally challenged with the viability of the global system.

The future may see it as profoundly curious that a global civilization should choose to opt for a binary dynamic echoing the worldwide enthusiasm for such a dynamic in competitive ball games at every level of society. There is little interest in alternatives, 3-way or 4-way football for example, why they are less attractive, or the development of exemplars by which they might be enhanced. The primary focus is on righteous triumphalism and crushing any "evil" opposition -- on scapegoats and *schadenfreude*. The pattern is echoed worldwide in legislative assemblies, rendering mysterious any assumptions regarding the viability of governance necessary in the case of 16 goals ([Destabilizing Multipolar Society through Binary Decision-making](#), 2016).

Such previous considerations have focused on a possible 16-fold organization of which the 17th Goal is the coordinating function or perspective -- however that is itself to be understood. This suggests the possibility of representing the configuration of goals in diagrammatic or geometrical form in order to highlight their potential relationships and the patterns they form that are integral to the systemic coherence of the set. To this end SDG iconography has tended to focus on a variety of circular diagrams and tabular arrangements. Understood in that way, any exploration of how the 16 goals might be more fruitfully configured -- as in the following -- can then be recognized as a pursuit of the 17th Goal: [Partnership for the Goals](#).

The following argument is however based on the assumption that the current SDG iconography in 2D is inadequate to the challenge of articulating the recognized complexity -- given the questionable performance of global governance, or that at the national level. This justifies recourse to eliciting a memorable sense of coherence from representation in 3D -- if not 4D or more. As with the previous exercise, this follow-up explores use of a compound of 16 tetrahedra, one of a number of such [polyhedral compounds](#) composed of simpler polyhedra sharing a common centre (a central perspective usefully symbolized by the 17th Goal).

The exercise here takes the use of web technology further in order to explore even more fruitful ways of representing the dynamics of the partnership within a 16-fold articulation of goals -- and of interacting with such complexity, given its challenge to comprehensibility and memorability from a "17th perspective". As a work in progress, the animations are presented here as a means of eliciting imaginative ways of "thinking otherwise" about SDGs regarding any more coherent response of global governance.

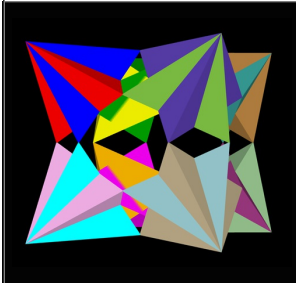
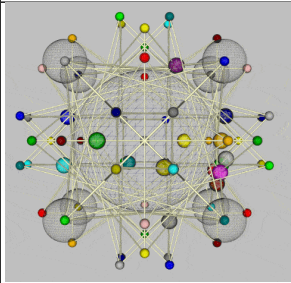
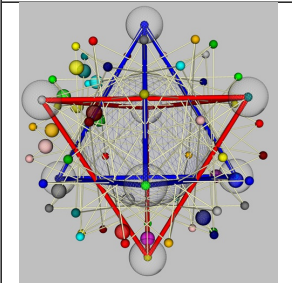
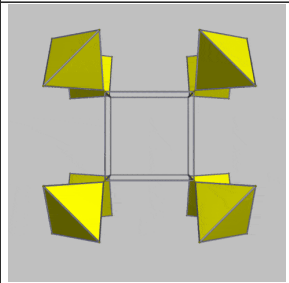
The focus on "goals" evokes the question as to whether the 16 SDGs need only be understood as a simple analogue to the goal in any ball-game -- or whether they call for more fundamental cognitive consideration, as may be implied by the subtle symbolic significance potentially associated with goal-scoring in such games. It is in this sense that achievement of a viable 17th Goal, and its comprehension, is explored here as a dynamic -- whether from the perspective of operations research, compact geometrical configuration, or as a journey whose coherence is appreciated in symbolic terms.

Eightfold prelude to a 16-fold configuration

This exercise takes as its point of departure the approach illustrated previously by the 16-fold repetition of a tetrahedron in a symmetrical arrangement using the "[polyhedral kaleidoscope](#)" facility of the [Antiprism Polyhedron Modelling Software](#) to form a 16-tetrahedral compound. This was adapted and presented separately as an interactive virtual reality model ([Experimental interactive animation of a 16-tetrahedra complex of UN SDGs in 3D](#), 2022). A screen shot of the 16-fold compound is presented below left. As the argument highlighted, the alternative representation emphasized the 8-fold pattern associated with a cubic configuration and the stella octangula, as illustrated by the central animations

The question this framed was whether this could be used as the basis for another approach by first producing an 8-fold model (below right) that might have been relevant to a representation of the 8 Millennium Development Goals which preceded the 16 Sustainable Development Goals. It could be argued that the 8 MDGs offer the implication of a 9th Goal as the earlier implicit variant of the explicit 17th Goal of the SDGs. Such a 9th MDG Goal being an implied challenge to comprehension of the coherence of the earlier "partnership for the goals -- the 8-fold set.

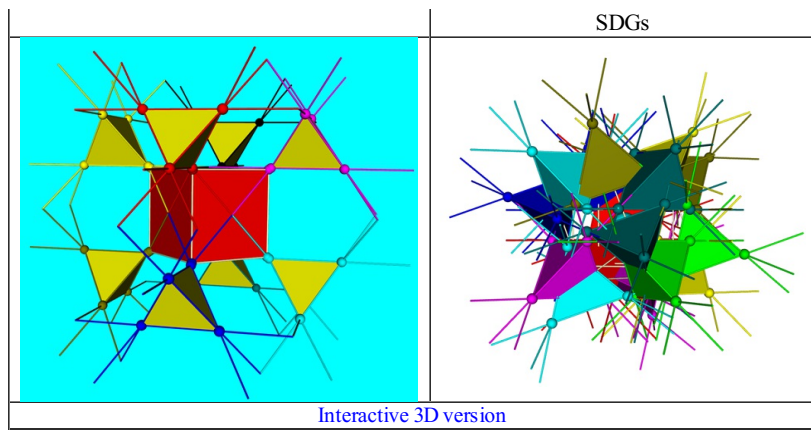
The configuration below right was produced with the Stella4D polyhedral modelling software. For illustrative purposes, abridged labels of the Millennium Development Goals have been added to one face of each of the 8 tetrahedra in the animation.

Clarifying the potential relationship between 8-fold and 16-fold configurations of goals			
Screen shot of interactive 3D model of 16 tetrahedra	View of movement of spheres along 16 tetrahedral pathways between 64 vertices	View of stella octangula configuration of 2 tetrahedra in a compound of 16	Animation of 8-fold cubic model (surfaces labelled indicatively with Millennium Development Goals)
			
Interactive 3D version	Interactive 3D version	Interactive 3D version	

The 8-fold Stella4D model was then exported into the VRML format -- then imported into the X3D format, via the X3D-Edit application, to enable its further modification. The format of the code did however require the same tedious pattern recognition process (as [described previously](#)) in order to cluster the code defining individual tetrahedra.

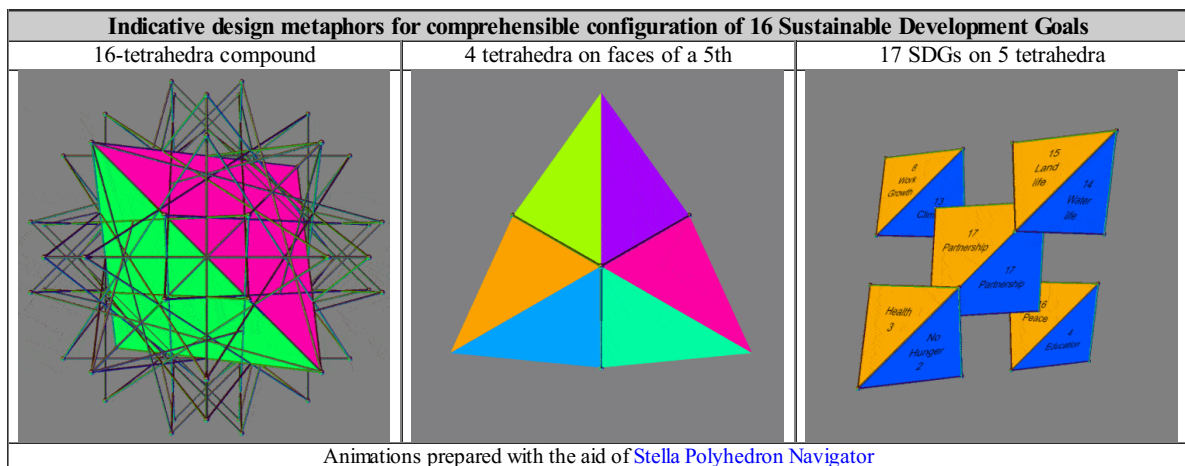
This 8-fold exercise gave rise to the following representation. In the left-hand images tThe edges are extended to encourage reflection on other patterns of systemic interaction -- including strategic conflict and overshoot. In the image on the right (and the interactive animation) the conflation is indicative of the confusion with which the set of 16 SDGs may be associated -- and which could merit particular consideration.

Experimental configuration of tetrahedral SDGs	
Expanded schema of 8 SDGs	Screen shot of conflating schema of 16

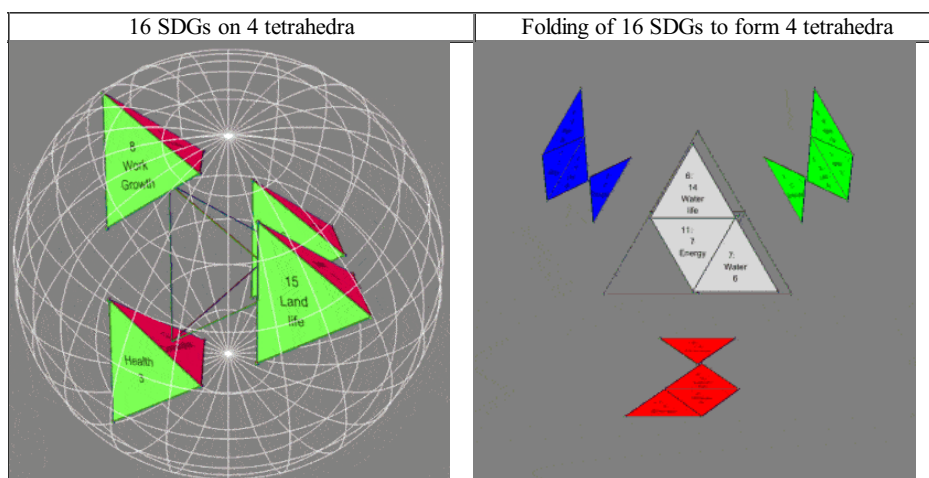


Towards a configuration of 16 SDGs in 3D

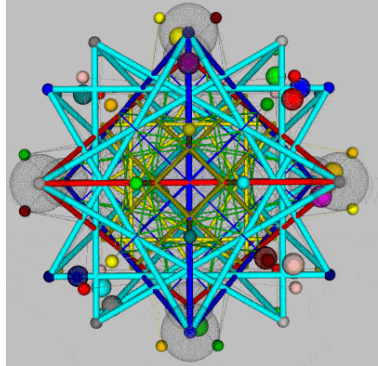
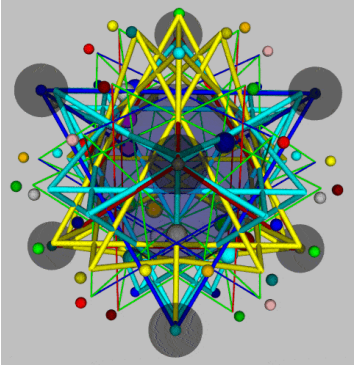
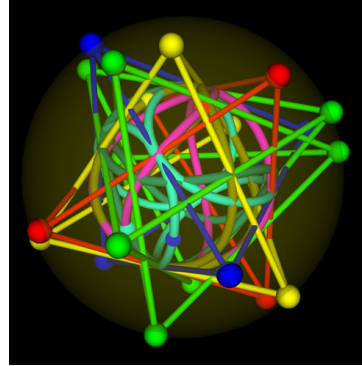
The 16-tetrahedron explored in the previous exercise is clearly a challenge to comprehension if individual tetrahedra are used to represent individual SDGs -- of which the animation on the left is a reminder, with only one tetrahedron shown. Another approach is to position of 4 tetrahedra on the faces of a fifth (invisible), as suggested by the second animation below. This offers 3 visible faces per tetrahedron with which 12 SDGs might be associated -- with a further 4 effectively hidden (potentially suggestive of neglected or denied strategic challenges). Yet another approach is to use a fifth tetrahedron as an indication of the 17th partnership goal linking 4 other tetrahedra on the faces of which the 16 SDGs could be indicated. The individual SDGs have been indicatively clustered into 4 "systemic complexes" of potential mnemonic value.



The elusive role of the 17th goal is suggested by the animation on the left below, with the faces of the central tetrahedron rendered transparent. Again there is some sense to 4 of the strategies being potentially less visible (on the inner side). The challenge to the transformation from the conventions and confusion of a 2D "flat" perspective -- to achieve a degree of coherence in 3D -- is suggested by the animation on the right below.



Mapping of the potential systemic relationships between SDGs in 3D was a feature of the earlier exercise (*Pathway challenge between multiple tetrahedra*, 2022). The central image is a first (**unsuccessful**) step in ensuring the vertices of 4 tetrahedra are distributed symmetrically in relation to a global circumsphere, as described separately (Eric Weisstein (*Tetrahedron 4-Compound*, *MathWorld* -- *A Wolfram Web Resource*)). Interactive manipulation of the model in 3D offers a variety of suggestive perspectives.

Screen shots of experimental animations of dynamics between within 16 SDGs		
Pathway dynamics of 16-tetrahedra complex (animation of screen shots)	Pathway dynamics of 16-tetrahedra complex (animation of screen shots)	16 SDGs as vertices of 4 interlocking tetrahedra (each with a sphere circulating within a tennis ball seam curve, discussed below)
		
Interactive 3D version (in which smooth movement is best viewed)	Interactive 3D version (in which smooth movement is best viewed)	Interactive 3D version

Comprehension of SDG systemic complexity through minimizing visual constraint

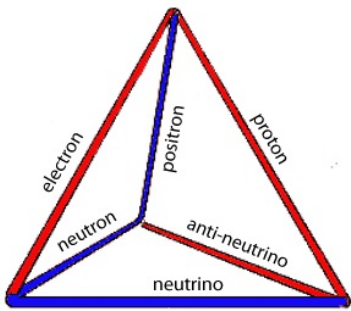
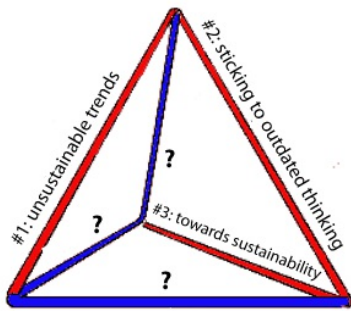
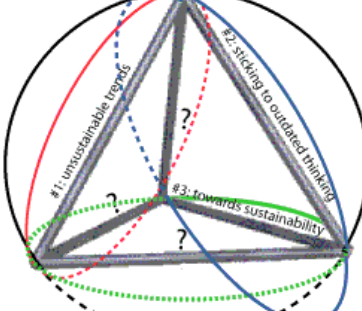
The explorations of Buckminster Fuller, which have given rise to the widely recognized geodesic domes, derive from the insight that: *All systems are polyhedra: All polyhedra are systems* (*Synergetics: explorations in the geometry of thinking*, 1975/1979, 400.56). For Fuller, the fundamental system can be represented by a tetrahedron as the simplest polyhedron (as noted and illustrated previously, and below left).

As discussed separately in the critique of a Club of Rome's report (*Come On! -- Capitalism, Short-termism, Population and the Destruction of the Planet*, 2018), conventional considerations of the meaning to be associated with geometrical configurations can now be fruitfully challenged by speculative reflection on quantum consciousness (*Towards a geometry of systemic thinking and its symbolism*, 2019). This has been notably articulated from an international relations perspective by Alexander Wendt (*Quantum Mind and Social Science: unifying physical and social ontology*, 2015; video; interview). The implications are discussed separately (*Quantum consciousness implications of fundamental symbol patterns*, 2017; *Paradoxes of communicating fundamental insight through metaphor*, 2017).

For Fuller:

The tetrahedron as a basic vectorial model is the fundamental structural system of the Universe. The open-ended triangular spiral as action, reaction, and resultant (proton, electron, and anti-neutrino; or neutron, positron, and neutrino) becomes half quantum. An association of positive and negative half-quantum units identifies the tetrahedron as one quantum. (*Tetrahedron as Vectorial Model of Quantum*)

Such thinking offered a provocative challenge to the 3-fold organization of the Club of Rome report -- especially given the absence of any systemic consideration of countervailing insight, too readily simply deplored as resisting appropriate social transformation -- even as "sin". From a psychosocial perspective, Fuller's depiction of "fundamental structure" might then be (very tentatively) labelled as follows -- inviting speculation on the analogues to the 6 quantum processes in relation to the 3 Club of Rome sections and their hypothetical "antitheses".

Tentative configuration of strategic significance in the light of the quantum speculation of Buckminster Fuller		
Fundamental tetrahedral configuration proposed by Buckminster Fuller	Adaptation of Fuller configuration (on left)	Further adaption of Fuller configuration (on left)
		
Redrawn from Buckminster Fuller, <i>Synergetics: explorations in the geometry of thinking</i> , 1975 (Fig. 620.06)	Reproduced from discussion in <i>Towards a geometry of systemic thinking and its symbolism</i> (2019)	

Of potential relevance to systemic coherence is therefore the presentation of a continuous curve within a tetrahedron, as indicated in the image (below centre), presented in animated form with a sphere moving along the toroidal pathway (below right). Improvements to the animation could have the pathway changing colour (as shown in the central image), or have the sphere change colour along particular portions of the pathway.

Indications of embedding of sports ball curve in tetrahedron		
Schematic of seam curve of baseball and tennis ball (with and without ball)	Variant of tennis-ball seam curve embedded in tetrahedron	Animation of tennis-ball curve in tetrahedron (extended edges and circulating ball)
Interactive variant in 3D	Reproduced from R. W. Gray (<i>Lymnclaire Dennis' Geometry: the pattern</i>)	Interactive 3D version

Intuitive recognition from ball design? Given the references above to ball-games, the curve in the central image is striking in the manner in which it recalls the seam curve of the tennis-ball and the baseball -- familiar worldwide. This curve is the focus of the mathematics of the [tennis-ball theorem](#), as discussed and illustrated separately ([Unrecognized reminder of globality from the focus of ball games](#), 2018; [Correspondence between the baseball curve and the baseball cap?](#) 2020).

The form of the curve in the central image above corresponds to a particular condition of a generalization of the tennis-ball seam curve which can be explored separately in 3D ([Interactive display of generalized baseball and tennis-ball seam curves in 3D](#)). As discussed below, less evident is how the variant above relates to the fundamental significance recently attached to the [Mereon Trefoil](#) as described by [Louis Kauffman](#) (*Pattern, Sign and Space: Mereon Thoughts*. 2003).

Goals as reconciliation of contrasting strategic directions? With the focus of this argument on comprehensible configurations of goals, the presentation above right is suggestive of ("linear") strategies -- pointing in 12 directions -- the edges of the polyhedron, potentially then to be understood as converging, intersecting or conflated at the four vertices. The vertex spheres could then be considered to represent 4 goals, even the reconciliation of what otherwise might be seen as incompatible "linear" strategies.

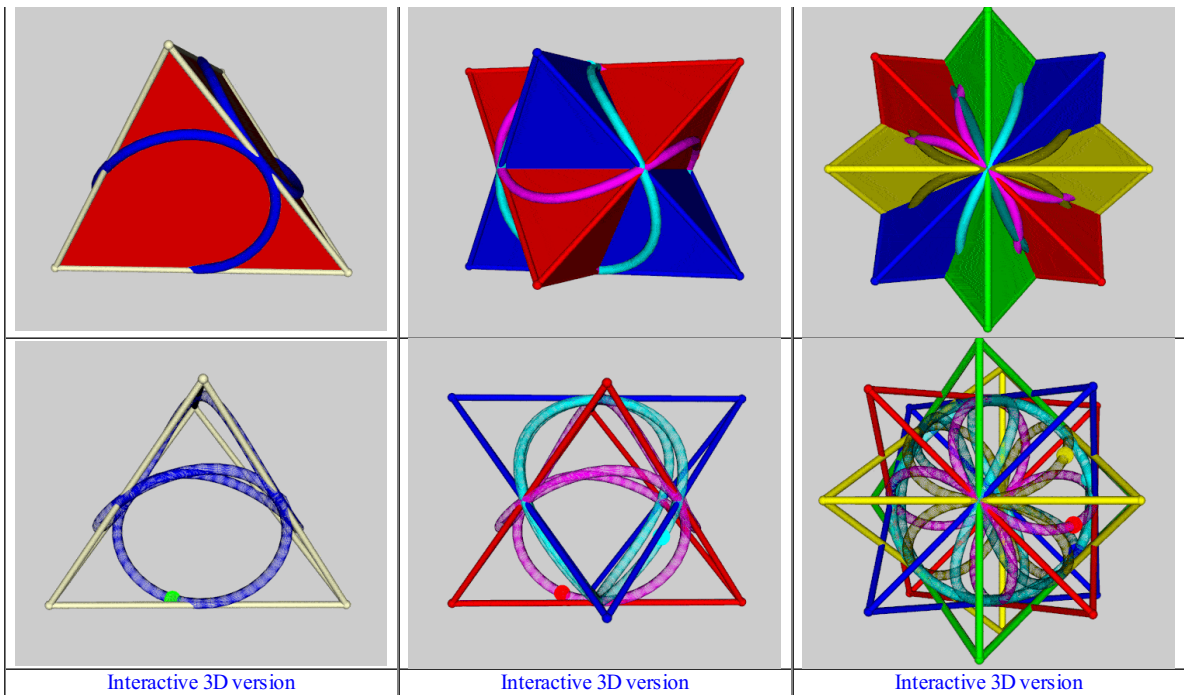
With 3 edges converging at a vertex in the tetrahedron, a goal could be understood in that context as achieving reconciliation between 3 directions. Together the 4 vertices of the tetrahedron could then be understood as indicative of reconciliation between 12 directions. The edges in that animation are extended beyond the vertices -- a suggestion of "goal overshoot". Other polyhedra, with edges converging from 4 directions or more, suggest higher degrees of reconciliation between contrasting directions.

Strategic coherence in practice? The curve could be understood as the strategic direction pursued in practice -- avoiding any final direction or goal by shifting to another priority ("shifting the goal posts"), as a consequence of learning from the process. The continuity of the curve exemplifies a degree of global coherence emerging in the light of feedback processes binding the set of directions together.

The representation may be taken further as shown below. The solid and wireframe animations on the left are alternative renderings of that above (right). A more complex version is presented in the centre using 2 tetrahedra. This offers 24 directions -- potentially intersecting at 8 vertex-goals -- rendered coherent by 2 curves binding the pattern together.

A further complexification can be presented in the animation on the right using 4 tetrahedra. This offers 48 directions -- potentially intersecting at 16 vertex-goals -- rendered coherent by 4 curves binding the pattern together.

Animations indicative of complexification of pattern of strategic directions using tetrahedra (solid faced and wireframe renderings)		
12 edge directions; 4 vertex goals	24 edge directions; 8 vertex goals	48 edge directions; 16 vertex goals



Inherent incommensurability of SDGs? The focus on oppositional logic recognizes 16 logical connectives. These have notably been organized by Robert Blanché into four logical quaterns (*Structures Intellectuelles: essai sur l'organisation systématique des concepts*, 1966). This followed from the work of Jean Piaget (*Essai sur les transformations des opérations logiques: les 256 opérations ternaires de la logique bivalente des propositions*, 1952).

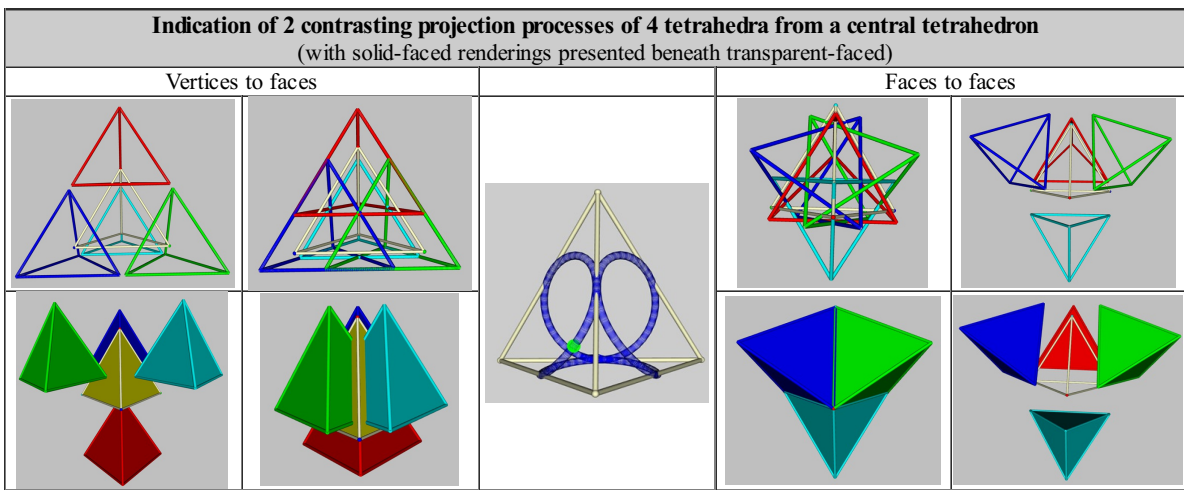
As noted by Alessio Moretti, such 4-fold organization remains incomplete in that: *while they organize the connectives into some well structured groups, these very groups remain isolated from each other without being into a whole structure* (*The Geometry of Logical Opposition*, 2009). This 4-fold organization of connectives, and its incompleteness, is the focus of detailed commentary by Fabien Schang (*Oppositions and Opposites*, 2012).

There is a case for comparing this focus with the possibility of any 4-fold clustering of SDGs and the manner in which these clusters might "remain isolated from each other" in the absence of appropriate integration into the "whole structure" implied by the 17th Goal. The arguments of Schang are especially relevant, notably in the light of his subsequent focus (*International Disagreements*, 2014; *Negation and Dichotomy*, 2009; *A Formal Semantics of International Relations: Depicting Negation in Diagrammatic Logic: legacy and prospects*, 2008).

Representation of 16 SDGs? On the assumption that a single tetrahedron can indeed "hold" 4 SDGs for systemic and mnemonic purposes (whether mapped to the vertices or the faces), one design metaphor is to allow 4 tetrahedra (then together "holding" 16 SDGs) to be variously projected from a central tetrahedron. The latter is then understood to represent the 17th SDG as the "partnership" between the 16.

Two contrasting projection processes then merit consideration as alternative ways of understanding how the 16 are "bound" to the 17th. These are most readily recognized through the distinctive screen shots of solid and transparent-faced renderings as shown left and right below. The central image is included for reference, with its inclusion of a potential dynamic between the strategic directions associated with each edge (as variously illustrated above).

The dynamics of the phases in each projection process are best understood through the interactive 3D version of each, especially since rotation of the models offers strikingly different perspectives on how the 16 SDGs might be seen as related to the 17th -- whether as a source of insight or as a means of understanding characteristic confusion.



Challenges to coherence? The tennis-ball curve embodied within the "central" tetrahedron invites distinct considerations:

- whether there is a case for recognizing that, as presented, versions of the curve could be oriented to each of the 6 edges of the tetrahedron -- suggesting distinctive dynamics between the 6 directions to which these point -- or to the 12, if each edge is understood to point in opposite directions (as suggested by their extension in the earlier image above)
- how versions of the tennis-ball curve might be replicated in each of the 4 tetrahedra projected from the central tetrahedron, suggesting dynamics within each cluster of 4 SDGs
- whether there is a case for recognizing that the central tennis-ball curve alone is expanded and contracted -- as an indication of how the "partnership bonding" between the 4 tetrahedra separating from it is retained to some degree or is "stretched" to breaking point.

Enriching comprehension of "goals" as the "external" focus of the 16 SDGs

As summarized by *Wikipedia*, a [goal](#) is an idea of the future or desired result that a person or a group of people envision, plan and commit to achieve. People endeavour to reach goals within a finite time by setting [deadlines](#). A goal is roughly similar to a purpose or aim, the anticipated result which guides reaction, or an end, which is an object, either a physical object or an abstract object, that has intrinsic value.

As noted above, understanding of "goal" and its achievement is readily simplified by analogy to its use in ball-games and competitive triumph. The "deadline" metaphor is unfortunate in emphasizing connotations at variance with the experience of a living process. The subtlety of a goal, and the implication of its achievement, might be more fruitfully explored as a [hyperobject](#), articulated by [Timothy Morton](#) as objects experienced as so massively distributed in time and space as to transcend spatiotemporal specificity (*Hyperobjects: Philosophy and Ecology after the End of the World*, 2013)

The manner in which the SDGs are presented and discussed avoids the question of how any "global goal" is to be understood in cognitive terms, as well as in systemic terms in relation to other goals. It is therefore useful to indicate comments in this respect through a set of quotes [*emphasis added*] from a study by Maurice Yolles and B. R. Frieden (*Autopoiesis and Its Efficacy: a metacybernetic view, Systems*, 9, 2021, 4). The study explores the nature of [autopoiesis](#) and its efficacy within the context of living systems by adopting three independent, demonstrably commensurable schemas. Through centripetal arguments, it is explained how these are related through autopoiesis. The capacity to deliver goals is understood to be determined by efficacy, and this is a function of how well the processes that compose that autopoietic network operate together.

- By mutually configuring GCI [General Collective Intelligence], [Eigenform](#), and EPI [Extreme Physical Information] together, an improved understanding will result of the nature of autopoiesis.... In the case of GCI, its interest lies in sets of autonomous collective processes in a living system that aims at common **operative goal outputs** that... constitute autopoietic processes, and which, when stably converging, provides an indication of the "evolutionary fitness"... which constitutes autopoietic efficacy
- ...qualitative learning parameters,... expressed in a value system involving three categories within which there are dichotomous paired values [including]...
 - *nurture versus challenge*, where, by equality/authority, it is sought to determine which is the more important **set of goals**, cooperation and security or recognition and advancement, which achieves better outcomes, and which are supportive or challenging acts.
 - *linear versus cyclic time*, where determination is sought about whether people see time as a path and whether **goals are necessary destinations**, or if time is seen as a pattern of interlocking cycles into which they step in and out over the course of a life.
- Hence, policy as a linguistic construct must have within it statistically measurable parameters, some of which may be hidden... They might then be associated with such attributes as **goals**, beliefs, and coordinated actions, where, for instance, **goals** might have parameters relating to who, what, where, and when.
- Such a development would enable robots to understand their environment and be cognizant about what they do and about the purpose of their actions, making timely initiatives beyond **goals set by others**, and to learn from their own experiences, knowing what they have learned and how
- ...**goals** that emanate from the ideate are regulatory phenomena that create autopoietic trajectorial imperatives that exclude agents from seeking alternative imperatives. Thus, a particular goal... is extracted from the ideate... that agency is tasked to manifest materially in a way that complements other related tasks belonging to other subagencies.
- GCI also arises from groups having commitment to cognitive alignment across **group goals**, accurate shared beliefs, and coordinated actions. GCI adopts the term generic mechanisms, these acting upon living structures that are capable of giving rise to morphogenetic rearrangements.
- Generic mechanisms are required within agency to enable cognitive alignment across **goals**, beliefs, and coordinated actions, and, as already indicated, are active through causal-agents.
- The way in which the interactions are solved is by analysing the abstract phenomenon of GCI as if it is a computational property of varied subagencies across an agency landscape. This involves the exploration of cognitive parameters such as beliefs, **goals**, and actions under strict alignment conditions.
- However, in the end, factors such as hidden parameters and dynamics (especially with respect to personality pathologies, idiosyncrasies, and cognitive biases) may occur. Instances might be declared subagency beliefs, **goals**, and actions having unexpressed caveats that perturb parameter representation and corrupt problem definition.
- The strategic-regulative metasystem delivers **goals**, deriving from a selected cognitive purpose, which is manifested in the

operative system through the causal-agent of autopoiesis as operative structure, from which behaviour arises.

- Efficacy, a capability to create a beneficial effect in real-world settings (such as effectively manifesting **goals** that are sustainable), is sought for the whole assembly

Contrasting engagement with "goals" by the Inner Development Goals initiative

Curiously little is said of the psychology of sustainability as it might relate to implementation of SDGs and any failure of uptake and commitment in that respect, as separately argued (*Psychology of Sustainability: embodying cyclic environmental processes*, 2002; Annamaria Di Fabio, *The Psychology of Sustainability and Sustainable Development for Well-Being in Organizations*, *Frontiers in Psychology*, September 2017). The complementarity of psychological and spiritual dimensions is a feature of the [Human Development Project](#) dataset -- profiling some 990 insights variously considered to be of potential relevance to the problems and strategies profiled in the complementary datasets of the online *Encyclopedia of World Problems and Human Potential*.

The external-internal complementarity has been presented as a visual adaptation of the set of [15 global strategic challenges](#) identified by the [Millennium Project](#) (*Embodying Strategic Self-reference in a World Futures Conference: transcending the wicked problem engendered by projecting negativity elsewhere*, 2015).

IDG initiative: In radical contrast to the "external" preoccupations SDG approach, of considerable potential interest is therefore the Inner Development Goals initiative (Thomas Jordan, *Inner Development Goals: background, method and the IDG framework*, 2021). As noted in the latter:

The IDG framework of skills and qualities relate to what is needed in order to successfully work with complex societal issues, in particular those identified in UN's Agenda 2030 and the 17 Sustainable Development Goals... The idea for IDG:s was born (first called Inner Global Goals) and was first publicly presented at the MindShift Digital Conference at Stockholm School of Economics during May 2020. The initiators thought that the scholarly field of adult development research has accumulated a lot of relevant knowledge that is sorely needed for us to become more successful in working towards a more sustainable world... We aimed at collecting views from categories of people we had reason to believe would have more insight into the challenges of working towards the SDGs than the general population.

The purpose of the IDG initiative is understood as:

... to draw attention to the need to support development of abilities, skills and other inner qualities for people and organizations involved in efforts to contribute to a more sustainable global society. By having a framework that is easy to grasp and that describes those skills and qualities, we hope to mobilize a broader engagement and effort among organizations, companies and institutions to significantly increase the investments in efforts to develop crucial skills and qualities.

The report notes that:

During the course of the IDG project we have found and received suggestions from others of a number of more or less similar initiatives to formulate frameworks describing important skills and qualities. These frameworks have evolved in different contexts, for different purposes, with different theoretical bases, and with different methodologies. Some of them...also explore the skills needed in order to manage sustainability issues more effectively. We have not been in a position to make a systematical review and comparison of these frameworks, but it is obvious that to a considerable extent they identify the same or very similar skills and qualities.

The IDG focus is partially sustained by monthly gatherings and resulted in the organization in 2022 of an Inner Development Goals Summit ([News and Resources](#)). An [IDG Alliance](#) was launched globally in March 2022. The initiative has been recommended as an important framework to achieve SDGs in the European Parliament resolution of 23 June 2022 on the implementation and delivery of SDGs.

The Inner Development Goals is a not-for-profit and open-source initiative founded by the 29k Foundation, [Ekskåret Foundation](#), and The New Division. The initiative's IP and economy is placed within and managed by Inner Development Goals AB (svb), a company with dividend limitation that is 100% owned by Ekskåret Foundation. As the IDG initiative grows the ownership is planned to be transferred from Ekskåret Foundation to a foundation of its own or an international NGO.

Convergent emergence of IDGs? Conceptually the current IDGs framework is organized in terms of 5 dimensions and 23 skills and qualities. Arguably these imply an understanding of "goals", although there appears to be no commentary on their nature as "goals" from the perspective of inner development and its integrative challenges.

From this perspective, a "goal" as such is not a key concept in the that framework -- other than as it relates to the "external" sustainability goals of the SDGs. Reference to goals in the IDG context is meant to convey that there are "external" goals. but their successful achievement requires development of cognitive and behavioural capacities. The 23 IDGs are not formulated as goals to be attained, but as dimensions to work with -- however "dimensions" are to be understood. The methodology is framed as pragmatic rather than precise. As such it appears to draw primarily upon the insights of the behavioural sciences rather than upon those of the psychological disciplines concerned with the coherent integration of skills in cognitive development.

As with the set of SDGs, no effort is made to indicate the systemic relations between the skills and qualities. This is problematic in that it

is presumably the set as a whole, as a systemic toolkit, which offers the coherence required in response to the SDGs -- and the 17th SDG Goal of partnership. As with any toolkit, there is a need to be able to shift appropriately from any one focus to another along pathways which merit recognition.

Especially valuable in the report, however, is commentary on the manner in which this pattern of 5 and 23 was derived -- in contrast to the lack of information on how the pattern of 17 SDGs was derived.

With respect to the survey process through which the IDG categories were identified, involving some 1,000-plus participants, the report notes that

Two scholars, Thomas Jordan and Maria Booth, independently coded the responses to the main open question. Many responses from different respondents used identical or very similar wording, but we also created some codes for responses that used different words for skills or qualities we found could be subsumed under the same coding. Thomas Jordan's coding initially yielded 36 codes, while Maria Booth's resulted in 22 codes, some of which had subcategories. We compared our codes and concluded that our codes were very similar, with few differences. However, over 30 categories are too many from a purely pedagogical point of view, so we went through a process, involving the steering group, to merge codes with closely related content...

There were some items in the survey responses that we decided to exclude for various reasons, even though they were listed by several respondents... In its present form, the IDG framework is probably biased by the fact that the majority of the respondents were from Western societies and many belonged to groups already interested in the science and practice of leadership development or global sustainability issues. We are keenly aware of this and hope to redress this bias in future work.

After consolidating some items, we had a draft version with 22 skills and qualities. The items were grouped into 4 main categories: *Cognitive skills; Values, attitudes and identifications; Relationship to self; and Social skills...*

Our initial idea was to use the results of the second survey to select 7-10 key skills/qualities and design a framework based on these. However, the question of whether to keep the 22 skills/qualities or making a selection among them was discussed in several fora, and it was eventually decided to retain all the 22 and even add a 23rd item, sense-making...

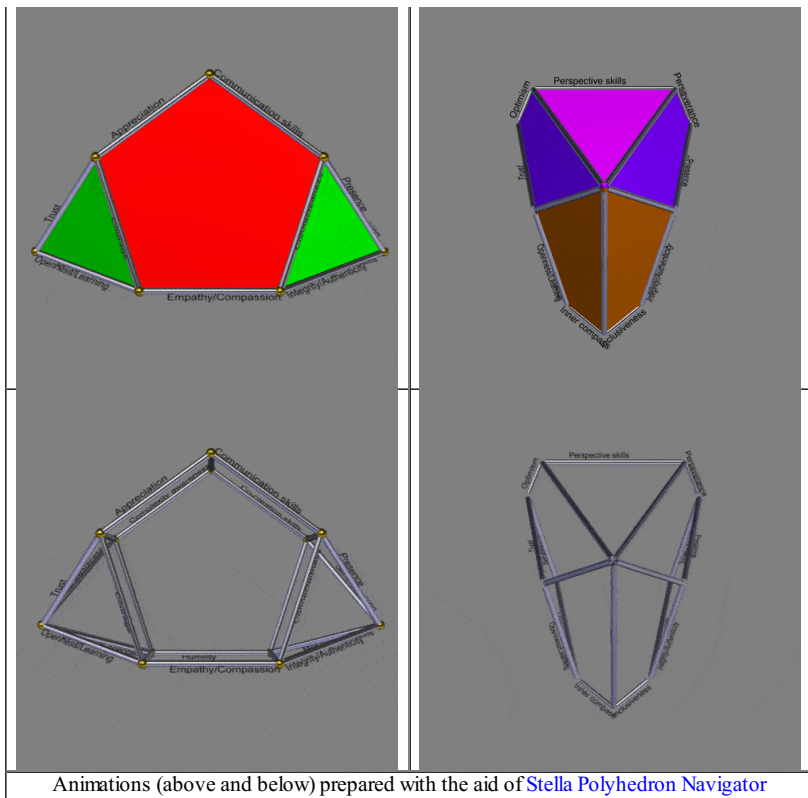
There was a certain cognitive tension involved in how to group the items and how to name the main categories, between on the one hand the wish for logical stringency in how the skills and qualities are grouped and terminological accuracy (a scholarly perspective), on the other hand the wish for having a structure and vocabulary that makes sense to practitioners (a mass communication perspective). There is no "correct" way to group the skills and qualities, as they are interdependent and overlapping in significant ways. Still, in order to have a framework that is as easy as possible to grasp and work with, a framework with a limited number of main categories was deemed useful.

Pattern of Inner Development Goals? Whereas the IDG iconography currently favours the depiction of the 23 skills as a circle (in "mandala form") -- in contrast to the primary tendency to present the SDGs in tabular form -- there is nevertheless a case for exploring the relevance of a 3D presentation as applied above to SDGs. Especially intriguing in this respect is the collective convergence on a 5-fold pattern and a 23-fold articulation. Also of interest is the rejection of a 30-fold articulation typical of the *Universal Declaration of Human Rights* -- presumably to be understood as an early form of compromise between "external" and "internal" development goals inviting its own representation in 3D (*Dynamic Exploration of Value Configurations: polyhedral animation of conventional value frameworks*, 2008).

With respect to collective conceptual convergence on the 5-fold set of primary goal categories, of potential relevance is the conclusion of the study by [Jeremy Lent](#) (*The Patterning Instinct: a cultural history of man's search for meaning*, 2017), critically reviewed separately as a 5-fold pattern (*Patterning Intuition with the Fifth Discipline*, 2019). This illustrates a 5-fold pattern in various ways.

An obvious point of departure in the 3D visualization of the 23-fold pattern of cognitive skills is the quest for a polyhedron offering their coherent representation. With the possibility of associating the skills with edges, the [Biaugmented pentagonal prism](#) and its dual) are seemingly unique in this respect, as presented below. The skills are arbitrarily associated with their edges. It might then be assumed that as directions, the disparate groups of 3 skills are "reconciled" in the 12 vertices of the model on the left, or in the 13 vertices on the right -- potentially to be understood as the "goals" of skill development.

Association of 23 IDG skills with edges of Biaugmented pentagonal prism (and its dual)	
23 edges (12 types); 13 faces (7 types); 12 vertices (6 types)	23 edges (12 types); 13 vertices (7 types); 12 faces (6 types)



Animations (above and below) prepared with the aid of [Stella Polyhedron Navigator](#)

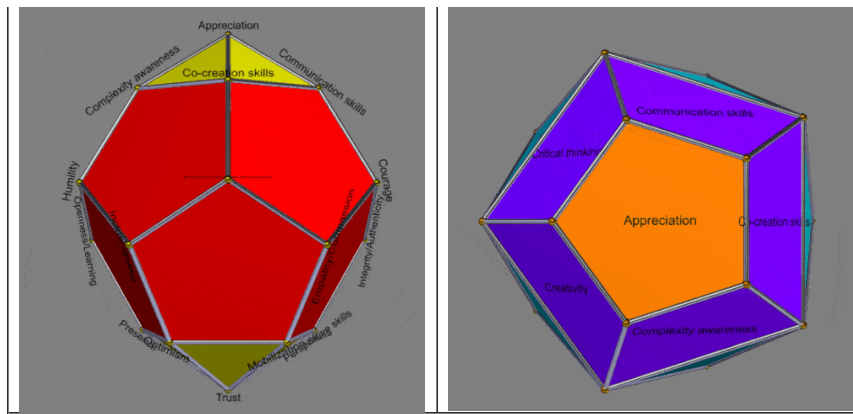
Of similar, if not greater interest is the possibility of associating the set of 23 skills with the vertices of a polyhedron -- with the [Triaugmented dodecahedron](#) seemingly unique in offering this possibility. Of notably interest are then the pentagonal configurations of skills by which it is characterized -- as these might relate to the primary 5-fold configuration of IDGs.

Association of 23 IDG skills with vertices of Triaugmented dodecahedron (and with faces of its dual)		
23 vertices (9 types); 45 edges (15 types); 24 faces (8 types)		Dual: 23 faces (9 types); 45 edges (15 types); 24 vertices (8 types)

As with the unusual pattern of 17 SDGs, and the coordinating function of their 17th Goal, the unusual pattern of 23 IDGs invites recognition of an especially integrative "23rd Goal". As noted above from the manner in which "sense-making" was added to an initial set of 22 IDG "goals", this could be understood as performing an analogous systemic function to "partnership for the goals". This would be consistent with the perspective of [Global Sensemaking](#), a network offering tools for dialogue and deliberation on wicked problems.

Of interest then are analogues to the exploration of possible polyhedral organization of 16 SDGs, namely that for 22 IDGs. With respect to association of the 22 with vertices, there are seemingly 5 possibilities of which the [Parabiaugmented dodecahedron](#) corresponds most closely to the Triaugmented dodecahedron above. A second listing offered 13 possibilities of which the most [Z4 Stewart toroid](#) might be considered the most mnemonically interesting.

Association of 22 IDG skills with vertices of Parabiaugmented dodecahedron and Stewart Z4 (and with faces of their duals)	
Parabiaugmented dodecahedron	Dual
22 vertices (3 types); 40 edges (5 types); 20 faces (2 types)	22 faces (3 types); 40 edges (5 types); 20 vertices (2 types)



Stewart Z4 toroid	Dual
22 vertices (11 types); 34 edges (17 types); 14 faces (8 types)	22 faces (11 types); 34 edges (17 types); 14 vertices (8 types)

The other four candidates are the [Metabiaugmented dodecahedron](#), the [Great dodecahemicosahedron](#) (or smaller variant), and the [Decagonal deltahedron](#). Seemingly the only 22-edged polyhedra of interest might be the [Sphenocorona](#) (22 edges of 12 types; 14 faces of 7 types; 10 vertices of 5 types).

It could be considered especially curious that the coherence of a seemingly unusual 22-fold pattern is most commonly recognized through the dynamic of very common ball games, namely association football, field hockey or cricket -- 2 teams of 11 players in each case. This suggests an exploration of the comprehensible coherence of a 30-fold strategic articulation, such as the *UN Declaration of Human Rights*, through 2 opposing factions -- as with 2 teams of 15 players in the case of rugby union. Such an inquiry could consider the insights for a configuration of 16 SDGs to be derived from the opposing 8-player team of [korfball](#) -- with its particular merit in having 4 men and 4 women in each team.

There is then a further question as to why the dynamic of a 22-fold articulation is preferred to that of a 30-fold articulation, as with obvious cultural preferences for association football or rugby union. Also curious is that opposing teams purportedly subscribe together to an elusively transcendent "spirit of the game" -- whilst seeking triumphantly to score "[goals](#)" against each other.

Goals as the comprehensible confluence of embodied values?

Illusory objective of goals and targets? Despite the visualization exercises above, the sense of how a "goal" might be understood in an SDG or an IDG context seems to remain ambiguous or elusive. The term itself is readily confused with a "target" and its achievement. The SDG process has identified 169 targets (*169 Targets for a Better World, The Global Goals*, 18 January 2018; *Measuring Distance to the SDG Targets*, OECD, March 2020).

Both goal and target are readily represented in visual form, most notably with respect to ball sports, archery and the like. There is little effort to address the unfortunate confusion with military usage, as discussed separately (*Enhancing Sustainable Development Strategies through Avoidance of Military Metaphors*, 1998; *Health and sustainability misleadingly framed as target acquisition*, 2012).

Given the significance of the SDGs, as upheld with respect to the salvation of the planet and humanity, missing from both SDG and IDG frameworks is any sense of how they might be expected to function as comprehensible attractors for the peoples of the world (*Reframing a fundamental attractor as a target*, 2014). How are the SDGs and the IDGs expected to evoke "universal" engagement in an increasingly polarized global civilization? With respect to qualities and skills identified by the IDGs, there is some irony to the fact that many have been identified in the advocacy of major religions over the centuries -- whether through using the same terms or synonyms.

Cognitive focus and fusion -- in the face of confusion? It is in response to such questions that the engagement with circular configurations of targets, dartboards, mandalas, codons and hexagrams merits consideration as embodying various forms of cognitive focus, as separately discussed (*Framing Dynamic Transcendence of Simplistic Cognitive Polarization*, 2021). Necessarily insightful is the engagement with mandala-like forms, especially as cultivated in Eastern cultures, but evident in the symbolic value associated with the rose windows of places of worship (cathedrals and the like). The degree of integrative focus seemingly called for can be described in terms of "cognitive fusion", as discussed separately (*Enactivating a Cognitive Fusion Reactor: Imaginal Transformation of Energy*

Resourcing (ITER-8), 2006).

Neither the SDGs nor the IDGs would appear to be concerned with the "psychic engagement" with such forms -- beyond the conventions of misleading superficial engagement with a target (*Objectively understood configurations indicative of fundamental cognitive implication*, 2021). Ironically the interplay of objectivity and subjectivity has notably been articulated with respect to the philosophical insights of the martial arts (*Eugen Herrigel, Zen in the Art of Archery*, 1948).

The interplay is even more evident in the engagement with a mandala-like configuration, in some cases as a highly disciplined lifelong quest as framed by Carl Jung (Peter Patrick Barreda, *Archetype of Wholeness: Jung and the Mandala, Spiritual Perspectives*, 16 May 2015). This contrasts with confrontation with the conventional tabular iconography of SDGs seemingly divorced from any consideration of the coherence, comprehension and memorability vital to evoking widespread engagement. Such tabular arrays reinforce the increasingly problematic conventional forms of cityscapes, tabular arrangements of concepts, and spreadsheets -- thereby provocatively evoking the possibility and potential of unexplored alternatives (*Spherical Accounting: using geometry to embody developmental integrity*, 2004).

It would seem that there has been some shift in the SDG iconography from a tabular to a circular configuration of the 17 goals -- a pattern primarily adopted by supporting institutions rather than the UN itself. The IDG initiative uses that circular configuration as coloured tabs. The pattern is of course reminiscent of depictions of circular legislative assemblies or the factions represented therein. Recognized as a mandala, it frames the question as the perspective from which that degree of coherence is perceived -- and by whom.

Goals and targets in relation to values? Both the SDGs and the IDGs seemingly avoid specific reference to the "values" so frequently cited in political discourse. Arguably however, the categories in each case can be seen as implying values -- potentially to a very high degree. As named, the skills and qualities of the IDGs could well be understood as values or their embodiment. The difficulty, as with "goals", is that the nature of such "values" is itself elusive, as extensively discussed separately (*Values, Virtues and Sins of a Viable Democratic Civilization*, 2022).

How then to distinguish fruitfully between values, goals and targets and the dilemmas they variously pose? How to avoid the premature closure associated with the ability to name and describe them -- in contrast with the openness with which evolving understanding is associated in a quest for comprehension and coherence? (*Openness and Closure in Pattern Language: geometry versus resonance*, 2012; *Challenge of closure*, 2004; *Dynamics of tank comprehension and enclosure*, 2019). Do the SDGs need to be "de-targeted" to evoke the engagement associated with mandalas?

N-fold lemmas of dimensional confluence? With the goals specified as edges in any of the configurations above, there is the implication that as "directions" or "dimensions" it is their confluence at vertices which frames a goal more clearly. Given the challenge of naming goals, as noted above, another approach would be to understand the IDG 22 skills as values to be embodied cognitively rather than as goals.

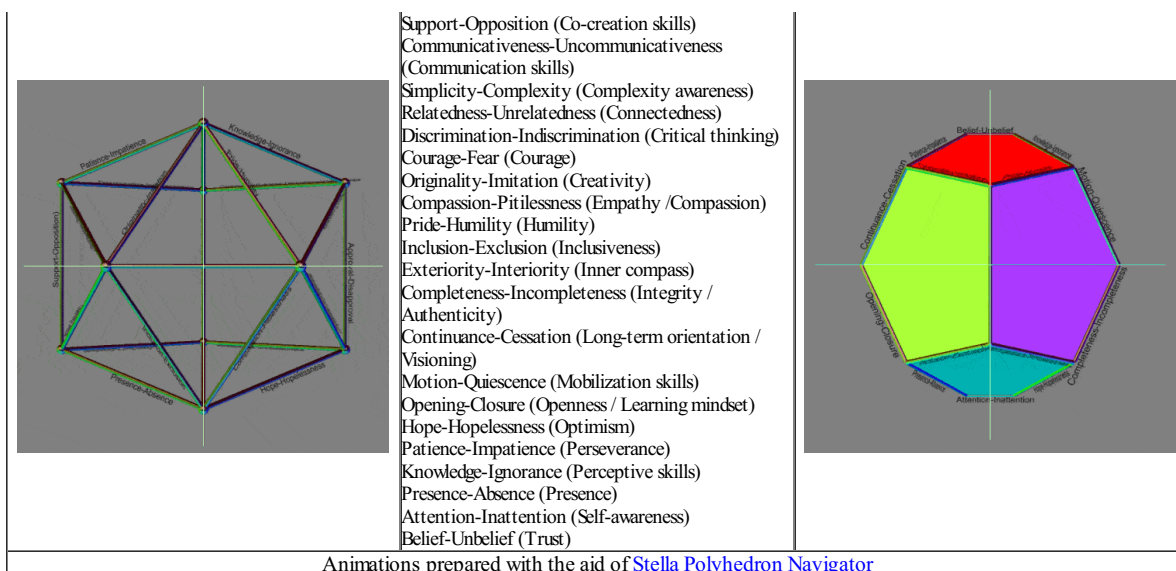
A goal would then be understood as the confluence of disparate values with the challenge of their reconciliation, especially as the potentially paradoxical resolution of a **tri lemma** or **quadrille** (*Geometry, Topology and Dynamics of Identity: cognitive implication in fundamental strategic questions and dilemmas*, 2009). Johan Galtung variously argues for eliciting a fourfold pattern from the typical dilemma associated with any conflict of goals (*Toward a Conflictology: the quest for transdisciplinarity, Handbook of Conflict Analysis and Resolution*, 2008). An extensive discussion of **Tetralemma (Quadrilemma)** is offered by the *Tibetan Buddhist Encyclopedia*.

This approach would relate the naming difficulty to the ambiguities associated with overdefinition of values and their synonyms, as addressed by the **Human Values** dataset as part of the *Encyclopedia of World Problems and Human Potential* (mentioned above). There the naming issue was resolved by grouping hundreds of value-charged terms within a set of **value polarities**. The edges in any polyhedral configuration could then be understood as pointing in opposing directions to **constructive values** and to **destructive values** -- clustered as value polarities. This allows for recognition of the possibility of a problematic counterpart to the IDGs as so constructively envisaged -- problematic "own goals", as provocatively named in the case of SDGs (*Polyhedral representation of Sustainable Development Goals -- including "Own Goals"?* 2022).

It is prudent to assume that comprehension of coherence -- and its embodiment -- is not as easy as it is too readily assumed to be (*Comprehension of Appropriateness*, 1986). The representation of cognitive qualities deemed to be requisite on any polyhedron could then be usefully understood as the configuration of dilemmas -- the edges with their implied polarity. Their confluence at vertices then merits recognition as the paradoxical challenge of trilemmas or tetralemmas. Given the integrative role for which the dodecahedron and icosahedron have variously been held to be significant, it is then appropriate to recognize the particular challenges of resolving dilemmas associated with their 5-foldness -- the challenge of a **pentalemma** (or **quintilemma**). From such a perspective, the occasional references to the relevance of a **hexalemma**, a **heptalemma**, and an **octalemma** raise further questions (*Vital distinctions beyond dilemmas*, 2015).

As an exercise, the set of 22 IDG quality/skills can be tentatively reframed as value polarities in order to include their questionable denial in practice. Arguably this then integrates their "shadow" dimension -- the challenge they pose as dilemmas. These can then be associated with the 22-edged **Sphenocorona** mentioned above (and its dual) as shown below. The Sphenocorona then suggests that their coherence is only achieved through addressing 6 tetralemmas and 4 pentalemmas (at the 10 vertices). In the case of the dual, there are 12 trilemmas and 2 tetralemmas (at the 14 vertices) -- a challenge for the 23rd IDG skill of sense-making.

Experimental association of 22 IDG qualities/skills as resonant values on 22-edged Sphenocorona		
Sphenocorona	Values in constructive-destructive resonance	Dual of Sphenocorona
22 edges (12 types); 14 faces (7 types); 10 vertices (5 types)	(value polarities with IDG term)	22 edges (12 types); 14 vertices (7 types); 10 faces (5 types)
	Approval-Disapproval (Appreciation)	



Of further potential interest in using the Sphenocorona (or the dual) as a mnemonic aid is the possibility of mapping better known configurations of cognitive modalities onto its features. Provocatively it might be asked whether their 10-fold features invite association of the Biblical 10 Commandments with them. This could evoke the question of whether these constitute an articulation of the reconciliation of the more complex lemmas. The 12-fold features could be similarly in the light of the widespread preference for that articulation. More intriguing is an association with the 14-fold features, as discussed separately (*Pattern of 14-foldness as an Implicit Organizing Principle for Governance? Web resources*, 2021; *Beyond the 14-fold patterns of sonnets through rhyme and rhythm*, 2021).

Comprehension of requisite symbolic coherence of viable development goals

Secular symbolism: Formal academic studies typically deprecate the value of symbolism and the coherence it is claimed to offer -- despite frequent recourse to "symbols" and their value in distinguishing academic achievement. Governmental authorities echo this secular bias -- except when faced with the challenge of communication to the wider population through flags and otherwise (*Symbolic Insignia Indicative of Global Health*, 2021). The questionable role of the *Anthem of Europe* in this period offers an interesting exception (*Reversing the Anthem of Europe to Signal Distress*, 2016).

The United Nations could be held to be relatively -- if not systematically -- uncreative in exploring the integrative symbolism capable of enabling credible sustainable development. The business community is particularly attentive to symbolic representation through development of distinctive logos -- most notably in the case of multinational corporations. A compilation of international logos framing global strategic preoccupations has been provided by the Union of International Associations (*World Guide to Logotypes, Emblems and Trademarks of International Organizations*, 1997).

Religious symbolism: A contrast is evident in the case of religions for which symbolism is upheld to be of importance -- if not of extreme importance with respect to the salvation of individuals and humanity. Somewhat ironically the various symbols are notably used in defensive encounters of one religion with another, with no effort whatsoever to reconcile the disparate perspectives with which they are respectively associated. The point is emphasized in experimental speculation in this regard (*Reconciling Symbols of Islam, Judaism and Christianity*, 2017; *Middle East Peace Potential through Dynamics in Spherical Geometry*, 2012; *Jerusalem as a Symbolic Singularity*, 2017).

In symbolizing, through their fundamental disparity, the fragmentation which characterizes global civilization, religions have much to answer for -- or do they? (Stephen Prothero, *God Is Not One: the eight rival religions that run the world -- and why their differences matter*, 2010). Despite multiplication of interfaith initiatives, their inadequacies are evident in the valuable insights of the Secretary General of Religions for Peace (Azza Karam, *COP27: Religious Multilateralism: an endangered species in the age of triple planetary crises*, Inter Press Service, November 2022). The point can be more provocatively made with respect to the Abrahamic religions (*Root Irresponsibility for Major World Problems*, 2007).

Curiously missing from the posture of religions in interfaith discourse is the immense importance they traditionally associate with configurations framed by specific numbers -- and the opportunities these offer for a degree of reconciliation through patterns of numbers and sacred geometry. The opportunities are faintly recognized in terms of **mathematical theology**, as described separately (*Mathematical Theology: future science of confidence in belief*, 2011). This perspective does not appear to evoke reflection of religions on the 16- or 17-fold patterns of the SDGs -- upheld as so fundamental to viable governance of global civilization. Is there any expectation that this would be otherwise in the case of the 22-fold or 23-fold patterns of the IDGs? This is despite the extensive *Wikipedia* summaries regarding the symbolic significance of the numbers: 16, 17, 22, and 23 -- if only for some religions.

Quest for strategic coherence through N-foldness? As exemplified by the case of the IDGs, it would appear that collective articulation of strategic frameworks is accompanied by a cognitive struggle for coherence which is resolved through convergence on particular number-governed patterns, as noted separately (*Checklist of 12-fold Principles, Plans, Symbols and Concepts: web resources*, 2011; *Checklist of web resources on 20 strategies, rules, methods and insights*, 2018). The SDG and IDG patterns are unusual in this respect -- perhaps due to accumulating recognition of the inadequacies of those more commonly favoured.

In the absence of explanations as to why there is convergence on particular N-fold patterns -- deemed satisfactory in their coherence --

there is a case for recognizing them as the process whereby **holons** are constructed. For **Arthur Koestler**, as formulator of the concept, a holon is something that has integrity and identity while simultaneously being a part of a larger system; it is a subsystem of a greater system (*The Ghost in the Machine*, 1967). The reference to "part" is of some relevance to the consideration of "partnership for the goals" as the 17th SDG. Given Fuller's understanding of polyhedra (cited above), the construction of a strategic array is effectively the construction of a holon, which as a polyhedron is necessarily part of a larger array of polyhedra.

Exemplifying strategic articulation of the highest order, it is appropriate to note the unexplained preferences for particular patterns in recent reports sponsored by the Club of Rome (**Ernst von Weizsaecker** and **Anders Wijkman**, *Come On! Capitalism, Short-termism, Population and the Destruction of the Planet*, Springer, 2018; Sandrine Dixson-Declève, et al, *Earth for All: a survival guide to humanity*, 2022). The former appears to favour a 40-fold articulation (in clusters of 10, 12 and 18), as variously mapped and discussed separately (*Exhortation to We the Peoples from the Club of Rome*, 2019).

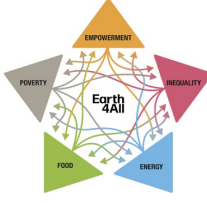

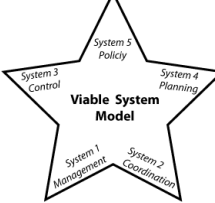
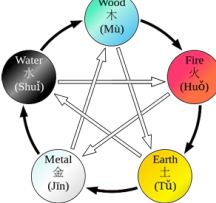
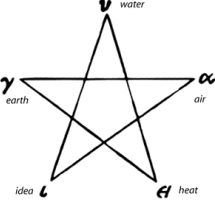
The **Earth4All** initiative embodies an unexplained preference for the use of four in the variant of its name, although it specifically builds on previous studies of the **9 planetary boundaries** distinguished by the **Stockholm Resilience Centre**. The latter framing could be understood to derive from the extensive significance of **nine in Norse mythology**, most notably the nine worlds that are supported by **Yggdrasil** as the "World Tree" (Joshua J. Markby, *Nine Realms of Norse Cosmology*, *Ancient History Encyclopedia*, 20 December 2018). The implications are discussed and visualized separately (*Aesthetic reconciliation of contrasting toroidal metaphors?* 2019; *Recognizing the Psychosocial Boundaries of Remedial Action: constraints on ensuring a safe operating space for humanity*, 2009)

Other than as a useful play on words for branding purposes, and its conception by four primary authors, the "four" of Earth4All seems to derive from recognition that it is the "fourth scenario" of the recent global modelling on which it is based -- and the only pathway to a viable future now deemed desirable (Jayati Ghosh, *Achieving Earth for All*, *Earth4All*, 22 July 2022)

A radically contrasting perspective on another "fourth scenario" is offered by Sabbah Uddin (*The Fourth Scenario*, *The Daily Times*, 29 January 2020). This comments on a report of the US **National Intelligence Council 2020 Project** (*Mapping the Global Future*, 2004). This explored four fictional scenarios regarding what was thought to be a reasonable forecast, giving an excellent overview of expert conventional wisdom on the major trends shaping global politics and economics. These were labelled: Davos World, Pax-Americana, A New Caliphate, and the Cycle of Fear. The latter was seen as a reign of terror produced by the underworld helping ideologically motivated Muslim groups to use a WMD of nuclear or biological catastrophe in Europe, America, Middle East or Asia. Of potential relevance as a metaphor, another perspective is offered by Ross Douthat with respect to the future of marriage (*A Fourth Scenario*, *The Atlantic*, 30 September 2008).

As with the IDG framework, the Earth4All framework favours a fundamental 5-fold strategic pattern. Curiously the "healthy" coherence of a 5-fold framework is traditionally esteemed in both Western and Eastern cultures, as **Hygieia** and **Wuxing** (*Memorable dynamics of living and dying: Hygeia and Wu Xing*, 2014). Is the preference for such strategic frameworks in multiple domains indicative of a more fundamental pattern -- one which remains a challenge to articulation and comprehension across disciplines? Given the arguments above relating to the 4-fold tetrahedron, the systemic challenges of interrelating 4-fold and 5-fold merit consideration, given the corresponding integrative role associated with quaternary (*Quaternary, quaternions and the unifying goal of partnership?* 2022).

Reconciling contrasting strategic frameworks: Curiously unexplored are the systemic equivalences between 5-fold articulations of the strategic challenge, as with that of the Global Government Forum (*The Five Principles of Strategic Communication*). Other examples are presented below of which the most articulated is that of the **Viable System Model**, originally developed by **Stafford Beer** (*Platform for Change*, 1975).

Variants of an unexplored 5-fold strategic pattern language?				
5 Turnarounds of Earth4All to create wellbeing for all	5 Dimensions of Inner Development Goals	Viable System Model	Chinese 5-phase Wu Xing cycle	Hugieia Pentagram of Pythagoreans
				
		As articulated by Stafford Beer	Adapted from Wu Xing entry in Wikipedia	Reproduced from Hygieia in Wikipedia

The difficulty at this time is less the recognition of a fundamental 5-fold pattern, embodied in an exemplary manner by the **Five Pillars of Islam**. The challenge with any 5-fold pattern, as with any preferred N-fold pattern, is the apparently incommensurable ways in which it is perceived (*Interrelating Multiple Ways of Looking at a Crisis: beyond the pandemic discipline of the one right way*, 2021). A case can be made for recognizing that reconciliation between groups favouring contrasting N-fold patterns -- understood as offering coherence and global closure -- could be fruitfully explored in terms of more complex patterns.

With respect to any 5-fold pattern, for example, the table below suggests the possibility of coherent reconciliation of 4 contrasting understandings of such a pattern in a 20-fold polyhedral pattern (4x5), or of reconciling 6 contrasting understandings of it in a 30-fold pattern (5x6). However 3, 5, 7, 8 or 9 contrasting understandings of a 5-fold pattern could not be coherently represented in Platonic or Archimedean polyhedra.



Indication of polyhedral patterns through which incommensurable N-fold patterns may be reconciled (coherent reconciliation restricted here to the global symmetry of Platonic and Archimedean solids indicated by letters below)								
	2	3	4	5	6	7	8	9
2	4-fold (a)	6-fold (a,b)	8-fold (b,c,f)	10-fold	12-fold (b,c,d,e,f,g)	14-fold (g,h,j)	16-fold	18-fold (f)
3	6-fold (a,b)	9-fold	12-fold (b,c,d,e,f,g)	15-fold	18-fold (f)	21-fold	24-fold (h,j)	27-fold
4	8-fold (b,c,f)	12-fold (b,c,d,e,f,g)	16-fold	20-fold (d,e)	24-fold (g,k,n)	28-fold	32-fold (p,q,r)	36-fold (h,j)
5	10-fold	15-fold	20-fold (d,e)	25-fold	30-fold (d,e,p)	35-fold	40-fold	45-fold
6	12-fold (b,c,d)	18-fold (f)	24-fold (g,j,k,n)	30-fold (d,e,p)	36-fold (h,j)	42-fold	48-fold (k,m)	54-fold
7	14-fold (g,h,j)	21-fold	28-fold	35-fold	42-fold	49-fold	56-fold	63-fold
8	16-fold	24-fold (h)	32-fold (p,q,r)	40-fold	48-fold (k,m)	56-fold	64-fold	72-fold (m)
9	18-fold (f)	27-fold	36-fold (h,j)	45-fold	54-fold	63-fold	72-fold (m)	81-fold

Regular and semi-regular polyhedra offering features with which N-fold patterns might be associated (letters correspond to the patterns in the table above; numbers to unused patterns above)		
Platonic solids	Archimedean solids	
<ul style="list-style-type: none"> a: tetrahedron b: cube c: octahedron d: dodecahedron e: icosahedron 	<ul style="list-style-type: none"> f: truncated tetrahedron g: cuboctahedron h: truncated octahedron j: truncated cube k: rhombicuboctahedron (26) m: truncated cuboctahedron (26) n: snub cube (38,60) 	<ul style="list-style-type: none"> p: icosidodecahedron (60) q: truncated icosahedron (60,90) r: truncated dodecahedron (60,90) s: rhombicosidodecahedron (60,62,120) t: truncated icosidodecahedron (62,120,180) u: snub dodecahedron (60,92,150)

Especially interesting is the impossibility of representing simply 2 contrasting understandings of a 5-fold pattern in any of those polyhedra. It is of course the case that other polyhedra, deemed memorably comprehensible from their symmetries, could be used, as discussed separately (*Identifying Polyhedra Enabling Memorable Strategic Mapping*, 2020). Significantly missing from any 2-factor reconciliation challenge is a 60-fold pattern which would only become relevant with 3 factors or patterns of larger size (eg 3x4x5, or 5x12, or 4x15, or 3x20). There are then several 60-fold mapping possibilities indicated above.

It is also the case that various "tricks" can be used by consideration of axes or totalling sides, vertices and edges of a polyhedron. Thus a tetrahedron (4 sides, 6 edges, 4 vertices) could be used to represent a 14-fold articulation. Perhaps surprisingly, 14 shares with 8 and 32 in being the most common number in that respect (among the Platonic polyhedra), occurring 4 times, even greater than that of 12. As discussed below, this could suggest that **the SDGs might be more appropriately memorable if they were a pattern of 14 rather than of 16. A set of 14 SDGs could be completely represented on a single tetrahedron**, with the "17th Goal" then associated with the centroid as the "15th". On the other hand, if each of the 4 vertices of a tetrahedron -- as the conjunction of 3 edges -- were to be considered as a "4-fold nexus", each such nexus could be associated with a cluster of 4 of a 16-fold pattern of SDGs.

Clearly the concern here is how contrasting understandings of a 16-fold pattern of SDGs might be represented in order to reconcile them, as discussed previously (*Polyhedral representation of Sustainable Development Goals including "Own Goals"?* 2022). The latter explored the value of encompassing the 16 Goals in a 32-fold pattern -- namely together with a critical perspective on their achievement in practice, or failure in that respect -- namely the "shadow" SDGs, otherwise neglected.

Recognition of an array of patterning possibilities frames the potential for shifting between them -- along transformational pathways, as presented separately (*Changing Patterns using Transformation Pathways*, 2015; *Pathway "route maps" of potential psychosocial transformation?* 2015)

Remedial proposals? In preparation for COP27, the United Nations Environment Programme asserts that the international community is falling far short of the Paris goals, with **"no credible pathway"** to 1.5°C (*Emissions Gap Report 2022: The Closing Window – Climate crisis calls for rapid transformation of societies*, October 2022):

Policies currently in place point to a 2.8°C temperature rise by the end of the century. Implementation of the current pledges will only reduce this to a 2.4-2.6°C temperature rise by the end of the century, for conditional and unconditional pledges respectively.

The report argues that only an urgent system-wide transformation can avoid climate disaster. [Thomas Homer-Dixon](#) and [Johan Rockström](#) take the systemic argument further (*What Happens When a Cascade of Crises Collide?* *New York Times*, 13 November 2022):

In reality, the likelihood that the current mess is a coincidence is vanishingly small. We're almost certainly confronting something far more persistent and dangerous. We can see the crises of the moment, but we're substantially blind to the hidden processes by which those crises worsen one another — and to the true dangers that may be enveloping us all.

Today's mess is better understood as a global polycrisis... The term implies that humanity is dealing with a complex knot of seemingly distinct but actually deeply entangled crises. Precisely because these crises are so entangled, they're causing worldwide damage much greater than the sum of their individual harms. In the last 10 years, things have gone fundamentally

awry.

The authors conclude:

We propose a [worldwide scientific collaboration](#) to identify the causal mechanisms operating among these risks. This collaboration would consist of a global consortium of nationally funded institutes. It would be dedicated, first, to studying mechanisms that are amplifying, accelerating and synchronizing global systemic risks and, second, to determining practical ways humanity might intervene. It would also look for ways these feedbacks might be harnessed to tip key economic, social, and ecological systems toward better outcomes.

Unfortunately the proposal itself exemplifies the problematic response of acclaimed expertise and the many hundreds of think tanks to which it gives rise, as discussed separately (*Tank Warfare Challenges for Global Governance: extending the "think tank" metaphor to include other cognitive modalities*, 2019). This fails to address the fundamental issue implied by the UNEP assertion that there is no credible pathway. **What is to be understood by "credible" and for whom?**

Correspondence between individual cognitive embodiment and collective strategic articulation

The question raised by this argument is the nature of a seemingly fundamental disconnect between "external" and "internal" conceptual articulations -- of which the SDGs and IDGs are potentially themselves symbolic. The disconnect is more commonly recognized in relation to nature (*Human Intercourse: Intercourse with Nature and Intercourse with the Other*, 2007). Considered otherwise, any **collective** uptake of SDGs or IDGs can be explored as a challenge to comprehension and memorability for the **individual** (*Memorability, Mnemonics, Maths, Music and Governance: memory enhancement ensuring strategic credibility*, 2022).

An insightful contribution by [Otto Scharmer](#) to the Earth4All initiative has framed the matter in one way (*Transforming our Economies from Ego to Eco, Earth4All, Deep-Dive Paper*, 11, 2022):

Here, I take Meadows' framework and combine it with methods of "awareness-based systems change" from the field of action research. As Meadows noted, the greatest potential for change lies in our capacity to "transcend paradigms" and I argue that we need to create a learning infrastructure...The key lies in better understanding the cognitive processes that allow people and social systems to access and navigate the underlying issues.

This could be deemed entirely consistent with the IDG perspective. However, as with that perspective, it can be challenged as a subtle failure to recognize the nature of the cognitive engagement with externalities articulated in strategic terms -- effectively to devalue it, if not to deny its relevance entirely. This could be understood as exemplified by the feeble response to religious injunctions, of which those of the Club of Rome and other worthy initiatives are potentially secular analogues.

Scharmer's reference to "economies" also calls for challenge in that conventional understanding of them precludes the manner in which non-human species "work" in thermodynamic terms, as do the forces of nature more generally -- from which hydropower and windpower are derived. Nature does not work? Economics focuses solely on remunerated human labour -- and is even challenged to integrate the major role of the so-called "[black economy](#)". The issue has been exemplified by exclusion of the unremunerated work of householders. For the world's economists, the gardeners of the world do not work.

Who indeed is to be appropriately understood as "unemployed"? Despite being renowned as the pioneer of ecological economics, does the framing offered by [Herman Daly](#) encompass the manner in which Nature "works" and is "remunerated" (Sam Pizzigati, *An Economist for the Whole Earth, Consortium News*, 18 November 2022).

Rather than Scharmer's transformation "from Ego to Eco", it is potentially more useful to see humanity as overly and misleadingly identified with particular externalities of the environment (with "Eco") -- a misplaced concreteness effectively empowered by simplistic identification with "Ego". What might then be the transformation "from Eco to Ego" -- otherwise understood -- if only as a requisite complementarity?

The question frames the need for consideration of how the externalities that are the focus of the SDGs might be fruitfully internalized and cognitively embodied. **How indeed do external goals become internal goals** -- beyond the manipulative preoccupations of leadership of collective agendas seeking to ensure mobilization and "buy-in"? The question may indeed be fundamental to any effective remedial response to climate change and environmental degradation.

Cognitive embodiment of externalities: "to Ego from Eco"? Whereas the IDGs endeavour to clarify the qualities and skills required of individuals to engage effectively with the SDGs, missing is any preoccupation with whether individuals find this mobilization initiative to be either comprehensible, desirable or **credible**. To what extent will the behaviour modification sought be criticized and experienced as manipulative indoctrination or righteous inculcation -- brainwashing? How might this differ from the efforts of religions over the centuries to elicit attitudes and behaviours appropriate to life on Earth (if not in preparation for heavenly salvation)? The response by authorities to the COVID pandemic has evoked concerns in this regard (*Application of Universal Vaccination Narrative to Climate Change*, 2021)

Would any conclusions of the proposed "worldwide scientific collaboration" be more credible -- as might be challenged by any critical review of the influence of the work of eminent authorities like the Club of Rome over decades (*Club of Rome Reports and Bifurcations:*

[a 50-year overview](#), 2018).

With respect to the mysterious nature of credibility and belief, there is a case for exploring the mirror metaphor which has long featured in philosophical reflections. This can be adapted to the crises of the times, as discussed with respect to the goals of sustainable development (*My Reflecting Mirror World: making my World Summit on Sustainable Development worthwhile*, 2002). There it was asked:

To what extent is the world around me merely a mirror of my very own successes and failures in world governance -- in governing 'my world'? It may indeed suit me to hold the world at arm's length -- as an object with its own dynamics quite beyond any responsibility of mine. And there may be many ways that this can be understood to be a useful, healthy, minimally presumptuous, perspective. But there is some value in reflecting on the ways in which every thing I encounter in 'the world' is engendered by me.

A further use of the metaphor, common in many folktales, is presented separately (*Stepping into, or through, the Mirror: embodying alternative scenario patterns*, 2008).

A relatively neglected opportunity lies in exploring how the features of external crises are embodied cognitively. There is necessarily considerable difficulty in clarifying this challenge to the conventions of perception. The many references in the following are indicative of ways in which this can be argued:

- [Cognitive Embodiment of Nature "Re-cognized" Systemically](#) (2018)
- [Embodying Strategic Self-reference in a World Futures Conference](#) (2015)
- [Embodying Global Hegemony through a Sustaining Pattern of Discourse: cognitive challenge of dominion over all one surveys](#) (2015)
- [¿Embodying a Way Round Pointlessness?](#) (2012)
- [Secret sharing, Shapeshifting and Embodiment Reintegration of a Remained World](#) (2011)
- [Embodying the Paradoxes and Contradictions of the Pursuit of Happiness](#) (2011)
- [¿Defining the objective ∞ Refining the subjective ?! Explaining reality ∞ Embodying realization](#) (2011)
- [Embodiment of Change: Comprehension, Traction and Impact? Discovering enabling questions for the future](#) (2011)
- [Existential Embodiment of Externalities: radical cognitive engagement with environmental categories and disciplines](#) (2009)
- [Embodying Values Dynamically through Alternation](#) (2008)
- [Conditions of Objective, Subjective and Embodied Cognition: mnemonic systems for memetic coding of complexity](#) (2007)
- [Psychology of Sustainability: embodying cyclic environmental processes](#) (2002)

Rather than the focus on cognitive embodiment, the understanding can be recognized as a form of cognitive osmosis (*Cognitive Osmosis in a Knowledge-based Civilization*, 2017). In the latter it is discussed as the interface challenge of "inside-outside", "insight-outsight", and "information-outformation". The requisite "inversion" is perhaps exemplified by the title of the final study by [Joseph Campbell](#) (*The Inner Reaches of Outer Space: myth as metaphor and as religion*, 1988).

The curious feature of that inversion is that -- whilst it can indeed be considered radical -- it is nevertheless credible as a transformation pathway with which many are variously familiar personally. **Faced with their impotence in responding to global crises, it is the cultivation of unquestionable conventional perspectives by academic and other authorities which so ironically inhibits access to a credible pathway for which the UN so despairingly calls.**

Missing would seem to be the recognition of a subtle correspondence between "external" (objective "eco") and "internal" (subjective "ego") suggesting the value of according collective attention to its potential as a means of reframing the crises of the times (*Theories of Correspondences -- and potential equivalences between them in correlative thinking*, 2007). In a period in which quantum physics is evoking reflection on the cognitive entanglement with reality as experienced, there is a case for creative exploration of transformation of personal entanglement with the natural environment (*Cognitive Implications of Lifestyle Diseases of Rich and Poor*, 2010).

Curiously the tragedy of the present times may be seen by the future as a failure of strategic imagination -- perhaps exemplified by the decades-long failure of Western intervention in Afghanistan. The pathway invites articulation through aesthetic insight into liminality and the implication of functioning cognitively "betwixt and between" the worlds defined as "outer" and "inner", as argued separately (*Living as an Imaginal Bridge between Worlds*, 2011; *Bibliography of "Betwixt and Between": including references to liminality and Neti Neti*, 2011).

Relevance of the classical travelling salesman problem of operations research

The classical [travelling sales problem](#) (TSP) considers what is the shortest possible route that visits each destination -- a set of cities -- exactly once before returning to the point of departure. It is an [NP-hard problem](#) in combinatorial optimization, important in theoretical computer science and operations research. The [travelling purchaser problem](#) and the [vehicle routing problem](#) are both generalizations of the problem.

Arguably it could be assumed that the UN has framed the challenge by which strategies have to be implemented such as to "sell" or "deliver goals" -- as specified by the individual SDGs -- over a period of time and as efficiently as possible. This can indeed be understood as a "salesman problem", especially since one application has been recognized as a "travelling politician problem" (Alex Bellos, *The Travelling Politician Problem: what's the shortest route between the 50 top marginals?* *The Guardian*, 21 April 2015; Masoud Shahmanzari, et al, *Multi-Period Travelling Politician Problem: a hybrid metaheuristic solution method*, *Journal of the Operational Research Society*, 2021; D. Aksen, et al, *A Periodic Traveling Politician Problem with Time-Dependent Rewards*, *Semantic Scholar*,

2020).

So defined, rather than "delivering goals", it may be deemed to be sufficient for the politician to travel to an array of locations in virtual space (or belief space) where achievement of the goals may be claimed for public relations purposes. Distinguishing between claims and intended achievement may itself be a challenge (*Climate Change -- Let's Just Pretend: why do we need to do anything?* 2019).

The mathematical approaches to the problem are of potential value to reframing the visualization of 16 goals, understood as distinctive strategic directions of movement of global civilization -- in this case as envisaged by the United Nations.

Most simply, and of little interest, are the 16 directions from a central point as traditionally defined by a compass rose for navigation purposes. If one useful constraint is that the 16 directions should require a return to a starting point, this could have each direction linked head to tail -- curving around in an approximation of a circle. Also not so interesting.

More interesting is when the question is the form this would take in 3D, namely how the set of lines would point to a (minimum) number of directions, with each connected to the previous one in a head-to-tail mode, and still returning to the point of departure. This could be understood as taking the form of a simple knot -- a relatively simple toroid, and possibly the [Mereon toroid](#). The changes of direction might then be understood as related to points of inflection -- to the extent that the sequence of lines constituted an (acceptable) approximation to a curve.

Missing from the description of the problem is how many "lines" (each associated with recognition of a distinctive goal to be attained) are required to constitute a smooth journey (a journey not disrupted by "turning back"). Framed in terms of operations research, how is the coherence of the UN-led strategic journey successfully approximated by a succession of lines? How jagged would be an 8-line journey compared to a 16-line journey? Was this constraint a factor in rendering unsatisfactory the earlier 8-fold set of Millennium Development Goals?

What is the constraint defining minimally acceptable jaggedness -- a form of "crease angle" in graphic visualization terms? This is perhaps to be understood as avoidance of a "radical" change of direction on a strategic journey -- as an appreciation of continuity. Also of interest is the shift from a central point in the 2D definition of the problem to a central axis in a 3D definition. How does the toroidal sequence of lines (as a knot) necessarily point both "up" and "down" in mapping out the range of directions in 3D -- to an optimal degree?

As previously presented and visualized, the problem is explored as an approach to eliciting coherence from a representation of the UN's 16 Sustainable Development Goals and their relation to constraints on comprehensibility and memorability. With the potential role of any axial line (as offering 2 "fundamental" directions), one possibility is that an interesting minimum is 14 directional lines -- especially given their role in oppositional logic and geometry in visualizing the Boolean connectives (*Oppositional Logic as Comprehensible Key to Sustainable Democracy*, 2018).

Of interest in this respect is the symbolic role of 14 directions in such processional journeys as the [Via Dolorosa \(Pattern of 14-foldness as an Implicit Organizing Principle for Governance?\)](#) 2022). Other intuitions of even greater coherence could well favour a greater number of lines -- thereby reducing the jaggedness of the journey, but increasing the challenges of comprehensibility and memorability. The problem could be presented otherwise in 4D, and possibly more compactly -- if posing other challenges to comprehensibility. It might well be asked whether the time dimension of a strategic adaptation would call for solutions to the problem in 4D.

Whilst the classical problem has long been studied in 2D, interest in a 3D variant is relatively recent (Yil Haxhimusa, et al, *2D and 3D Traveling Salesman Problem Journal of Problem Solving*, 3, 2011, 2). It is appropriate to note that even in 2D, the complexity of such problems is such that it is only recently that it has been solved for 22 cities (Caroline Delbert, *Scientists Solve Most Complex Traveling Salesman Problem Ever, Popular Mechanics*, 25 January 2020). This limitation is cause for reflection with respect to any adaptation to 3D and to eliciting coherence from a pattern of 16 contrasting strategic directions.

Indications with respect to the 3D variant are offered by:

- Hongtai Yang, et al: *Expected Length of the Shortest Path of the Traveling Salesman Problem in 3D Space (Journal of Advanced Transportation*, 2022, 4124950)
- Sebastian Meneses, et al: *A Genetic Algorithm to Solve 3D Traveling Salesman Problem with Initial Population Based on a GRASP Algorithm (28th International Conference on Computer Applications in Industry and Engineering, CAINE-2015)*
- Hüseyin Eldem and Erkan Ülker: *The Application of Ant Colony Optimization in the Solution of 3D Travelling Saleman Problem on a Sphere (Engineering Science and Technology*, 2017)
- Joseph O'Rourke: *Knotted TSP tours in 3D? (MathOverflow*, 15 July 2017)
- Stephen B Gray:
 - *Tying knot theory with traveling salesman problem (TSP) (Mathematics Stack Exchange*, 5 June 2012)
 - *Stick knot questions: simple but may not be easy (MathOverflow*, 10 June 2012)

References to a 4D variant include:

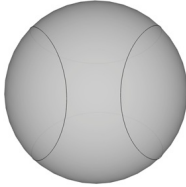
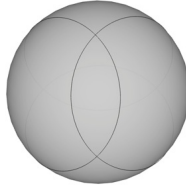
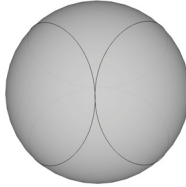
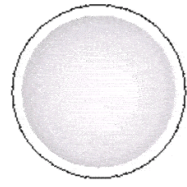

- Samir Maity, et al: *An Intelligent Hybrid Algorithm for 4- Dimensional TSP (Journal of Industrial Information Integration*, 5, February 2017)
- Arindam Roy, et al: *A Hybrid Heuristic for Restricted 4-Dimensional TSP (r-4DTSP) (Operations Research and Optimization*, 2018)

These note the surprising relevance to the movement of drones and robots in relation to potential targets as "goals". In one case, for example, the motion planning goal is to find a policy in belief space for the robot to traverse through a number of goal points (Ali Noormohammadi Asl and Hamid D. Taghirad, *Multi-Goal Motion Planning Using Traveling Salesman Problem in Belief Space, Information Sciences*, 471, 2018, 2). Considering "goal" as "objective", another example is of relevance to the challenge of 16 goals

Partnership for the Goals as "Phases of the Cross"?

The assumption underlying the argument above is that "partnership for the goals" calls for recognition of their relationship in systemic terms. How is the functionality associated with achievement of each goal to be recognized as vital to the coherence of a global strategic system? The argument has built on insight into the tetrahedron as the fundamental pattern in this respect. The irresponsible failure to map out the systemic relationships between the SDGs was noted -- as evident in the case of the IDGs.




Global "seam curve" and Mereon knot: The role of the seam curve of familiar sports balls was presented as ironically indicative of systemic coherence -- with the challenge of reconciling such a curve with the tetrahedron to offer a framework within which the disparate goals could be related. Visually the challenge can be presented as follows.

Perspectives on coherence offered by seam curves of familiar sports balls				
Tennis-ball / Baseball seam curve	Overlap condition (forming Vesica Piscis?)	Tangential condition	Animation of range of conditions	Embedding of tangential variant in tetrahedron
				
Interactive 3D version developed by Sergey Bederov of Cortona3D			Reproduced from R. W. Gray (<i>Lynnclaire Dennis' Geometry: the pattern</i>)	

The form of the curve in the image on the right above corresponds to the tangential condition of a generalization of the tennis-ball curve (left above) which can be explored separately in 3D (*Interactive display of generalized baseball and tennis-ball seam curves in 3D*). Although a feature of the page from which it is reproduced, less evident is how the variant on the right relates to the fundamental significance recently attached to the **Mereon Trefoil**, as described by Louis Kauffman (*Pattern, Sign and Space: Mereon Thoughts*, 2003). Also intriguing is the exclusion of the tennis-ball variant from the range of conditions portrayed in the animation by R. W. Gray.

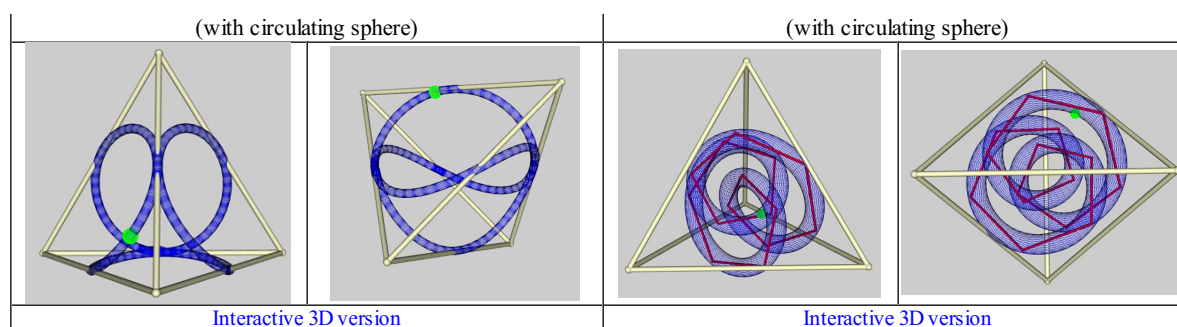
Otherwise known and visualized as the Mereon Matrix, the potential significance of the pattern is elaborated in a far more extensive work (Louis H Kauffman, et al, *The Mereon Matrix: everything connected through (k)nothing*, 2018; frontmatter). The potential cognitive implications are discussed separately in relation to an interactive version in 3D (*Cognitive embodiment of knots: knotting and knitting processes*, 2021; *Interactive display of three balls moving within Mereon Trefoil knot in 3D*, 2022). Whilst knots may indeed be used metaphorically as indicative of a challenge to governance, the "interestingness" of curves of increasing complexity in relation to sustainability merits more detailed consideration (*Cyclic Representation of Coherence as Knots and Otherwise*, 2022). The latter includes *Animations offering contrasting perspectives on the Mereon Trefoil pattern*.

Variety of simplest knots: The image above by Gray features in a discussion with Louis Kauffman and Lynnclaire Dennis regarding the embedding of the Mereon curve as a knot, from which the following images are reproduced -- indicative of the relationship to what has been termed the "Mereon knot". This determined that only three distinct knots can be formed onto a tetrahedron (R. W. Gray, *Knot Enumeration*).

Animations clarifying the embedding of the Mereon knot into a tetrahedron		
Animation showing distinctive (fore and back) weaves in a real knot onto a tetrahedron	Animation showing 2 distinctive crossings of fore and back variants on a tetrahedron	Animation showing 3 possible knots (2 trefoil and 1 figure-of-eight)
		
Adapted from figures of R. W. Gray (<i>Knot Enumeration</i>)		

With respect to the argument above, the animations frame the question as to how the more complex Mereon curve might itself be associated with a tetrahedron, as explored below right.

Contrasting presentations of tennis-seam and Mereon curves	
Tangential variant of tennis-ball seam curve in tetrahedron	Expanded version of Mereon knot in tetrahedron



The argument above has assumed that the tetrahedron is a form indicative of fundamental systemic coherence. The tennis-ball/baseball seam curve can be seen as an intuitive recognition of that -- if only as a symbol -- to whatever degree it may be acknowledged, despite its familiarity. Understood as a more generic form, the Mereon knot offers more complex cognitive implications.

Approximations of systemic coherence: It is therefore intriguing to consider the set of SDGs as a some kind of approximation to the systemic coherence of which the Mereon curve is indicative. As an approximation, it is to be expected that the linear thinking typical of global strategic development would decompose the systemic coherence of any curve into linear segments. Arguably these could number 16, in the light of a reduction of a non-linear perspective to 16 SDGs, whose partnership is envisaged from a 17th perspective. The images on the right above are a suggestion of this -- with the 16 red lines then approximating to the coherence of the curve.

The linear nature of the approximation invites another interpretation, if the curve is understood as a "conceptual tunnel" along which collective strategic determination travels -- as suggested by the circulating green sphere. The linear constraint would then suggest that the "end of the tunnel" visible from a given linear perspective would determine a form of horizon effect preventing any view "around the curve" of the tunnel. Fixation on any perceived end, as the "light at the end of the tunnel" would then correspond to a particular goal to be achieved. The closer the movement to that goal, the more the curvature of the tunnel would challenge the appropriateness of the linearly determined target. Finally the relevance of another goal, linearly perceived, would become apparent. So framed, there are then 16 approximations to global coherence.

Given the history of the SDGs as the successor to the UN's 8-fold Millennium Goals, a set of 8 linear segments could have been similarly embedded in the curve to illustrate a cruder systemic approximation to global coherence. As a systemic knot with which global governance is confronted, the representation above recalls discussion of the [Gordian Knot](#) to which strategic reference continues to be made (*Mapping Grossness: Gordian knot of governance as a Discordian mandala?* 2016). A distinction of 12 linear segments could be similarly explored in terms of the mythological cycle of [12 Labours of Hercules](#). Each SDG could indeed be recognized as involving a form of laborious journey.

14-foldness versus 16-foldness: Rather than 8, 12 or 16, of particular interest is a 14-fold segmentation of a systemically coherent cycle. (*Variety of System Failures Engendered by Negligent Distinctions*, 2016). Such a segmentation follows from the remarkable range of management-related principles and stages, as indicated separately (*Pattern of 14-foldness as an Implicit Organizing Principle for Governance?* 2021). These include those framed from a religious perspective, such as:

- [14 Stations of the Cross](#) (*Listverse*); [Stations of the Cross](#) (*Wikipedia*); [Stations of the Cross](#) (*Catholic Online*)
- [14 Principles of Maimonides](#) [*in distinguishing positive and negative obligations*] (*Chabad*)
- Sideris Church: [14 Principles Living Out the Gospel in the Real World](#)
- Azriel ReShel: [Thich Nhat Hanh's 14 Principles of Engaged Buddhism](#) (*Uplift*)
- Taylor Marshall: [The Fourteen \(14\) Articles of Faith according to Thomas Aquinas](#) (March 2009)
- William J. Barber II and Jonathan Wilson-Hartgrove: [14 Steps to Moral Fusion Organizing](#) (*Repairers of the Breach*)
- Oscar Ichazo: [The 14 Pillars of Perfect Recognition](#) (*Arica*)

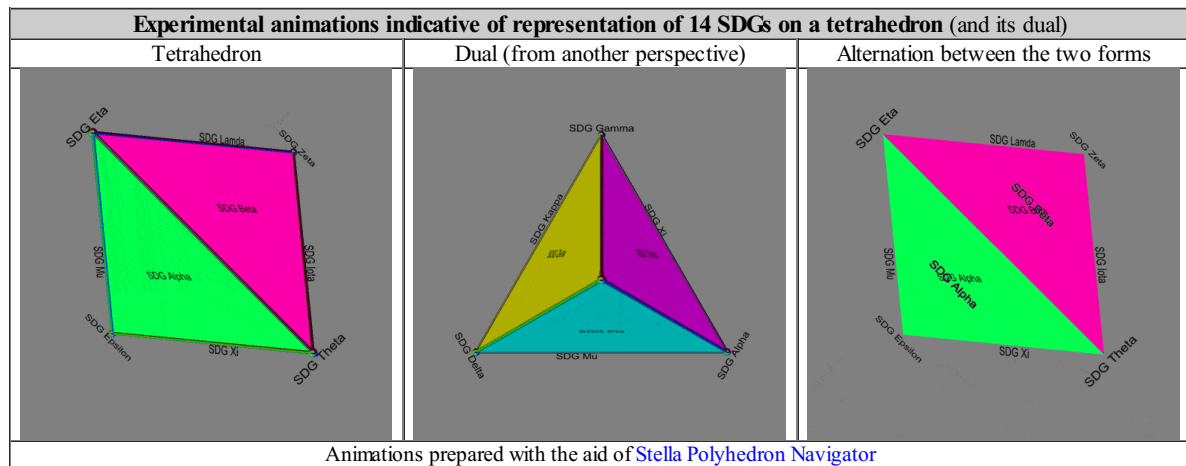
There is a case for assuming that the pattern of 16 SDGs was engendered by an intuitive recognition of the 16 logical connectives. However as noted separately, whilst it is indeed the case that there is formal recognition of 16 such connectives, it is remarkable to discover that this set of 16 is variously reduced in the light of arguments indicating that this or that set of connectives is unnecessary in practice -- as being trivial or redundant (*Governance beyond the logical focus on true vs false?* 2021). Conventional arguments for reduction of the 16 to 14 include:

- contradiction, namely when a connective is matched by a contradictory perspective -- *should any SDG be recognized as in contradiction with another?*
- tautology, namely when one connective is effectively the same as another -- *should any SDG be recognized as duplicating another?*

The argument leads to the conclusion that 5 connectives would be adequate, and even one of those is superfluous (see [Selection of Logical Connectives](#), *Philosophy Stack Exchange*; Maarten van Wijk, [Logical Connectives in Natural Language -- a cultural-evolutionary approach](#), 2006; Rowan Patricia Garnier, [Understanding Logical Connectives: a comparative study of language influence](#), 1992). The argument for five is to achieve a "balance between efficiency and parsimony" -- as may be convenient under certain circumstances, or a matter of personal preference. Hence the systemic merit of the 5-fold configurations presented above

Representation of SDGs on a single tetrahedron: Understood systemically, and despite the controversy this might evoke, how might "contradiction" and "tautology" justify the reduction of the set of SDGs from 16 to 14, as suggested above? This would offer a means of representing the set of 14 SDGs on the features of a tetrahedron as indicated above -- a configuration potentially more succinct and memorable than the conventional tabular configuration. One exploration to that end is presented (below left), substituting letters of the

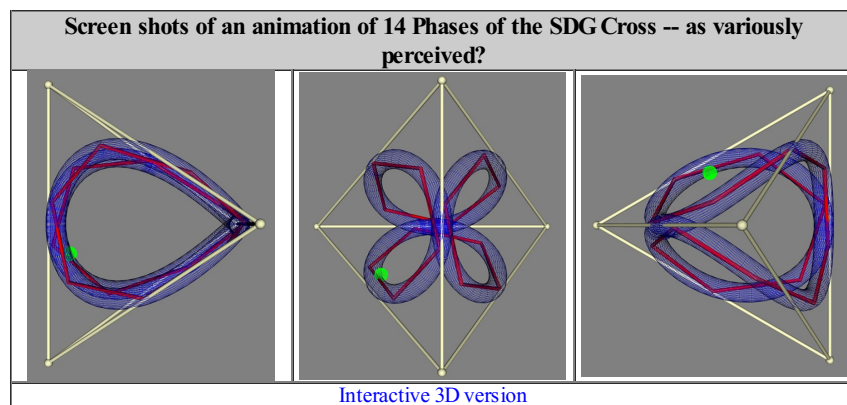
Greek alphabet to avoid addressing the controversies over which 2 of the 16 would be "absorbed" into the 14 and how they should be juxtaposed. Since the tetrahedron transforms into its dual as a tetrahedron (vertices becoming sides; central image), a potentially challenging dynamic in systemic terms can also be presented (below right). Offering other insights, there are a number of other ways in which a polyhedron can be morphed in this way into its dual.



Representation of SDGs within a single tetrahedron: It is in this light that the partnership of the SDG Goals could be understood dynamically to involve recognition of 14 "phases" of a "linear" journey as features in the animation below (engendered by the horizon effects within the curvature of the tunnel, as explained above). Rather than the static connotations of "stations", "principles" or "goals", use of "phase" suggests a dynamic. Cognitively the phases might then be understood as consecutive or simultaneous in some manner -- even as a [standing wave](#).

As a dynamic, such considerations evoke questions regarding "what flows" around the curve -- such as to offer a sense of global coherence and to sustain it (*Circulation of the Light: essential metaphor of global sustainability?* 2010; *Flowering of Civilization -- Deflowering of Culture: flow as a necessarily complex experiential dynamic*, 2014).

As implied by the central image below, humanity can however be understood as bearing a symbolic "cross" -- with all the symbolic implications of a collective *Via Dolorosa*. This constraint can be seen as a consequence of 2 unresolved fundamental dilemmas in a context characterized by a configuration of 4 trilemmas (at the vertices) -- effectively a tetralemma posed by four potential modes of failure (*Classification of failure and social pathology*, 2016). A similar configuration to that below could of course be presented for 16 "phases" (as indicated above).



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