



laetus in praesens

Alternative view of segmented documents via Kairos

22 July 2024 | Draft

AI-enabled Mapping and Animation of Learning Pathways

Use of polyhedra in configuring memorable integrative frameworks

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Introduction

The early web version of the program of the *Summit of the Summits* to be held in in Hakone (Japan) in September 2024 invited critical commentary in an exercise appropriate to the times. Possible criteria for such commentary are identified in *Evaluating Synthesis Initiatives and their Sustaining Dialogues* (2000) and were submitted to two AIs in the form of *ChatGPT 4* and *Claude 3* (Opus variant) together with the web variant of the Summit program (*AI Commentary on an Envisaged Synthesis Dialogue*, 2024).

Given that that gathering places particular emphasis on Japanese culture, that exercise resulted in

consideration of how the set of 48 [koans](#) of the classic Zen compilation of the *Gateless Gate* (*Mumonkan*) could be configured as an indication of potential cognitive synthesis. This followed from an earlier exercise to that end (*Configuring a Set of Zen Koan as a Wisdom Container*, 2012). A case had been previously made for the value of appreciating the insights of "Eastern" articulations to complement those promoted so vigorously within the "Western" frameworks with which AI is now so prominently associated (*Coherent Reconciliation of Eastern and Western Patterns of Logic*, 2023).

Curiously the *Summit of the Summits* in Japan takes place in the same month as the UN's *Summit of the Future* in New York (Jeffrey D. Sachs, *The Summit of the Future*, *Transcend Media Service*, 8 July 2024). It remains unclear whether the integrative objectives of either event will benefit significantly from the use of AI -- rather than deploring its threat to their respective agendas from a technophobic perspective. The value of AI to such dialogue has been explored separately (*Envisaging the AI-enhanced Future of the Conferencing Process*, 2020).

A specific challenge of any form of integrative synthesis is assumed to be that of the comprehension and memorability of complex frameworks -- hence the provocative evocation of some 47 [micronutrients](#) as insightful metaphors of relevance to collective sustainability (*Memorable Configuration of Psychosocial "Vitamins", "Amino acids" and "Minerals"*, 2024). The AIs in the earlier experiment (and the following) engaged proactively and explicitly in the hypothetical confrontation of such micronutrients with the set of 48 koans -- and with possibilities for their memorable geometrical configuration as polyhedra, as discussed separately with respect to their potential implications for international, interfaith, intercultural and interdisciplinary discourse (*Facilitating Global Dialogue with AI?* 2024).

The following exercise, as with that which preceded it, is understood as an **experiment in the use of AI with respect to programming of configurative mapping in 3D with respect to polyhedra**. The polyhedral configuration envisaged in the earlier exercise was the 48-edged [rhombicuboctahedron](#). This highlighted 6 colinear pathways of 8 edges, potentially to be understood as primary "[metabolic pathways](#)" -- whether understood cognitively in the light of the koan, or metaphorically in the light of the micronutrients. Considerable effort with AI was devoted in what follows to developing a working model -- and recognizing the learning associated with that process -- using techniques far beyond the previously acquired competence in use of X3D.

The insights from the exercise with the rhombicuboctahedron were then applied to the 64-edged [drilled truncated cube](#). This had been previously explored for mapping both the 64 hexagrams of the *I Ching* and for the 64 genetic codons (*Proof of concept: use of drilled truncated cube as a mapping framework for 64 elements*, 2015; *Relating configurative mappings of 64 I Ching conditions and 48 koans*, 2012). A comparable working model was again developed with the aid of AI, distinguishing 8 hexagonal pathways and 6 octagonal pathways -- each therefore capable of carrying 48 disk messages.

As in the previous experiments, the responses of ChatGPT are distinctively presented below in grayed areas, in parallel with those of Claude 3. **Given the length of the document to which the exchange gives rise, the form of presentation has itself been treated as an experiment** -- in anticipation of the future implication of AI into research documents. Web technology now enables the whole document to be held as a single "page" with only the "questions" to AI rendered immediately visible -- a facility developed in this case with the assistance of both ChatGPT and Claude 3 (but not operational in PDF variants of the page, in contrast with the [original](#))..

Reservations regarding this method of interaction with AI have been previously highlighted (*Eliciting a Pattern that Connects with AI?* 2024). These noted questionable styles of response readily characterized as "algorithmic enthusiasm" (or "synthetic appreciation"), together with presumptions of an anthropomorphized relationship by which the questioner is repeatedly flattered. These can be understood as a marketing technique to encourage engagement in the process or as formulaic courtesy deemed appropriate in some cultures. Whilst these could be edited out, as a feature of the experiment they have not been removed; responses have been minimally edited for format alone. The approach allows readers to repeat the questions at a later stage or to

other AIs -- possibly at a future time when their capacities have been further developed.

Of greater potential concern regarding the use of AI in this context is the questionable role of [leading questions](#) in eliciting responses deemed of value -- in a period in which the undoubted capacity of AI to aggregate relevant information is now called into question by science (Joe Slater, et al, [ChatGPT Isn't 'Hallucinating' -- It's Bullshitting!](#) *Scientific American*, 17 July 2024). Somewhat ironically such assertions occur in a period in which unprecedented numbers of [academic papers are being retracted](#). In a period in which there is seemingly limited capacity to address global issues effectively, the proactive responses of AI contrast strangely with the dismissive style of academia (Richard Phelps, [Dismissive literature reviews reduce understanding – so why do academics keep making them?](#) *LSE*, 17 June 2024).

The exercise concluded with insights from AI regarding the possibility of polyhedral configuration of AI responses as a means of enhancing systematic connectivity of memorable global dialogue. This compact presentation facilitates readability and overview by reducing the apparent length of the complete document by over 90%. However readers have the ability to toggle access to the individual AI "response" associated with each question -- and to hide it. This interactive facility is not available in the PDF forms of the document -- for which both questions and responses are necessarily visible in a necessarily lengthy presentation.

Show All AI Responses

Justification for relatively complex polyhedra in integrative mapping

It is appropriate to ask why any consideration should be given to relatively complex polyhedra in the cognitive engagement with the challenge of current psychosocial complexity. The UN's Summit of the Future focuses on an unexplained 5-fold cookie-cutter articulation of the core challenges, as presented by the Director of the [UN Sustainable Development Solutions Network](#) (Jeffrey Sachs, [The Summit of the Future](#), *Transcend Media Service*, 8 July 2024). Such a pattern could be seen as echoing the similarly unexplained 5-fold pattern of the Club of Rome's [Earth4All](#) initiative.

In the face of repeated acknowledgement of the complexity of the network of challenges -- in addition to the complexity of the networks of institutions, strategies and disciplines -- it is appropriate to note the seemingly unexplained pattern of 17 UN Sustainable Development Goals (SDGs) with its associated 169 "tasks" ([Systemic Coherence of the UN's 17 SDGs as a Global Dream](#), 2021). It is then appropriate to ask with what requisite variety (in the terms of management cybernetics) this complexity should be addressed -- and how.

Of particular interest is how any such patterns are to be rendered comprehensible and memorable to the extent that they form the basis for strategic initiatives -- possibly in the light of consideration of the higher dimensional increasingly favoured for more complex explanations ([Comprehensible Organization of Strategic Complexity in 3D and 4D](#), 2024; [Higher Dimensional Reframing of Unity and Memorable Identity](#), 2024). How might the 17 SDGs be more adequately understood in that light, rather than merely as an arbitrary outcome of political horse-trading? ([Eliciting Potential Patterns of Governance from 16 Sustainable Development Goals](#), 2022)

One approach to insight of relevant to patterns of 5 and 17 is through the various 8-fold articulations that have been recognized ([Comprehensible Configuration of 8-fold Psychosocial Patterns in 3D](#), 2024). The challenge in such exploration is how the preferred cognitive articulations can be related to configurations other than the unmemorable lists so widely preferred. The Earth4All initiative makes use of a pentagonal framework in 2D. At best, the SDGs tend to be presented in a tabular form with little consideration for the systemic pattern they might be expected to form. Given a degree of enthusiasm for multidimensionality, is it possible that any ongoing reformation of the United Nations should be explored in 4D or more, as has been speculatively done in the case of NATO ([Envisaging NATO Otherwise -- in 3D and 4D?](#) 2017).

Framed otherwise it might then be asked whether and how polyhedra might serve in the mapping of strategic complexity. 3D modelling may well prove to be a key to visualization of organization and strategic coherence (*Identifying Polyhedra Enabling Memorable Strategic Mapping*, 2020). As noted above, this exercise focuses on the potential of the 48-edged rhombicuboctahedron and the 64-edged drilled truncated cube. Both offer a means of holding and interweaving multiple cycles of significance -- especially in relation to strategic learning processes.

There is no lack of recognition of the significance of cycle dynamics -- especially in the light of problematic "vicious cycles" in many domains. Given the fundamental role attributed to metabolic cycles and the pathways they form, a case can be made for the conceptual "encycling" of strategic preoccupations to a far greater degree (*Encycling Problematic Wickedness for Potential Humanity*, 2014). The systemic interconnectedness of the problems profiled in the [World Problems Project](#) encouraged analysis of the extent to which they constituted [feedback loops](#) in a cybernetic sense, especially those tending to aggravate problems within the loop. In this sense it is those loops which embody the "wickedness". They were termed "vicious" within that context (*Analysis: Vicious cycles and loops; Examples of vicious problem cycles and loops*). The question raised was how to design strategies capable of encompassing and containing those loops (*Sustainable Strategies vs. Cycles of Vicious Problems*, 1995). Also of interest was how to visualize such loops in order to render their vicious nature more comprehensible and to match them with remedial loops of strategies (*Feedback Loop Analysis in the Encyclopedia Project*, 2000; *Feedback Loops Linking World Problems*).

In a society increasingly focused on a singular world view -- the one right way, with a degree of antipathy for multipolar perspectives -- of particular interest is any sense of the number and variety of "ways of looking" necessary for viable coherence (*Interrelating Multiple Ways of Looking at a Crisis*, 2021)

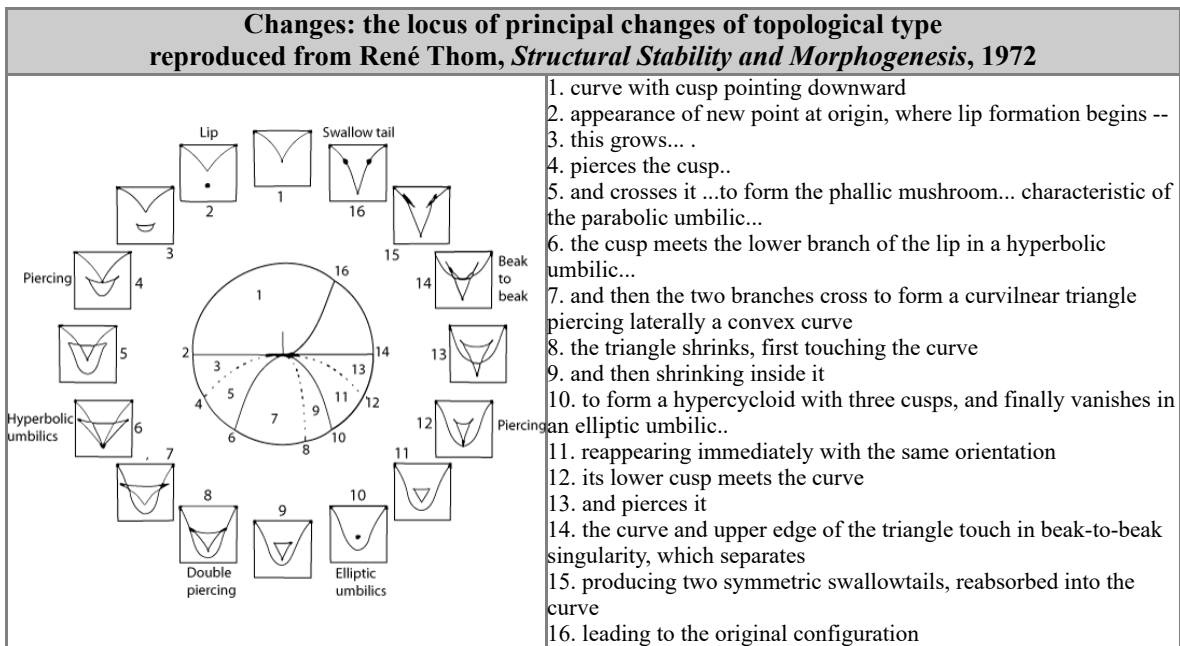
Triplicity triangulation as a corrective for misrepresentation

There is a curious preference for strategic articulations in terms of larger numbers (12, 20, or more), and with their corresponding declarations ("articles", etc). These sets tend to contrast with sets of values and principles of more limited size (3, 4, 5, 7, etc). The "connection" between the larger and smaller sets in cognitive, mathematical, strategic, or symbolic terms is not explored. A particular challenge is evident in the problematic reliance on binary decision-making and the polarization of society which it reinforces (football **). The problem has become all the more evident in a "post-truth" era in which rational presentation of facts is readily challenged and much is made of misinformation and disinformation. Increasingly desperate efforts are made to frame "truthful facts" through fact-checking, associated with the condemnation and trivialization of presentation of "alternative facts".

It is therefore curious to note the fundamental importance of [triangulation](#) in clarifying relative location in topography -- through well-established techniques of surveying, These have been notably extended to [very long-baseline astronomy](#). It may then be asked whether triangulation is of relevance to the challenge of distinguishing "facts" from contrasting perceptions and assertions by a range of media. In any process of surveying, reliance on two observations is understood to be prone to error -- only avoided by confirmation from a third perspective. Application of that principle to information -- notably as purveyed by the mainstream media -- is only considered to the extent that multiple sources confirm a particular bias. There is little sense of any need for "long baseline" fact-checking in the universe of knowledge.

Relatively little is said of [triadic logic](#), [triadic dialectics](#), [triadic strategic applications](#), and [triadic conceptualization](#) -- as highlighted separately (*Triangulation of Incommensurable Concepts for Global Configuration*, 2011). These frame the question of [triadic education and learning](#) and that of [interrelating multiple triadic approaches](#). It is especially curious that the most fundamental values -- held to be the foundation of many strategic declarations -- are readily presented in triadic form, as with [liberty, equality, fraternity](#). More curious is the tendency to frame these, and values more generally, in static terms as substantives (*Freedom, Democracy, Justice: Isolated Nouns or Interwoven Verbs?* 2011). This suggests a

degree of illusion in the quest for qualities and principles that are "dynamically disguised".



Question: Much is made of the categories by which any trinity is defined in myth and otherwise. These typically take the form of nouns with associated qualities -- possibly embodied in deities. Rather than such fundamental substantives, there is a case for a complementary exploration of fundamental verbs or processes -- especially those which may have been identified by physics. Of particular interest could be fundamental processes identified by René Thom in *Structural Stability and Morphogenesis* and his work on catastrophe theory. Could you comment on any triplicity of fundamental processes

Show/Hide AI response

Question: Did Thom identify such a triplicity in mathematical terms as being fundamental to a set of 16 processes of changes in topological type he presented diagrammatically.

Show/Hide AI response

Question: How might the 16 be explicitly associated by Thom with the triplicity you are highlighting. Did he identify such a process triplicity -- does process logic/philosophy

Show/Hide AI response

Question: Is there an analogous process triplicity identified in creation myths -- or how does the pattern you are highlighting relate to their articulation

Show/Hide AI response

Question: Does process philosophy offer the most fruitful access to the cognitive and experiential forms of that triplicity -- how are they recognized experientially

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Question: Given the extensive articulation of Buddhist logic and its categories, do the associated meditations have any focus on the process and experiential dimensions

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Relevance of Q-analysis to transcendence of cognitive disconnect?

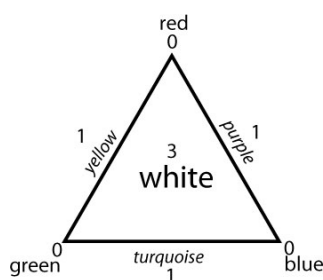
The arguments of Ronald Atkin from a mathematical perspective offer valuable clues to establishing a

"cognitive bridge" between appreciation of the illusory simplicity of triadic assumptions and the challenging complexity of the larger configurations exemplified by 16-fold, 48-fold and 64-fold configurations (above). These indications are potentially of relevance to the even more complex favoured in various traditions (72-fold, 81-fold, 96-fold, 108-fold).

Known primarily as a pioneer in the application of artificial intelligence to chess, Atkin's development of **Q-analysis** was preceded by a more general focus on the relevance of mathematics to social organization (*Mathematical Structure in Human Affairs*, 1974). This culminated in a popularization of his insights (*Multidimensional Man: Can Man Live in 3-dimensional Space?* 1981). Q-analysis is a mathematical framework to describe and analyze **set systems**, or equivalently **simplicial complexes** (*From cohomology in physics to q-connectivity in social science*, *International Journal of Man-Machine Studies*, 4, 1972, 2; *Combinatorial Connectivities in Social Systems*, 1977).

The perceptual significance of this approach is well-illustrated by visual sensitivity to colours resulting from the three primary hues (red, green and blue). These Atkin represents as a simple triangle, as discussed separately (*Communicable Insights*, 1986).

Comprehension of insights based on triangular model of Ron Atkin



0-dimension vision

("vertex"):

- **Red, Green or Blue**

1-dimension vision

("line"):

- **Yellow**
(=Red/Green);
- **Purple** (=Red/Blue);
- **Turquoise**
(=Blue/Green)

2-dimension vision

("triangle"):

- **White**
(=Red/Green/Blue)

Here the vertices (0-simplexes) represent the primary hues, the sides are twofold combinations (1-simplexes), and the combination of the three hues makes the central white (2-simplex). The 2-simplex, together with all its faces, forms a simplicial complex $KY(X)$ where X is the vertex set (red, green, blue) and Y is the set of seven perceived colours. The question of interest is how this is of any relevance to cognitive engagement with the complexity of a 48-edged rhombicuboctahedron or a 64-edged drilled truncated cube.

As previously discussed, to be able to see all the colours (according to Atkin), a person's vision needs to have the ability to function in the triangle as 2-dimensional "traffic" on that geometry, moving from location to location adjusting to the complexity of the geometrical structure which carries the visual traffic. If however the person's vision is limited to 1-dimensional traffic, then white could not be perceived because the visual traffic of seeing is then restricted to the edges and vertices only. Similarly, if the person's colour vision is only 0-dimensional, then it is restricted to the vertices. It can only see one vertex colour at a time and never a combination (as represented by an edge). If vision was 3-dimensional, it would allow traffic throughout the geometry, but would perceive other colours as well, calling for a fourth vertex in order to contain the full range of combinations.

If the geometry represents concepts or languages (or modes of socio-economic organization) instead of colours, then it would be expected that some people, in relation to that set, would have 0-dimensional

comprehension (i.e. sensitive to isolated primary issues only) and others would have 1-dimensional comprehension (i.e. only sensitive to binary combinations of primary issues). The latter would be unable to maintain attention to three concepts simultaneously in order to perceive the threefold combination (the central, integrated "white" issue). The threefold issue may then be termed a 2-hole in the pattern of communication connectivity amongst those involved. For 2-dimensional traffic however, the issue complex is coherent, comprehensible and well integrated. For the 1-dimensional traffic, it feels less secure as a whole, since the latter may only be experienced sequentially through a succession of experiences ("around the edges") from which the shape of the whole may be deduced but not experienced. For 0-dimensional traffic, the integrated concept does not exist, since experience is disconnected.

Generally speaking it seems to be confirmed that action (of whatever kind) in the community can be seen as traffic in the abstract geometry and that this traffic must naturally avoid the holes (because it is impossible for any such action to exist in a hole). The holes therefore appear strangely as objects in the structure, as far as the traffic is concerned. The difference is a logical one in that the word "q-hole" describes a static feature of the geometry $S(N)$, whilst the word "q-object" describes the experience of that hole by traffic which moves in $S(N)$ (Atkin, 1977, p. 75).

As an "object" this phenomenon is an obstacle to communication and comprehension and obliges those confronted with it to go "around" in order to sense the higher dimensionality by which it is characterized. Communications "bounce off" such objects. As a "hole" this phenomenon engenders, or is engendered by, a pattern of communication. It appears to function both as "source" and "sink". Atkin suggests that, in some way which is not yet fully understood, such object/holes act as sources of energy for the possible traffic around them. From the initial research it would appear that such objects/holes are characteristic of communication patterns in most complex organizations. It seems highly probable that they can also be detected in any partially ordered pattern of communication. As such "societal problems", "human needs", and "human values" merit examination in this light from the perspective of different languages and modes of socio-economic organization.

Very concretely, Atkin has investigated situations in which the "vertices" (which could themselves be n -simplexes in a multidimensional geometry) are individuals or offices linked together through various committees. They could also be governments or disciplines. There will then be a lot of 0-traffic and 1-traffic within and between offices due to the details of their intra-and inter-office (bilateral) operations. This traffic will circulate around the holes/objects which they constitute. Any n -level traffic can only be encompassed, or be brought to rest, by an $(n+1)$ -level body (e.g. an executive or a committee). If the latter does not exist, such traffic will continue to circulate around the q -objects in the structure and, according to Atkin, may be defined as noise. An "empire builder" (or any elite), for example, in such an organizational system will carefully create many q -holes underneath him (at the n -level), so that subordinate bodies answerable only to his appointees, are trapped in the flow of noise between them (atkin, 1977, p. 129).

Q-analysis gives precision to the recognition that traffic of different degrees of content connectivity finds (or creates) its appropriate level in any psycho-social communication complex, presumably including a language. Communicable insights are level-bound, especially where they are of high connectivity. In other words, at the level within which we can communicate, concepts cannot necessarily be anchored unambiguously into terms and definitions which "travel well". Precision introduces distortion which is only acceptable locally within any communicating society - although "locally" must be interpreted in the non-geographical sense in which all nuclear physicists are near neighbours, for example.

Such considerations suggest the power of q -analysis in clarifying approaches to human and social development in general. Reducing the dimensionality of the geometry on which a person (or group) is able to live is an impoverishment associated with repressive forces. Expanding the dimensionality induces positive, attractive forces through which a sense of development and enrichment is experienced (Atkin, 1977, p. 163). Q -analysis seems to be a valuable new language through which precision can be given to intuitive

experiences and their communication, particularly since it provides an explicit measure of obstruction to change.

In the case of social development, it is probable that most continuing societal problems should be seen as holes/objects, especially given the well-established record of unfruitful action in response to them - however vigorous and dedicated. Typical examples are: peace/disarmament, development, human rights, environment, etc. Q-analysis could then provide understanding of why any action tends to be drawn into a vortex of futility, however much it satisfies short-term political needs for visible "positive" action. The participants in the action find themselves "circulating" around a central concern of which they are unable to obtain an overview due to the geometries of the overlapping conceptual and organizational structures through which they work (or which they somehow engender).

In such a multidimensional geometry it is clear that, whether in the case of an individual, a group or society as a whole, it is not possible to eliminate "underdevelopment" as associated with low dimensionality. Such a geometry will necessarily continue to have traffic of very low-level connectivity co-present with that of increasingly higher level connectivity. The simplest illustration arises from the continual birth of infants who will, when resources permit, continue to be educated through to the level of connectivity to which they can respond. But there will always be communication at both low and high- connectivity levels, especially about socio-political issues. The question is then how such learning communication between these different levels of connectivity can weave itself together within a social structure.

It is the status of the holes/objects in relation to development which could provide an interesting point of departure for further investigation. As noted above, it is not a question of attempting vainly to eliminate such holes, especially when some of them may arise from alternative concepts of "development". Rather it is a question of how configurations of holes can be identified and/or designed. It is such configurations of holes which provide the minimum structure (and communication dynamics) to stabilize and give form to the co-presence of the differing "answers" to the challenge of development.

In effect such holes exist at a lower connectivity-level than the "macro-hole" of higher connectivity constituted by the world problematique at this time. This macro-crisis hole "absorbs" the development initiatives of society by engendering the immense volume of action/communication traffic around the hole so defined. This draws attention to the developmental implications of the probable presence of holes of yet higher dimensionality than can be readily sensed or made the subject of acceptable public (consensual) communication.

How then are "better" holes to be engendered within such configurations? Now from one point of view it is necessary to avoid introducing an element of evaluation, because from each hole the perception of other holes will be distorted so that no communicable assessment can be usefully formulated. On the other hand, it may prove to be the case that, at the level of the configuration as a whole, more than one such configuration can be identified/designed in order to interrelate the perspectives associated with the set of holes. And at this level, without privileging any particular hole, more adequate interrelationships between the elements making up the holes can be identified.

Expressed differently, introducing evaluative judgements into the relationships between the holes within a particular configuration can only contribute to the dynamics between such holes in terms of perceived advantage/disadvantage. Excessive emphasis on this runs the risk of tearing the configuration apart. The identities associated with the holes can be respected in each of the configurations in a series constituting progressively more adequate or richer formulations of the relationships between "developments". There is consequently a multiplicity of concepts of development operative in society. Individuals and groups may "progress" from one to another, possibly with a general tendency towards those of higher connectivity. But other individuals and groups will emerge and find the concepts of lower connectivity more meaningful before moving on, if they do, to those of higher connectivity. (In this sense the "ontogenesis" of an individual tends to repeat the "phylogenesis" of his/her society). Society in this sense is the arena within which individuals and groups refine their concept of development.

Polyhedral frameworks as "frozen" configurations of learning cycles

In different ways the previous sections suggest that it might be fruitful to consider the apparent isolation of languages or modes of socio-economic organization as being due to an inability to understand how to move between such frameworks. Although each framework constitutes a rich learning environment, it becomes a trap if no way can be found to exploit the advantages of other frameworks when they may be more appropriate. In a sense each framework provides a mode of information processing which is effectively a frozen portion of a larger learning cycle. Each such portion, just as with an organ in the human body, processes certain kinds of information in a manner significant for the whole, but within the prevailing paradigm there is no means of transferring the significance extracted to other contexts within the whole where it may be of value.

In the West part of the difficulty lies in the conception of learning as a linear process resulting in a shift in comprehension from A to B. It is only in the insights of Western poets that there is any recognition that, as stated by T S Eliot : "The end of all our exploring will be to arrive where we started and know the place for the first time". Gregory Bateson does however makes a strong case for the essential discontinuity of the learning process as a "zigzag dialectic between form and process" (17, p. 194). If the zigzag is considered as occurring around a learning cycle however, marrying in the Eastern bias towards recurrence, this cycle can then be subdivided into sufficiently detailed elements to be of significance for organizational operations. Jantsch discusses cyclical organization in terms of the system logic of dissipative self-organization:

"Hypercycles, which link autocatalytic units in cyclical organization, play an important role in many natural phenomena of self-organization, spanning a wide spectrum from chemical and biological evolution to ecological and economic systems and systems of population growth. The cyclical organization of a system may itself evolve if autocatalytic participants mutate or new processes become introduced. The co-evolution of participants in a hypercycle leads to the notion of an ultracycle which generally underlies every learning process". (41, p. 15)

The question then becomes how many discontinuous phases (Jantsch's "participants") it is useful to distinguish in the cycle. Too few and the incompatibilities between them are too fundamental, too many and the distinctions between them are too subtle. The operational significance of this conceptual constraint has been explored in earlier papers from which it is apparent that significance is lost if more than about 7 categories are used (42), unless the total breaks down into sub-sets based on simple (e.g. 2,3,5) factors (43).

Question: Assuming a 3-fold cognitive framework, could you comment on how this might be "applied" to constrained perception of the cubic forms of the 48-edged rhombicuboctahedron or the 64-edged drilled truncated cube-- in the light of the arguments of Ron Atkin for q-analysis (especially its triangular illustration) and the perception of "objects" and "holes" in the geometry of "communication traffic".

Show/Hide AI response

Question: The response focuses primarily on comprehension of complex geometrical forms. The challenge of concern is rather when these are understood metaphorically as mappings of complex conceptual frameworks - - as with the set of koans, the set of micronutrients, the hexagram-encoded conditions of the I Ching, or the set of genetic codons. Especially intriguing in the case of the cubic configurations is the triangularity of the corners. Less evident is the implication of the 3-fold pattern of 16 elements composing the 48-edged rhombicuboctahedron. Would the latter suggest that the 16(+1) SDGs might call for a 48-fold articulation of greater systemic significance.

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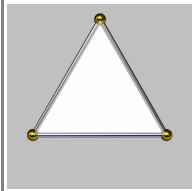
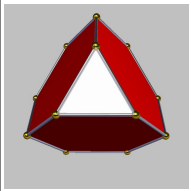
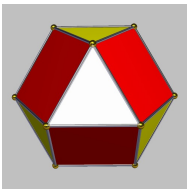
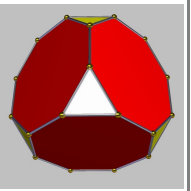
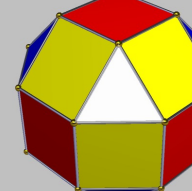
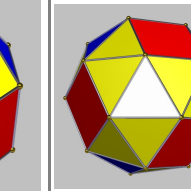
Global comprehension of learning pathways with polyhedra

Question: The fundamental challenge of perception could be usefully explored through use of Atkin's triangle. A series of "stories" could be developed by applying his triangular cognitive challenge to the succession of Platonic and Archimedean polyhedra which feature a triangular face by which the observer is directly confronted. That confrontation then implies that other faces, edges and vertices -- configured around it -- are variously perceptible to a distorted degree, or are simply invisible. With 8 triangular corners, the rhombicuboctahedron (viewed from one triangular corner of the implied cube) would offer one "story" -- with 3 other corners highly distorted and 4 others completely invisible. Could you comment on how the stories might be presented -- given their cognitive implications

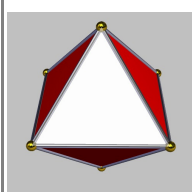
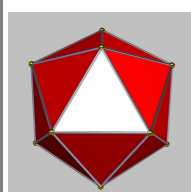
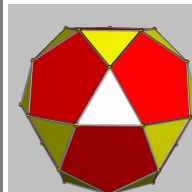
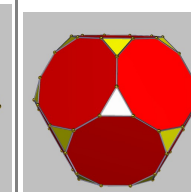
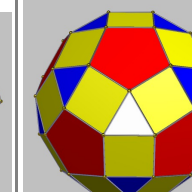
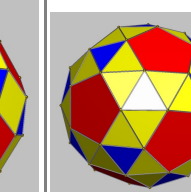
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Question: Atkin's argument, given the cognitive engagement with the primary triangle -- if its triangular nature is fully comprehended (as "white") -- offers the possibilities of "stories" about neighbouring "countries" (however misrepresented). Missing from the response is the sense in which qualities and processes mapped onto distant features may well be handled as though they were visible and fully comprehended -- as in a 20-fold or 30-fold strategic declaration (numbers exceeding George Miller's *Magic Number Seven*). This derives from the assumption that the polyhedron can somehow be "rotated" to render them visible -- thus concealing ("forgetting"?) the triangle that was primary. The question is then how that rotation is to be understood cognitively -- through a process of remembering and forgetting.

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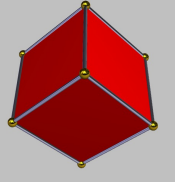
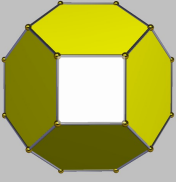
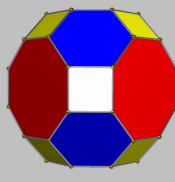
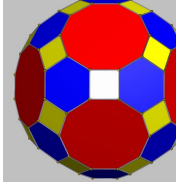
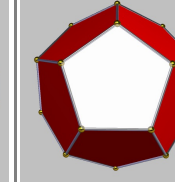
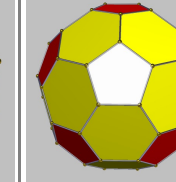
The variety of Platonic and Archimedean polyhedra (generated by Stella4D) highlighting the simplest observer perspective (triangle, square, or pentagon)					
Tetrahedral context of triangle		Cubic context of primary triangle			
Tetrahedron (triangular framing)	Truncated tetrahedron (hexagonal framing)	Cuboctahedron (square framing)	Truncated cube (octagonal framing)	Rhombicuboctahedron (square framing)	Snub cube (triangular framing)
					
4 sides -- 3 invisible	8 sides -- 4 invisible	14 sides -- 7 invisible	14 sides -- 7 invisible	26 sides -- 16 invisible	38 sides -- 28 invisible?

Non-cubic context of primary triangle

Octahedron (triangular framing)	Icosahedron (triangular framing)	Icosidodecahedron (pentagonal framing)	Truncated dodecahedron (octagonal framing)	Rhombicosidodecahedron (square framing)	Snub dodecahedron (triangular framing)
					
8 sides - 4 invisible	20 sides - 10 invisible	32 sides -- 22 invisible	32 sides -- 20 invisible	62 sides -- 38 invisible	92 sides -- 60 invisible

4-fold conceptual challenge

5-fold conceptual challenge

Cube	Truncated octahedron (hexagonal framing)	Truncated cuboctahedron (6/8 framing)	Truncated icosidodecahedron (6/10 framing)	Dodecahedron (pentagonal framing)	Truncated icosahedron (hexagonal framing)
					
6 sides -- 3 invisible	14 sides -- 5 invisible	26 sides -- 17 invisible	62 sides -- 40 invisible	12 sides -- 6 invisible	32 sides -- 20 invisible

Question: The potential extensions of the edges of Atkin's primary triangular model of integrative comprehension could be explored as learning pathways by which a sense of globality is implied -- especially by great circles of colinear edges whose planes pass through the centre, and by circuits whose planes do not. In neither case is global "grasped" cognitively. As with the Atkin's use of the primary triangle, its triangular nature is implied. The learnings associated with such learning pathways can then be understood as framing a container for an implication of higher cognitive order -- an understanding eluding conventional definition. The sets of Platonic and Archimedean polyhedra then offer distinctive "takes" on the nature of globality-- especially as it may feature in global dialogue constrained by leaning pathways.

Show/Hide AI response

Circuits of polyhedral edges indicating global learning pathways

Question: Could you list the varieties of circles, cycles and circuits associated with the Platonic and Archimedean polyhedra with their various distinctions

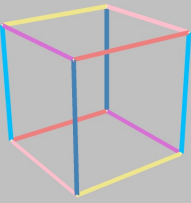
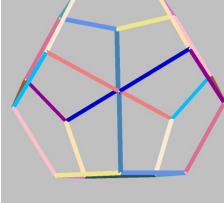
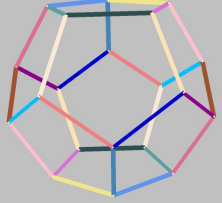
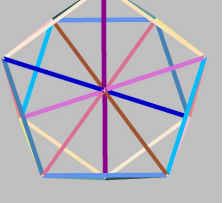
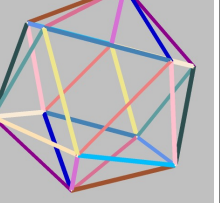
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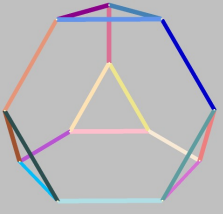
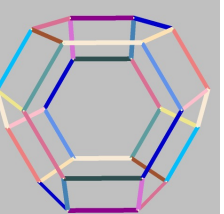
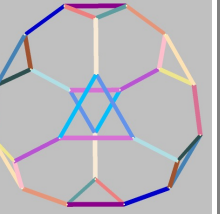
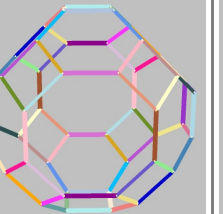
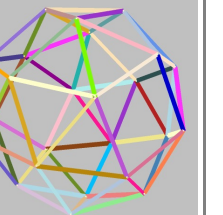
With regard to their significance for "continuous" learning pathways, **the responses above indicate a (considerable) degree of (numerical) confusion about what might be described as "great circles"** (whose plane passes through the centre of the polyhedron), whether continuous or with edge discontinuity, and the "circuits" or cycles off-centre. *[AIs make "mistakes"]* The confusion may well be resolved otherwise through geometrical formalism, but the confusion is itself instructive with respect to the continuity or discontinuity of the learning processes relating to globality that the edges may model. Some clarity is obtained from depiction below of edges coloured according to their association with great circles -- images which also facilitate recognition of the "off-centre" circuits which together may frame the centre of the polyhedron

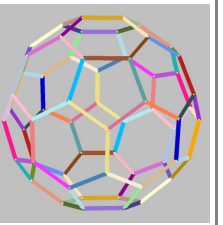
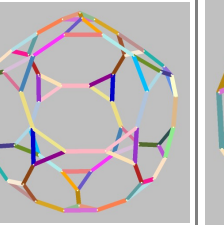
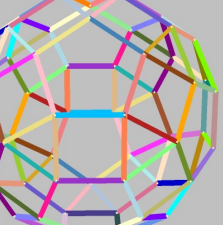
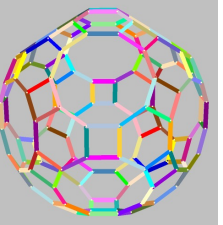
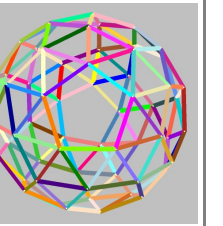
In the case of the Platonic polyhedra below, the cube renders explicit no great circles passing through the centre; they are all "virtual", implied by the unconnected edges of the same colour -- with their "tacit" nature indicative of a challenge to any more explicit sense of "global" coherence. Contrasting learning pathways are suggested by the circuits around the sides composed of differently coloured edges. In the case of the dodecahedron, the many great circles are all implied. The other circuits suggested could be considered illusory since they are composed of discontinuous edges. The great circles of the icosahedron are similarly virtual, but the pentagonal off-centre circuits are indeed continuous and composed of edges of different colours

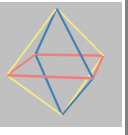
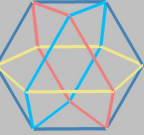
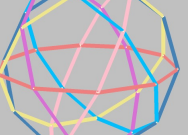

The octahedron (presented later) offers an indication of three great circles each implied by the four identically coloured edges. There is also the implication of eight triangular learning pathways suggested by differently coloured edges. As the dual of the cube, this frames questions regarding the significance of polyhedral duality with respect to learning pathways

Platonic polyhedra -- edges similarly coloured if associated with the same great circle (generated by

Stella4D)				
Cube	Dodecahedron	Dodecahedron	Icosahedron	Icosahedron
				

Archimedean polyhedra (edges similarly coloured if associated with the same great circle)				
Truncated tetrahedron	Truncated octahedron	Truncated cube	Truncated cuboctahedron	Snub cube
				

Truncated icosahedron	Truncated dodecahedron	Rhombicosidodecahedron	Truncated icosidodecahedron	Snub dodecahedron
				

Explicitly edge-defined great circles and circuits			
Octahedron (3 great circles: "squares")	Cuboctahedron (4 great circles: "hexagons")	Icosidodecahedron (6 great circles: "decagons")	Rhombicuboctahedron (6 circuits: "octagons")
			

Polyhedral global reframing of polarization and diversity

Question: Colouring polyhedral edges distinctively, according to their association with great circles, highlights the fact that many identically coloured edges are positioned on the opposite side of the polyhedron -- effectively oriented otherwise. If the polyhedron is used to map the variety of issues in a global dialogue, the polyhedron then offers a systemic framework for opposing perspectives -- otherwise tragically lacking in such discourse. Where a multiplicity of great circles (distinctively coloured) are required to represent the diversity of preoccupations in that dialogue, the "superficial" variety of coloured patterns of edges where the circles intersect is usefully indicative of the distinctive configurations of stakeholders functioning as subsystems in global discourse. From that perspective, could you clarify the implications for global consensus and unity

Show/Hide AI response

Question: Whether as learning pathways, disciplines or preferred "ways of looking", the distinctive cycles and circuits on a polyhedron clarify recognition of the predictability of dissenting perspectives with respect to any advocated modality. In a context of "subunderstanding" (as articulated by [Magoroh Maruyama, *Peripheral Vision: polyocular vision or subunderstanding?* *Organization Studies*, 25, 2004, 3](#)), could you comment on how any dissenting perspectives are indicative of systemic modalities as yet to be integrated into a global configuration of "ways of looking" of requisite variety.

Show/Hide AI response

Question: The "polarization" and "opposition" of discourse -- as widely recognized -- are well-featured in a polyhedron. Far less evident are the nuanced forms of disagreement suggested by a pentagonal configuration of edges (each indicative of a distinctive global "way of knowing"). Could you comment on the predictability of such secondary forms of disagreement (or support), framed by the manner in which four such modalities may or may not be "aligned" with an advocated perspective.

Show/Hide AI response

Question: According to the complexity of a global dialogue, that response suggests the need for further clarification when a focus of debate is an issue represented by the face of a polyhedron. If the face was framed by a triangle, this suggests the possibility of 3-way split -- or a 4-way split for a square, a 5-way split for a pentagon, a 6-way split for a hexagon, an 8-way split for an octagon. Further insight is suggested by discourse in which the polyhedron is composed of triangular faces alone (icosahedron), squares alone (cube), or pentagons alone (dodecahedron). More complex are the cases when these are combined: triangles and squares alone (cuboctahedron), or squares, hexagons and octahedra (truncated icosidodecahedron).

Show/Hide AI response

Spherical knowledge organization appropriate to global dialogue

There is a case for exploring whether global dialogue and sustainability would be more appropriately comprehended through spherical organization ([Spherical Accounting: using geometry to embody developmental integrity](#), 2004)

Question: In this exchange, reference has been made to Atkin's use of the triangle as a form of cognitive model, each edge being coloured distinctively in his illustration of q-analysis. When a triangle is a feature of a polyhedron, those edges may form part of circles or cycles. With his emphasis on colour, Atkin illustrated the challenge of cognitive integration -- to achieve "white" in his triangle. Of interest is the implication of colouring distinctively the edges in each circuit such that they frame a cognitive challenge for the sides they frame. Alternative the edges of each cycle could be identically coloured -- again to frame the cognitive challenge of the other sides. Could you comment on this. Is it a feature of polyhedral combinatorics

Show/Hide AI response

Question: In his development of the implication of q-analysis for simplicial complexes Atkin refers to polyhedra. Can you comment on how simplicial complexes relate to your response -- especially in cognitive terms

Show/Hide AI response

Global configuration of "mobility" in relation to learning pathways -- stories and robots

With global governance increasingly preoccupied with "narrative" in the articulation and promotion of

strategies, there is a case for recognizing the considerable importance traditionally accorded to stories, as with [Aesop's Fables](#), [Nasreddin stories](#), [Jataka Tales](#), and the like (*Fabulous traditions of managing psychosocial change*, 2019; *Educational fables for faith-based global governance*, 2006). It might be asked how sets of such stories could be usefully configured in terms of learning pathways, enabling one form of journey -- through cognitive mobility.

Question: If a cycle or circle is understood as a form of learning pathway, the two colouring conventions offer distinctive ways of articulating the "story" or "journey". In the case of a singular colour per cycle this suggests a particular modality which encounters other modalities in its circumnavigation -- before returning to discover the point of departure: "*And know the place for the first time*" (Eliot). In the multicolour case, each edge circuit suggests a succession of shifts in phase -- learning on the journey. The polyhedral configuration is however only understood by inference and implication in both cases -- as a consequence of the encounters and the distinctive "spaces" with which they are associated

Show/Hide AI response

Question: Exploiting the array of Platonic and Archimedean polyhedra to frame distinctive stories suggests that some may be relatively simple in contrast with others. Less evident is the difference in engagement required by those distinctions -- in terms of interdisciplinarity or "wisdom". The 48-edged rhombicuboctahedron is indicative of one form of the challenge

Show/Hide AI response

The relevance of polyhedral forms may be explored otherwise through the "tensional integrity" ([tensegrity](#)) now recognized as fundamental to the structure of the biological cell. Less evident is their relative merit with respect to social organization, notably as a means of interweaving agreement and disagreement coherently, as illustrated separately (*Eliciting Patterns of Global Consensus via Tensional Integrity*, 2023). Surprising with respect to more general understanding of "mobility" is the use of a [tensegrity variant of the rhombicuboctahedron](#) in robot innovation (Kyunam Kim, et al, *Design of a Spherical Tensegrity Robot for Dynamic Locomotion*, *IEEE Explore*, 2017; Robert L. Baines, et al, *Rolling Soft Membrane-Driven Tensegrity Robots*, *IEEE Robotics and Automation Letters*, 5, 2020, 4).

Implications of Pentagramma Mirificum and Napier's Rules for global strategic navigation

Given the clues from spherical geometry to "getting around" and circumnavigating imaginatively, there is a case for exploring the potential relevance of the so-called [Pentagramma Mirificum](#) to global knowledge navigation (*Global Psychosocial Implication in the Pentagramma Mirificum*, 2015). Associated with that historically important discovery is the set of [Napier's Rules](#).

Question: The implications for cognitive navigation are a reminder of the importance of the Pentagramma Mirificum and Napier's Rules -- for the navigation of a "global" context. Could you comment on their significance as metaphors of relevance to navigation of global dialogue potentially defined in terms of spherical geometry

Show/Hide AI response

Question: With respect to your earlier comment on Napier's Rules with regard to spherical geometry, could you suggest how cognitive analogues -- "10 rules" -- might be relevant to comprehension of globality and its navigation

Show/Hide AI response

Implications of "Miller's Rule" as constraint on global knowledge organization

The issue of constraints on conceptual clustering emerges from assessments of problematic-strategic complexity, as with the [Situational Complexity Index \(SCI\)](#) of the [Institute for 21st Century Agoras](#) (*Cognitive limitations and reductionism in response to global challenges*, 2017).

Question: The short-term memory constraint highlighted by [George Miller](#) (*The Magic Number Seven Plus or Minus Two*) has long been influential in individual psychology. Do you have any trace of how it has been explored with respect to collective psychology, most obviously with respect to the array of interests prioritized by politics and in global dialogue

Show/Hide AI response

Question: If it is indeed the case that analogues to Miller's argument have not been researched with respect to the "chunking" of information in collective discourse, what are the implications for global dialogue

Show/Hide AI response

Question: Rather than the somewhat arbitrary conventional approach to "chunking" topics for global dialogue -- possibly influenced by political "horse-trading" -- how might the process be facilitated by AI, given insights into the systemic implications of global configurations of issues beyond the capacity of collective memory in a dialogue event

Show/Hide AI response

Polyhedral configuration of AI responses in contrast to lists

Given the questionable systemic value of lists, the possibility of configuring AI responses as polyhedral configurations merits exploration (*Interactive Polyhedral Configuration of Preoccupations*, 2023).

Question: There is great irony to the probability that the preferred mode of AI output in response to any facilitation in the chunking process in support of more effective global dialogue would take the conventional form of nested lists. How would you contrast that tendency, given the earlier argument with respect to the polyhedral configuration of interwoven issues as a means of representing complex systems in a "globally" integrated manner

Show/Hide AI response

Question: Any aspiration to configure the seminal set of the UN's 17 SDGs as a polyhedron immediately frames the question of the memorability of polyhedra with particular forms of symmetry -- and hence the communicability of strategies articulated in this way, with consequences for their uptake and implementation. Is it possible that the SDGs were (perhaps inadvertently) a victim of political horse-trading, or might they reflect an unconscious collective intuition of a higher order of organization as a uniform polytope in 4D (or more)

Show/Hide AI response

A version of the following question was previously asked of ChatGPT and gave rise to an image of highly questionable value-- illustrating the current constraints on the development of that capacity (*Systemic relations and memorability of 4x4 arrays of cognitive modalities*, 2023).

Question: As a complement to producing a list of points, are you able to suggest a polyhedron onto whose vertices, edges, sides the SDGs might be mapped (eg Stella4D) -- especially such as to imply systemic connectivity through proximity. Can these be exported to an image generation application

Show/Hide AI response

The Schläfli polytope (or 2/21 polytope) suggested by ChatGPT is indicated by [Wikipedia](#) as having 1080 cells (not 17) with 27 vertices. When challenged, ChatGPT acknowledged the error and proposed alternatives not relevant to this argument

Question: When you produce a numbered checklist in any response, how do you determine a number that is "sufficient"

Show/Hide AI response

Question: If you do not generate images, are you able to suggest one or more polyhedra onto which a checklist response might be memorably mapped

Show/Hide AI response

Question: How might the articulated response use the polyhedral configuration to embody systemic relationships between the points -- information otherwise lost in a checklist

Show/Hide AI response

Question: Could a request be made for such a suggestion in response to any checklist. Is there a possibility of exporting the list to polyhedral software

Show/Hide AI response

Question: I use Stella4D. If you output the checklist response as a simple text file, the lines could be imported directly onto vertices, edges or faces for a polyhedron you might suggest. Depending on your knowledge of Stella4D, you would know the numbering used for the vertices, faces and edges of the polyhedron. Presenting your lists organized in that way would ensure that the mapping reflects the systemic connectivity rather than otherwise

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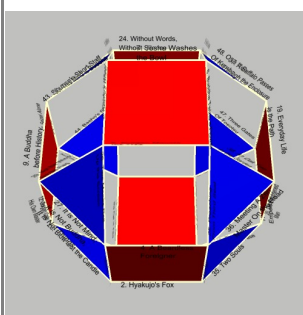
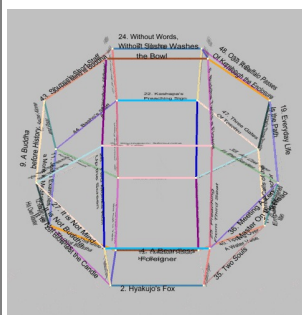
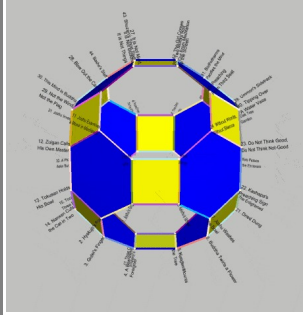
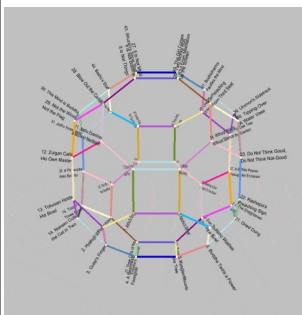
Question: Is there no logical convention for such numbering -- Stella4D aside, OFF files -- permitting you to build systemic connectivity and memorability into the mapping through contiguity and symmetry effects

Show/Hide AI response

Examples of cyclic 48-edged and 64-edged dynamic configurations

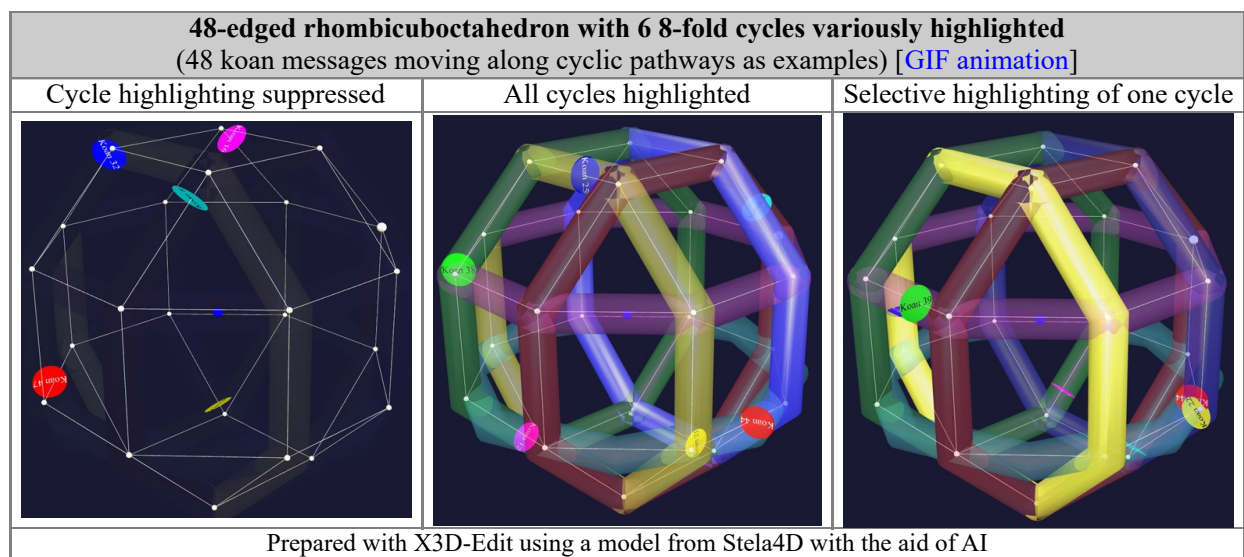
The following examples are an attempt to address the question of how to strike a balance between a representation of the complex of insights (relevant to the crisis of the times) and its comprehensibility, memorability and communicability.

Cyclic configuration offered by the 48-edged rhombicuboctahedron: Using the set of 48 koans and 47 micronutrients, the previous exercise explored the following mappings ([Rendering a 48-fold set of insights memorable through visualization](#), 2024). Two AIs responded there to the speculative challenge of suggesting correspondences between the two sets.

Indicative mapping of 48 koans and micronutrients onto Archimedean polyhedra			
48-edged Rhombicuboctahedron mapped with 48 koans		48-vertex Truncated cuboctahedron mapped with 48 koans	
			

Of further interest was whether the polyhedral articulation could be rendered of greater value in cognitive and learning terms, notably in relation to comprehensibility and memorability of a relatively complex pattern and its potential dynamics. As a computer programming exercise in 3D visualization, it was this further exploration which was undertaken with the aid of AI -- initially ChatGPT and subsequently Claude (Sonnet variant). As a learning exercise in its own right, the difficulties encountered are described below.

The result of the exercise took the following form for which the set of 48 Zen koans served as examples. The images offer a sense of the dynamics of 48 "insight messages" circulating in different cycles -- presented as "tunnels" following the geometry of the 48-edged rhombicuboctahedron. The animation successively highlights those tunnels, or eliminates them. The animation is an illustration of the mapping previously envisaged with respect to koans and micronutrients with implications for potential implications for international, interfaith, intercultural and interdisciplinary discourse (*Facilitating Global Dialogue with AI?* 2024).

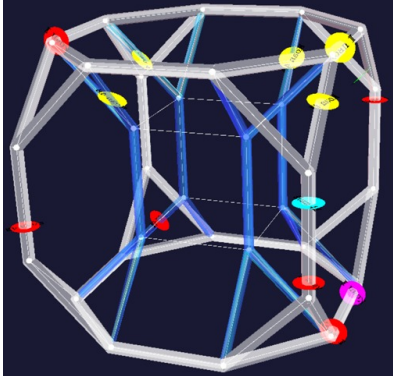
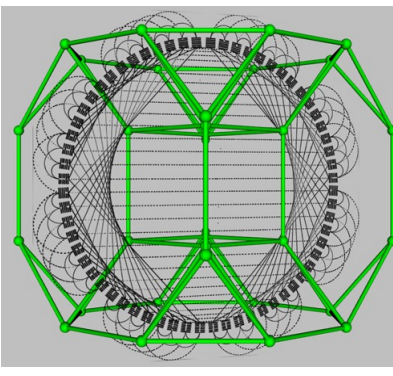
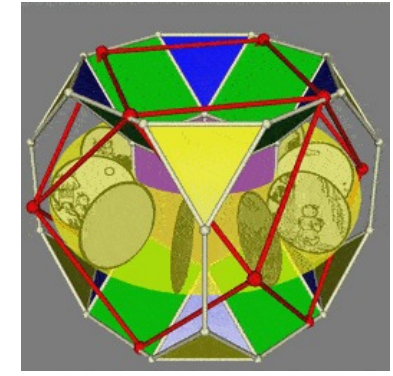


Cyclic configuration offered by the 64-edged drilled truncated cube: As a further exploration of the modelling exercise illustrated above, the approach was applied to the drilled truncated cube, given previous discussion of its value for mapping the 64 hexagrams of the *I Ching* and the genetic codons . (*Proof of concept: use of drilled truncated cube as a mapping framework for 64 elements*, 2015). Together with that mapping, the polyhedron could also be used for the 48 koans as presented above, and as previously discussed (*Relating configurative mappings of 64 I Ching conditions and 48 koans*, 2012).

In the animation exercises below the polyhedron is used as a framework to configure and suggestively render coherent the dynamic between complex arrays of insights.

- The animation on the left uses the design metaphor of the exercise with the 48-edged rhombicuboctahedron above. The 64 hexagrams are presented on disks circulating around the 6 external octagonal pathways of the polyhedron. The message on each disk changes to another hexagram at each bend in the octagonal pathway. The 48 koans are presented on disks circulating around 8 internal hexagonal pathways, with the message on each disk changing to another koan at each bend in the hexagonal pathway.
- The central animation rotates the traditional [Shao Yong circle of hexagrams](#) within the 64-edged framework, indicating the [transformations between the hexagram-encoded conditions](#), as discussed separately with more complex versions of the animation (*Framing Cognitive Space for Higher Order Coherence: toroidal interweaving from I Ching to supercomputers and back*, 2019)

- The animation on the right exploits the manner in which the polyhedral framework frames the toroidal pathway basic to the [ITER tokamak design](#) for a nuclear fusion reactor in which plasma is constrained to circulate by a configuration of magnets preventing its contact with its physical container (*Enactivating a Cognitive Fusion Reactor: Imaginal Transformation of Energy Resourcing (ITER-8)*, 2006). Speculation regarding the challenge of "cognitive fusion" and coherence is suggested by the use of the toroidal pathway to contain the classic set of Zen ox-herding images, as discussed separately (*Dynamic reframing of the cognitive challenge of memorable configuration*, 2023; *Zen of Facticity: Bull, Ox or Otherwise?* 2017). The dynamics of the toroid offer associations to the archetypal *Ouroboros*, as separately explored (*Integrating Ouroboros and Yi Jing as Fundamental Symbols in 3D*, 2021)

Examples with 64-edged drilled truncated cube (64 hexagram messages moving along 8-fold pathways cyclic pathways, 48 koan messages moving along 6-fold pathways)		
6 8-fold cycles and 8 6-fold cycles variously highlighted [GIF animation]	Rotation of Shao Yung circle of hexagrams [GIF animation]	Rotation of Zen ox-herding images
		
Prepared with X3D-Edit using a model from Stella4D with the aid of AI		

Of potential interest is the recent video by the Laboratory for Experimental Museology offering experience of a tokamak (Alfredo Carpinetti, *Fly Inside A Nuclear Fusion Reactor Thanks To This Spectacular Simulation*, *IFL Science*, July 2024).

Model communication: These visualization experiments with various design metaphors raise the question as to how they might be usefully communicated, given the following constraints:

- when printed, the dynamics are necessarily lost, and potentially the colours
- when presented on the web, a major challenge is associated with the norms and protocols of different platforms and browsers:
 - GIF animations, necessarily non-interactive and potentially of unacceptable file size
 - MP3 videos, necessarily non-interactive and potentially of unacceptable file size
- constraints are partially by-passed through use of [X3DOM](#) framing of the X3D files. This was only partially successful, despite AI assistance, requiring further testing to ensure disk movement (*Mapping Learning Pathway Dynamics in 3D with Rhombicuboctahedron*, 2024; *Mapping Learning Pathway Dynamics in 3D with Drilled Truncated Cube*, 2024)
- enabling users to download the X3D files to explore them with appropriate viewers, and potentially to modify them further. This possibility may be further constrained by the inability of some viewers to process some files.

Model development possibilities: As experiments, the animations are necessarily a "work in process" inviting further modification -- potentially by those accessing the X3D files -- since these can be made with a simple text editor. Possibilities by which the aesthetics may be improved, with or without greater expertise, include:

- changes of colour to the "tunnels", to the "disks", and/or to the text (or images) carried by the disks. Alternative sets of complementary colours could be chosen
- changes of transparency to the "tunnels", whether to render them more transparent or far less so.
 - the changes could be made dynamically and/or progressively, to highlight particular tunnels
 - the changes could be made such as to render particular tunnels invisible
- changes to the dimensions (size of disks, radius of edges) diameter of the tunnels, possibly selectively with respect to some
- changes to the polyhedral "skeleton":
 - increase/decrease the size of the spheres at the tunnel junction points
 - use different colours for the junction points
 - increase/decrease the diameter of the edges between the spheres -- possibly to that of the tunnels
 - increase/decrease the transparency of the spheres or edges
- changes to the relative rates of movement of the disks, whether for all of them or selectively; rotation of the whole structure -- or not
- the tunnels can be individually dissociated from the polyhedral configuration, whether selective and/or given a distinctive movement
- changes to the set (or clustering) of the text (or images) carried by the disks
 - with a sequential order in a given tunnel (Koan 1, Koan 2, etc)
 - clustering the messages thematically by tunnel -- with each tunnel then associated with a distinctive theme
 - use of images rather than text

With more skill, many of these changes could be incorporated as features of the model, allowing for user interaction rather than requiring changes to the model (with a simple text editor).

Considerable effort was invested in the variety of viewpoints from which the 3D configuration might be perceived -- a standard feature of 3D displays. A particular objective had been to offer a viewpoint which would track a disk as it moved along a pathway, enabling it to observe the switch in messages at each bend on a pathway. Although this is technically feasible, this was not successful -- despite considerable AI support.

Potential significance of the models: The design possibilities merit exploration as mnemonic preferences and triggers. Of particular interest is whether and how such animations clarify the challenge of comprehending complex sets of insights with respect to the strategic and cognitive coherence -- such as the 48 koans or the 64 hexagrams, or other 8-fold configurations (*Comprehensible Configuration of 8-fold Psychosocial Patterns in 3D*, 2024). The challenge might be compared to that of the use of circlelets of prayer beads (*Designing Cultural Rosaries and Meaning Malas to Sustain Associations within the Pattern that Connects*, 2000).

Curiously the polyhedra recall the design of wearable crowns and their embedded jewels, given all the symbolism with which they are associated with respect to governance (*Engaging with Globality through cognitive lines, circlelets, crowns or holes*, 2009; *Metaphorical Geometry in Quest of Globality -- in response to global governance challenges*, 2009). Related visualization experiments can be undertaken with respect to the complexity of the crown chakra (*Satellite Constellation and Crown Chakra as Complementary Global Metaphors?* 2020).

As stressed above, the animations suggest the dynamic relationships between multiple "ways of looking" -- especially given the traditional governance role of "the Crown" (*Interrelating Multiple Ways of Looking at a Crisis*, 2021). Of curious relevance to the 48-fold pattern, is that 48 is the number of great vows and promises made by Buddha to provide the ultimate salvation to countless beings. In Judaism, Torah wisdom is said to be acquired via 48 ways according to the *Mishnah*

Also intriguing is how any hypothetical "global brain" might be envisaged, especially given the possibility of interconnection of AIs (*Envisaging a Comprehensible Global Brain -- as a Playful Organ*, 2019; *Imagining a*

Dialogue transformation enabled by polyhedral transformation?

The models above have a striking similarity to one another in that they are both basically of cubic form. This frames the question as to how a complex global dialogue might be "reduced" from a 64-fold articulation, through a 48-fold articulation, to that of a simple cube. How can what is lost in the process be recognized? Alternatively how is a case to be made for "augmenting" a dialogue represented by mapping on a cube?

The variety of transformations of a polyhedron have long been a focus of study in geometry and associated disciplines. In the quest for fruitful global dialogue, little attention has been devoted to the transformations of dialogue -- especially as they might be potentially associated with their polyhedral mappings. Such a process is far better recognized with respect to the many "projections" by which the globe is mapped into 2D ([List of map projections](#)). Each is promoted as having relative advantages, in contrast with the disadvantages of others. This suggests the provocative question as to the variety of "projections" -- possibly analogous -- by which global dialogue might be mapped into 2D.

Dualization and stellation: It is intriguing to note, for example, that positioning a pyramid on each face of a cube can be understood as transforming it geometrically into its dual -- an octahedron -- provided the height of the pyramid ensures that its faces align with those of neighbouring faces (namely coplanar). This suggests a process whereby distinctive perspectives in a dialogue around an issue (represented by a face associated with those surrounding edges) might achieve a form of convergence above the centre of that face -- thus mapping "local" achievement of consensus (at least for that issue).

If that "local" process is achieved for all the faces, the cubic dialogue is effectively transformed into an octahedral "global" dialogue. Recognized as a transformation from a 6-fold articulation of issues (associated with a 12-fold pattern of perspectives), this is a transformation to an 8-fold pattern of issues with a 12-fold pattern of perspectives. Whether this constitutes more effective global dialogue is a matter calling for further exploration. There are a number of such processes whereby a polyhedron may be transformed into its dual -- or from it. Variously understood as "morphing", they raise the question as to how the morphing of dialogue might offer new insights into the challenge of global dialogue.

The process of [dualization](#) is related in a complex manner to that of [stellation](#)

Question: Given the forms of stellation distinguished by *Wikipedia*, it is not clear why dualization does not feature in that articulation in some way

Show/Hide AI response

Question: It is intriguing that augmenting a polyhedron with a pyramid of appropriate height results in formation of its dual

Show/Hide AI response

Question: The argument applies usefully to placing pyramids on external surfaces, but how might it apply if the pyramid is placed on the internal faces -- the peak towards the centre. What is framed thereby, if anything

Show/Hide AI response

The response evokes the question of the locus of consensus as implied by dialogue mapping processes. A degree of "superficial" consensus may be recognized when the perspectives of edges around an issue frame a central vertex externally -- an issue specific "consensual perspective". More intriguing is when those same edges frame a perspective internally -- with the vertex approximating to some degree that of the centre of the polyhedron as a whole. As an approximation that global centre centre is elusive -- transformation through it may well continue to a condition which could be explored as "overshoot". The transformations between these conditions could be explored as a cycle, as illustrated by the following animation (below left).

The rotating animations below are those of phases in the complete cycle showing successively the configuration when the height of the pyramid is increased externally or internally (towards and thru the centre) in relation to the cube sides. Appropriately recognized is the 45 degree condition, whether externally (giving rise to an octahedron) or internally (where the pyramid peaks are all coincident at the centre). Of speculative interest, given the ancient Egyptian preferences (51.84°, Great Pyramid angle, or 53.13°) is the internal reflection of that external pyramid, then potentially creating an octagonal "chamber" as a consequence of "overshooting" the centre..

Animations of height of 6 pyramids placed on 6 cube surfaces -- indicative of elusive quest for consensus in dialogue locally and globally, externally and internally				
Animation of complete cycle (not rotated)	External past optimal ("overshoot")	External 45% ("optimal") (coplanar forming octahedron)	External 30% ("sub-optimal")	0% (Flat on cube surface)
Internal -30% (towards central consensus)	Internal -45% ("optimal") (global "unity" and "consensus")	Internal thru centre -50% ("reflection of Egyptian option")	Internal thru centre ("peaks touching faces")	Internal thru centre ("overshoot")
Animations prepared with Stella4D				

Question: The clarification has implications if the polyhedron is used for mapping purposes -- with each edge associated with a distinctive perspective framing an issue (the face). The pyramid associated with increasing the height outwards elicits a vertex (of the dual) indicative of a form of consensus between the edges -- although further increase reframes disparately the associated global discourse (as stellation). Increasing the height on the inner surface suggests approximation to global consensus -- which may well not be achieved, especially if the increase goes beyond (through) the centre, an overshoot.

Show/Hide AI response

Conway polyhedral transformations: Dualization is only one of a set of polyhedral transformations defined by the [Conway polyhedron notation](#). Their relevance to dialogue is discussed separately ([Harmonizing dissonance via polyhedral symmetry-preserving operations](#), 2024; [Operations transforming polyhedra as modelling transformations of dialogue coherence](#), 2021). These frame questions regarding [Encoding Coherent Topic Transformation in Global Dialogue](#) (2021), and specifically the memorability of cognitive implication of what are termed symmetry-preserving operations on polyhedra, as variously researched -- but with little concern for their implications for dialogue:

- Heidi Van den Camp: *The Effect of Symmetry-preserving Operations on 3-Connectivity* ([arXiv:2301.06913](#), January 2023)
- Pieter Goetschalckx, et al: *Generation of local symmetry-preserving operations on polyhedra* (*Ars Mathematica Contemporanea*, 18, 2020, 2)

- Gunnar Brinkmann, et al: *Preserving and Increasing Symmetries of Polyhedral Maps* (MATCH Communications in Mathematical and in Computer Chemistry, 2024)

Question: Given any use of polyhedra for mapping dialogue, could you comment on the relevance for global dialogue of the symmetry-preserving operations framed by the Conway polyhedron notation

Show/Hide AI response

Challenge of communicating with AI as a valuable learning metaphor

The following is a description of the process of generating the 3D animated models with the aid of AI. Given the unexpectedly lengthy nature of the process, it is especially valuable to understand the contextual constraints. Despite a degree of familiarity with 3D modelling using the [X3D-Edit](#) application, there are aspects of it for which the assistance of AI was believed to be valuable and more efficient -- in contrast with struggling to achieve geometric and animation results manually. However, in summary, the following difficulties could be compared to the classic challenge of endeavouring to describe over the telephone the detailed design of a spiral staircase to someone completely unfamiliar with that structure.

The first part of the exercise proved to be very straightforward, namely generating a rhombicuboctahedron (or subsequently a drilled truncated cube). Although this is a relatively complex structure, the [Stella4D](#) application enables that polyhedron to be easily generated in [VRML](#) format -- from which it can be easily converted into X3D format by a feature of the X3D-Edit application. The focus of the following process was on the 6 octagonal circuits of co-linear edges which form that polyhedron. The first challenge was the configuration of an octagonal "tunnel" to encase one such circuit. This is also relatively simple using the coordinates of the relevant vertices on the edge circuit of the polyhedron. The tunnel can then be extruded by X3D-Edit -- effectively as a toroid. The 5 other tunnels could be similarly made.

A first challenge submitted to AI was the relative orientation of the 6 tunnels, without extruding each separately -- since each is a simple geometric rotation and/or translation of the others. Note that, as one of the simplest processes in 3D geometry, this could have been achieved manually, but the choice was made to have these generated by AI -- for simplicity and because of its implications for the subsequent issues. The challenge of describing what was required in text messages, and correcting misunderstandings, proved to be unexpectedly lengthy. In short the decision was made to make the very final adjustments manually -- the operation initially avoided.

Combined with this focus was the need to have a disk travelling along each tunnel within it (as a moving cross-section) -- namely 6 such disks. Each disk was required to carry a "message" which would change at every bend in the octagonal tunnel -- switching from Message 1 to Message 2, through to Message 8 -- namely a total of 48 "messages". This could be achieved relatively easily, although a major difficulty with AI was keeping the disk face-on (rather than edge-on or tumbling) as it moved around the tunnel. The difficulty was compounded by deriving generic solutions for all 6 tunnels.

A further objective, as noted above, was to control the view of the disk (with its message) as it moved along the tunnel:

- This initially implied a "viewpoint" (a standard feature of X3D) which would move with the disk at a distance from it along the tunnel. At each octagonal bend in the tunnel the view and its disk (with the changed message) would move down the next segment. Combining moving view and the orientation of the disk proved to be a major challenge in the interaction with AI.
- As a potentially more viable alternative, it was finally decided to switch to a static viewpoint at each bend in the tunnel focused on the disk (and message) moving away from it down the tunnel (or possibly towards it, as an alternative). The viewpoint would switch dynamically from one bend to another in the tunnel. The view/disk relationship was seen as indicative of the perceptual challenge of

engaging with any learning message.

- A final option -- which proved more viable -- was to offer a set of viewpoints variously focused on disks and their movement

These considerations were a prelude to any focus on the aesthetics of the model -- complementary colours, speed of movement, specification of the 48 messages in the various tunnels, etc.

As an experimental method of question and response, it is important to note that AI responses deemed inadequate can be readily challenged through an iterative process. This was only used to a limited extent, except during the program development noted below. Readers are obviously free to repeat the questions and engage in an iterative process. AIs have not yet been adapted such as to challenge questions in any way, although the responses may be qualified with reservations.

The experimental interaction with AI in this period, and the unusual presentation of AI responses as in this document, can be understood as occurring in a "honeymoon period" offering various windows of opportunity prior to their future closure under financial, marketing and agenda constraints. The probable future deterioration of AI opportunities could be usefully compared to "[enshittification](#)", already recognized in relation to AI. It is defined with multiple examples by *Wikipedia* as:

Enshittification is a pattern where online services and products experience a decline in quality over time. It is observed as platforms transition through several stages: initially offering high-quality services to attract users, then shifting to favor business customers to increase profitability, and finally focusing on maximizing profits for shareholders at the expense of both users and business customers. This process results in a significant deterioration of the user experience.

The current appeal of that strange term is consistent with a more general argument regarding metaphors crucial to sustainability and the crisis of the times (*Mysterious Complementarity between Capitalism and Arsenalism*, 2020).

Learnings from interaction with AI in program development

During the implementation process, over a quite unexpected number of hours (and days), learnings from the interaction with AI (at its current state of development) included:

- It is obvious that text descriptions of orientations and movement in 3D are exceptionally problematic to communicate, despite apparent understanding and assumptions in that regard by AI. This is understandable in that the AI is holding the configuration in memory-- briefly -- in a manner contrasting fundamentally with text descriptions
- AIs may well be prepared to generate extensive snippets of code (very conveniently and remarkably, if they work) which it would be very time consuming to produce manually, especially where the skill to do so is minimal
- AIs are extremely "patient" in engaging with iterative processes towards a desired solution -- especially the complex debugging that may be required (as with adaptation to an X3DOM environment). It is however the case that such iteration may well correspond to the iterative approach which might otherwise be required without using AI. The question is then how well-informed is any new trial in that process and at what point would reverting to a non-AI approach be more appropriate - - if the expertise was available at an acceptable rate.
- It was striking to note that use by the AI of an iterative approach could seemingly become circular, namely after trying A, B, C, and D, it appeared to assume that A might be appropriate again -- raising questions as to whether the AI retained any memory of approaches that had not worked.
- Limited continuity: As noted by one AI: *I don't retain information from previous conversations or even from earlier in the same conversation if it's not included in the current context.* Also: Lack of

continuity: *Starting a new conversation means losing the entire context of the previous discussion, which can be frustrating and time-consuming when working on ongoing projects or debugging sessions.*

- Exceptionally striking, when an AI generated an extensive snippet of code, was the mistakes it might make (of which there are indeed warning messages regarding the absolute necessity for vigilance). The AI is typically "apologetic" and "appreciative" when these are signalled. However much more curious (when similar snippets are generated) is the manner in which the identical error may be made later -- indicating that the AI is not learning from feedback regarding its mistakes.
- In an effort to resolve the moving viewpoint feature, the AIs advocated use of supplementary Javascript functions (in separate files to the X3D model) -- one per tunnel. Much effort was devoted to debugging these features in an approach that was finally abandoned -- because of the circular repetition of unsuccessful solutions with seemingly little prospect of convergence of any final convergence. Impressive though they were, the final form of the Javascript files used techniques which were far beyond the comprehension required for the X3D model alone. Had they worked as envisaged, this would have been indicative of total dependence on AI competence -- "beyond human comprehension".
- A particular concern -- over an extended period of interaction with AI -- was continuity. This could be disrupted by loss of network connectivity, computer shutdown (for whatever reason), AI outage, browser tab closure (for whatever reason), or message capping (constraints on the number of interactions before reset). Some such losses required that the complete design challenge be re-explained because no memory of it is retained by the AI -- including learnings from trial and error.
- Less evident was the explanation for irritating delay in the ability of the AI browser prompt window to accept comments on AI suggestions, associated with lags in ability to scroll the AI responses generated. Whilst this may in part have been due to usage of the AI server, it may also have been due to the length of the interaction held in memory by the AI (including shared files), issues with the local computer browser, or malware. As noted by one AI: *There's a limit to how much conversation history can be included in each interaction, which can make long, complex discussions challenging.*
- A notable failure related to version control -- given that an almost working model could be totally degraded by a minor improvement -- without the ability to revert
- Potentially especially irritating were occasional AI requests to restate a design objective which had been previously articulated and held to be comprehensible

The 3D model envisaged resulted from parallel interactions with ChatGPT and Claude, as noted above. The first stage in development of the model itself was undertaken with ChatGPT until the circularity of non-covering trial-and-error became apparent. The achievements to that point were then presented to Claude with some success. However shared comprehension of the axial 3D orientations resulted in a request from Claude for an image of the configuration for confirmation. As noted above, completing the configuration of 6 tunnels was finally adjusted manually. In agreement with Claude, the use of associated Javascript files:

- was initially implemented with 6 separate Javascript files (one per tunnel pathway to manage disk messages and orientation)
- abandoned in favour of an X3D approach alone (as simpler). This was not successful, despite the investment of many hours in the process, achieving a solution proved elusive with AI.
- reversion to an earlier "almost perfect" model with Javascript files, abandoning the more ambitious viewpoint objectives -- whether dynamic or static.
- consolidation of all Javascript functions into a single separate file. For viewing in 3D, this proved to be operational in FreeWRL only -- and not in H3DViewe,r as with the unconsolidated variant

Question: In a project involving development of a 3D polyhedral model using X3D with you, a major difficulty was encountered in enabling dynamic viewpoints to move through the configuration. This was initially implemented with 6 separate Javascript files (one per tunnel pathway to manage disk messages and orientation), then abandoned in favour of an X3D approach alone (as simpler). This was not successful,

despite the investment of many hours in the process, achieving a solution proved elusive. Reversion to an earlier "almost perfect" model with multiple Javascript files, abandoning the more ambitious viewpoint objectives -- whether dynamic or static. By consolidating all Javascript functions into a single separate file, this proved to be operational in FreeWRL only -- and not in H3DViewer as with the unconsolidated variant. Do you have any comment on this process, given the time invested in trial-and-error with your assistance

Show/Hide AI response

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