



# laetus in praesens

Alternative view of segmented documents via Kairos

6 September 2021 | Draft

## Enabling the "New Normal" through "Renormalization"

### Space-Time crystals as metaphorical clues to global governance of the surreal

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#### Introduction

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References

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## Introduction

The pandemic and its consequences have highlighted widespread concern with the increasingly elusive possibility of conditions returning to "normal". This is now framed as "the light at the end of the tunnel". Recognition that it is becoming unreasonable to expect to return to that old "normal" -- whether or not that is desirable -- discussion has however shifted to understanding the nature of the so-called "[new normal](#)" (*The New Normal – what needs to be different than before?* UNESCO Futures of Education; *The New Normal and Coronavirus*, Johns Hopkins Medicine; Hans Eicholz, *Defining the "New Normal" after Covid-19 will Require More Just Scientific Expertise*, EconLib; *Covid-19: What does the 'new normal' mean?* The Star, 21 May 2020; *This Week in the New Normal*, OffGuardian, August-September 2021).

The radical changes associated with the strategic responses to the pandemic have also been seen as the opportunity for a [Great Reset](#), as explicitly promoted by the World Economic Forum and its constituency. This agenda has aroused predictable criticism from those suspicious of an underlying agenda of the elites associated with that reset -- namely those potentially configured in the World Social Forum. The question is how any "new normal" might be related to the paradigm shift of any "reset" -- whatever form it takes.

Global governance of the multiplicity of crises -- at this time and as foreseen -- has however become increasingly problematic, if not chaotic. Given the uncertainty with which many are now expected to live, it can be readily experienced as surreal (*Surreal nature of current global governance as experienced*, 2016). It could be said that [surrealism has become a defining characteristic of international politics](#), if only to some degree (as argued on a website *Surrealism in Politics*).

The unprecedented global consensus with regard to the strategy of universal vaccination can indeed be optimistically seen as a "silver bullet" through which a return to normality will be enabled. Whether this is more than a pious hope, remains to be seen -- especially given the emerging shift in the strategic goal posts to the necessity of "learning to live with COVID", as with flu (Patrick Durkin and Finbar O'Mallon, *Why now is the time to learn to live with COVID-19*, Financial Review, 19 August 2021; Jamie Ducharme, *Why COVID-19 Might Be Here to Stay -- And How We'll Learn to Live With It*, Time, 12 August 2021; Peter Lewis, *Morrison's bold new 'Living with Covid'™ pitch sounds breezy, but the devil is in the detail*, The Guardian, 31 August 2021).

It is however becoming clear that there are few clues to a new mode of global governance to address the divisive polarization by which civilization is now characterized. This polarization is variously framed in terms of right-or-left, positive-or-negative, included-or-excluded, good-or-evil, true-or-false, right-or-wrong, and "headless hearts"-or-"heartless heads" -- with such distinctions conflated according to circumstance. The capacity to transcend such polarization is itself problematic, to the very limited extent that it is explored.

In the meantime people could be said to be obliged to adapt -- however they can -- to the polarization and the surreal in ways which tend

to defy description. They are essentially experiential, as implied separately (*Living with Incomprehension and Uncertainty: re-cognizing the varieties of non-comprehension and misunderstanding*, 2012; *Living as an Imaginal Bridge between Worlds: global implications of "betwixt and between" and liminality*, 2011). Reality can no longer be said to "make sense". Coherence has become elusive -- although it is claimed that "everything is connected to everything", if only by the so-called **Internet of Things** (*Engaging with Elusive Connectivity and Coherence: global comprehension as a mistaken quest for closure*, 2018).

The following argument explores clues offered by a recent major breakthrough with regard to fundamental order, as framed by so-called **space-time crystals**. As a highly obscure preoccupation of mathematicians, the potential significance of the breakthrough with regard to governance of polarization can only be explored (and comprehended) as a metaphorical clue. It is a development beyond the familiar **crystals** in space via the known (but highly unfamiliar) **time crystals**.

A time crystal is held to be a quantum system of particles whose lowest-energy state is one in which the particles are in repetitive motion. Some implications of the quantum paradigm for governance have been explored by Alexander Wen dt (*Quantum Mind and Social Science: unifying physical and social ontology*, 2015; *The mind-body problem and social science: motivating a quantum social theory*, *Journal for the Theory of Social Behaviour*, 48, 2018, 2).

The familiar crystals of space are of course widely valued as symbolic of transcendent order -- as with precious stones, and especially the diamond (*Gemstones as an accessible metaphoric exemplar of the dynamics of coherence*, 2002). In the spirit of science fiction, the notion of **Spaceship Earth** has long been evoked as offering strategic clues. This has since evolved into the possibility of a "timeship" by which the universe might be travelled. This too suggests an alternative strategic possibility -- one of engaging otherwise with time (*Timeship: Conception, Technology, Design, Embodiment and Operation*, 2003; *Embodying a Timeship vs. Empowering a Spaceship*, 2003; *Strategic Embodiment of Time: configuring questions fundamental to change*, 2010).

Reference to "space-time crystals" therefore has the great advantage of provoking the imagination and evoking connotations from science fiction, fantasy and myth. They suggest the possibility of a meaningful quest, as is evoked by reference to an archetypal riddle, a Gordian Knot, the Holy Grail, or the mythical Conference of the Birds (*Global Governance as a Riddle*, 2018; *In Quest of Sustainability as Holy Grail of Global Governance*, 2011; *Mapping grossness: Gordian knot of governance as a Discordian mandala?* 2016; *Insights from the Conference of the Birds?* 2012). However even the possibility of any meaning remains challenged by the sense of pointless nothingness, exemplified by the current chaotic reversal in Afghanistan after two decades (*Emerging Significance of Nothing*, 2012; *¿ Embodying a Way Round Pointlessness ?* 2012).

The argument here can be introduced by calling into question the use of "global" as a metaphor considered appropriately descriptive of a civilization bound to a spherical planet. This can be contrasted with continuing preoccupation of cosmologists with the **shape of the universe**. Extreme hypotheses are defined in terms of its "curvature": whether zero (namely flat), positive (namely spherical), or negative (namely hyperbolic). This suggests the unexplored question as to the "shape of society" or civilization -- "flat" being currently deprecated in favour of "global", with little attention to hyperbolic. It is however the unusual nature of hyperbolic which is potentially most relevant to encompassing the current experiential sense of surreal -- and the existential challenge of otherness and **alterity**, especially when the subject of "hype".

Especially problematic in the case of the hyperbolic form is the sense in which it indeed embodies visually what is experienced as polarization. The topology of that form divides into two separate parts which seemingly never touch. It is however fundamental to the combination by physics of three-dimensional Euclidean space and time into a four-dimensional manifold -- known as **Minkowski space-time**.

The breakthrough regarding space-time crystals offers a means of transforming that ("incoherent") hyperbolic form (back) into a coherent spherical form, through a mathematical process termed "**renormalization**". Of particular importance to the breakthrough is a special treatment of the "negative" by which the hyperbolic is otherwise distinguished mathematically.

In the quest here for metaphorical clues, it is the process of renormalization which is suggestive of the nature of the possible transition to a "new normal" -- effectively a "new global". As "new", of particular relevance is the manner in which this holds, if only by implication, the hyperbolic form embodying the paradoxical sense of polarization -- and its **hyperreality** as experienced.

The argument which follows is necessarily speculative since the subtleties of the mathematics are beyond the comprehension of most, and especially this author. The focus here is on the familiar visual forms by which the topological transformation might be represented -- and which are far more readily comprehensible.

As a speculative exercise, however, the coherence of the argument derives from a degree of "aesthetic licence". This would appear to be justified in a period in which physics has otherwise little to offer with respect to more appropriate modes of governance -- consistent with the unity and coherence variously upheld as fundamental to transcendence of polarization. Little is to be expected from physics in that regard, despite the major warning offered by the IPCC to the forthcoming **COP-26 UN Climate Change Conference** in Glasgow (*Sixth Assessment Report, Climate Change 2021: The Physical Science Basis*, August 2021).

## **Topological challenges to the geometry of globalization and polarization**

The following considerations derive from reflection on the widespread use of geometrical metaphors in support of strategic thinking and governance (*Metaphorical Geometry: in quest of globality in response to global governance challenges*, 2009; *Geometry of Thinking for Sustainable Global Governance*, 2009).

**From flat to spherical?** As experienced in daily life, it is appropriately assumed that the Earth is flat. Urban, regional and infrastructure planning (and that of many countries) all work with that assumption. Despite the heliocentric struggle of Galileo centuries ago, the daily weather forecasts of meteorologists reinforce that perception with their indication of "sunrise" and "sunset". The point is otherwise made

by the award-winning argument of [Thomas L. Friedman](#) (*The World Is Flat: a brief history of the Twenty-first Century*, 2005).

At a different scale, and from a different perspective, it is widely recognized that the Earth is spheroid. This is not a common experience, however much a degree of curvature is perceptible from high-flying aircraft or from orbiting space craft -- and their photographs. It is far from clear how people can understand living on a sphere, despite explanations regarding the changing seasons and the implications of time zones for travellers and use of telecommunications. Few could "prove" they are living on a sphere or could attribute particular meaning to doing so. The claims of the [Flat Earth community](#) are nevertheless deprecated by science and by those promoting the need to [think globally, act locally](#) (*Irresponsible Dependence on a Flat Earth Mentality -- in response to global governance challenges*, 2008).

Curiously the point is made otherwise through the extension of plans appropriate to assumptions of flatness in urban planning to those plans based on spreadsheets through which more complex strategies are organized. There is little question as to whether forms of accounting based on the sphere would be more appropriate to global governance (*Spherical Accounting: using geometry to embody developmental integrity*, 2004).

In a period in which there is a strong tendency (from a [cancel culture](#) perspective) to reframe as a "myth" anything held to be a misconception from an authoritative perspective -- even misinformation when propagated in any way. There is the curious danger that the manner in which the Earth is indeed appreciated as "flat" may itself be deleted from authoritative sources of information with which it is not permissible to disagree. This may well impose the obligation to cease reference to "sunrise" and "sunset", despite their aesthetic value to poets over millennia. How the myth of flatness is then to be deprecated in urban planning remains to be seen. The dilemma has been raised with respect to vaccination (*Comparability of "Vaxxing Saves" with "Jesus Saves" as Misinformation? Problematic challenge of global discernment*, 2021).

The challenging value of myths with respect to the space people inhabit may be clarified otherwise through the teasing remark of the eminent social scientist, [Kenneth Boulding](#):

Our consciousness of the unity of self in the middle of a vast complexity of images or material structures is at least a suitable metaphor for the unity of a group, organization, department, discipline, or science. If personification is only a metaphor, let us not despise metaphors -- we might be one ourselves. (*Ecodynamics: A New Theory of Societal Evolution*, 1978, p. 345).

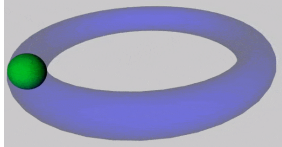
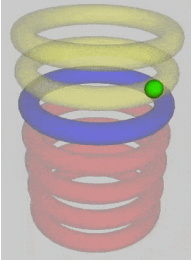
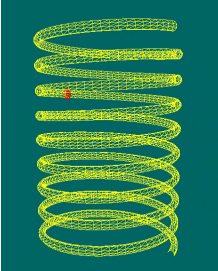
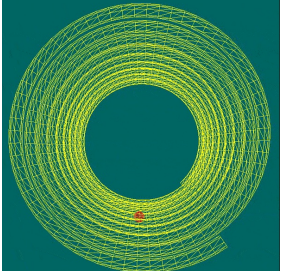
**Toroidal?** At yet another scale, and from another perspective, the Earth is understood to move around the Sun -- effectively along an annual circuit which could be described as a torus. Other than significance given to the changing seasons, few would claim to be living on a torus -- despite the reality of that annual dynamic. Both science and science fiction have extensively explored the possibility of dwelling on a torus (or within it) in the light of a variety of designs. An extensive indication of both is provided by [Wikipedia](#) (*Tori and annular habitats*). These have contributed to imaginative reflection on the matter.

It could be emphasized that **whether flat, global or toroidal, each understanding has relevance but is clearly based on a degree of illusion**. Each perspective can be variously challenged from the others -- especially in experiential terms. Rather than the prevailing emphasis on global, as basic to globalization, there is however a case for exploring the possible implications for understanding life on a torus, as argued separately (*Imagining Toroidal Life as a Sustainable Alternative: from globalization to toroidization or back to flatland?* 2019). Whereas the Earth as sphere embodies time in one way, Earth as torus does so in another.

That argument can be usefully clarified visually. The animation on the left below places the emphasis on an annual cycle -- in the form of a torus -- through which a globe circulates. This is a conventional view. The question is whether one identifies more with the moving sphere on which one can imagine one lives, or the year as a whole as it is experienced. A point to be made is that it is somewhat of a cognitive juggle (or struggle) to switch from the Flat Earth perspective from a particular location on the globe to a sense of the spherical nature of that globe and its revolution around the Sun. Is it more of a struggle to imagine the annual torus? Is the juggling equivalent in both cases? Does focusing on the torus "bypass" the struggle to focus on the globe revolving along its toroidal pathway?

A succession of years could then be understood as a stack of toroidal pathways -- from the past to the future. The central animation offers a suggestion of this -- without offering any indication of how high the stack should be considered to be, namely how many toroidal annual cycles need to be stacked in this way. Clearly an elderly person would be represented by a high stack.

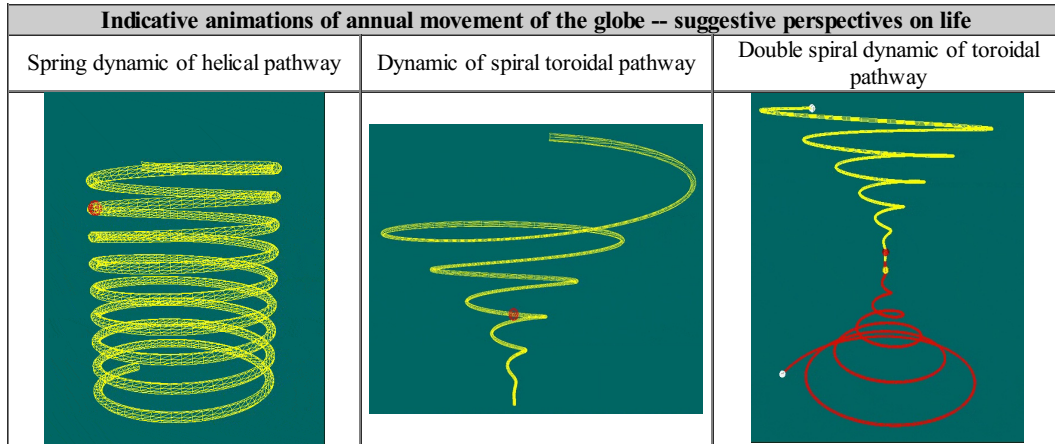
The animation on the right offers a sense of the link between one year and the next since the toroidal pathways are continuous rather than separate -- other than through any claim to the distinction between one year and the next.

Indicative animations of annual movement of the globe -- suggestive perspectives on life			
Heliocentric annual toroidal pathway	Succession of annual toroidal pathways	Helical annual pathway	Helical annual pathway
			

The animation on the right below could be understood as taking the form of a spring, more densely or more loosely packed -- as

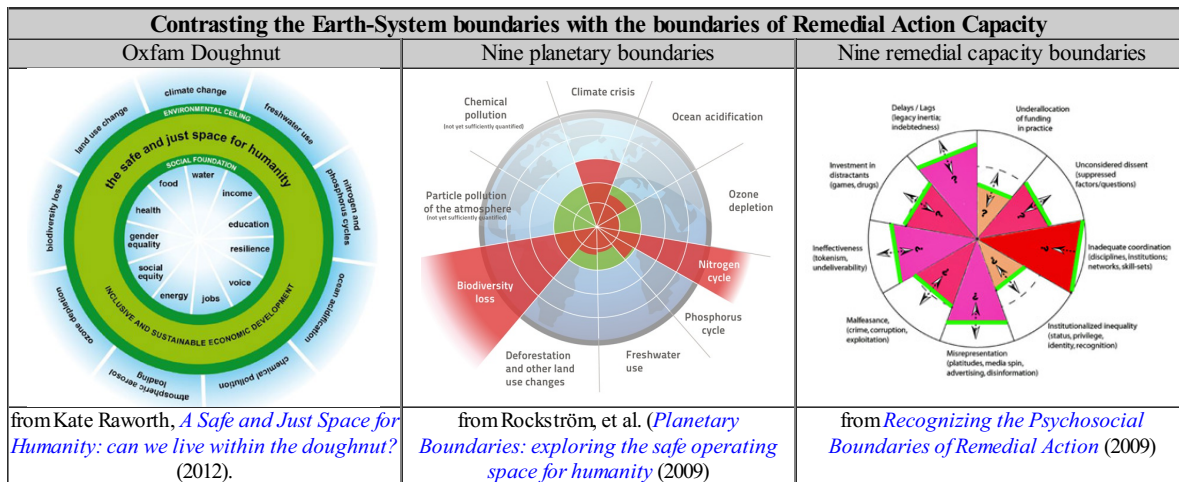
suggested by the animation below left. This invites reflection the potential cognitive significance of seeing a sequence of years as more compact or more loose -- or even that there is a subtle experience of "bounce" or "spring" in one's life.

The succession of years can be considered quite differently, namely as a spiral -- of narrow radius in the early years to a far wider radius in later years. Whether experience shifts from "down" to "up" (as shown), or from "up" to "down", may be an individual matter. Possibly there could be alternation between the two worldviews, or one could be a shadowy reflection of the other, as might be suggested by the animation on the right below.



**Global models:** Rather than the possible space-time contexts of civilization, indicated above, the sense of "global" can be recognized in the quest for a cognitive global model, with all the biases this may imply (*Misleading Modelling of Global Crises: unquestioned bias in authoritative representations of reality by science?* 2021). Irrespective of the "shape of the physical universe" on which cosmologists focus, the question is then how to consider the possible "shape of the cognitive universe" which people and society may inhabit in some way.

The relevance of a toroidal perspective can for example be associated with the argument for a so-called **Doughnut economic model** (Kate Raworth, *Doughnut Economics: seven ways to think like a 21st-Century economist*, 2017). Although statically depicted in 2D (despite the name), this can be variously explored (*Exploring the Hidden Mysteries of Oxfam's Doughnut: recognizing the systemic negligence of an Earth Summit*, 2012; *Recognizing the Psychosocial Boundaries of Remedial Action*, 2009)



The model can be complexified by allowing for the presence of others who share one's experience to a degree -- friends, relatives, or colleagues, as suggested by animations in the commentary from which they derive.

There is also a case for recognizing that the credibility of a model may derive in part from the metaphors by which a challenge to governance is framed -- whether with the depicted form of the coronavirus or the spiral form of hurricanes, for example (*Coronavirus -- Global Plan, Doughnut, Torus, Helix and/or Pineapple? Zome modelling dynamics allowing for uncertainty in perception of order in governance?* 2020; *Psychosocial Learnings from the Spiral Form of Hurricanes: Implications of the triple helix and the 3-fold triskelion as "cognitive cyclones"?* 2017; *Spike-endowed Global Civilization as COVID-19: humanity "bristles" as the world "burns"*, 2020).

## Space-time crystals as fundamental to comprehension of global order

As suggested above, a recently presented innovation in the modelling of relativistic geometry merits careful consideration with regard to a more fruitful conception of global order.

As introduced by Venkatraman Gopalan (*Relativistic spacetime crystals, Acta Crystallographica (Foundations and Advances)*, A77, 2021, pp. 242–256)

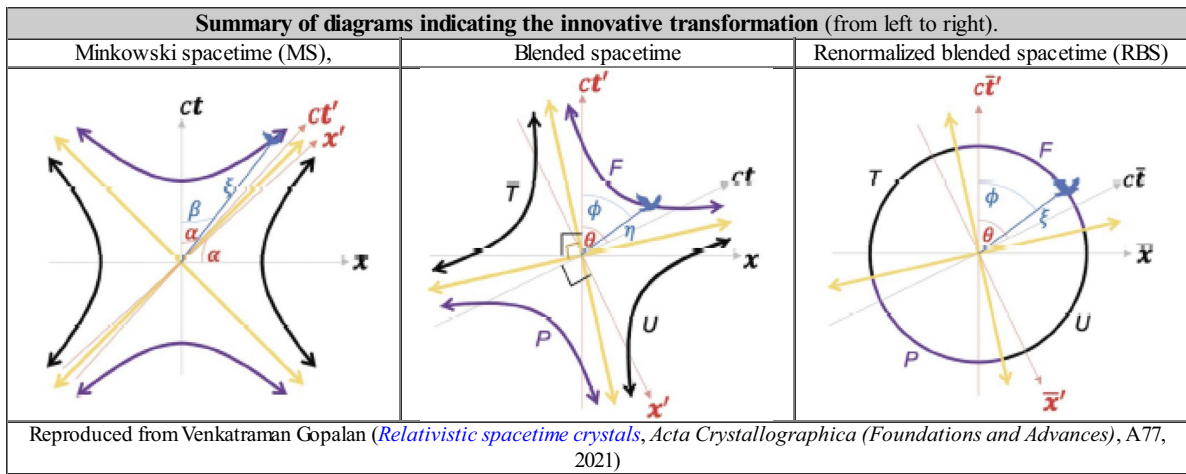
Periodic space crystals are well established and widely used in physical sciences. Time crystals have been increasingly explored

more recently, where time is disconnected from space. Periodic relativistic spacetime crystals on the other hand need to account for the mixing of space and time in special relativity through [Lorentz transformation](#), and have been listed only in 2D.

This work shows that there exists a transformation between the conventional [Minkowski spacetime](#) (MS) and what is referred to here as renormalized blended spacetime (RBS); they are shown to be equivalent descriptions of relativistic physics in flat spacetime. There are two elements to this reformulation of MS, namely, blending and renormalization.

When observers in two inertial frames adopt each other's clocks as their own, while retaining their original space coordinates, the observers become blended. This process reformulates the Lorentz boosts into Euclidean rotations while retaining the original spacetime hyperbola describing worldlines of constant spacetime length from the origin. By renormalizing the blended coordinates with an appropriate factor that is a function of the relative velocities between the various frames, the hyperbola is transformed into a Euclidean circle. With these two steps, one obtains the RBS coordinates complete with new light lines, but now with a Euclidean construction.

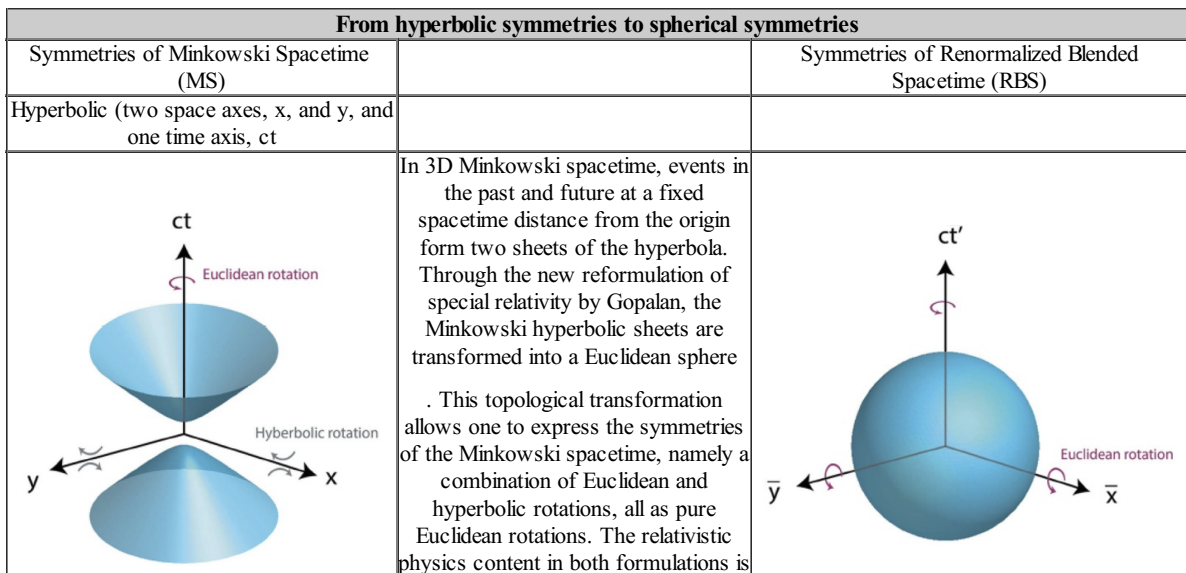
The argument is summarized by the following set of diagrams in 2D. Especially noteworthy in the transformation from a hyperbola (negative curvature) to the arc of positive curvature between the central and right-hand diagrams. Understood in 3D, rotation of the hyperbola engenders a hyperboloid (in the central diagram), whereas rotation of matching arcs engenders matching segments of the surface of a sphere (in the right-hand diagram).



In a comment on this new perspective by Martin Bojowald and Avadh Saxena ([From crystal color symmetry to quantum spacetime](#) *Acta Crystallographica (Foundations and Advances)*, A77, 2021, pp. 239-241), the authors note:

A hallmark of important new results is their potential applicability in various contexts, a distinguishing feature that applies to Gopalan's construction. The hyperbolic geometry suitable for spacetime, introduced by Hermann Minkowski (1908), may be viewed as a modification of Euclid's geometry in which the time direction contributes by a negative squared term in the Pythagorean theorem, relating the side lengths of right-angled triangles. Although a single minus sign might seem innocuous, the counter-intuitive nature of this non-Euclidean geometry is well documented by the existence of several paradoxes in special relativity. While they can formally be resolved by doing suitable calculations in Minkowski geometry, they leave a nagging aftertaste of something not being quite right.

The following images, comparable to those of Gopalan, are presented by the authors to clarify the distinction.



equivalent.
Figures courtesy of Hari Padmanabhan (The Pennsylvania State University, USA)

The authors conclude with an extensive discussion of "flipping the minus sign" in quantum spacetime. It is the implications of this insight of Gopalan which is explored below in relation to the vexatiously divisive challenge of psychosocial polarization.

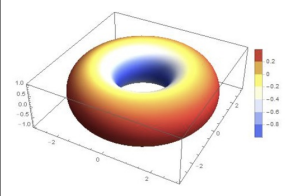
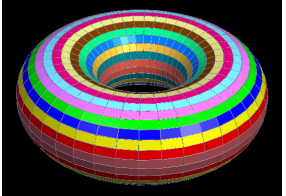
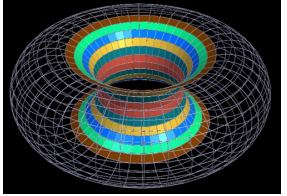
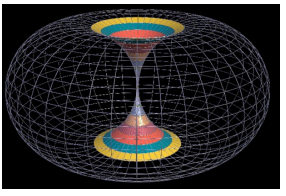
As noted by Gopalan, the RBS point and space groups in various dimensions can be enumerated in a manner consistent with their mapping to the well known space crystal groups. This is relevant to the potential choice of polyhedra of value to strategic mapping, as discussed further below (*Identifying Polyhedra Enabling Memorable Strategic Mapping: visualization of organization and strategic coherence through 3D modelling*, 2020).

## Via sphere, torus and hyperbola to space-time crystals of governance?

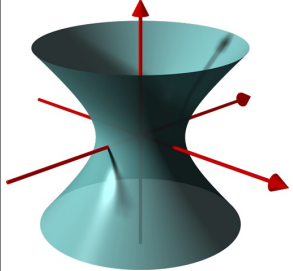
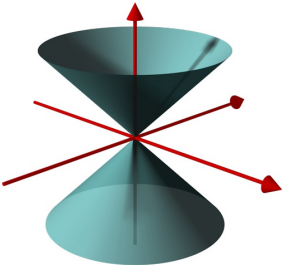
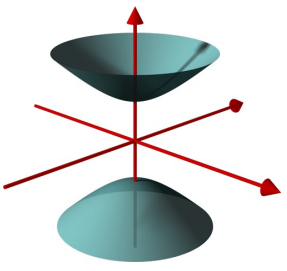
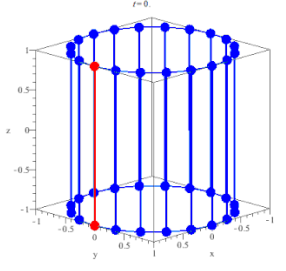
As indicted above, the following argument is a **speculative visual exercise** -- emulating to some degree the indications offered above with respect to the transformation from a hyperbolic ordering of space-time to a more comprehensible spherical one -- from a "negative" assumption to a "positive" one. The concern is whether any visualization enables more fruitful understanding of polarization and of how it may be transcended.

An initial point to be made is that the surface of a torus has all three types of curvature noted above, namely zero (flat), positive (spherical) and negative (hyperbolic). This is illustrated by the image on the left below. There the outside has positive curvature (red); the inside has negative curvature (blue); and a ring on the top and bottom of the torus have zero curvature (yellow-orange). Further comments on such curvature, with illustrations, are usefully offered by Brian Keng (*Hyperbolic Geometry and Poincaré Embeddings*, 17 June 2018).

A torus is presented in the second image, with an arbitrary number of rings and segments. The faces on the outer rings are then rendered transparent, leaving only those on the inner side. Two variants are shown.

Indications of a torus progressively cut to highlight a hyperboloid			
Contrasting curvature on torus	Torus	Hyperboloids engendered by distinctive parameters	
			
Reproduced from <a href="#">Mathematica Stack Exchange</a>	Generated with <a href="#">Stella Polyhedron Navigator</a>		

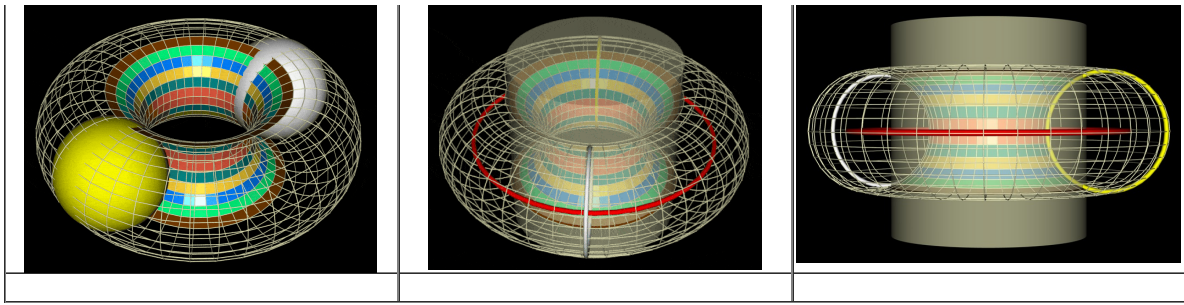
The coloured portion remaining in the images above right can then be recognized as a **hyperboloid**. This is the surface generated in 3D by rotating a 2D hyperbola around one of its principal axes, as illustrated below.

Hyperboloids of various forms			
Hyperboloid of one sheet	Conical surface in between	Hyperboloid of two sheets	Contrasting parameters
			
Lars H. Rohwedder (User:RokerHRO), Public domain, via Wikimedia Commons			Cmapm, CC BY-SA 3.0, via Wikimedia Commons

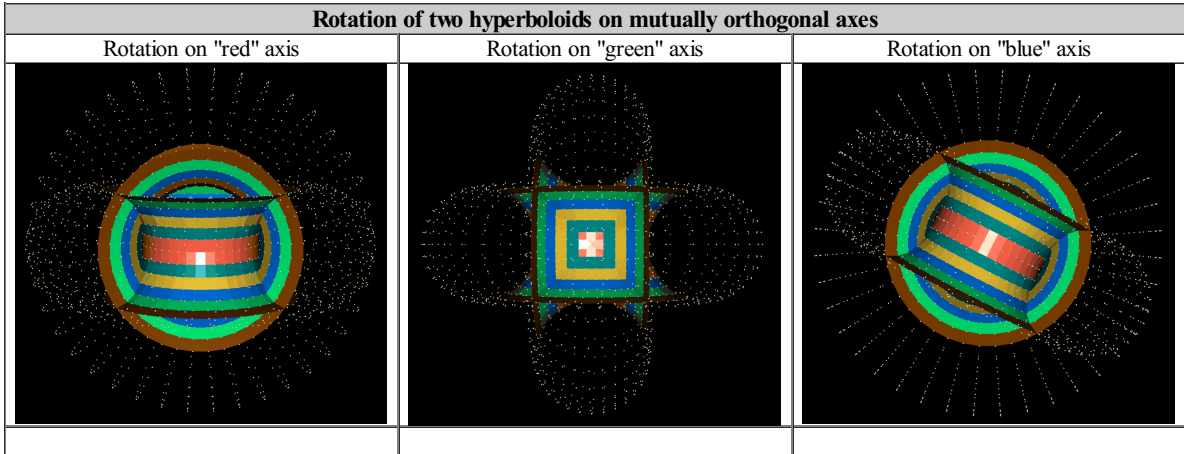
The image below left shows two spheres travelling through the circular pathway framed by the torus -- much as the Earth moves around the Sun (as illustrated earlier). The image endeavours to highlight the manner in which the surface of either sphere coincides with the shape of the hyperboloid on the inner side of the torus. This of course implies a torus and a hyperbola of a particular form -- with particular parameters. The validity of this assumption calls for further exploration although for the purpose of this argument it can be considered provisionally a useful approximation for purposes of comprehension.

A cylinder can be introduced into the image as an indication of where the surface of the sphere and hyperboloid no longer coincide, as in the central animation below and on the right -- namely the point at which the hyperboloid is no longer tangential to the surface of the sphere. There 2 circles are used in its tread of the spheres on the left.

Indications of relationship between torus and hyperboloid -- clarified with presence of cylinder and sphere		
Rotation of spheres around torus	Rotation of circles around torus	Cylinder at boundary of torus and hyperboloid



The images in 2D indicative of Minkowski space-time (presented earlier) feature two hyperbola with the suggestion that these are variously rotated. One approach to their representation in 3D is to add a second hyperboloid orthogonally to that depicted above right, as shown in the animations below. There the edges of the transparent portion of the original torus are in each case rendered transparent, leaving only the vertices of their points of intersection as an indication.



The confusing complexity of these animations can be reduced by considering how they can be understood in the light of the seams on the tennis ball or the baseball, as discussed below.

## Comprehension of requisite complexity through game-ball design?

It is curiously ironic to note that the seam on the familiar [tennis ball](#) and [baseball](#) share a distinctive form (but not with that of a [cricket ball](#)). The pattern of the seam line in both cases is elegantly complex, although readily comprehended. It has been the focus of mathematics, and gave rise to the *Tennis ball theorem* of [Vladimir Arnold](#) by which it is described as a curve englobing a sphere and subdividing it. The seam derives from the common design challenge of manufacturing a spherical form from flat material (although new technologies may now enable other designs to be envisaged without relying on such a seam)

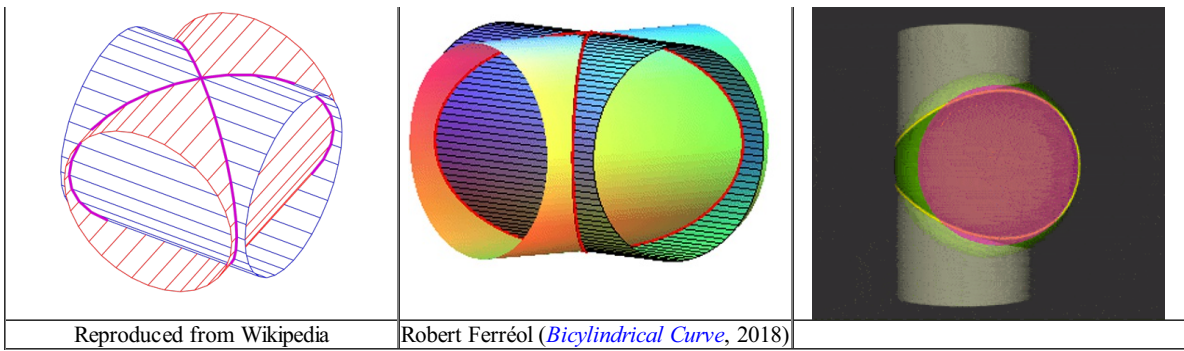
The form of the curve featured in a separate discussion (*Game ball design as holding insight of relevance to global governance?* 2020; *Re-memering the Globe from a Flatland Perspective: reconciling in 3D the Vitruvian archetype with sports ball curves*, 2020).

There it was noted that questions continue to be raised as to the most appropriate curve in mathematical terms, as separately summarized and illustrated (Robert Ferréol and Alain Esculier, *Seam Line of a Tennis Ball, Math Curve*, 2018). It is also the focus of generalizations, potentially applicable to spheres of higher dimensionality (Mohammed Ghomi, *Torsion of Locally Convex Curves*, *arxiv.org*, 2 September 2018).

The potential relevance to the above argument lies in the mutually orthogonal cylinders implied in the animations of the hyperboloids above. Bicylindrical curves are the intersections between two [cylinders of revolution](#), as discussed and illustrated by Robert Ferréol (*Bicylindrical Curve*, 2018). The curve is also known as the [Steinmetz curve](#). The intersection obtained is one of the possible seam lines of a tennis ball (or of a baseball). The familiarity with these seam lines therefore offers a way of comprehending implications of the relation between the hyperboloids -- readily inferred to be relatively incomprehensible.

The images at left and centre below show bicylindrical (Steinmetz) curves with particular conditions of orthogonality. The animation on the right has the mutually orthogonal cylinders slightly offset -- to show the tennis/baseball curve wrapped around a ball. Given the argument with respect to space-time crystals, the cylinders can be understood to imply the presence of two mutually orthogonal hyperboloids -- calling for a separate animation. As to the need for any "offset" to achieve the appreciated elegance of the seam curve, its potential significance in that case remains to be explored.

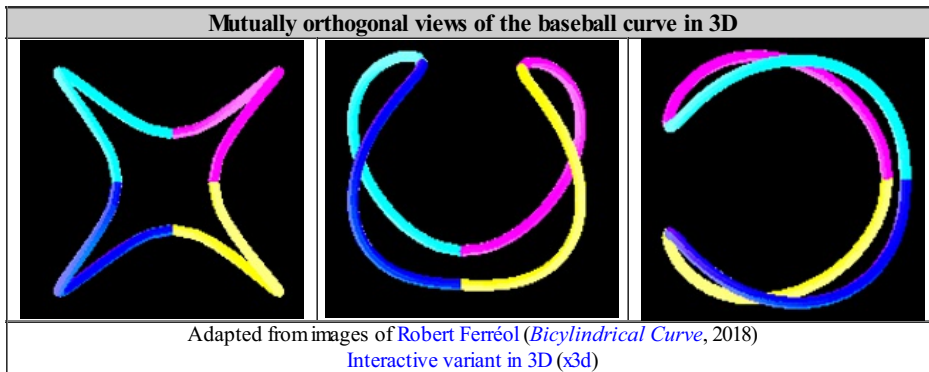
Mutually orthogonal cylinders variously positioned to show curve at their junction		
Steinmetz curve	Bicylindrical curve	Bicylindrical "seam" curve and sphere



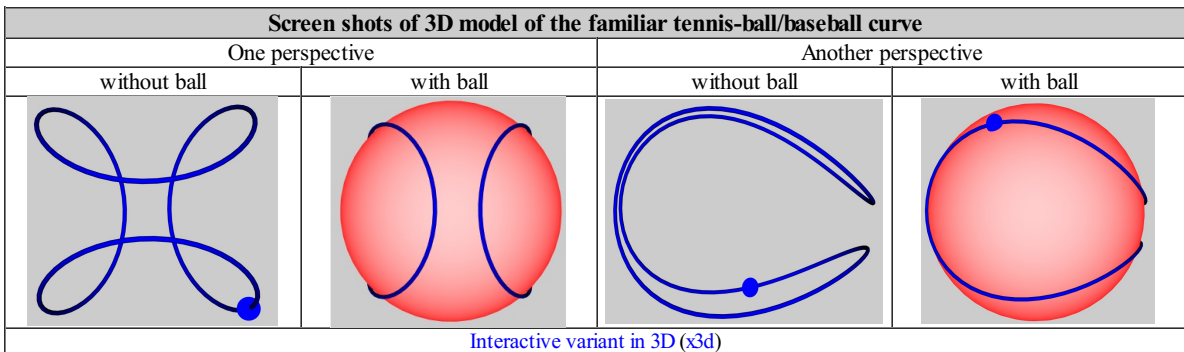
Reproduced from Wikipedia

Robert Ferréol (*Bicylindrical Curve*, 2018)

The simplicity and complexity of the "tennis ball curve" can be understood through the following screen shots -- with and without the ball around which it curves. Despite its relative complexity, or because of it, its elusive elegance can be readily appreciated.



Adapted from images of Robert Ferréol (*Bicylindrical Curve*, 2018)  
Interactive variant in 3D (x3d)



Interactive variant in 3D (x3d)

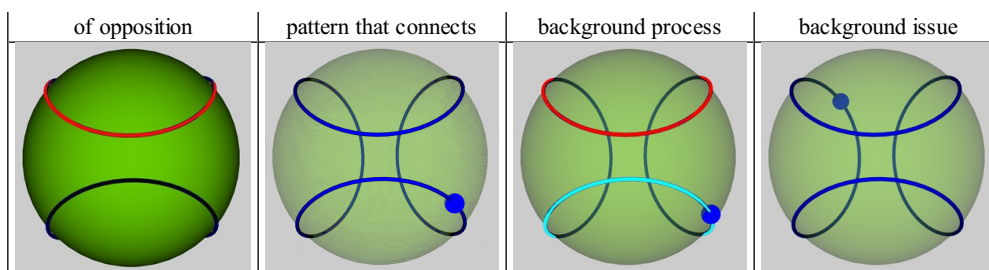
In the quest for comprehensibility of the relation between the hyperboloids, the earlier focus on the geometry of the seam line of the baseball can be speculatively compared with that of the familiar baseball cap (*Correspondence between the baseball curve and the baseball cap?* 2020). Views of the same curve from different perspectives are reproduced below from that discussion -- with quarter portions distinctively coloured.

Any association between the familiar ball seam curves and the quest for comprehension of order relevant to global governance might be readily considered ridiculous, if not absurd. For a civilization widely considered to be heading for collapse, that assessment can be called into question by the arguments of **Jared Diamond** with regard to how it might choose to fail (*Collapse: How Societies Choose to Fail or Survive*, 2005). There is every possibility that **the current civilization is choosing to confront itself on a daily basis (through games, and items of clothing) with symbolic clues to the forms of order through which it might survive -- clues which it carefully ignores.**

**Conflictual engagement with otherness:** The argument can be developed further in the light of the animations above with two baseball caps in relation to a single curve. The second cap then bridges a second quarter of the global system -- across two other octants. The merit of the juxtaposition of the two caps is the manner in which it frames the engagement between two competing teams -- a Red Team and a Blue Team. Baseball -- as a game -- needs two teams. As suggested by the animations, this "need" is fundamental to the cognitive dynamics implied by a baseball cap -- as an approximation to requisite global systemic dynamics. The wearer of a cap needs a "them" to exemplify the identity of the wearer -- collectively understood as an "us", especially in the US.

This point is consistent with the well-developed argument that the USA has long demonstrated its need for enemies to confirm and sustain its sense of identity (Francis Wilkinson, *Trump's Inexhaustible Need for Enemies*, *Bloomberg*, 11 June 2018; Michael Streich, *Americans Need an Enemy: common enemies have united the nation since independence*, *Decoded*, 18 July 2013). Curiously, in metaphorical terms, it could be said that an "enemy" is framed and perceived as anybody failing to follow the straight line favoured in linear strategic thinking -- or adhering to the plan in 2D thinking. Unfortunately there is every probability that "progressives", in order to ensure their coherence and identity, have a similar need for "regressives" as enemies -- a phenomenon which goes unexamined.

Need for enemies when failing to comprehend a global system			
Consciousness	Incomprehensible global	Lack of awareness of	Lack of awareness of



The animations help to clarify how, in the absence of comprehension of the whole, engagement with what is perceived as an "other" -- as an apparent opponent -- offers a degree of connection with the whole of which both are a part within a global system that is only recognized unconsciously (John Ralston Saul, *The Unconscious Civilization*, 1997).

The animations then serve to illustrate the much studied cognitive challenges of engagement with "otherness" and any "shadow" (*Us and Them: Relating to Challenging Others patterns in the shadow dance between "good" and "evil"*. 2011; *Reframing the Dynamics of Engaging with Otherness*, 2011). Such studies extend into oppositional logic and "oppositional geometry" (Fabien Schang, *Agreeing about Disagreement Academia; International Disagreements, Academia*, 2014) as argued separately (*Oppositional Logic as Comprehensible Key to Sustainable Democracy: configuring patterns of anti-otherness*, 2018).

## Contrasting forms of coherence framed by positive and negative curvature

**Negative curvature?** The case for topological complexification in the quest for more fundamental order can be made in terms of the significance accorded by astrophysicists to recognition of negative curvature and its implications for understanding the shape of the universe, as discussed separately (*Eliciting a Universe of Meaning -- within a global information society of fragmenting knowledge and relationships*, 2013; *Prime number and curvature implications for global governance?* 2021).

Recent research by Stephen Hawking and colleagues (*Accelerated Expansion from Negative Lambda*, 2012) has shown that the universe may have the same surreal geometry as some of art's most mind-boggling images (Lisa Grossman, *Hawking's 'Escher-verse' could be theory of everything*, *New Scientist*, 9 June 2012). This has offered a way of reconciling the geometric demands of string theory, a still-hypothetical "theory of everything", with the universe as observed -- through a negatively-curved Escher-like geometry (essentially a hyperbolic space).

The in question insight relied on a mathematical twist previously considered impossible, namely the use of a **negative cosmological constant** rather than a **positive** one. The new approach provided a description of "all the possible universes that could have been -- including ones in which the solar system never formed, or in which life might have evolved quite differently". Making conventional use of a positive cosmological constant, it had proven impossible to describe universes that were "anything more than clunky approximations to reality". A plethora of universes have now been generated from wave functions with negative cosmological constants.

Arguably, whether discovered by artificial intelligence or otherwise, analogous topological breakthroughs may have significance for connectivity in the ways of knowing, as argued separately in relation to deprecated symbol systems (*Engaging with Hyperreality through Demonique and Angelique? Mnemonic clues to global governance from mathematical theology and hyperbolic tessellation*, 2016; *Quest for a "universal constant" of globalization? Questionable insights for the future from physics*, 2010). **Might viable global governance require some analogue to negative curvature to render global order coherent?**

Or, as argued above, is global civilization now best experienced as being in a "hyperbolic condition" rather than in a "global" one? In which case the possibility of "renormalization" merits careful consideration in order to recover a "normal" condition -- spherically framed -- but with a form of hyperbolic implication.

**Rotation of "existential" perspective?** As noted above, considerable controversy is engendered in society by the inversion of some symbols (as with any cross or pentagon), or between left and right-facing (as in the case of the swastika). This can be variously explored (*Unquestioned Bias in Governance from Direction of Reading? Political implications of reading from left-to-right, right-to-left, or top-down*, 2016; *Reversing the Anthem of Europe to Signal Distress: transcending crises of governance via reverse music and reverse speech?* 2016; *Symbol rotation as dynamic essential to engaging with value-inversion*, 2017).

It is significant that the attributions by logicians to polyhedra are indifferent as abstractions to what is implied by such inversion -- as understood in popular culture and in the depiction of symbols on flags (for example). This suggests that dimensions of existential significance are indeed "missing" from conventional academic understanding -- in accord with the above-mentioned argument of Terrence Deacon (2001, 2010).

The point may be explored otherwise in terms of the neglect in conventional models of any consideration of the role of some form of "corruption" -- notably in relation to the trilogy of academia / government / business in the **Triple Helix model of innovation**, for example. And yet the extent of such corruption (and its denial) is a matter of daily record in the media -- most notably at the highest level.

In addition, just as the inversion of some symbols is associated with "evil", it is indeed the existence of "evil" which is frequently proclaimed and deprecated by the leaders of the world, notable for attributing that quality to their peers (*Existence of evil as authoritatively claimed to be an overriding strategic concern*, 2016; *Which world leaders have (not) been labelled "evil"?* 2015). The helical dynamics in models partially address this issue through an associated "cognitive wormhole" (perhaps usefully recognized as a "cognitive sinkhole") and reference to the process of **enantiodromia** highlighted by William Irwin Thompson (*From Nation to Emanation: Planetary Culture and World Governance*, 1982).

## Space-time crystals as space-time polyhedra fundamental to appropriate organization

There is an intimate relation in geometric terms between crystals and polyhedra (G. W. Hart, *Crystallographic Polyhedra*, 2000).

[Regular polyhedra in nature](#), corresponding to some Platonic solids, can be found in the form of crystals. The [coordination geometry](#) of an atom is the geometrical pattern formed by atoms around the central atom. Crystals are formed by linking of coordination polyhedra ([Table of coordination geometries](#), *Wikipedia*).

As noted by Gopalan with respect to his transformation:

By renormalizing the blended coordinates with an appropriate factor that is a function of the relative velocities between the various frames, the hyperbola is transformed into a Euclidean circle. With these two steps, one obtains the RBS coordinates complete with new light lines, but now with a Euclidean construction. One can now enumerate the RBS point and space groups in various dimensions with their mapping to the well known space crystal groups....

A striking mathematical consequence of this formulation is that the RBS Lorentz and Poincaré' groups can now be mapped to the Euclidean point and space groups for space crystals, respectively; the latter are all fully listed... Space crystals in various dimensions can be classified into point and space groups: 17 space and ten point groups in 2D; 230 space and 32 point groups in 3D; 4895 space and 271 point groups in 4D, and so on... In contrast, to the best of my knowledge, only a handful of relativistic crystal groups (in 2D) have been listed so far....

With respect to periodic renormalized blended spacetime (RBS) crystals, Gopalan then notes:

The defining feature of periodic spatial crystals is their translational symmetry, namely, that they are periodic in various spatial dimensions. In describing their symmetry, one moves beyond point groups to add translations to create space groups.... In the context of conventional MS [Minkowski space-time], one moves from Lorentz groups to Poincaré' groups. The group theoretical procedure to move from point groups to space groups is well established.... Here, given the equivalence established between space crystals and RBS crystals, one could similarly move from the RBS point groups to RBS Poincaré' groups in analogy with space groups... we limit our discussion to 2D, but similar extensions will be possible in higher dimensions. There are 17 2D space-group types describing spatial crystals...

The RBS crystals can be imagined as a series of events periodically arranged in the RBS being observed by an RBS observer at the origin. In the 2D case, the periodicity arises from translations along [two]... axes. Naturally, the event periodicity will result in the RBS observer herself being replicated periodically in the RBS as depicted... Similar constructions can be made in 3D and 4D RBS. These are interesting topics left to be explored in future works...

On a more general mathematical note, this approach could allow one to straddle between Euclidean and hyperbolic coordinate systems in flat space or spacetime.

As noted above, crystals in the form of gemstones are especially valued as symbolic of higher orders of coherence. Separately the potential value of polyhedra for ordering insights relevant to strategic thinking and governance has been extensively discussed and illustrated ([Identifying Polyhedra Enabling Memorable Strategic Mapping: visualization of organization and strategic coherence through 3D modelling](#), 2020; [Towards Polyhedral Global Governance: complexifying oversimplistic strategic metaphors](#), 2008).

Of particular interest is Gopalan's indication of the mapping relation to the 17 space-group types in 2D. Their relation to [local symmetry-preserving operations](#) (with their temporal implication) is potentially fundamental to defining the relations between polyhedra, as discussed separately ([Encoding Coherent Topic Transformation in Global Dialogue: memorability of cognitive implication in symmetry-preserving operations on polyhedra](#), 2021). This concludes with speculation regarding the relation of that 17-fold "wallpaper group" to UN strategy ([Global dialogue via a 17-fold pattern of Sustainable Development Goals? 2021](#)).

In response to crisis, a separate discussion of the [Coping Capacity of Governance as Dangerously Questionable](#) (2019) concluded with consideration of:

- [Reframing the pattern of logical choices through polyhedra](#)
- [From disorderly "collapse" to orderly "renaissance"](#)

The renormalization indicated by Gopalan indicates ways in which the time dimension could be more fruitfully integrated into such considerations.

## Imagining complementary images of the shape of civilization

The argument was introduced by contrasting the vigorous debate of cosmologists with regard to the shape of the universe -- in contrast with the relative indifference to any creative exploration of ways of thinking about the "shape of civilization".

**Images of civilization?** There is therefore a case for learning from the much-cited study by Gareth Morgan ([Images of Organization](#), 1986). This offers the following frameworks through which organizations can be perceived: machines, organisms, brains, cultures, political systems, psychic prisons, flux and transformation, and instruments of domination. Presumably such images could be used with respect to civilization as a whole. A corresponding argument was developed with respect to the "shape of a crisis" ([Interrelating Multiple](#)

*Ways of Looking at a Crisis: beyond the pandemic discipline of the one right way*, 2021).

The Morgan study has been fruitfully reviewed by Matthew J. Lambert III (*A review of Images of Organization, Complicity: An International Journal of Complexity and Education*, 6, 2009, 2). It has since been the focus of other works (Anders Örténblad, et al, *Exploring Morgan's Metaphors: theory, research, and practice in organizational studies*, 2016; Gareth Morgan, *Reflections on Images of Organization and Its Implications for Organization and Environment. Organization and Environment*, 24, 2012, 4).

**Complementary metaphors:** However, rather than giving preference to any one image as particularly meaningful, another approach is to consider such images as complementary metaphors -- namely without any one of them exhausting the relevant insights with regard to the shape of civilization. Such a set could then be understood as characterized by requisite variety for appropriate comprehension. The argument was developed with respect to the coronavirus (*Alternating between Complementary Images of Coronavirus: requisite variety to enable viable strategic engagement*, 2020).

It is in this sense that the succession of various topological forms identified above could be understood as of value under particular circumstances. The point was made with respect to "flat" versus "global" -- neither of which exhausts the manner by which people might engage cognitively and experientially with their environment, or be obliged to do so in seeking to make some sense of their reality.

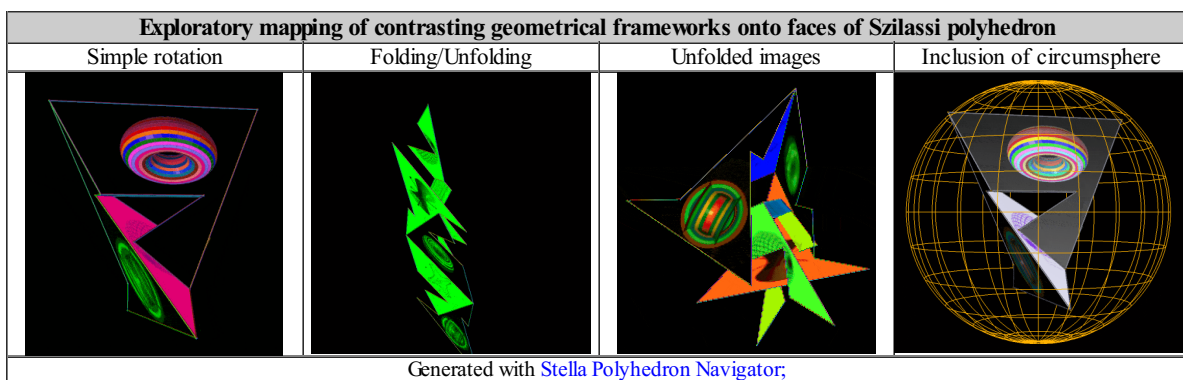
**Reframing the short-term:** Provocatively, and recalling the mythical origins of the [naming of the days of the week](#) (extensively described in *Wikipedia*), a case could be made for a mnemonic equivalent with which people could engage dynamically in imagining otherwise the experiential reality of civilization -- successively (and periodically) from "flat" to "renormalized". This might then take the following form -- from "Monday" to "Sunday":

<ul style="list-style-type: none"> <li>• Flat-day ("old normal"; plan-day)</li> <li>• Sphere-day (global-day; Earth day)</li> <li>• Torus-day (cycle-day; recycle-day)</li> </ul>	<ul style="list-style-type: none"> <li>• Hyperboloid-day ("surreal day")</li> <li>• Orthogonal-day ("reflection day")</li> </ul>	<ul style="list-style-type: none"> <li>• Blending-day ("re-cognition day")</li> <li>• Normal-day ("new normal")</li> </ul>
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**Polyhedral mapping:** It is intriguing to note that there is a relatively unique polyhedron -- the [Szilassi polyhedron](#) -- which offers a means of mapping seven contrasting modes of understanding onto a singular, coherent structure. It is itself topologically a torus, with seven hexagonal faces. It has the unique property that all seven faces share a common edge with each other -- suggesting a boundary between every mode of understanding. It requires seven colours to colour all adjacent faces, thereby providing the lower bound for the [seven colour theorem](#).

As an exercise, images characteristic of the distinctive cognitive frames -- modes of knowing -- of the above argument could therefore be mapped onto the faces of the polyhedron to offer some suggestion of how an individual might switch between them, whilst retaining some sense of the integrity of the pattern of modes as a whole. This then emphasizes that no one mode is the most appropriate in that all have their place and function. Some of the animations help to emphasize the extent to which the relationship between the geometries may be experienced as muddled and incoherent.

The choice of images and their attribution to the distinctive faces is clearly arbitrary in the examples presented here -- inviting further speculation on the possibility of more fruitfully suggestive choices. The value of the Szilassi polyhedron for such purposes (with other animations) is one feature of a separate discussion (*Time for Provocative Mnemonic Aids to Systemic Connectivity? Possibilities of reconciling the "headless hearts" to the "heartless heads"*, 2018).



## Logic of renormalization as enabling flying metaphorically understood?

As the title of this article indicates, this argument was triggered by the challenge of achieving "normality" -- once again. This purportedly desirable collective goal is confused with assumptions regarding the need to eradicate radical extremes perceived as a challenge to it (*Norms in the Global Struggle against Extremism: "rooting for" normalization vs. "rooting out" extremism?* 2005; *Eradication as the Strategic Final Solution of the 21st Century?* 2014). Despite terminological confusion, radicals are therefore framed as a primary concern, currently embodied in the unvaccinated (*Radical Innovators Beware -- in the arts, sciences and philosophy*, 2016).

It is therefore ironic to recognize that the [discovery of hyperbolic geometry](#) by [Gauss](#) in the 19th century was considered so radical that he avoided its publication for fear that it would undermine his status as a mathematician. Although understanding of the relationship between distinctive geometrical frameworks may be justified as a consequence of the possibility of transformation from any one to the others in a fundamental sense, the relationship is at the heart of continuing debate regarding [metamathematics](#), [metalogic](#) and [metamodelling](#).

It is however far from clear how these debates enable more fruitful understanding of governance of a new normal through renormalization or otherwise. Nor do they appear to address the dilemmas of the variety of "ways of looking", as previously mentioned (*Interrelating Multiple Ways of Looking at a Crisis: beyond the pandemic discipline of the one right way*, 2021). Even more problematic is the sense in which the radical [incompleteness theorems](#) of Kurt Gödel establish inherent limitations on all but the most trivial axiomatic systems.

Such implications would appear to preclude any coherence in global governance, other than of the most trivial nature -- as is only too readily evident. Missing is fruitful recognition of the experiential role of complementarity and the sense of coherence it offers in practice - - transcending any apparent logical incompatibility. The "mysterious" nature of this is usefully addressed by [Ndabenhle Mthembu](#) (*Mystery as Theoretical Incompleteness, Academia Letters*, 2021).

The issue goes to the heart of the problematic interplay between the "two cultures" of the sciences and the arts. It is now most creatively addressed by the [Bridges Organization](#) which oversees the annual Bridges conference on mathematical connections in art, music, architecture, and culture. Missing is relevant insight into the complementary bridging role of the strategic coherence offered by aesthetics (*Strategic Jousting through Poetic Wrestling: aesthetic reframing of the clash of civilizations*, 2009; *Coherence of hyperreality through aesthetic intuition and embodied cognition?* 2021).

The complementarity of the metaphors appropriate to coherent renormalization, as suggested by the dynamics of the unfolding Szilassi polyhedron above, frame another consideration. If indeed there is a fundamental dynamic intrinsic to a viable renormalized condition, it might be usefully compared to the flying of birds and the necessity of their wing tip extremes for controlled flight, as argued separately (*Counteracting Extremes Enabling Normal Flying: insights for global governance from birds on the wing and the dodo*, 2015). The flying metaphor is central to the argument of [Nassim Nicholas Taleb](#) with regard to questionable use of knowledge derived from modelling in *Teaching Birds How to Fly* (10 August 2009; Pablo Triana, *Lecturing Birds on Flying: can mathematical theories destroy the financial markets?* 2009).

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