



# laetus in praesens

Alternative view of segmented documents via Kairos

15 July 2019 | Draft

## Comprehension of Requisite Variety via Rotation of the Complex Plane

### Mutually orthogonal renderings of the Mandelbrot set framing an eightfold way

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#### Introduction

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References

## Introduction

Faced with global crises, it is useful to recall the variants of the well-known insight: *There Is Always a Well-Known Solution to Every Human Problem -- Neat, Plausible, and Wrong*. How many of the advocated global strategies can be recognized in that light?

There is no lack of recognition of the complexity of "strategic space" within which the articulation and display of strategies could be compared metaphorically to the competitive challenge faced by flowers ([Keith Critchlow, \*The Hidden Geometry of Flowers: living rhythms, form and number\*, 2011](#)). Missing is any sense of the requisite complexity within which otherwise incommensurable strategies may need to be embedded in order for their collective coherence to become comprehensible.

The tendency to organize any such articulation into multiple sections -- multi-petalled "strategic flowers" -- can then be compared with the branching 3-fold, 5-fold, N-fold patterns in the animations presented separately ([Dynamics of tank comprehension and enclosure](#), 2019). The "bullet points" by which an articulation is presented could then be usefully compared to the seeds of such flowers -- as with the UN [Sustainable Development Goals](#). Metaphorical reference to "tanks" can be made in order to demonstrate the strategic challenge of interrelating the many relatively closed contexts in which strategy is variously envisaged ([Tank Warfare Challenges for Global Governance: extending the "think tank" metaphor to include other cognitive modalities](#), 2019). That argument can be further developed.

The [complex plane](#), from which strategic patterns can be understood mathematically to emerge, is indicative of a complex context in which stable patterns of various branchings emerge in various positions -- with unstable patterns emerging outside the boundaries, as remarkably rendered by the fractal order of the [Mandelbrot set](#) with its fascinating aesthetics. There is however little collective understanding of the complexity of that strategic space or of how the relationship between any such patterns is indicative of the possibility of larger coherence -- however that is to be comprehended. This is the challenge of governance, whether democratic or otherwise, as previously argued ([Sustainability through the Dynamics of Strategic Dilemmas -- in the light of the coherence and visual form of the Mandelbrot set](#), 2005; [Psycho-social Significance of the Mandelbrot Set: a sustainable boundary between chaos and order](#), 2005; [Imagination, Resolution, Emergence, Realization and Embodiment: iterative comprehension ordered via the dynamics of the Mandelbrot set](#), 2005).

There is no lack of recognition of the increasingly surreal nature of governance processes at this time ([Surreal nature of current global governance as experienced](#), 2016). This sense is reinforced in daily media coverage of the extraordinary lack of coherence of governance at all levels of society -- chaotic is a common descriptor -- matched by ever-increasing polarization of factional discourse, together with the proliferation of fake news of every kind ([Varieties of Fake News and Misrepresentation](#), 2019).

The spirit of the times is indicated by UK preparations for a non-deal Brexit, with scenarios including chaos at the ports, chaos in food and medicine distribution, chaos in care staff recruitment and chaos as financial markets shift to the EU. However, as argued by [Simon Jenkins](#) with respect to the leadership offered by Boris Johnson:

Yet ask Johnson's small band of more sophisticated no-dealers, and a different justification begins to emerge. It lies in the theories of creative disruption espoused by the postwar economist Joseph Schumpeter and his followers. To them, occasional bouts of chaos are necessary. As during wars, recessions and Thatcherism, Britain needs a therapeutic shock to jolt it into a new karma, a new inner greatness.... As Thatcher showed, even creative destruction demands crisis management. Johnson's politics seem more in tune with the wilder shores of [chaos theory](#). In one gaffe after another, he has been the butterfly whose wing-beat can effect an unpredictable storm. While the chaotic forces of no deal whirl ever faster, his bland shrug of the shoulder becomes the "[strange attractor](#)" around which they mysteriously cohere. As with Donald Trump, anarchy can mean bad things, good things, absolutely any things. (*Trump created a storm over Kim Darroch. Boris Johnson will bring a hurricane, The Guardian*, 11 July 2019)

Arguably there is a need for a more complex "container" for the subtleties of such complexity. It is intriguing that the "planar" language is reflected in the widespread reference to "plans" and "planning" (by which a "Flat Earth" understanding is reinforced), or otherwise in reference to the "field" with which they are associated -- as one preferred metaphor for any academic discipline or specialization. With respect to the argument regarding "tanks", the boundary offered by the Mandelbrot set is usefully suggestive of that between the orderly stable space within the tank and the chaotically unstable condition outside it. Potentially of greater interest is the sense in which the positions within the Mandelbrot set sense boundary, with which the patterns are variously located, themselves constitute tank boundaries -- with that of the Mandelbrot set as a whole then constituting an elusive meta-pattern encompassing and containing all such patterns -- effectively a "meta-tank", a "tank of tanks", or a tank container.

As yet, the amazing insights promised by the Mandelbrot set could readily be said to have been less than useful, notably in the light of efforts to apply them to financial governance -- especially before and after the [subprime mortgage crisis](#) (Horace Campbell, *Fractals and Benoit Mandelbrot: lessons for society, Pambazuka News*, 21 October 2010; Alejandro Nadal, *Understanding Instability: Mandelbrot, fractals, and financial crises, Triple Crisis*, October 2010; David Orrell, *Fractal Finance, World Finance*, 4 January 2011; Christian Walter, *The Mandelbrot programme and the pragmatic programme, Chance and Finance*, 3 November 2015; Tren Griffin, *Benoit Mandelbrot's Ideas about Investing and Markets, 25iq*, 9 December 2017). Tentatively this could be understood as a consequence of the **restrictive narrow focus on the conventions of a singular complex plane** -- when mathematics has already envisaged higher dimensional extensions.


One approach to considering the relevance of such complexity is to develop further the earlier argument regarding the need for variously oriented planar frameworks for "tanks" of distinctive nature, notably mutually orthogonal planes. Naively, as an exploratory illustration to that end, the complex plane in which the Mandelbrot set is conventionally rendered could be subject to rotation on its two axes -- the axis of real numbers and the axis of imaginary numbers. The Chinese yin/yang notation of unbroken and broken line can then be used to distinguish the real and imaginary characteristics of 8 distinctive [octants](#) (rather than 4 "quadrants"), thereby framed in a [multiview projection](#).

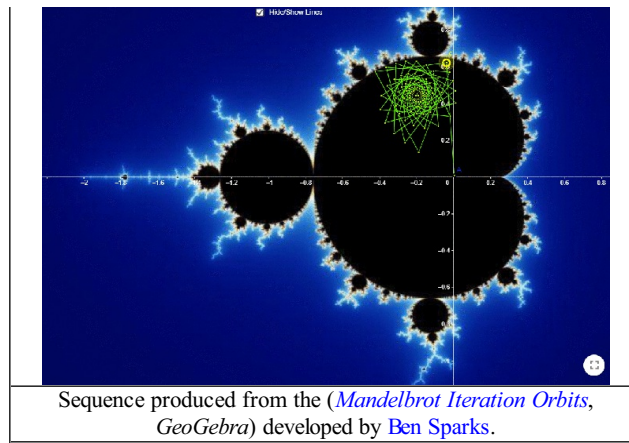
The exercise is of potential relevance to climate change strategy since the traditional Chinese 8-fold *BaGua* notation is comprehended through specific use of weather-related metaphors, as previously explored (*Enhancing Strategic Discourse Systematically using Climate Metaphors: widespread comprehension of system dynamics in weather patterns as a resource*, 2015; *Weather Metaphors as Whether Metaphors*, 2015). There is a degree of irony to the fact that human understanding of the subtleties of the weather enables direct engagement with it in a period when ever more powerful supercomputers are seemingly required to comprehend the global complexity of climate.

## Mandelbrot sets rendered in a mutually orthogonal configuration of 3 complex planes

The primary concern of this argument is the identification of aids to comprehension of complexity and coherence, as previously argued (*In Quest of Mnemonic Catalysts -- for comprehension of complex psychosocial dynamics*, 2007).

In mathematics, the complex plane is a geometric representation of the complex numbers established by the horizontal real axis and the perpendicular imaginary axis. It can be thought of as a modified Cartesian plane, with the real part of a complex number represented by a displacement along the x-axis, and the imaginary part by a displacement along the y-axis. Mathematically, the Mandelbrot set ( $M$ ) is just a set of complex numbers. A given complex number  $c$  either belongs to  $M$  or it does not. This is admirably explained by [Ben Sparks](#) (*What's so special about the Mandelbrot Set?* 2019), notably with regard to the following using different values of  $c$ . The distinctive configurations can be understood as indicative of articulations of distinctive strategies in "strategic space" as mentioned above.

Selected iteration orbits within a Mandelbrot set rendering (selection limited as indicated by movement of positions of yellow circle)




As shown below left, a picture of the Mandelbrot set can be made by coloring black all the points  $c$  that belong to  $M$ , and colouring white all other points that do not belong to that set.

The fractal boundary of the set as rendered can be understood as that between orderly stability within the boundary and chaotic instability beyond it. The many colourful renderings usually seen are generated by coloring points not in the set according to the degree of stability/instability. The axes of the plane divide the Mandelbrot set into 4 quadrants. More complex approaches to the dynamics of complexity include less familiar renderings of the Mandelbrot set in 3D, termed a *mandelbulb*. Also of relevance are variants termed *multibrot sets*, for which there are various images and animations (*Animated morph of multibrots  $d = -7$  to  $7$* ). It is possible to construct Mandelbrot sets in 4 dimensions using *quaternions* and *bicomplex numbers*. In contrast with the conventional orientation of that rendering (below left), a distinctive vertically oriented rendering, termed a *Buddhabrot*, has been developed -- so named because of its resemblance to a seated Buddha.

In the following exploration of the possibility of coherent comprehension of complexity, it is assumed that the complex plane can be rotated both on the real and on the imaginary axis. This results in the configuration of 3 mutually orthogonal planes. These can be understood as a feature of *multiview projection*, as shown in the central image below -- with the configuration framing 8 octants. Relevant to extensions of this argument, geometry recognizes the existence of an *orthant* (or hyperoctant) as the analogue in  $n$ -dimensional *Euclidean space* of a quadrant in the plane or an octant in three dimensions.

Quadrants and Octants																																							
Mandelbrot quadrants in complex plane	Octants in solid geometry	Octant sign convention	Octants with signs																																				
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The following images are indicate of the complexity of the eightfold pattern -- and the degree of coherence suggested by the aesthetic nature of that framework.

Rotation of rendering of Mandelbrot set on axes of complex plane (using distinctive colours)		
Minimal rotation on real axis	Minimal rotation on real and imaginary axes	Rotation of mutually orthogonal configuration
Animations developed using X3D-Edit		

## Psychosocial and strategic implications of distinct octants

An earlier approach to this theme elaborated a fourfold framework to interrelate four contrasting categories of [Problematique](#), [Resolutique](#), [Imaginatique](#) and [Irresolutique](#) (*Imagining the Real Challenge and Realizing the Imaginal Pathway of Sustainable Transformation*, 2007). The first two were introduced by the Club of Rome, but only the first is commonly used. Together they framed the question as to the extent to which "problems" and "strategies" could both be considered imaginary in some ways, or at least intangible concepts. The last identified the game-playing associated with effective decision-making. A degree of relation to the complex plane was indicated through the use of an axis of explicit real and an axis of explicit imaginary -- thereby suggesting that the four quadrants of the complex plane could be used to explore that pattern.

The mutually orthogonal configuration of complex planes offers a framework inviting consideration of the distinctive octants so framed. The coding convention for the octants noted above suggests one approach. The axial distinctions between positive and negative extremes suggests another. Most intriguing is how the distinction between real and imaginary axes can inform that exploration, especially given the emergence of a third axis as a consequence of rotation of the original plane. Given the asymmetric positioning of the Mandelbrot rendering with respect to any axis, there is the further question of the chirality consequent on the direction of rotation.

In this preliminary discussion, it is not proposed to attempt any reconciliation of these possibilities -- necessarily presumptuous. Of potentially greater interest are the distinctions which may be framed by each octant as the locus for the articulation of strategy of a given (cognitive) style -- a "way". In developing that argument, there is a case for recognizing the original association of the Cartesian x-axis with real numbers and the y-axis with imaginary numbers -- thereby framing the question as to what a z-axis might be understood to imply as the third axis.

**Imagination vs. Reality:** It is of course strange that the use of "imaginary" by mathematicians in the study of complexity has virtually nothing to do with the imagination which is recognized as a valuable theme of both strategic thinking and of mathematics (Matthew Handelman, *The Mathematical Imagination: on the origins and promise of critical theory*, 2019; Ricardo Nemirovsky, *Mathematical imagination and embodied cognition*, *Educational Studies in Mathematics*, 70, March 2009; Edward Kasner and James R. Newman, *Mathematics and the Imagination*, 1940). How is that imagination to be understood as related to the reality with which governance is purported called upon to deal -- purportedly informed by the "real numbers" of statistics?

Curiously it is asserted with respect to an [imaginary number](#), or [imaginary unit](#) (denoted by "i"), that despite the historically "imaginary" nomenclature (and initial scepticism in that regard), [complex numbers](#) are regarded in the mathematical sciences as just as "real" as the real numbers, and are fundamental in many aspects of the scientific description of the natural world. It is therefore unfortunate that mathematics has been unable to extend this comprehension to the imagination which is so fundamental to the manner in which the people of the world engage with reality -- a theme of relevance both to the reality of religion in society and to the relation between art and science, as addressed by [Arthur Koestler](#) (*The Truth of Imagination*, *Diogenes*, 25, 1977). With so many iconic mathematicians having been people of faith, it is also unfortunate that in a society wracked by religious violence that mathematics has found so little means of engaging credibly with the imaginative dimension which empowers such conflict (*Mathematical Theology: Future Science of Confidence in Belief*, 2011).

Potentially fundamental to that argument is mathematical appreciation of the so-called [Euler identity](#). As discussed [separately](#), this equation has been named as the "most beautiful theorem in mathematics" and has tied in a nomination by mathematicians for the "greatest equation ever" (Robert P. Crease, *The greatest equations ever*, *PhysicsWeb*, October 2004). It may be presented as follows in two variants:

Euler Identity	
some variants	legend
$e^{\pi i} + 1 = 0$	<ul style="list-style-type: none"> <li>• <b>e</b> is Euler's number, the base of <a href="#">natural logarithms</a>,</li> <li>• <b><math>\pi</math></b> is the ratio of the circumference of a circle to its diameter</li> <li>• <b>i</b> is an <a href="#">imaginary number</a> defined by its property <math>i^2 = -1</math>. This is consistent with 3 variants: <math>i^0 = 1</math>, <math>i^1 = i</math>, <math>i^3 = -i</math></li> </ul>
$e^{\pi i} = -1$	

In a much quoted comment with reference to the above by [Benjamin Peirce](#): *It is absolutely paradoxical; we cannot understand it, and we don't know what it means, but we have proved it, and therefore we know it must be the truth.* In the light of the arguments of [George Lakoff](#) and [Rafael E. Núñez](#) (*Where Mathematics Comes From: how the embodied mind brings mathematics into being*, 2000), metaphor has been exploited to facilitate its comprehension (*Understanding Without Proof*, 2004; *Intuitive Understanding of Euler's Formula*, 2010; Chris Fields, *Metaphorical Motion in Mathematical Reasoning: further evidence for pre-motor implementation of structure mapping in abstract domains*, 2013).

The argument here exploits the mathematical formalism of imaginary numbers in order to give a degree of formal "legitimacy" to the role of the imagination, whether individual or collective, whether in governance or otherwise. Whilst this may be anathema to mathematicians, the question is **what imaginative insights articulated by mathematics are of value to the engagement with the surreal challenges of governance at this time?**

In the surreal condition of society calling for appropriate governance, if the question is to be understood as one of how to encompass both the "unimaginative" and the "unreal", **can the distinction between real numbers and imaginary numbers offer an indication beyond the constraints of the mathematical formalism?** Is there a strong case for "appropriate appropriation" of mathematical insights at this time?

**Quadrants from Cartesian 2-fold axes:** The surreal condition of the times can be fruitfully associated with the confusion of fake news

and the polarization of discourse -- extending into the irrational world of blame-gaming and demonisation. Polarization can therefore be distinguished or conflated as:

- real versus imaginary
- positive versus negative

Conventional renderings of the Mandelbrot set then offer the distinctive quadrants indicated in the image above: of the complex plane.

Quadrants of complex plane		Quadrant notation	
real negative / imaginary positive	real positive / imaginary positive	(- / +)	(+ / +)
real negative / imaginary negative	real positive / imaginary negative	(- / -)	(+ / -)

To that pattern may be added those of the **tetralemma** -- with the emphasis it offers as to the nature of the confusion of surreality. This is of concern in **paraconsistent logic**, namely the effort to deal with **contradictions** in a discriminating way (Hajime Sawamura and Edwin D. Mares, *How Agents Should Exploit Tetralemma with an Eastern Mind in Argumentation*, In: Barley M.W., Kasabov N. (eds) *Intelligent Agents and Multi-Agent Systems*. PRIMA 2004. Lecture Notes in Computer Science, 3371. Springer, 2004).

Tetralemma (or Quadrilemma)		Fourfold experiential strategic assessment	
["IS NOT"]	["IS"]	realistic doom-mongering	realistic hope-mongering
["neither IS nor IS NOT"]	["both IS and IS NOT"]	fearful imaginings	emergency preparedness

Four-gatedness has been variously explored in fiction (Doris Lessing, *The Four-gated City*, 1969). The domain of "fearful imaginings" is exemplified by the description by Stanley Brunn (*Gated Minds and Gated Lives as Worlds of Exclusion and Fear*, *GeoJournal*, 66, 2006, 1/2).

**Octants from 3-fold axes:** With the rotation of the complex plane on the x-axis, such distinctions would appear to hold although the consequent incursion into the z-dimension implies the emergence of other considerations. It is the rotation of the complex plane on the y-axis that confirms or reinforces the existence of such a dimension -- whatever it may be held to imply in containing more appropriately the surreal or hyperreality.

In contrast with the 2-fold polarization, the z-axis could then be understood as indicative of what is variously and mysteriously indicated as a "**third way**" -- with which strategic initiatives have been variously associated, notably as articulated by **Anthony Giddens** (*The Third Way: the renewal of social democracy*, 1999; *The Third Way and its Critics*, 2000). From the perspective of the above argument, it has been unclear with what part of "strategic space" such initiatives are associated -- and how to distinguish it from other parts. Reference is also variously made to an elusive "middle way", notably the **Middle Way** described by Siddhartha Gautama as the path leading to liberation. Other variants include the philosophical **golden mean** between extremes, the Confucian **Doctrine of the Mean**, a **Middle Way Approach** advocated for Tibet (in China), and the political philosophy of Harold Macmillan (*The Middle Way*, 1938).

Despite the variety of such references, and the degree to which some have been related to the strategic challenges of governance, there is clearly a subtlety to any "middle way" which transcends the problematic dynamics of polarization. One "reasonable" approach to its clarification is through second and higher order feedback processes characteristic of cybernetics. It could then be inferred that the transcendence characteristic of a middle way would be associated with a self-critical capacity and some degree of enactivism. From a poetic perspective these could be understood in terms of the **negative capability** famously articulated by **John Keats**. Such subtlety could be recognized in **interoception**, as argued by Noga Arikha (*The interoceptive turn is maturing as a rich science of selfhood*, *Aeon*, 17 June 2019).

The eightfold pattern of octants indicated above suggests the possibility of a fruitful relation to classical Chinese thinking and its succinct use of the trigram notation of a pattern of 3 broken or unbroken lines.

Attribution of trigram codes and signs to octants										
Adaptation of table above				Attribution of trigram codes				Octant sign convention		
	x	z	y							
I	+	+	+					real	"third"	imaginary
II	-	+	+					pos	"pos"	pos
III	-	+	-					neg	"pos"	neg
IV	+	+	-					pos	"pos"	neg
V	+	-	+					pos	"neg"	pos
VI	-	-	+					neg	"neg"	pos
VII	-	-	-					neg	"neg"	neg
VIII	+	-	-					pos	"neg"	neg

## Reframing an eightfold way by entangling imagination and reality?

**Eightfold way?** There is of course no lack of references to an "eightfold way" with which a pattern of octants might be appropriately associated. These include frameworks as fruitfully diverse as:

- **Noble Eightfold Path**, understood as the set of Buddhist practices leading to liberation from **samsara**, namely the painful cycle of "rebirth" (*Eightfold Path, aka: Eightfold Way; 5 Definition(s)*, Wisdom Library). Any particular understanding of the meaning of rebirth can be usefully challenged by the variety of ways in which it may be understood (*Varieties of Rebirth: distinguishing ways of being "born again"*, 2004). Of relevance to the strategic challenge of governance, and the cycles of violence which have yet to be transcended, is the insight of **George Santayana**: *Those who cannot remember the past are condemned to repeat it*.
- *Particle-physics theory*: the **eightfold organizational scheme** for the class of subatomic particles known as **hadrons** that led to the development of the **quark model**. (Murray Gell-Mann and Yuval Ne'eman, *The Eightfold Way*, Benjamin, 1964).
- *Hydrodynamics of dissipation*: Felix Haehl (*The Eightfold Way to Dissipation: classification of hydrodynamic transport*, Duke University, 2016 )
- *Symbolic logic*: (Jonathan P. Cummings, Sy-David Friedman and Assaf Rinot, *The Eightfold Way, Journal of Symbolic Logic*, 83, 1, 2018; pdf). The mutual independence of three central combinatorial properties in set theory can be demonstrated by showing that any of their eight Boolean combinations can be forced to hold under particular conditions.
- *Hyperbolic geometry*: **The Klein Quartic Curve fundamental to hyperbolic geometry** can only be visualized by approximation in 3D, inviting an 8-fold commentary (Silvio Levy, *The Eightfold Way: the beauty of Klein's Quartic Curve*, Cambridge University Press, 1999)
- *Modal dichotomies of philosophy*: Douglas Ian Campbell, *The Eightfold Way: why analyticity, apriority and necessity are independent*, *Philosophers' Imprint*, 17, 2017). These can be combined to produce a tri-dichotomy of eight modal categories.
- *Policy analysis*: (Eugene Bardach, *A Practical Guide for Policy Analysis: the Eightfold Path to more effective problem solving*, 2000)
- *Data-driven business*: *Eightfold Way To Data-Driven Business*
- *Deliberation dialogue*: Peter Mcburney, David Hitchcock and Simon Parsons (*The Eightfold Way of Deliberation Dialogue, International Journal of Intelligent Systems*, 2002)
- *Coaction cardioid*: **Edward Haskell** (*Full Circle: The Moral Force of Unified Science*, 1972)

The assumption in assembling such seemingly disparate 8-fold patterns is that there are cognitive constraints and biases in determining patterns of N-foldness, as discussed more generally (*Patterns of N-foldness: comparison of integrated multi-set concept schemes as forms of presentation*, 1980; *Comprehension of Numbers Challenging Global Civilization*, 2014). These would be consistent with the arguments of George Lakoff and Rafael E. Núñez (*Where Mathematics Comes From: how the embodied mind brings mathematics into being*, 2000). Examples are indicated by the following:

- *Checklist of 12-fold Principles, Plans, Symbols and Concepts: web resources* (2011)
- *Requisite 20-fold Articulation of Operative Insights? Checklist of web resources on 20 strategies, rules, methods and insights* (2018)
- *Examples of 9-fold patterns* (2016)
- *Examples of 5-fold patterns* (2019)

The Chinese pattern of trigrams, known as **BaGua** (as employed in the image above), can be understood as indicative of an 8-fold way, especially given its traditional circular configurations suggestively termed the "BaGua mirror". Usefully recognized as barring any eightfold way is an understanding of an eightfold fence, recognized as central to Japanese cultural identity. One of Japan's first recorded poems, in the imperial anthology *Kojiki* from the early eighth century, celebrated an "eightfold fence" separating Japan from other lands and peoples, a realm where the gods dwelled (Michael Auslin, *Japan's Eightfold Fence, American Affairs*, 1, 2017, 3). Symbolic significance is variously attributed to eight-gatedness, as with the eight gates of Jerusalem, or of Heaven. Such a pattern is evident in the description of **Stephen Prothero** (*God Is Not One: The Eight Rival Religions That Run the World -- and why their differences matter*, 2010).

Eastern martial arts tend to distinguish eight "directions of unbalancing" (*Kuzushi* in Judo and Kendo) These may be associated with eight compass directions (in two dimensions) in which an opponent may be moved so as break their balance. In three dimensions they might be understood as the eight corners of a cube within which the fighter is centered. In Aikido these eight directions are understood as ways to move one's body (*Unsuiko*), to move one's opponent (*Kuzushi*), or to throw one's opponent (*Tsukuri*). The eight directions and five postures have been combined in different martial art traditions through movements, techniques, "energies", "gates", "stances" or "powers" (cf Michael P. Garofalo, *Thirteen Postures of Taijiquan: Eight Gates and Five Directions*, 2005; Michael P. Garofalo, *Cloud Hands Taijiquan and Qigong Guides, Bibliographies, Links, Resources*).

**From 2D to 3D octant configuration**: It is intriguing to note that many of the articulations of an 8-fold way take the form of checklists, potentially even the original Noble Eightfold Path of Buddhism. Those of physics imply some form of hyperdimensional configuration, as with those of symbolic logic. There is less emphasis on how any such pattern is to be comprehended as a whole -- with the cognitive engagement that might especially enable. However of particular relevance are the insights of oppositional logic (Guoping Du, Hongguang Wang and Jie Shen, *Oppositional Logic, LORI'09 Proceedings of the 2nd international conference on Logic, rationality and interaction*, 2009; Fabien Schang, *Logic in Opposition, Studia Humana*, 2013). This is an extended system of classical propositional logic.

Of particular relevance is the use of 3D symmetrical polyhedral configurations to render the insights comprehensible (*Oppositional Geometry: mathematics (and philosophy) of opposition*; Alessio Moretti, *The Geometry of Logical Opposition*, 2009). Curiously, as with mathematics, these remarkable insights have seemingly had no detectable impact on the many conditions of opposition so characteristic of society at this time -- as discussed separately (*Neglected recognition of logical patterns -- especially of opposition*, 2017; *Oppositional Logic as Comprehensible Key to Sustainable Democracy: configuring patterns of anti-otherness*, 2018).

One approach to developing this argument, and the relevance of a rotational configuration of the complex plane, is through the Coaction Cardioid cycle of Edward Haskell (*Full Circle: The Moral Force of Unified Science*, 1972), further elaborated by Timothy Wilken (*UnCommon Science*, 2001).

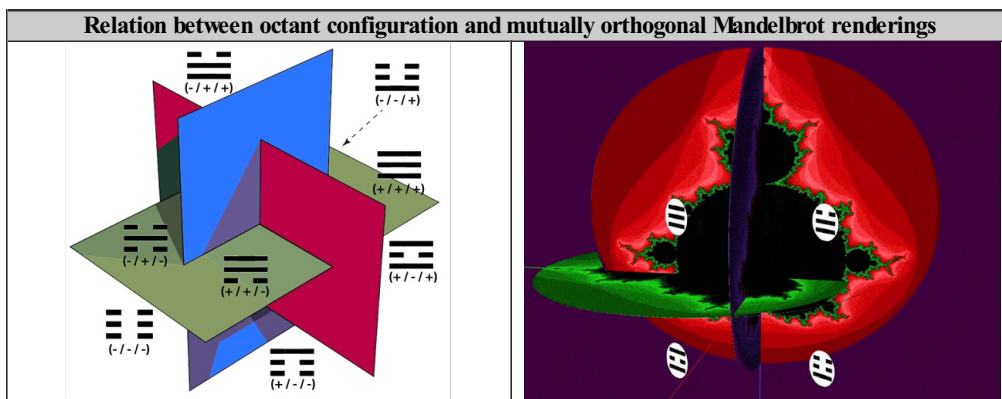
Possible 8-fold Positive-Negative Hybrid Conditions				
		Y = "Control component"		
		Negative [ - ]	Neutral [ 0 ]	Positive [ + ]
X = "Work component"	Positive [ + ]	<i>predation</i> [- +] (positive negativity)	<i>allotrophy</i> [0 +] (positive neutrality)	<i>symbiosis</i> [+ +] (positive positivity)
	Neutral [ 0 ]	<i>amensalism</i> [- 0] (neutral negativity)	O [0 0] (neutral neutrality)	<i>commensalism</i> [+ 0] (neutral positivity)
	Negative [ - ]	<i>synnecrosis</i> [- -] (negative negativity)	<i>allopathy</i> [0 -] (negative neutrality)	<i>parasitism</i> [+ -] (negative positivity)

Those indications resulted in the separate argument (*Cardioid Attractor Fundamental to Sustainability: 8 transactional games forming the heart of sustainable relationship*, 2005). This included the following sections, notably taking account of the BaGua pattern:

**A. Marrying positive and negative**  
 Interrelating positive-negative hybrids  
 Ordering classes of interpersonal relationship  
 Corresponding Taoist perspective: Ba Gua mirror  
 Transcending dualism

**B. Cyclic dynamic perspective**  
 Dynamics of a sustainable cycle  
 Psycho-social heat cycles  
 Disrupting the cycle  
 Coaction cardioid: interrelating the "games"  
 Mathematical functions of the cardioid

**Encoding indications of significance:** The illustrative images there were of 2D form. In the light of the arguments above with respect to rotation of the complex plane, there is then a case for considering how 8 distinctive cognitive significance might be associated with the octants of the 3D configuration of Mandelbrot sets as cognitive contexts of particularly quality. Insights may be distinctively associated with the BaGua trigrams (or encoded by them) as with those of oppositional logic. How then might these relate to that configuration -- as suggested by their association with the octants in the image above (and below)?



**Imagination, fantasy and aesthetic coherence?** With regard to the challenging alienation of abstract models, such as that on the left above, it is intriguing to recognize that the aesthetic complexities of the configuration on the right would not be unfamiliar to those engaging in widely popular online games of multiple levels in virtual worlds, for which level design is now a discipline in its own right. This includes the manner in which these may be segmented into domains or worlds governed by different characteristics, as with the 41 fantasy novels of Terry Pratchett's *Discworld* series.

Such complexity would seem to have a degree of intuitive appeal which is far from widely evident in models engendered by the policy-making environment. Of particular relevance is the design preoccupation with dynamic game difficulty balancing, namely the process of automatically changing parameters, scenarios, and behaviours in a video game in real-time, based on the player's ability, in order to avoid engendering boredom in a player. This may include nonlinear gameplay. Given increasing levels of alienation from science and world news, it could be asked how these environments now compare to the engagement offered by gaming (Les Sillars, *The Future of News, First Things*, March 2019; Nic Newman, *Journalism, Media and Technology Trends and Predictions 2019, Digital News Publications; Most young lack interest in politics: official survey, BBC*, 21 February 2014).

With respect to the aesthetic appeal of the Mandelbrot set, further speculation is possible, given the manner in which it embodies the golden ratio as the convergence of the Fibonacci series (Holly Krieger, *Fibonacci Numbers hidden in the Mandelbrot Set, Numberphile*, 5 October 2017). The circumference of the visual rendering is characterized by what are termed "bulbs". These are distinguished by their periodicity. This raises the question as to how many bulbs there are, as discussed separately. If there is a degree of intuitive recognition

of the coherence of the pattern represented by such a rendering, it could be asked whether this is somehow associated with the considerable value attached to prayer beads in many cultures. More specifically, is it possible that the number of beads in any such circlet is related to the bulbs and their periodicity? Thus there are: 6 bulbs of period 4, 15 of period 5, 27 of 6, 63 of 7, 120 of 8, 252 of 9, and 495 of period 10. Such numbers are of the order of various prayer bead circlets (*Designing Cultural Rosaries and Meaning Malas to Sustain Associations within the Pattern that Connects*, 2000).

Given the mysterious constraint on the neocortical cognitive limit to the maintenance of stable social relationships, at approximately 150 - known as **Dunbar's number** -- could that also be related to that pattern of conceptual distinctions? This has been clarified by David Burkus (*Dunbar's number doesn't represent the average number of social connections*, *Quartz*, 8 August 2018). This notes that research has shown that the average (mean) network size of those surveyed was 611 people. Taken by itself, this number is dramatically larger than Dunbar's estimate. But while the mean network size was 611 contacts, the median was 472 contacts (period 10?). To a statistician this is a clear signal that the number of contacts in people's networks doesn't follow a normal distribution. Instead, network sizes may follow a **power law** (Tyler H. McCormick, et al, *How Many People do you Know?: Efficiently estimating personal network size*, *Journal of the American Statistical Association*, 105, 2010).

## Comprehension of coherence currently constrained by convention

It is relevant to note that representations of the complex plane, and renderings of the Mandelbrot set in relation to it, are governed by a consideration which is rarely questioned. In the case of the Mandelbrot set, some non-mathematicians have favoured a vertical orientation -- specifically recalling some representation of a seated Buddha. This is necessarily anathema to mathematicians.

**2-foldness:** In developing this argument there is an issue to be addressed with respect to various conventions, notably the conventional preference placing the "negative" on the left (or below) -- whatever that may imply. Other issues relate to the associations with up and down. These can be explored more extensively (*Unquestioned Bias in Governance from Direction of Reading? Political implications of reading from left-to-right, right-to-left, or top-down*, 2016).

Associated with such issues, there is potentially a more fundamental issue in relation to universal assumptions regarding the mutually orthogonal axes of the Cartesian system. This too is so widely useful that any question as to its adequacy in enabling comprehension is readily rejected. Curiously however, some other domains suggests some real challenges in comprehending the nature of what is simply described as a set of three dimensions and how people may engage with them.

An obvious issue in the argument above with regard to the rotation of the complex plane on the axis of real numbers, or that of imaginary numbers, is any implication regarding the direction of that rotation. Any resulting "three dimensional" framework could then take several forms as a result of **chirality**. These then raise issues as to interpretation of the octants so defined -- and especially in the light of any encoding system used, as suggested by trigram attributions -- effectively an instance of "semantic compactification" (as discussed below).

**3-foldness:** There is then a sense that a degree of polysemic ambiguity is embodied in a given trigram code. This contrasts with the unquestionable clarity and lack of ambiguity conventionally associated with the eight **Boolean operations** which the trigram pattern could be considered to encode. More fundamentally problematic still is the vexatious question of what is understood or implied by "positive" and "negative", and the role of AND (**conjunction**), OR (**disjunction**) and NOT (**negation**) (*Risk-enhancing Cognitive Implications of the Basic Mathematical Operations*, 2013). Use of both positive and negative is highly charged in society, the one cultivated at all costs, and the other deprecated in many situations (*Barbara Ehrenreich, Bright-sided: how the relentless promotion of positive thinking has undermined America*, 2009).

It could be said that the challenges of governance in society are indicated by the problematic interpretation of Boolean operations and their representation. Provocatively this can be explored through any effort to represent the unity for which appeals are so widely made, on the unquestionable assumption that its nature implies no challenge to comprehension (*Exploring Representation of the Tao in 3D: virtual reality clues to reconciling radical differences, global and otherwise?* 2019). right/left up/down -- right/wrong -- know/ignorance  
\*\*\*

Although presumably a lesser challenge, the problem of comprehension of threefoldness has long been a cause for reflection. In a simple form it can be recognized in the traditional challenge of the 3-element game of **Rock-Paper-Scissors**, It can be explored through the linkage of **Borromean rings**, or the **3-body problem** of physics. The 3-fold configuration of the complex plane above can be recognized both as three mutually orthogonal planes and as 3 mutually orthogonal disks or rings.

Threefoldness has of course been cause for reflection in theology over centuries, as most clearly made and illustrated in an extensive analysis of how **Dante Alighieri** describes the three rings (*tre giri*) of the Holy Trinity in *Paradiso 33* of the *Divine Comedy* (Arielle Saiber and Aba Mbirika, *The Three Giri of Paradiso XXXIII, Dante Studies*, 131, 2013, pp. 237-272). That remarkable interdisciplinary exploration combines insights from speculative theology, geometry and knot theory, as discussed separately (*Engaging with Elusive Connectivity and Coherence: global comprehension as a mistaken quest for closure*, 2018).

**4-foldness:** Whilst the 3-fold Boolean operations can indeed be considered basic, notably to the logical operation of computers, it is appropriate to note the contrasting 4-fold pattern of the **tetralemma** of some Asian logic, and a feature of **De Morgan's laws**. Reconciling these frameworks is further challenged by **quantum superposition**, now a much-explored feature of **quantum computing**. In that context, qubits can be in a 1 or 0 **quantum state**. But they can also be in a superposition of the 1 and 0 states -- with fundamental implications for the social sciences and governance (Alexander Wendt, *Quantum Mind and Social Science: unifying physical and social ontology*, 2015). Most obviously, such a framework reframes the challenges and opportunities of the "two-state" dilemma of Israel-Palestine -- seemingly stuck in a "one-state" framework in the absence of access to more complex imagination (*Jerusalem as a Symbolic Singularity: comprehending the dynamics of hyperreality as a challenge to conventional two-state reality*, 2017).

Aside from the 2-fold nature of its axes, the geometry of 3 mutually orthogonal planes offers 4 diagonal axes through the opposing octants, suggesting possibilities of reconciling the conventions of any 3-fold comprehension with those of 4-fold comprehension. It is appropriate to note that a major focus of the work of [Carl Jung](#) can be recognized as the exploration of the relation between the 3-fold and the 4-fold through the indications offered by symbolism. It is in that light that the challenge of this argument can be succinctly framed in commentary on [William Blake's Milton: a poem in two books](#) as discussed by Matthew A. Fike (*The One Mind: C. G. Jung and the future of literary criticism*, 2013) with regard to the *Ways of seeing in Blake's Milton* (pp. 184-215) expressed as follows:

Now I a fourfold vision see.  
And a fourfold vision is given to me,  
'Tis fourfold in my supreme delight

And threefold in soft Beulah's night  
And twofold Always. May God us keep  
From Single vision and Newton's sleep

The challenge of "ways of seeing" (understood singularly rather than as multifold) has also been evoked in extensive commentary on the poem by [Wallace Stevens'](#) (*Thirteen Ways of Looking at a Blackbird*, 1917), as discussed separately (*Anticipating When Blackbirds Sing Chinese*, 2014) with respect to the following themes:

Cognitive fusion to engage with information complexity and overload	Ways of looking at ways of looking -- in a period of invasive surveillance
Transformation of linear information into a songbite	Post-modern challenge to simplistic binary framing of the other
Memescapes engendered and sustained by multidimensional soundscapes	Imaginative composition of ways of looking or listening
Information transfer possibilities of blackbird singing capacity	Embodying a multiverse of uncertainly ordered incongruity
Noopolitics and memetic warfare within the noosphere	Thirteen ways of apprehending blackbird song
Engaging with a memespace of paradoxical complexity	Imagining future communication integrity enabled by aesthetics

**Insight from fundamental physics?** Given the chaotically surreal condition of society, it is curious that coherence with regard to the fundamental constitution of matter is framed in terms of the strange properties imputed to the [quark](#) as a type of elementary particle. Somewhat extraordinarily this is described with the following language (as offered by *Wikipedia*):

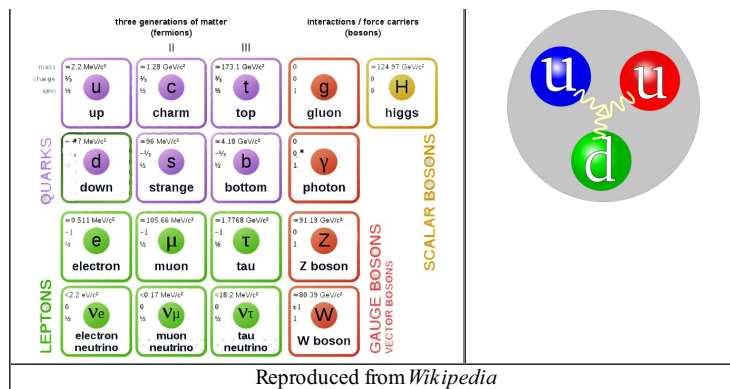
- Due to a phenomenon known as [color confinement](#), quarks are never directly observed or found in isolation
- Quarks have various [intrinsic properties](#), including [electric charge](#), [mass](#), [color charge](#), and [spin](#).
- They are the only elementary particles in the [Standard Model of particle physics](#) to experience all four [fundamental interactions](#), also known as *fundamental forces* ([electromagnetism](#), [gravitation](#), [strong interaction](#), and [weak interaction](#))
- There are six types, known as [flavors](#), of quarks: [up](#), [down](#), [strange](#), [charm](#), [bottom](#), and [top](#).
- For every quark flavor there is a corresponding type of [antiparticle](#), known as an [antiquark](#), that differs from the quark only in that some of its properties (such as the electric charge) have [equal magnitude but opposite sign](#).
- As one of the fundamental constituents of an atom, a [proton](#) is understood to be composed of two up quarks, one down quark, and the [gluons](#) that mediate the forces "binding" them together. The [color assignment](#) of individual quarks is arbitrary, but all three colors must be present.

In the light of major initiatives by the United Nations to frame a coherent strategic framework for governance, it could be asked why that has been done through the 8-fold [Millennium Development Goals](#), since replaced by the 17-fold [Sustainable Development Goals](#). In the desperate quest for strategic global coherence, why is a set of the latter size matched by the 15 [Millennium Global Challenges](#) of the [Millennium Project](#) and most recently by the 16 Global Challenges of Policy Horizons Canada (*The Next Generation of Emerging Global Challenges, Horizons*, 19 October 2018)?

How indeed are coherence and wider comprehension to be related to such sets? One approach to this matter is through widespread engagement with [Rubik's Cube](#) (*Interplay of Sustainable Development Goals through Rubik Cube Variations: engaging otherwise with what people find meaningful*, 2017). The 8 Millennium Goals can for example be [mapped onto the 3x3x3 surfaces of Rubik's Cube](#), raising the question as to whether a sense of 15-fold coherence derives from the mathematics of a "magic square of sustainability" -- given that 15 is the [magic constant](#) for a 3x3 square?

Whilst that approach can be developed, is the conceptual coherence seemingly attributed to the 17-fold Sustainable Development Goals curiously suggested by that of the Standard Model of Elementary Particles -- "goals" as "particles"? Could the coherence of the following diagram be understood in that light -- given the 17 categories so coherently distinguished? There is a delightful irony to any comparison of the 17th Sustainable Development Goal, namely [Partnership for the Goals](#), with the role of the [Higgs boson](#) (otherwise known as the God Particle).

Standard Model of Elementary Particles	
Six of the particles are quarks (shown in purple). Each of the first three columns forms a <a href="#">generation</a> of matter.	A <a href="#">proton</a> is composed of three quarks and the gluons that mediate the forces "binding" them together. The <a href="#">color assignment</a> of individual quarks is arbitrary, but all three colors must be present.



Conceptually such considerations raise the question as to the nature of any future "standard model" of relevance to the strategic issues of governance and their comprehension (*Beyond the Standard Model of Universal Awareness: Being Not Even Wrong?* 2010; *Epistemological Panic in the face of Nonduality: does nothing matter?* 2010; *Metaphorical Insights from the Patterns of Academic Disciplines: learning from the Standard Model of Physics?* 2012; *Interweaving threads beyond the standard model: "life crafting"?* 2014)

**Truth tables:** Despite what might be expected in terms of unambiguous clarity from logical and boolean operators (in addition to the 3-fold set indicated above), the literature offers a variety of 2D "truth tables" of various sizes in terms of which sets of such operators are presented.

- There are 16 possible truth functions of two binary variables (*Truth table for all binary logical operators*): Contradiction; Logical NOR ; Converse nonimplication; Negation; Material nonimplication; Negation\*; Exclusive disjunction; Logical NAND; Logical conjunction; Logical biconditional; Projection function; Material implication; Projection function\*; Converse implication; Logical disjunction; Tautology
  - Logical conjunction (AND) (12 cells)
  - Logical disjunction (OR) (12 cells)
  - Logical implication (12 cells)
  - Logical equality (12 cells)
  - Exclusive disjunction (12 cells)
  - Logical NAND (12 cells)
  - Logical NOR (12 cells)
- A truth table of 12 secondary operations
- 6 logical or boolean operators are considered in database searches: AND, conditional AND, OR, conditional OR, exclusive OR, and NOT (*Database Search Tips: Boolean operators*)

One clarification of this variety is offered (by *Wikipedia*) in terms of the digital logic of electronic hardware. The Boolean algebra of 0 and 1 consists of logic gates connected to form a circuit diagram. Each gate implements a basic Boolean operation (AND, OR, NOT) and is depicted schematically by a shape indicating the operation. The eight subsets of any of the three ports of either an AND or OR gate may be complemented. The resulting sixteen possibilities give rise to only eight Boolean operations, namely those with an odd number of 1's in their truth table. There are eight such because the "odd-bit-out" can be either 0 or 1 and can go in any of four positions in the truth table. There being sixteen binary Boolean operations, this must leave eight operations with an even number of 1's in their truth tables. Two of these are the constants 0 and 1 (as binary operations that ignore both their inputs); four are the operations that depend nontrivially on exactly one of their two inputs.

Perhaps needless to say, these matters are further complexified in the case of quantum logic gates (Ashok Muthukrishnan, *Classical and Quantum Logic Gates: an introduction to quantum computing*, 1999)

## Memorability: "comprehension tables" as complement to "truth tables"

**Comprehension?** Given this subtle complexity, there is great irony to the fact the governance of society depends formally on the binary distinction between "true-or-false", or "guilty-or-not guilty". A rare exception with respect to the latter is the "not proven" of Scottish law, and the cultivated evanescent nature of fake news and its deniability (*Varieties of Fake News and Misrepresentation: when are deception, pretence and cover-up acceptable?* 2019; *Deniable responsibility for any ultimate crime against humanity?* 2019). The emergence of a "post-truth" society, characterized by post-truth politics, even suggests the need for a post-truth adaptation of truth tables (*Towards articulation of a "post-truth table"?* 2016)

Curiously missing from any discussion of an "eightfold way", or of the subtle intricacies of "truth tables", is the challenge they may imply to comprehension. It is as though the simple presentation of such patterns is naively assumed to trigger comprehension of the knowledge implied -- as with declarations regarding the threat of global warming and other crises. Whereas the focus of truth tables is on the "shades of grey" in the relation between "true" and "false", their presentation is seemingly to be recognized as constituting a simple binary distinction between "knowledge" and "ignorance". The reality that any "eightfold way" (as encoded by such tables) may be meaningless (or incomprehensible) is not a consideration.

Focus has been widely placed on the Biblical quote: *And you shall know the truth, and the truth shall make you free* (John 8:32). Unfortunately, "truth" will not make people free unless it is comprehensible -- otherwise incomprehension will be conflated in practice with "false" and "wrong".

From that perspective, exposure to any pattern of knowledge supposedly invites a learning process in which people may engage -- or should be encouraged to do so. Failure to do so may then invite a degree of condemnation as an indication of deliberately "wallowing" in ignorance -- as with massive loss of biodiversity. Since the focus of this argument is on the coherent comprehension of complexity, it is then appropriate to explore the sense in which any articulation of a truth table might be more fruitfully understood in terms of a "comprehension table".

**Memorability?** The argument is all the stronger when "memorability" is associated with comprehension. There is always the possibility that a new pattern of knowledge may be only briefly understood after explanation -- and then forgotten. Of potentially greater concern in an aging society, with aging decision-makers, is the manner in which a previously known pattern may be gradually forgotten or incompletely remembered -- however it was recognized in the first place.

How is account to be taken of the experience of an expert on propositional logic when gradually affected by Alzheimer syndrome? Knowledge may well be effectively "lost", especially collectively, as can be variously discussed (*Societal Learning and the Erosion of Collective Memory -- a critique of the Club of Rome Report: No Limits to Learning*, 1980).

That critique argued the point through the description offered by [Doris Lessing](#) of the fictional encounter of a "galactic development officer" with the representative of a "developing planet":

To say that he understood what went on was true. To say that he did not understand -- was true. I would sit and explain, over and over again. He listened, his eyes fixed on my face, his lips moving as he repeated to himself what I was saying. He would nod: yes, he had grasped it. But a few minutes later, when I might be saying something of the same kind, he was uncomfortable, threatened. Why was I saying that? and that? his troubled eyes asked of my face: What did I mean? His questions at such moments were as if I had never taught him anything at all. He was like one drugged or in shock. Yet it seemed that he did absorb information for sometimes he would talk as if from a basis of shared knowledge: it was as if a part of him knew and remembered all I told him, but other parts had not heard a word. I have never before or since had so strongly that experience of being with a person and knowing that all the time there was certainly a part of that person in contact with you, something real and alive and listening -- and yet most of the time what one said did not reach that silent and invisible being, and what he said was not often said by the real part of him. It was as if someone stood there bound and gagged while an inferior impersonator spoke for him. (*Re: Colonised Planet 5 - Shikasta*, 1979, pp. 56-57).

The issue is potentially relevant to the set of 17 Sustainable Development Goals. What proportion of those promoting them would be capable of remembering all of them? What of those who have only vaguely heard of them -- or have never heard of them? What is the role of memory aids in mitigating between forgotten knowledge and its remembrance through a "reminder"?

The tetralemma, notably in the light of its importance in Asian logic, could then be adapted -- or be recognized as implying:

- knowledge (AND) -- pattern recognition
- ignorance (NOT) -- non-recognition of a pattern
- partial knowledge/ignorance (BOTH)
- neither knowledge nor ignorance (NEITHER)

**Ignorance vs. Comprehension?** Adapting any approach to truth tables could then give simpler patterns of the following kind. The pattern below left acquired considerable publicity through being cited in poetic form by [Donald Rumsfeld](#) as US Secretary of Defense (*There are Known Knowns*, 2002; *The Unknown Known*, 2013).

Ignorance vs. Comprehension?			
	Ignorance	Knowledge	
Remembrance	Remembered ignorance	Knowledge remembered	
Unremembrance	Forgotten ignorance	Knowledge forgotten	
	Unknown	Known	
Known	Known unknowns	Known knowns	
Unknown	Unknown unknowns	Known unknowns	

	Ignorance	Partial knowledge	Knowledge
Remembrance	Remembering having known	Both knowledge and ignorance	Knowledge remembered
Partial remembrance	Partially remembered ignorance		Knowledge partially remembered
Unremembrance	Ignorance forgotten	Neither knowledge nor ignorance	Knowledge forgotten

As with the extensive literature on the nature of [truth](#), the question of what is [knowledge](#) is clearly a matter of continuing reflection -- despite the clarity supposedly offered by propositional logic. The same can be said of [ignorance](#) -- too readily understood in terms of a lack of knowledge or information, given the challenge of comprehension. This is variously acknowledged ([Gerd Gigerenzer](#) and Rocio Garcia-Retamero, *Cassandra's Regret: The Psychology of Not Wanting to Know*, *Psychological Review*, 124, 2017, 2; Lee McIntyre, *The Attack on Truth: we have entered an age of willful ignorance*, *The Chronicle of Higher Education*, 12 June 2015). Especially insightful in this regard are the work of [Nicholas Rescher](#) (*Ignorance: On the Wider Implications of Deficient Knowledge*, University of Pittsburgh Press, 2009; *Unknowability*, Lexington Books, 2009). What recognition is to be given to the widely cited pejorative judgement of science with regard to a theory being *Not Even Wrong*?

It is curious to note that ignorance is not a valid plea before the law (*Ignorantia juris non excusat*). However it is also appropriate to note the extent to which "forgetting" plays a role in legal proceedings, potentially ensuring impunity. Such considerations cannot be readily set

aside, despite the purported [inconvenience of the truth of climate change](#) (*An Inconvenient Truth -- about any inconvenient truth*, 2008). Arguably the [leakage of US diplomatic cables](#) via Wikileaks offered a form of knowledge, where public ignorance had previously been ensured.

In a period of global crisis, with the threat of World War III and various forms of collapse, it is useful to recall the effect of one weapon which may be used -- EMP ([nuclear electromagnetic pulse](#)) -- which can have the capacity to erase electronic memory and any associated cultural heritage. Seemingly less violent, but with similar consequences, are the increasing effects of cyberwarfare and dissemination of malware -- ensuring permanent individual and collective memory loss.

**Semantic compactification?** The argument with regard to true-false, knowledge-ignorance, memorability-forgettability and innocence-guilt could be taken further. If indeed there is a remarkable tendency to simplistic semantic conflation in binary terms, especially in discourse with strategic implications, could understanding of it be fruitfully informed by the understanding of physics of [compactification](#)? In [string theory](#) this endeavours to reconcile the gap between the conception of the universe based on its four observable dimensions with the ten, eleven, or twenty-six dimensions which theoretical equations suggest the universe is composed. There is a degree of irony to the choice by physics of the "string" metaphor when discourse, especially that enabled by the internet, makes extensive use of the "thread" metaphor and the challenges it poses (*Interweaving Thematic Threads and Learning Pathways*, 2010; *Weaving together the threads: warp and weft*, 2002)

In the physics of compactification, some of the [extra dimensions](#) are assumed to "close up" on themselves to form circles -- to be "curled up" in some way. At the limit where these curled up dimensions become very small, spacetime can then be treated as being effectively of a lower number of dimensions. Compactification may then be understood in terms of a form of ["dimensional reduction"](#) which would seem to be only too apparent in the recourse to binary argumentation.

**Towards recognizing an array of "dimensions":** Many unresolved strategic challenges then lend themselves to exploration as being variously conflated in the associated discourse:

true-false	right-wrong	profit-loss
knowledge-ignorance	memorability-forgettability	justice-injustice
agreement-disagreement	comprehension-misunderstanding	positive-negative

Whether understood as "conflation" or "confusion", the implication merits consideration in terms of the cognitive process associated with "con" (*Prefix "Re-cognition" as Prelude to Fixing Sustainability -- "Pro" vs "Con" ? Speculative review of missing emphases potentially vital for psychosocial balance*, 2017; *Considerable Conglomeration of "Cons" of Global Concern: eightfold constraint on constructive conflict control?* 2010; *Exploration of Prefixes of Global Discourse: implications for sustainable confidility*, 2011).

This would then suggest that such "value polarities" could be decomposed in terms of "tables", then to be understood in more general terms as "value tables" (rather than limited to "truth tables"). Of some relevance is an earlier systematic approach to the identification of an extensive set of [value polarities](#) through the [Human Values Project](#), taking account of the ambiguities with which they may be associated (in English). These were clustered experimentally into a 5x9 table of [value types](#). Provocatively it might then be asked whether ["value theory"](#) (axiology) could require "ten, eleven, or twenty-six dimensions" -- to conform to an analogue to the [M-theory](#) unifying all consistent versions of [superstring theory](#). Clearly the complex condition of society suggests that some such number of "extra dimensions" is required, if it is appropriate to assume that the psychosocial system is at least as complex as the physical system -- if not more complex -- as it would appear to be.

The challenge is highlighted by the incredible capacity of science to enable travel to the limits of the solar system -- matched by the incredible incapacity to address effectively the complexities of a social system in crisis (*Challenges More Difficult for Science than Going to Mars -- or exploring the origins of the Universe or of Life on Earth*, 2014).

**Arrogance vs Humility:** Just as the comprehension dimension is missing from consideration of truth tables, fundamental to the complexity of dynamics between strategies and their advocates is the dramatic consequence of any association of arrogance with possession of truth. Such possession is subtly related to the widespread preoccupation with acquisition of intellectual property -- potentially to the point of holding to ransom a society in crisis (*Future Coping Strategies: beyond the constraints of proprietary metaphors*, 1992). How does exclusive possession of truth -- in the form of secrecy --condemn others to a condition of falsehood?

Whilst truth is a focus of considerable attention, the arrogance potentially associated with any assumption of its exclusive possession is a remarkably neglected focus of study -- despite widespread acknowledgement of its effects in practice. The arrogant scientist is as recognizable as the arrogant politician, ideologue or entrepreneur (*Knowledge Processes Neglected by Science*, 2012). **How is the assertion of truth to be distinguished from the perception of arrogance?** As yet to be clarified with respect to any compactification of dimensions are the dynamics framed by the following table, indicative of the self-reflexivity associated with higher orders of cybernetics.

value-polarities	false (ignorance)	true (knowledge)
humility	recognizing lack of knowledge	recognizing the relativity of knowing
arrogance	ignorant assertion of knowledge	denying relevance of other ways of knowing

Metaphorically framed, there is a curious sense in which arrogance can be compared to gravity, especially when truth is asserted with gravitas (*Arrogance as an analogue to gravity -- equally fundamental and mysterious*, 2015; *Exertion of "gravitational" effects by a big lie?* 2016), The articulation of conceptual models as forms of truth lends itself to exploration in such terms (*Understanding models otherwise -- as centres of "gravity"*, 2015). Of related interest is the diminishing effect of such gravity with distance -- itself to be

understood in communication terms, as suggested by proxemics (*Local "force" vs Global "gravity"-- or the reverse?* 2019). Rather than being "made free by truth", there is a sense in which the manner in which it is possessed can then be understood as a form of entrapment -- as with being trapped in a [gravity well](#).

## Metaphors associated with trigram and tetragram encodings

**Metaphors of 8-foldness:** Various seemingly disparate understandings of an "eightfold way" are cited above. Any focus on "eight Boolean operations" could also be considered in that light -- as another metaphorical framework indicative of cognitive insight. Together these various sets could be understood as complementary metaphors of an 8-fold mode of far more subtle understanding. Each such framework is then to be recognized as offering insights into its cognitive significance, with any one framework understood as potentially more accessible to some -- however alienating and irrelevant it may be to others.

Each 8-fold set is however far from being as memorable as might otherwise be assumed. Hence the widespread recourse to the dangerously simplistic binary distinction of "true-or-false", etc. Evidence indeed shows that users of database or information systems have difficulties specifying complex boolean queries. Similarly in legal proceedings (and other forms of examination) there is little subtlety to the binary requirement of whether something is known or not. Such questions are clearly of relevance to democratic governance where a popular vote may be exploited to argue that a majority of 51% reflects the "will of the people" -- as in the case of Brexit.

It is therefore understandable that there is interest in the metaphors which might facilitate comprehension of Boolean complexities and the relevance of their memorability:

- Krister Segerberg: *A Modal Logic of Metaphor Studia Logica: An International Journal for Symbolic Logic* 99, 2011, 1/3
- Mitchell J. Nathan and Kristi Jackson: *Reframing the Role of Boolean Classes in Qualitative Research From an Embodied Cognition Perspective*, 2006
- Charles Dziuban Patsy Moskal: *Analytics and Metaphors: Grounding Our Understanding in a Conceptual Framework* 3 June 2013
- Luca Paolino, Monica Sebillio, Genoveffa Tortora and Giuliana Vitiello: *The Predicate Tree: a metaphor for visually describing complex Boolean queries International Conference on Advances in Visual Information Systems VISUAL 2007: Advances in Visual Information Systems* pp 524-536
- Francesco-Alessio Ursini: *A Unified Approach to Metaphors and Polysemy: the case of At* (Cambridge University Press. 2010)

**Challenge of seemingly incommensurable frameworks:** A characteristic of the variety of "eightfold ways" is the extent to which each is deemed irrelevant to the other -- to some degree, if not entirely. There is little sense of the [requisite variety](#), as appreciated from a cybernetic perspective. Employment of truth tables may then be understood as playing out through the manner in which the proponents of each way claim it as "true" -- with other ways variously claimed to be "false". Any subtlety, potentially deriving from consideration of [correspondence theories of truth](#), is thereby ignored (*Theories of Correspondences -- and potential equivalences between them in correlative thinking*, 2007).

There is little capacity, if any, to engage in discourse with regard to frameworks deemed incommensurable. One is unquestionably right and true, and the other is necessarily the epitome of the wrong, the false and superstition -- or even a manifestation of evil. This is the challenge of interfaith, interdisciplinary and intercultural dialogue. It is only too evident in that between political parties of distinctive ideological persuasion, as between right and left, however this might be reframed (*Coordination of Wing Deployment and Folding in Politics: bird flight and landing as complementary metaphors of global strategic coherence*, 2018; *Counteracting Extremes Enabling Normal Flying: insights for global governance from birds on the wing and the dodo*, 2015). The pattern is variously nuanced, for some, in the relation between the ["two cultures"](#), the arts and the sciences

Dialogue with the "other" (the "enemy") is readily framed as treasonous -- as exemplified by the case of the Taliban. Ironically, with the extreme polarization of gender politics, this has become increasingly evident between the sexes, for which "truth tables" of a distinctive form could well be envisaged following widespread recognition of the LGBT and LGBTIQ patterns. Together these examples are indicative of a conflation of true/false, right/wrong, innocent/guilty with agreement/disagreement. The latter is emphasized by US foreign policy doctrine: *You're either with us, or against us*. Such conflation of distinctions could indeed be explored in the light of the physics of compactification.

## Confrontation of highly "incompatible" frameworks as a vital necessity in times of chaos?

Given the prevailing degree of incommensurability in society, there is therefore an argument for exploring the rare examples of whatever is to be understood by their reconciliation -- given the subtle complexity for which this may call (as implied by the desperate appeals for "unity"). Ironically there is a sense in which the cognitive modes, disciplines or approaches which most call for "correlation" are those whose proponents "would not be seen dead" at the same table or gathering, or represented in the same publication. Gatherings of the congenial, characterized by mutual appreciation, cannot be said to embody the requisite variety for which the complexity of the crisis calls. Congenial gatherings of the "self-righteous" are necessary but not sufficient.

It is vital to recall the plethora of strategies variously held to be "right" -- but together seemingly unable to respond to the crisis of society. It is then appropriate to ask why their advocates fail to explore the dynamics whereby each is deprecated by others as problematic -- if not dangerously so. History may well find it incredibly naive that society pursues consensus so desperately -- being unable to explore the possibilities of building on the disagreement so characteristic of biodiversity valued otherwise (*Using Disagreements for Superordinate Frame Configuration*, 1992).

The difficulty is usefully framed by the adage: *one person's meat is another person's poison*. In an ecologically sensitive context this could

be reframed as: *one person's sense of what is right is another person's sense of what is wrong*. The challenge is then framed as one of "recycling" the "waste" produced "wrongfully" by those acting "righteously" (*Encycling Problematic Wickedness for Potential Humanity*, 2014; *Transcending the wicked problem engendered by projecting negativity elsewhere*, 2015)

The paradoxical challenge lies in the interaction of those whose perspectives are mutually non-comprehensible -- a challenge exemplified by that of any hypothetical encounter with extraterrestrials (*Designing a Team for Alien Encounter: Communicating with Aliens*, 2000). The relevant cognitive modalities now merit recognition as mutually "alien" (*Systemic Function of Highly Unrepresentative Minorities: recognizing the role of the "Dark Riders" of social change*, 2018)

A useful case for consideration is offered by the extremes of Western articulation of the Standard Model of physics on the one hand and the subtlety of Chinese thinking over centuries -- however this may be considered to have since been subsumed by the advance of science. Any assessment is usefully qualified by the arguments of such as Xiaoying Qi (*Globalized Knowledge Flows and Chinese Social Theory*, 2014).

Examples of such controversial authors, variously constrained and deprecated in mainstream publication and appreciation of their work, include:

- Quincy Robinson and Paul Martyn-Smith (*Evidence of Modern Physical Knowledge from Asiatic Antiquity: Re-integration: Nine Realms of Middle Earth*, 2015). [see [collection of papers](#)]
- Kent D. Palmer [see [collection of papers](#)]
- Frank Dodd Tony Smith Jr [see [collection of papers](#)]. *PhiloPhysics* describes some religio-philosophical systems and some physics models, with comments about some relevant interrelationships
- Arthur M. Young (*The Geometry of Meaning*, 1976)

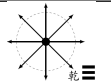
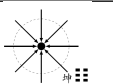
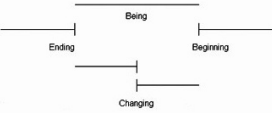
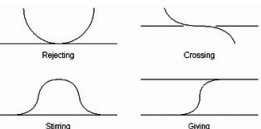
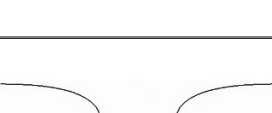

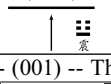
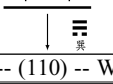



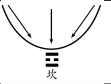
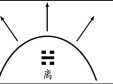
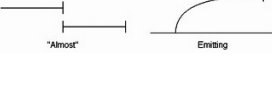

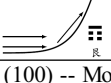
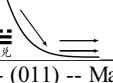
A notable effort to provide a context for such contrasting perspectives is that compiled by Helene Finidori (*Systemic Change, Spanda Journal*, 6, 2015, 1). A remarkably articulated example, extensively informed by mathematics, is that of Shu Shengyu (*The Relations Between Ancient China's Taoism and Modern Mathematics and Physics*, The Zhong Language Computing Technology Research and Development Alliance, 2015). It is structured as follows:

Tao and YinYang The Five Elements	The Eight Trigrams	QED and the Standard Model
<ul style="list-style-type: none"> <li>• The traditional theory</li> <li>• The graph structure and Maxwell's equations</li> <li>• Interaction and a math problem</li> </ul>	<ul style="list-style-type: none"> <li>• The traditional theory</li> <li>• The relation between Houtian theory and Maxwell's equations</li> <li>• The relation between Xiantian theory and Dirac's equations</li> <li>• The Gua representation of Einstein's equations</li> <li>• The unified change patterns in Gua space</li> </ul>	<ul style="list-style-type: none"> <li>Appendix A: Period theory</li> <li>Appendix B: Macroscopic motion represented by BaGua</li> <li>Appendix C: Magic square theory</li> </ul>

Shu Shengyu's consideration of macroscopic motion, represented by *BaGua* (Appendix B), notes that the eight basic trigrams also correspond to eight categories of macroscopic motion, each category having a certain degree of correlation with the original meaning given by the *I Ching* (*Book of Changes*). These eight categories of motion are simply explained as follows (and depicted below):

- *Qian*-category motion is defined as diffusion or out break from a space-time point uniformly towards the outside of the spherical surrounding it. A typical example is the fission of the nucleus.
- *Kun*-category motion is defined as in a spherical spatial and temporal scope, matter and energy aggregates to the center. A typical example is the fusion of nucleus.
- *Zhen*-category motion is defined as two objects which move in the same direction and collide. A typical example is the collision between objects.
- *Xun*-category motion is defined as two objects which move in reverse direction and separate. A typical example is the expansion of the gas.
- *Kan*-category motion is defined as an object move in the vicinity of the minimum point of a potential field. A typical example is the oscillatory movement of objects in the potential well.
- *Li*-category motion is defined as matter and energy radiate towards a particular direction from a certain region of spacetime. A typical example is the combustion radiating heat and light.
- **Gen**-category motion is defined as an object with a certain velocity deceleration or even stop after encountered obstacles, and then trapped in a space-time point. A typical example is the braking deceleration, friction, and such as the motion of reducing kinetic, increasing potential in the potential field.
- *Dui*-category motion is defined as objects get freedom from restraint or accelerate by the external force of the push. A typical example is the motion of increasing kinetic, reducing potential in the potential field.

The connectivity implied by such metaphors of motion suggests the possibility of further coherence through confrontation with the archetypal morphologies of the 2x8-fold set of archetypal morphologies identified by René Thom (*Structural Stability and Morphogenesis: an outline of a general theory of models*, 1972), as doscessed separately (*In Quest of a Dynamic Pattern of Transformations: sensing the strange attractor of an emerging Rosetta Stone*, 2012). Of particular interest is Thom's own interest in their cognitive implications as processes, following his semiotic generalization (*Esquisse d'une Sémiophysique: physique aristotélicienne et théorie des catastrophes*, 1989).

Comparison of archetypal morphologies with BaGua			
Macroscopic motion represented by BaGua Shu Shengyu ( <i>The Relations Between Ancient China's Taoism and Modern Mathematics and Physics</i> , 2015)		Archetypal morphologies René Thom ( <i>Structural Stability and Morphogenesis: an outline of a general theory of models</i> , 1972, p. 307)	
			
Qian -- (111) -- Sky	Kun -- (000) -- Earth		
			
Zhen -- (001) -- Thunder	Xun -- (110) -- Wind		
			
Kan -- (010) -- Water	Li -- (101) -- Fire		
			
Gen -- (100) -- Mountain	Dui -- (011) -- Marsh		

## Coherence of a cognitive nexus comprehended dynamically

Whilst the distinctions made above are valuable, it is not as though society lacks patterns of distinction. The challenge would appear to lie both in how they are interrelated systemically and how any such system can be understood as working coherently -- even how it may be cognitively embodied. Inherently problematic is any assumption of permanent solidity or rigidity as is readily attributed to a fixed category, statically framed (by convention and definition), as separately discussed (*Dynamic Transformation of Static Reporting of Global Processes: suggestions for process-oriented titles of global issue reports*, 2013)..

Ironically the challenge to such rigidity has been most recently exemplified -- with a very high degree of controversy -- through the politics of [gender identity](#) and [sexual identity](#), as discussed separately (*Global Civilization through Interweaving Polyamory and Polyanimosity? Loving/Hating the world otherwise through contractual bonding with any significant other*, 2018; *Reimagining Intercourse between the Righteous Unrightly Challenged: attraction and harassment in psychodynamic terms beyond the binary blame-game*, 2017). The latter discusses:

Mapping processes of harassment and terror systemically  
 Framing a psychosocial ecosystem in terms of control factors  
 Missing dimensions -- exploring the shadow and crafting the unsayable?  
 Mutual perceptions and boundaries -- recognizing the experiential challenge  
 Promoting ostentatious inequality: dubious complicity in an unmentionable game of unquestionable dimensions?

Cultural distinctions and contradictions regarding harassment  
 Toward encompassing relationship discontinuities through phase diagrams and catastrophe theory  
 Encompassing the "attraction-harassment" dynamic with a notation of requisite ambiguity?  
 Patterning psychosocial relationships in 3D or more?

The consideration there of notations of "requisite ambiguity" offers animations associated with the Chinese trigram system. Shu Shengyu (2015) explicitly notes the challenge of comprehending the relationship between *yin* and *yang* in terms of the intimate dynamics of "coitus". As seemingly the most fundamental driver in the dynamics of global civilization, defying all rationalization, any speculation in that regard is justified (*Reframing the Dynamics of Engaging with Otherness: triadic correspondences between topology, Kama Sutra and I Ching*, 2011).

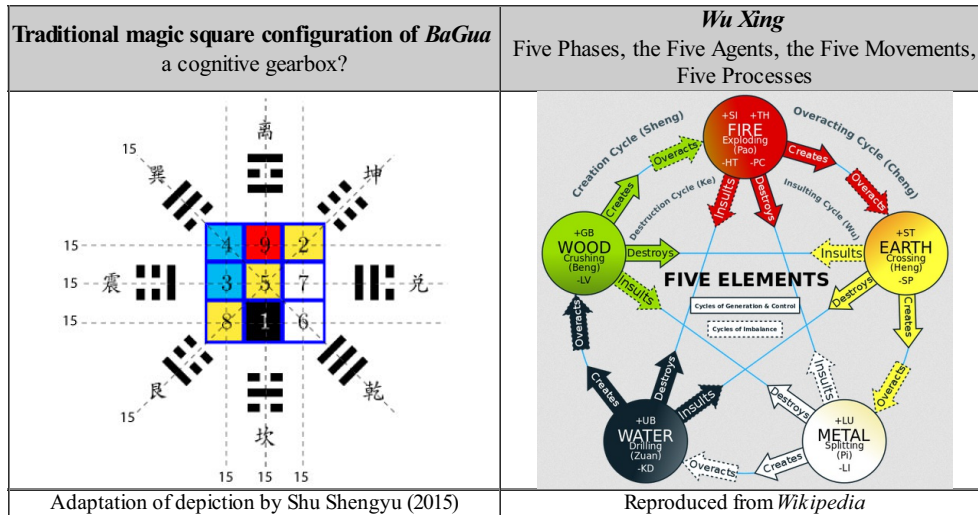
**Coherence through Chinese frameworks:** A particular merit of the Chinese 8-fold articulation is the manner in which it has long been rendered comprehensible (to a degree) through metaphor, most notably climate-related metaphors as indicated above. As indicated there, it is in this sense that the argument here follows from that made separately with respect to the possibility of understanding the strategic challenge of climate otherwise (*Enhancing Strategic Discourse Systematically using Climate Metaphors: widespread comprehension of system dynamics in weather patterns as a resource*, 2015; *Weather Metaphors as Whether Metaphors*, 2015). In a period of notably shambolic global governance, that argument was presented in anticipation of the significance of the [UN Climate Change Conference](#) (Paris, November 2015).

The apparent role of incommensurability, indicated above as a feature of requisite cognitive and strategic variety, suggests that this may have further implications. The manner in which the "ways" of any eightfold way may be mutually incompatible to some degree (if not mutually incomprehensible), could be compared to the (eight?) gears of a vehicle -- only one of which can be appropriately used at any time. Expressed otherwise, each way is inadequate and "unfit for purpose" under certain conditions. Gear shifting (enabled by a gearbox) allows such imperfection to be managed by the driver -- recalling the Buddhist recognition of cognitive imperfection and the Sanskrit adage: *Neti Neti* (Not this, Not that). The gear metaphor is also helpful in that the cognitive distinctions made above relate to different kinds of motion.

It is in this sense that the traditional circular configuration of the *BaGua* is of value for the coherence it implies. Of further interest is the manner in which this is traditionally configured in the form of a [magic square](#), as noted by [Quincy Robinson](#) and Paul Martyn-Smith (*Evidence of Modern Physical Knowledge from Asiatic Antiquity: Re-integration: Nine Realms of Middle Earth*, 2015) and by Shu Shengyu (*The Relations Between Ancient China's Taoism and Modern Mathematics and Physics*, 2015). A magic square could also be

understood as a form of cognitive gearbox with its operative coherence suggested by its so-called magic constant -- 15 in the variant depicted below.

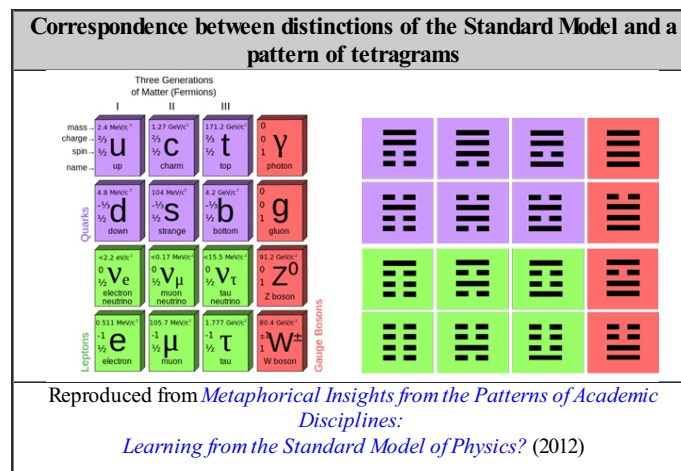
As noted separately (*Chinese articulation of magic square insight*, 2015), histories of mathematical insight into the development of magic squares make repeated reference to their first recognition in China as the **Lo Shu square** (Schuyler Cammann, *The Magic Square of Three in Old Chinese Philosophy and Religion*, History of Religions, 1, 1961, pp. 37-80; Frank J. Swetz, *Legacy of the Luoshu: the 4,000 year search for the meaning of the magic square of order three*, A K Peters, 2008). With respect to the **Wu Xing** configuration (indicated below), in Chinese culture the "elements" in the phase diagram have long had metaphoric interpretations rendering them variously comprehensible and meaningful. The mathematical relation of the 5-fold pattern to the 8-fold pattern is extensively discussed by Shu Shengyu (2015).



**Metaphor mining vs. Data mining:** Of relevance to this argument, comprehension of the states of matter through metaphors with which they are often associated, lends itself to understanding in terms of the symbolism of the classical **four-element** Western pattern, with its implication of a fifth. Although this can be readily deprecated, it does however allow for representation in a **phase diagram** with plasma as a fifth state of matter (*Cognitive patterns of environmental significance*, 2010). Such distinctions might then correspond to the stages of reification as the quality of knowing in the moment "hardens" into objective reality -- passing through analogues to the states of matter (plasma -- gas -- liquid -- solid).

In a condition of society in which there is ever greater need for integrative comprehension, the degree of investment in **data mining** could be said to be incredibly disproportionate. It is far from evident that ever more powerful techniques of data mining are enabling more integrative comprehension -- except (potentially) for artificial intelligence. A complementary case could be made for "metaphor mining" -- neglected by contrast (Google search: data mining, 37,500,000 hits; "metaphor mining", 1,180). It is however intriguing to note that such results have apparently not been affected by the US **Intelligence Advanced Research Projects Activity** announcement of **The Metaphor Program** in 2011, with participation of the **US Army Research Laboratory**,

An example of such metaphorical exploration is indicated by the following juxtaposition using the coding system of the tetragram rather than of the trigram. The tetragram is employed by another Chinese classic the *Taixuanjing* (*T'ai Hsüan Ching*), as discussed separately (*9-fold Magic Square Pattern of Tao Te Ching Insights -- experimentally associated with the 81 insights of the T'ai Hsüan Ching*, 2006).



As suggested by the arguments of Alexander Wendt (2015) there is a subtlety calling into question the prevailing dissociation of "outside" with respect to "inside" (*World Introversion through Paracycling: global potential for living sustainably "outside-inside"*, 2013). This subtlety is notably evident in the interpretations through metaphor of the Chinese encoding systems.

Whereas the argument above has focused primarily on the objective articulation of the complex plane, there is some irony to the complementary insight offered by the notion of a **plane of immanence**, as articulated by Gilles Deleuze (Stephan Günzel, *Immanence and*

*Deterritorialization: the philosophy of Gilles Deleuze and Félix Guattari*, 1998). A degree of reconciliation is offered by the discussion of a "complex plane of immanence" by Inna Semetsky (*Deleuze, Education and Becoming*, 2006). This is seen to be a feature of the thinking of **John Cage**, as articulated by Joseph Edward Panzner (*The Process That Is the World: Cage/Deleuze/Events/Performances*, Ohio State University, 2012):

This world of the preformed and pre-existent fed-forward into reproductive production is identified with the "world of objects", the realm of transcendent stabilities, rather than the fluctuating and complex plane of immanence. While the transcendent is real so far as it acts in the conscious reproduction of preexisting objects, it is clearly of secondary importance to the primary plane of immanence, understood as the world-in-becoming, the process that is the event-of-all-events. (p. 69)

## Fractal comprehension of coherence requiring an 8-fold uncertainty principle?

The apparent role of incommensurability, indicated above as a feature of requisite cognitive and strategic variety, suggests that this may have further implications usefully understood in terms of **uncertainty** -- in contrast with the certainty and predictability with which preoccupation with "true" and "right" is associated. There is extensive commentary on the uncertain condition of society and the role of surprise (Nassim Nicholas Taleb, *The Black Swan: the impact of the highly improbable*, 2007; John Kenneth Galbraith, *The Age of Uncertainty*, 1977; **Charles Handy**, *Beyond Certainty: changing world of organizations*, 1995)..

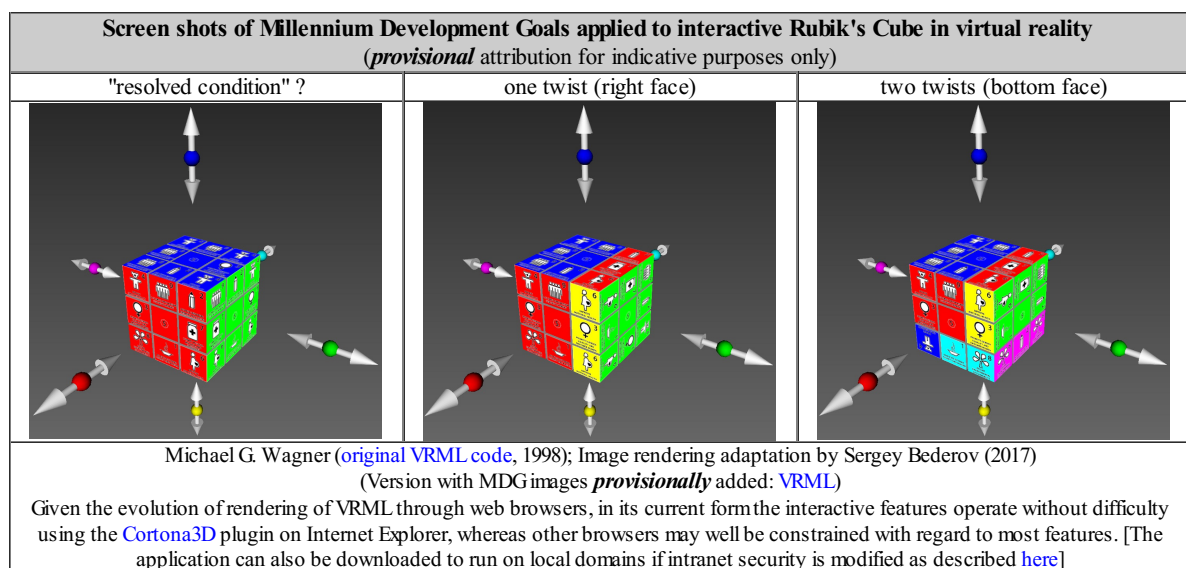
**Uncertainty?** Arguably closure may be necessarily eluded (*Engaging with Elusive Connectivity and Coherence: global comprehension as a mistaken quest for closure*, 2019). Righteous certainty about one mode, model or articulation typical precludes certainty about the validity of any other. Being "right" may be a matter of convention in ways distinct from what is deprecated as **relativism** -- in a civilization with galactic ambitions, as yet come to terms with the implication of moving frames of reference of general relativity.

The challenge may be more complex in that any eightfold way may call for an eightfold mode of comprehension -- namely there may be eight ways of comprehending any eightfold way, suggesting a fractal mode of organization, and a degree of self-reflexivity.

This possibility is reinforced by a conceptually frustrating degree of "fluidity" between interpretations in the case of both the *BaGua* and *Wu Xing* patterns -- a fluidity skillfully addressed in mathematical terms by Shu Shengyu (2015). It is as though any definitive assertion required recognition as being both "true" and "not true". Curiously this recalls the credibility long attached by physics to the paradox of the **Uncertainty Principle**, despite both the total lack of credible evidence for the inadequately informed -- and the seeming lack of relevance to issues of global governance, in anticipation of due consideration of the arguments of Alexander Wendt (2015).

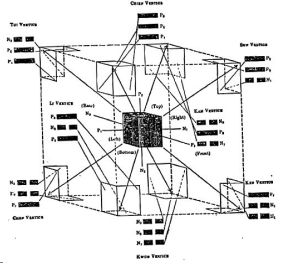
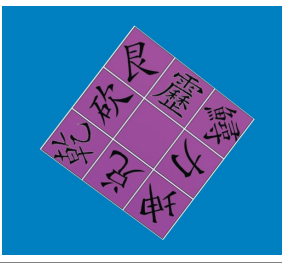
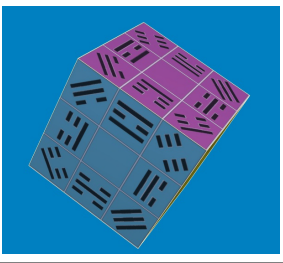
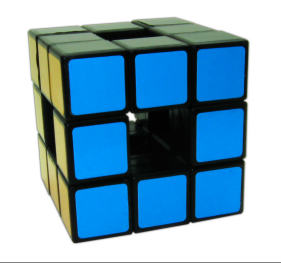
There is little trace of consideration of such a principle in the social sciences (Garrison Sposito, *Does a generalized Heisenberg Principle operate in the social sciences? Inquiry: an Interdisciplinary Journal of Philosophy*, 12, 1969, 1-4; Richard Lichtman, *Indeterminacy in the social sciences, Inquiry*, 10, 1967, 1-4). Far more evident are the references to **complementarity** (Gerald Holton, *The Roots of Complementarity. Daedalus*, Fall 1970; Pierre Livet, *Diversity and Complementarity of Agent-Based Models in the Social Sciences, Revue Francaise de Sociologie*, 55, 2014, 4)

**Visualization:** The argument is usefully developed through visualizations, initially in the case of the 8 Millennium Development Goals (*Interplay of Sustainable Development Goals through Rubik Cube Variations*, 2017).

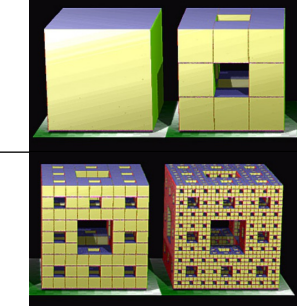
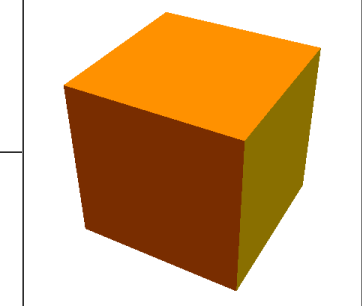
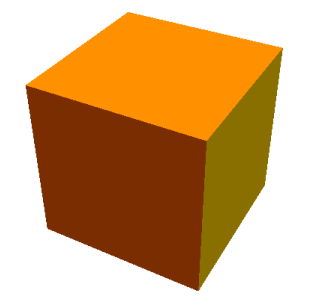


The above approach can be similarly adapted with respect to the arrangement of *BaGua*, as shown in the animations (below centre) in which the central positions are unmapped. A potentially far more suggestive possibility for their mapping is the use of the **void cube** (right below). Like the Rubik cube it is a 3-D mechanical puzzle, with the notable difference that the center pieces are missing. This cause the puzzle to resemble a level 1 Menger sponge (as shown below). Of potential relevance to the argument, it is composed of 20 pieces (8 corner pieces; 12 edge-middle pieces), 6 internal support pieces with the square hole through them, and 12 mostly-hidden internal sliding pieces with several functions

<b>8-fold BaGua</b>	<b>8-fold BaGua applied to surfaces of a Rubik Cube</b>	<b>Void cube</b>
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pattern applied to corners of a cube	Fu Xi ("Earlier Heaven") and King Wen ("Later Heaven") arrangements placed in opposition	Fu Xi ("Earlier Heaven") and King Wen ("Later Heaven") arrangements placed in opposition	central positions absent from cube in contrast to the Rubik Cube
			
Reproduced from Z. D. Sung, <i>The Symbols of Yi King or the Symbols of the Chinese Logic of Changes</i> (1934, p. 12)	tabbed version for model construction	tabbed version for model construction	By Hellbus - Own work, CC BY-SA 3.0, Link (Reproduced from Wikipedia)
	Animations prepared using <a href="#">Stella Polyhedron Navigator</a>		

**8-fold uncertainty?** Of greater relevance to comprehension of the coherence of the 8-fold pattern of cognitive modes is the visualization of the dynamics of its potentially fractal organization, as illustrated by the [Menger sponge](#) and its iterations. Insights are similarly suggested by the associated Sierpinski-Menger snowflake. This emphasizes the extent to which coherence is mistakenly understood in static terms when cognitively it is not one pattern or another by the dynamic between them -- with eight such patterns exemplifying the challenge.

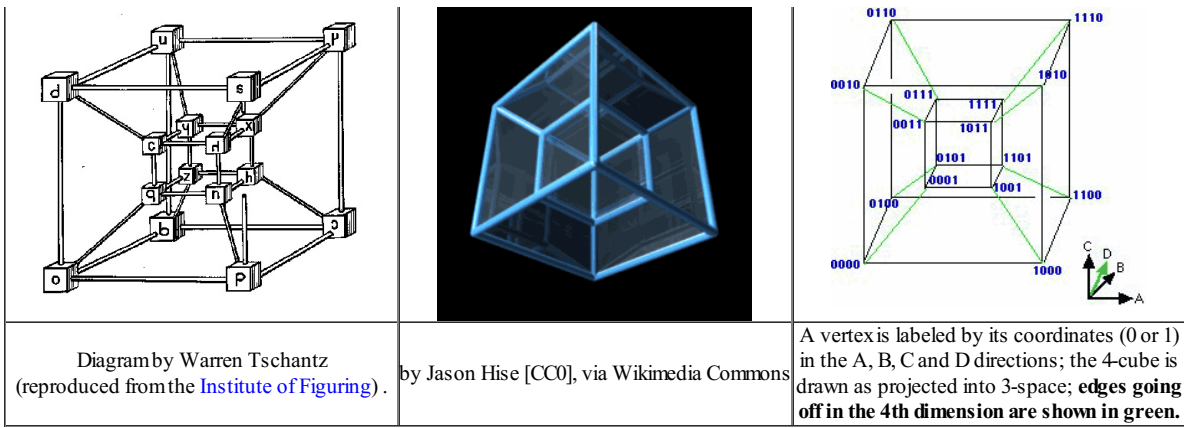
Menger sponge		
Iterations 1 to 3 from cube	Animation through 4 recursion steps	Animation of Sierpinski-Menger snowflake.
		
Reproduced from <a href="#">Wikipedia</a>	By <a href="#">Mattcomm</a> - Own work, CC BY-SA 4.0, Link (Reproduced from <a href="#">Wikipedia</a> )	

**4D Tesseract:** The challenge to comprehension is all the greater in that any dynamic suggests that it is at least in 4D that a 3D framework merits consideration. With respect to the [Logic Alphabet Tesseract](#) (below left), as noted by [Louis Kauffman](#):

[Shea Zellweger](#) did an extensive study of the sixteen binary connectives in Boolean logic ("and", "or" and their relatives -- all the Boolean functions of two variables), starting from Peirce's own study of these patterns. He discovered a host of iconic notations for the connectives and a way to map them and their symmetries to the vertices of a four dimensional cube and to a three dimensional projection of that cube in the form of a [rhombic dodecahedron](#). Symmetries of the connectives become, for Zellweger, mirror symmetries in planes perpendicular to the axes of the rhombic dodecahedron... Zellweger uses his own iconic notations for the connectives to label the rhombic dodecahedron, which he calls the "Logical Garnet". This is a remarkable connection of polyhedral geometry with basic logic. The meaning and application of this connection is yet to be fully appreciated. It is a significant linkage of domains. On the one hand, we have logic embedded in everyday speech. One does not expect to find direct connections of the structure of logical speech with the symmetries of Euclidean Geometry. It is the surprise of this connection that appeals to the intuition. Logic and reasoning are properties of language/mind in action. Geometry and symmetry are part of the mindset that would discover eternal forms and grasp the world as a whole. To find, by going to the source of logic, that we build simultaneously a world of reason and a world of geometry incites a vision of the full combination of the temporal and the eternal, a unification of action and contemplation. The relationship of logic and geometry demands a deep investigation. This investigation is in its infancy (*The Mathematics of Charles Sanders Peirce, Cybernetics & Human Knowing*, 8, 2001)

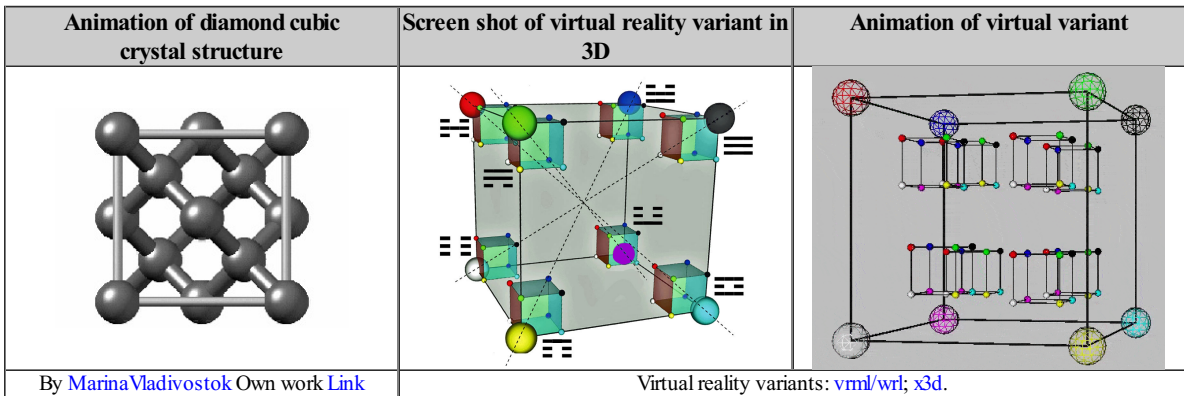
Zellweger's depiction is usefully complemented by that of the 4D tesseract as in the other images below, as discussed separately (*Oppositional logic?* 2018; Tony Phillips, *Topology of Venn Diagrams*, AMS, June 2005).

<b>The Logic Alphabet Tesseract</b> - a four-dimensional cube (see <a href="#">coding</a> ). by Shea Zellweger	<b>Tesseract animation</b> simulating requisite 4-dimensionality?	<b>Topologically faithful 4-statement Venn diagram</b> is the graph of edges of a 4-dimensional cube as described by Tony Phillips

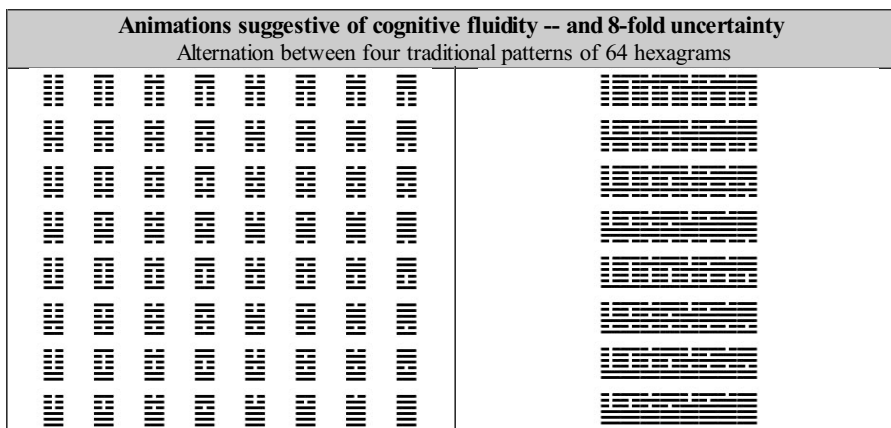


The images above recall that of the [diamond cubic crystal structure](#) with its repeating pattern of 8 atoms (below left). This is all the more intriguing because of the value attached to diamonds in society and the particular value associated with it in Buddhism. Major symbolic importance is associated with the diamond, notably in Buddhist traditions, as a metaphor of a particular emergent order of the mind and the understanding of that order as a 'vehicle', or 'body', for the spirit (*Patterning Archetypal Templates of Emergent Order: implications of diamond faceting for enlightening dialogue*, 2002). The terms 'diamond mind' and 'diamond body' are widely used in Buddhism and are notably a focus for [Diamond Way Buddhism](#). This metaphor seems however to focus on the individual and not on the ordering of society.

Other experimental animations may be used to suggest other ways of comprehending the cognitive dynamics. As shown below, the moving cubes could be understood as the "cognitive tanks" discussed in the preceding argument (*Tank Warfare Challenges for Global Governance: extending the "think tank" metaphor to include other cognitive modalities*, 2019). That on the left is reproduced from an earlier discussion (*Destabilizing Multipolar Society through Binary Decision-making: alternatives to "2-stroke democracy" suggested by 4-sided ball games*, 2016; *Neglected recognition of logical patterns -- especially of opposition*, 2017).



Another approach to representation of the dynamic coherence of a form of 8-fold uncertainty is by use of the four traditional depictions of the pattern of 8x8 hexagrams of the *I Ching* ([Fu Xi](#) pattern, [Jing Fang](#) pattern, [King Wen](#) pattern, and [Mawangdui](#) pattern), as discussed separately (*Towards a Periodic Table of Ways of Knowing -- in the light of metaphors of mathematics*, 2009). The alternation between these configurations is then suggestive of the fluidity of the cognitive dynamic -- possibility recalling the resonance hybrid integrity fundamental to molecular biology and life.



**Hyperreality vs. Surreality?** Whereas the condition of global civilization is readily characterized as chaotic, inviting a degree of exploration in terms of [chaos theory](#), less evident are the insights required to address the condition of governance faced with such chaos -- readily experienced as surreal. One feature of the renderings of the Mandelbrot set, which have evoked extensive commentary, are its

**hyperbolic componenents**. Arguably, in calling upon some understanding of "hyper", as in hyperdimensional, possibilities appropriate to a surreal condition may be suggested (M.S. El Naschie, *Hyperdimensional Geometry and the Nature of Physical Spacetime, Chaos, Solitons and Fractals*, 10, 1999, 1).

In semiotics and postmodernism, **hyperreality** is recognized as an inability of consciousness to distinguish reality from a simulation of reality, especially in technologically advanced postmodern societies (Umberto Eco, *Travels in Hyperreality*, 1975). It is seen as a condition in which what is real and what is fiction are seamlessly blended together so that there is no clear distinction between where one ends and the other begins. It allows the co-mingling of physical reality with virtual reality (VR) and human intelligence with artificial intelligence (AI) (*Hyperaction through Hypercomprehension and Hyperdrive: necessary complement to proliferation of hypermedia in hypersociety*, 2006; *Engaging with Hyperreality through Demonique and Angelique? Mnemonic clues to global governance from mathematical theology and hyperbolic tessellation*, 2016).

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## References

Paul Carter. *Decolonising Governance: archipelagic thinking*. Routledge, 2018

Ephraim Chamiel. *The Middle Way: the emergence of modern-religious trends in Nineteenth-Century Judaism*. Academic Studies Press, 2014

Keith Critchlow. *The Hidden Geometry of Flowers: living rhythms, form and number*. Floris Books, 2011

Dalai Lama. *The Middle Way: faith grounded in reason*. Wisdom Publications, 2009

Barbara Ehrenreich:

- *Bright-sided: how the relentless promotion of positive thinking has undermined America*. Metropolitan Books, 2009
- *Smile Or Die: how positive thinking fooled America and the world*. Granta Books, 2010 [[summary](#)]

Matthew A. Fike. *The One Mind: C. G. Jung and the future of literary criticism*. Routledge, 2013

Howard Gardner:

- *Frames of Mind: the theory of multiple intelligences*. Basic Books, 1983
- *Multiple Intelligences: new horizons in theory and practice*. Basic Books, 2006
- *Intelligence Reframed: multiple intelligences for the 21st Century*. Basic Books, 1999
- *Five Minds for the Future*. Harvard Business Review Press, 2006

Anthony Giddens:

- *The Third Way: the renewal of social democracy*. Polity, 1999;
- *The Third Way and its Critics*. Polity, 2000

Francisco Gonzalez. *The Third Way*. Rowman and Littlefield, 1995

Matthew Handelman. *The Mathematical Imagination: on the origins and promise of critical theory*. Fordham University Press, 2019

Edward Haskell. *Full Circle: The Moral Force of Unified Science*. Gordon and Breach, 1972 [[text](#)]

Vladimir G. Ivancevic and Tijana Ivancevic. *Geometrical Dynamics of Complex Systems: a unified modelling approach to physics, control, biomechanics, neurodynamics and psycho-socio-economical dynamics*. Springer, 2006

Mark Johnson. *The Meaning of the Body: aesthetics of human understanding*. University of Chicago Press, 2007

Edward Kasner and James R. Newman. *Mathematics and the Imagination*. Simon and Schuster, 1940

Alexander Klose. *The Container Principle: how a box changes the way we think*. MIT Press, 2015

George Lakoff and Mark Johnson. *Metaphors We Live By*. University of Chicago Press, 1980

George Lakoff and Rafael E. Núñez. *Where Mathematics Comes From: how the embodied mind brings mathematics into being*. Basic Books, 2000

Hilary Lawson. *Closure: A Short History of Everything*. Routledge, 2002

Lou Marinoff. *The Middle Way: finding happiness in a world of extremes*. Sterling, 2007

Nagarjuna. *The Fundamental Wisdom of the Middle Way: Nagarjuna's Mulamadhyamakakarika*. Oxford University Press, 1995

Ismael Nobre. *Radically Changing the Sustainable Development Paradigm for the Amazon*. PNAS, 2016 [[text](#)]

Stephen Prothero. *God Is Not One: The Eight Rival Religions That Run the World -- and why their differences matter*. HarperOne, 2010

Xiaoying Qi:

- *Paradoxical Integration: globalised knowledge flows and Chinese concepts in social theory*. University of Western Sydney, 2011 [[text](#)]
- *Globalized Knowledge Flows and Chinese Social Theory*. Routledge, 2014 [[contents](#)]

Thomas A. Quiggin. Seeing the Invisible: national security intelligence in an uncertain age. World Scientific, 2007

Inna Semetsky. Deleuze, Education and Becoming. Sense Publishers, 2006 [[text](#)]

Maxine Sheets-Johnstone:

- The Primacy of Movement. John Benjamins, 1999
- The Corporeal Turn: An Interdisciplinary Reader. Imprint Academic, 2009

Shu Shengyu. The Relations Between Ancient China's Taoism and Modern Mathematics and Physics. The Zhong Language Computing Technology Research and Development Alliance, 2015 [[text](#)]

Mark Siderits. Nagarjuna's Middle Way: Mulamadhyamakakarika. Wisdom Publications, 2013

Harvey Stein. A Third Way: settlers and Palestinians as neighbors. Documentary, 2016 [[text](#)]

Nassim Nicholas Taleb:

- The Black Swan: the impact of the highly improbable. Random House, 2007 [[summary](#)]
- Antifragile: things that gain from disorder. Random House, 2012 [[summary](#)]
- Skin in the Game: hidden asymmetries in daily life. Random House, 2018

Rene Thom:

- Structural Stability and Morphogenesis: an outline of a general theory of models. W. A. Benjam, 1972
- Esquisse d'une Sémiophysique: physique aristotélicienne et théorie des catastrophes. Interéditions, 1989
- Apologie du Logos. Hachette, 1990

Barbara Tversky:

- Mind in Motion: how action shapes thought. Basic Books, 2019
- The Geometry of Thought. *Edge*, 26 June 2019 [[text](#)]

Alexander Wendt. Quantum Mind and Social Science: unifying physical and social ontology. Cambridge University Press, 2015

Timothy Wilken. UnCommon Science, 2001 [[text](#)]

Arthur M. Young. The Geometry of Meaning. Delacorte Press, 1976



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