



laetus in praesens

Alternative view of segmented documents via Kairos

9 September 2019 | Draft

Imagining Toroidal Life as a Sustainable Alternative From Globalization to Toroidization or back to Flatland?

-- / --

Introduction

Reality distortion, psychosocial torsion and psychological torque

Intuitive recognition of toroidal cycles?

Imagining life on a torus, or within it -- as lived in reality?

Being "flat"-- or "global" and "well-rounded"?

Transforming the world into a doughnut: a vital clarification

Toroidal conceptualization

Toroidal embodiment, knottedness and being a torus?

Mistaken recognition of holes repressed by a global focus?

Torc-bearing, Playing-ball, Scoring and Nesting

Aesthetic reconciliation of contrasting toroidal metaphors?

Transformative interplay between flat, global and toroidal?

References

Introduction

Much is made of the fundamental shift in historical perspective from living on a Flat Earth to dwelling on a rotating sphere -- a globe revolving around the Sun. Much has since been made of the socio-economic and political significance of the globalization process. However it is indeed difficult to live on a globe as such, since at any moment one necessarily experiences oneself as dwelling on a Flat Earth, whether or not one travels extensively over it. But the sense of the obviously global geopolitics, and the possibility of being a global citizen in some way, have reinforced the assumption that people can indeed dwell variously on that globe.

Are we misleading ourselves -- are people being misled? The daily lived reality is of course of a Flat Earth, an impression variously qualified by images and explanations regarding the movement of the Sun and the changing seasons. Is the "movement" of the Sun to be recognized as an illusion, since it is purportedly stationary in a heliocentric system itself moving otherwise? And yet language, even of astronomers, still refers to sunrise and sunset. The illusion is knowingly cultivated as a convenience in the light of the reality of perception.

There is something reassuring about the implications of living on a globe in conformity with the insight of astronomers and of those with exposure to images of the curvature of the Earth. There is coherence to explanation for perception of night and day, for the seasons, and for the movement of the stars at night -- for those who seek it.

Arguably however, the shift in perspective from Flat Earth to Globe is quite subtle -- however it is now variously justified. Few who dwell comfortably within a Flat Earth framework would have the capacity to prove its nature as a sphere revolving around the Sun, as was so recently done (in historical terms) by astronomers -- despite considerable opposition from the most eminent authorities of the time.

Given the now unquestionable revolution of the Earth around the Sun, there is subtlety of a different nature to be recognized. By that revolution the rotating Earth traces out a torus around the Sun -- annually -- effectively travelling through it. There are of course qualifiers to oversimplistic descriptions. The Earth is not a sphere, rather it is a slightly oblate spheroid. The torus is not circular, rather it is slightly elliptical. The Earth and Sun are together -- as elements of the solar system -- understood to be moving variously through the galaxy. The toroidal motion can therefore be understood to be of spiral form. However these qualifiers are of less significance to the following argument.

The question is why it is assumed that humanity dwells on a globe rather than on a torus? Why do the assumptions regarding dwelling on a globe override any sense that humanity could be just as readily understood to be dwelling on a torus?

Arguably it is the indications relating to daily rotation of the Earth which are given precedence as being of more obvious relevance in the

short-term -- even though they depend on the cultivated illusion regarding the "movement" of the Sun. And yet there is considerable reference to the annual changes in the seasons as a consequence of the toroidal movement of the Earth around the Sun -- dependent to a different degree on a cultivated illusion regarding the position of the Sun in summer and winter. For many the two "illusions" could be considered to have equal weight -- as being equally natural.

It could be argued that it is the physical reality of the sense of groundedness in dwelling on a globe which justifies the distinction and validates the assumption. However, as suggested above, people do not have the sense of dwelling on a globe -- as a sphere -- rather the lived reality is of a Flat Earth, irrespective of the strange experiences of travelling around it. The Sun is most readily assumed to rise and set from that perspective. There is therefore just as much reason to consider that one is living on a torus -- it could be assumed.

Missing from any focus on geometry -- "flat", "sphere", or "torus" -- is the role of time and the dynamics which are so fundamental to daily life and the cycle of the seasons. Perception in each case is however governed by a space-time framework. Dwelling within a Flat Earth framework is clearly governed by the daily cycle of the "movement" of the Sun. The Earth as a globe is clearly not static, as confirmed by science -- but as might be too readily assumed (as history has shown). In addition to its rotation, the Earth is revolving around the Sun. Determining any fixed position on the globe involves ignoring such movements. The supposedly fixed position effectively traces out a path within the toroidal framework.

Any planning of future commitments, dependent to a degree on Flat Earth assumptions, raises interesting issues concerning a meeting scheduled some time in the future at a particular location. Clearly, both with the rotation of the Earth, and its revolution around the Sun, that meeting is effectively "elsewhere" in space-time -- on the surface of the torus. Holding a meeting at the "same place" -- even at the "same time" of year -- reinforces the illusion ignoring the toroidal movement, however conveniently. The challenge recalls the insight of Heraclitus regarding the inability to step twice into the same river.

Given the cultivation of this pattern of illusions in practice, is there benefit to shifting from a Flat Earth perspective, through a global perspective, to one of dwelling on a torus? The global orientation has of course become politically charged through arguments regarding the problematic dynamics of globalization. **How might globalization be reframed by recognition of the possibility of toroidization -- and its neglected reality?**

Why is it assumed that humanity lives on a ball -- if not a flat surface -- and not on a torus, given annual revolution around the Sun? Why is that understanding never discussed?

It should be strongly emphasized that **this argument is quite distinct from that envisaging the physical Earth as a torus**, as criticized by Beckett Mufson (*Apparently, Some People Believe the Earth Is Shaped Like a Donut*, Motherboard, 13 November 2018) and to a related question and comments (*Is the earth a torus?* Quora, 2018; *Toroidal Earth Society* (Reddit, 2016; Anders Sandberg, *What would the Earth be like if it was the shape of a donut?*, Gizmodo, 2014). A 3D model of that possibility has however been produced (Henry Segerman, *Torus Earth: Peirce quincuncial projection*, 2016). The following argument does however clarify the confusion favouring such imagination.

In a period of global crisis, there is considerable irony to the topological association of the world with a doughnut in strategic terms, given the use of the metaphor by Kate Raworth (*A Safe and Just Space for Humanity: can we live within the doughnut?* Oxfam Discussion Papers, 2017; *Introducing 'The Doughnut' of social and planetary boundaries for development*, Oxfam International, 10 February 2012). This has evoked a preoccupation with **doughnut economics** in relation to achieving the UN's Sustainable Development Goals. The irony is all the greater given a widely noted proposal in the same period to use the pizza as a more appropriate metaphor for the principal driver of psychosocial dynamics -- namely sex.

The argument here endeavours to clarify the manner in which the toroidal form can be used in support of imaginative insight of strategic relevance -- for the individual, if not for the collective..

Reality distortion, psychosocial torsion, and psychological torque?

There is a degree of experience of being "twisted" by circumstances, of "being bent" in a manner which may well be unwelcome -- or of subjecting another to such a force. "Bending the arm" of another is a common phrase with respect to being manipulated -- as with having it "bent". The experience is beyond the focus of the natural sciences and is inadequately described, although it is clearly an effect sought by public relations, propaganda campaigns and brainwashing. As a typically problematic experience it does however offer a means of recognizing the nature and possibility of fruitful toroidal experience.

Of the greatest potential relevance to this argument are the shared associations of "torc" and "torque" -- with the latter best understood in dynamics with respect to a form of twisting. In such terms **torque** is what causes an object to acquire angular acceleration. As a static object, a torc could be understood as implying some such force -- if only in symbolic terms. **The exploration of "toroidal life" in what follows is then suggestive of "life with a dynamic twist" -- potentially vital to enabling and sustaining change.** A torc can then be considered a traditional reminder of that possibility -- and hence its symbolic importance in some contexts where change is otherwise elusive. As experienced personally, references to "psychological torque" and "psychic torque" are discussed below -- but not in the light of their potential relevance to the twisting experience of **structural violence** and its variants (cultural violence, emotional violence, spiritual violence).

Reality distortion: Curiously the clearest description of the problematic nature of the phenomenon may be with respect to the so-called "reality distortion field" exerted by charismatic personalities to convince themselves and others to believe almost anything with a mix of charm, charisma, bravado, hyperbole, marketing, appeasement and persistence:

- Markus Giesle: *Is There a Science Behind Reality Distortion Fields?* (*The Huffington Post*, 16 September 2015)
- Matt K. Lewis: *The Trump Reality Distortion Filter: why so many US Republicans are suspending their disbelief* (*The Telegraph*,

28 November 2015)

- Peter Baker and Linda Qiu: *Inside What Even an Ally Calls Trump's 'Reality Distortion Field'* (*The New York Times*, 31 October 2018)
- Fred Barnes: *Trump's Reality Distortion Field* (*Washington Examiner*, 21 May 2017).
- Chris Golis: *Emotional Intelligence and the Reality Distortion Field* (*Practical Emotional Intelligence*, 26 June 2018)
- Richard Waters: *The Long and the Short of Elon Musk's Reality Distortion Field* (*Financial Times*, 9 August 2018)
- Yen Makabenta: *Duterte has his own 'reality distortion field'* (*The Manila Times*, 1 November 2016)
- Michael Shermer: *The Reality Distortion Field: Steve Jobs's modus operandi of ignoring reality is a double-edged sword* (*eSceptic*, 10 July 2013)
- Tim Ferriss: *How It Works: Clinton's "Reality Distortion Field"* (21 November 2010)

Commentators now recognize the phenomenon in relation to Boris Johnson. The capacity to engender such a field may now be the essence of leadership -- and the primary requisite for those seeking that role. Comprehending the nature of such reality distortion is necessarily rendered more complex by the phenomenon of *fake news* (*Varieties of Fake News and Misrepresentation: when are deception, pretence and cover-up acceptable?* 2019). This is compounded by increasing recognition of "bullshit" and mutual accusations in that regard (Gordon Pennycook, et al, *On the Reception and Detection of Pseudo-profound Bullshit, Judgment and Decision Making*, 10, 2015, 6; Harry Frankfurt, *On Bullshit*, Princeton University Press, 2005). This suggests the possibility of a new skill - metaphorically understood (*Viable Global Governance through Bullfighting: challenge of transcendence*, 2009).

Torsion and twistedness: To the extent that such psychosocial experience is described, the language for its description borrows from the dynamics of torque and torsion as well-recognized in mechanical terms. In that context, **torsion** is the twisting of an object due to an applied **torque**. The latter, as the moment, moment of force, or "turning effect", is the rotational equivalent of linear force. The power output of an engine is expressed as its torque multiplied by its rotational speed of the axis. In considering the generation of any form of psychosocial power in the implementation of a strategy -- and getting it to "fly" -- there is a case for recognizing the role of torque. Using a typical helicopter as a metaphor, its single main rotor creates torque such that its aerodynamic drag must be countered by an opposing **anti-torque rotor** -- the smaller rotor in the tail. The question is how such compensation is achieved in psychosocial systems -- and whether many strategies spin uselessly for lack of an "anti-torque" rotor.

The following description of a combination of socio-economic forces as "torsions" by Matthew C. Ally clarifies the matter somewhat, although lacking any reference to corresponding psychosocial forces:

Each tetrad has a tendency to pull and push in a certain direction: the first toward new varieties of economic interaction and new relations of consumption and production; the second toward novel varieties of social experience and political engagement; the third toward renovated varieties of ecological relation and pattern and process. We might call these torsions: economic torsion, social torsion, and ecological torsion respectively, twisting together from the ground up, bending the arm of the status quo. And of course the three heuristic torsions overlap, the economic, the social, the ecological, nudging and tugging at each other in complementary and critical ways through the push and pull of theory and practice... (*Ecology and Existence: Bringing Sartre to the Water's Edge*, Lexington Books, 2017 p. 485)

Quotations indicative of understandings of "psychological torque", "psychic torque" and "psychological torsion" (emphasis added)

Psychological torque:

- Following their lead, one can construct a decision procedure in which one computes a "**psychological torque**" *T* (this need not correspond to true physical torque)... (Tony J. Simon and Graeme S. Halford, *Developing Cognitive Competence: new approaches to process modeling*, Psychology Press, 2015, p. 165)
- Yet the dynamic **psychological torque** in this work does not justify assimilating H. D. to the expressive subjectivity we have long associated with lyric poetry. We are not simply in the presence here of a discourse of resplendent or imperiled identity. (Cary Nelson, *Repression and Recovery: modern American poetry and the politics of cultural memory*, University of Wisconsin Press, 1989, p. 82)
- As is well known, the cultural travails of middle-class America in the twentieth century produced the separate, sovereign self, the final logical extension of the Protestant Reformation's **psychological torque** that spun toward more and smaller sects until the irreducible sect of one was eventually reached (Loren Baritz, *The Good Life*, Knopf/Doubleday Publishing, 2013)
- I want to suggest that the unique **psychological "torque"** of modern rhetorical power can be explained as a mechanism "funded" by the divided character of modern self-structure. Modern forms of ethos can "divide" us from our habitual values because, as moderns, we are always, in advance, at a deeper level, divided, self-conflicted selves. (Marshall W. Alcorn, *Narcissism and the Literary Libido: rhetoric, text, and subjectivity*, NYU Press, 1997, pp. 51-52)
- Ballard has long maintained that... science fiction is the only literature capable of making sense of the moment we live in. It is a moment whose **psychological torque** is centripetal, not centrifugal -- a moment where "social relationships are no longer as important as the individual's relationship with the technological landscape," which is another way of saying that interpersonal psychology has been displaced by a new, cyborgian psychology: the feedback loop between human and machine (Mark Dery, *'Always Crashing in the Same Car': a head-on collision with the technosphere*, *The Sociological Review*, 54, 2006, 1; *An Extremely Complicated Phenomenon of a Very Brief Duration Ending in Destruction: the 20th Century as slow-motion car crash*, *TechnoMorphica*, 1997).
- ... the concept of war becomes an attempt to describe a low-intensity warfare that reconstitutes the most mundane aspects of everyday existence through **psychosocial torque** and sensory overload. (Steve Goodman, *Sonic Warfare: sound, affect, and the ecology of fear*. MIT Press, 2012, p. 33).
- The author succeeded in making his point, a realization of the evil at the center of human experience, without breaking the organic unity of his life like documentary styled narrative and without losing the **psychological torque** of the tale. (Debraj Moulick, *Book Review: Conrad's Heart of Darkness, Intellinotions*, January 2014)
- *Torque, hemispheric dominance, and psychosocial adjustment*. (Donald Woods, et al, *Journal of Abnormal Psychology*, 89, 1980, 4).

Psychic torque:

- So, in pursuit of being lively and clear, the sheer **psychic torque** of Edwards's emotional range is noteworthy. Hyperbole-like metaphor, a bit of linguistic fantasy in disguise-forces Edwards to an awareness "of the barely thinkable" (Edward Ingebretsen, *Maps of Heaven, Maps of Hell: religious terror as memory from the Puritans to Stephen King*, Routledge, 2016)
- The empirical demonstration of Eddie Oshins' work on self-referential motion and the hunt for **psychic torque**. (*Physics of Tao, Eco Echo Invasives Extraction*, May 2017)
- Paul (an engineer by training) and I discuss torque. He explains the mechanics, the opposing forces, the stress factor, the cause and effect ... we talk about the **psychic torque** we are all experiencing ... certainly a time shift ... without a doubt a culture shift that intensifies the torque ... and yet this is what allows you (if you permit it) to become part of the experience ... (*The Faces of Gujarat: Experiencing India Subliminally, The Philosophical Traveller*, May 2009)
- ... the **psychic torque** produced by the sheer weight of the emotional pain he confronts through the letters ultimately lays waste to every intellectual defense he can muster to distance himself from that pain. (Michael Anthony Reardon, *Becoming Visionary: reading and living in the existential mode*, 1994, p. 98)
- Spillers defines this as 'a locus at which self-interrogation takes place [...] Its operations are torque-like to the extent that they throw certainty and dogma [...] into doubt.'... All these are markers of what Fanon termed 'existential deviance', which could be related to both as a **psychic torque** – a forceful twisting (into pre-made definitions of the square hole Real) – that can be very painful (psychologically disturbing) and, yet crucially, an opening towards hybridity. (Howard Slater, *Homicidal Melancholics of the World Unite! Mute*, 15 August 2017)

Psychological torsion:

- The psychological torsion that now belongs to this 'activity' captures the precise sense of 'media' (*medios*, or *recursos*), sometimes appearing beneath an instrumental determination of aesthetic culture and sometimes as a new form of agency itself. (Gregg Lambert, *The Return of the Baroque in Modern Culture*, A and C Black, 2004, p. 28)
- ... she enacts a conflicted embodiment of the monstrosity Eliot repeatedly explores as a renunciation of the human, civilised self. Maggie's taking 'her stand out of herself' not only implies a psychological torsion (twisting towards the eccentric or demented), but also shows her arguably 'most monstrous' (Hollis Berry, *Victorian Psychology Monstrous Maidens and George Eliot*, Brill, 2019, p. 120)
- This brings me to my third topic: the **torsion** exerted on the liberal self by finance. Specifically, I argue that financialization abstracts the formerly immediate and organic relationship between possession and ownership; as the two terms drift apart, the very basis of liberal subjectivity, what C.B. McPherson famously termed possessive individualism, begins to fray. (Matt Kavanagh, *Second Nature: American fiction in the Age of Capitalist Realism*, 2007)

Psychic torsion:

- This is one of Wilde's most famous epigrams..., but, in context, it is something more than a subversion of Victorian piety. It captures the peculiar **psychic torsion** that structures Wildean self-fashioning, within which he recuperates a sense of will, and with it a sense of freedom. (Michael F. Davis, Petra Dierkes-Thrun, *Wilde's Other Worlds*, Routledge, 2018).

Rather than the problematic nature of such torsion, the question is whether toroidal insight offers a more fruitful mode of engaging with that reality -- of which **flow psychology** is especially suggestive (Mihaly Csikszentmihályi, *Flow: The Psychology of Optimal Experience*, 1990).

Is it appropriate to ask at this time: **Does "global" reality -- and the requirement to believe in it -- involve a very particular and peculiar form of cognitive "torsion" or "twist", in contrast with the daily direct experience of "flat earth" reality?**

Intuitive recognition of toroidal cycles?

The argument above could be considered obscure since few attach meaning to the geometry of a "torus" -- let alone to any kind of toroidal cycle. The question is then whether this toroidal recognition has taken other forms with which credibility has long been associated in some manner.

Aspects of the question have been explored separately (*Engaging with Globality through Cognitive Circlets*, 2009). This indicated, notably with respect to the following:

Rosaries: The earlier paper (*Designing Cultural Rosaries and Meaning Malas to Sustain Associations within the Pattern that Connects*, 2000) noted how principles vital to understanding of the integrity of a pattern of belief were associated in many cultures with beads or symbols on some form of rosary. These provided a set of mnemonic triggers to recollect that pattern. Such devices are then to be understood as succinct carriers or holding frames. They provide a symbolic interface with that which is larger or more complex than can be coherently comprehended. The individual elements on any such necklace might then be understood as a set of cognitive "lenses" through which a larger context can be partially comprehended -- a form of "macroscope" (Joël de Rosnay, *The Macroscope*, 1979; Luc de Brabandère, *Le Latéroscope: systèmes et créativité*, 1989)

Identity: Necklaces, bracelets, anklets and belts may of course also be used to signify identification with a set of beliefs or understandings. They may be used to denote acquisition of understanding, notably as a mark of rank. They are a means of tribal identification in many cultures. More commonly they may also take the form of fashion accessories, expressive of other collective affiliations or associations. The distinct functions essential to integrated application of insight are best exemplified by the use by artisans of belts from which hang a set of tools. The use of key rings may also be understood symbolically and practically as holding access to a range of domains relevant to the exercise of an integrated set of functions.

Without any reference to a "torus" as such, a section on *Cognitive torque and fruitful associations* (2009), the latter discusses whether greater significance might be associated with such devices in practice, both in terms of their integrative capacity and the potential for psychoactive cognitive engagement. This necessarily goes beyond their mnemonic function and implies some form of existentially enhancing role. A potentially fruitful point of departure is the role of the torc as a more rigid form of necklace that has been the focus for symbolic and speculative treatment, as well as constituting a problematic symbol of high or low status -- even an indicator of property or

enslavement in the latter case.

The **torc** (torq or torque) can be worn as an arm ring, a circular neck ring, or a form of necklace. Whereas a necklace or a rosary typically has a point of discontinuity, in the case of a torc it may be open-ended in that the ends do not meet -- the integrity being ensured by the rigidity of the material (typically metal). This is also true of the bracelet form or as a finger ring.

The significance of the torc may be understood through various fruitful associations:

Halo: as a **halo** (nimbus, aureole, glory, or gloriole), it is depicted as a ring of light that surrounds a person of spiritual significance, typically in religious art representing holy or sacred figures. So depicted, it may notably surround the head or be positioned as a ring above it. Rather than a ring, from some representations it is readily to be inferred that it is considered to be a sphere, namely a form of crown.

Mark of property and dominance:

-- notably as a mark of enslavement, as offering a means through which slaves could be chained, Slave collars made of iron were used to discipline and identify slaves who were considered to be a risk of becoming runaways
-- this being one controversial interpretation of its use on women, even of the highest social standing and irrespective of the quality of the torc
-- in relation to dominance and bondage in a range of role-playing activities (known by the acronym **BDSM**) outside of commonly held social norms regarding sexuality and human relationships. A **collar** (possibly with an attached leash) is then a device of any material placed around the neck of the submissive partner -- owned by another.

Enabling "metapsychic powers": as enabling distinct "metapsychic" powers, notably as imaginatively explored in the science fiction series of **Julian May** (*Saga of Pliocene Exile*, notably *The Golden Torc*, 1982) where several torcs conferring such powers are distinguished: *gold* (ensuring complete operacy of those with latent powers), *silver* (ensuring control of the powers of the wearer by those wearing the golden form), *grey* (enabling only a degree of "farspeech" and ensuring control by those wearing the golden form). The series provided early imaginative support for understandings that now permeate online role-playing games and movie variants.

Signifying secular powers or bonds: as implying or conferring "powers" of some kind, if only in secular terms:

-- "**Collar**":

- a **clerical collar** (or "dog collar") worn by all ranks of Christian clergy. It was allegedly adopted as a symbolic gesture to reflect the iron collar that slaves were often made to wear around their necks.
- a **livery collar** (or chain of office) is a collar or heavy chain (usually of gold, possibly linking jewels) worn as insignia of office or a mark of fealty or other association in Europe from the Middle Ages onwards. Related significance is attached to widespread current use of collars of orders of knighthood, mayoral collars, and collars of freemasonry regalia (with the addition of a suspended jewel indicative of rank and having distinct symbolic significance)

-- **Necklace:** as a necklace (or **neck ring**), notably as associated with indigenous knowledge systems, for example:

- the Native American tradition inspired the wearing of long-beaded necklaces (**love beads**) within the hippie culture and by its inheritors
- inspired by Egyptian tradition, the community of **Damanhur** promotes the use of **selfic** bracelets
- use of **lapis lazuli** (from Afghanistan and ancient Babylon to Peru and the Inca civilization) to form "power amulets" were formed when shaped into the form of an eye and ornamented with gold.
- the sacred thread (*Yajnopavita*), accorded through a Hindu Brahmin ritual recognizing the status of twice-born. It symbolizes the connection between material and spiritual worlds and is composed of nine fine threads; three such threads being connected by a knot. As a whole, the thread is circular, normally supported on the left shoulder and wrapped around the body, falling underneath the right arm.

-- **Tiara:** as a **tiara**, namely a semi-circular band, often metal, and decorated with jewels, which is worn (especially by women) as a form of adornment on very formal or high social occasions, possibly as a feature of bridal wear; tiaras are frequently used to "crown" the winners of beauty pageants. Award winners may be described as "officially enforced".

-- **Wreath:** In contrast to metallic forms, are those woven from leaves or flowers. **Wreaths** are common to many cultures; laurel wreaths were used as a form of crown in classical Greece and Rome; they are depicted as part of the logo of the UN and some of its Specialized Agencies. Floral wreaths continue to be used as crowns at midsummer festivals, especially in Scandinavia (Elizabeth Jane Lloyd, *Enchanted Circles*, 1991) and in neo-pagan celebration of Beltane.

-- **Crown** (the focus of **Dimension 3**): with arches or covering to the basic circlet arrangement of a tiara, typically indicating that the wearer's power, wisdom, and authority comes from on high as well as symbolizing power, rank, honor, victory, elevation, wealth, reward, perfection, and achievement:

- as a **crown of royalty**
- the **papal tiara**, being the symbol of his authority, is a high cap surrounded by three crowns and bearing a globe surmounted by a cross (see more extensive discussion of the triple crown in **Dimension 3**).

-- **Bracelet:** as an anklet, bracelet, or armring, etc

-- **Ring:** as a ring (whether on the **finger, ear, toe, arm**, or elsewhere), perhaps echoing or focusing the function of a necklace and the integrity (or sense of most highly valued wholeness and bonding) it implies, as indicated by:

- as a **mood ring**, changing colour in response to the mood of the wearer
- as a sentimental association
- as a fraternity ring: notably as worn by students and by members of masonic and other fraternal lodges
- as an **engagement ring** or as a **wedding ring**: presented in many marriage ceremonies to signify marital commitment (Matt Jacks, *The History of the Wedding Ring: a recognizable symbol of love*, 2008)
- as a **signet ring**: an emblematic, often familial, ring, often bearing a coat of arms, notably for use to imprint a wax seal on official documents etc; may also be indicative of authority typically acknowledged in a ritual of kissing the ring as a recognition of fealty. Prominent examples are the papal **Piscatory Ring** and the **ecclesiastical rings**.
- as a **rosary ring**: with 10 indentations and a cross on the surface, representing one decade of a rosary; used to keep track of place in the prayer by rotating the ring on a finger and feeling the marks.
- as magical ring, the imaginative focus of many legends and popular tales including *The Ring Cycle* of **Richard Wagner**, and that of **J. R. R. Tolkien** (*The Fellowship of the Ring*; *The Lord of the Rings*; see commentary on *The One Ring*); also .Will Kalif (*The*

Symbolism and the Power of the Ring in Epic Fantasy). In addition to their representation in movies, they also figure in internet role-playing games. In the Wiccan tradition, rings are ritually imbued with magical power as "witches' rings" -- presumably echoing processes of consecration of ecclesiastical rings.

See further discussion in Peter Breslin (*Sacred Geometry and Ring Symbolism*, 2006).

Of particular interest is the associated use of **piercing**, recalling the practices of indigenous peoples and the symbolism (of wholeness?) they may have attached to rings used in this way. However piercing also suggests an intuitive sense of the higher dimensionality that can only be reflected at lower dimensionality through such "cuts" (in psychoanalytic terms). On the other hand, disparaging references are made to being led by "a ring through the nose" -- as with a bull.

Rings as a mode of psychosocial organization: Widespread reference is made to "rings", as in **organized crime** (drug rings, call-girl rings, **criminal rings**), and **web rings**. (including a **Witches Circle Web Ring**). A related variant is reference to a circle of contacts or a circle of friends, possibly reflected in circle, ring and **round dances**, including those of children (*Ring a Ring o' Roses*). In the Wiccan tradition the construction of a ring is of ceremonial significance (R.J. Thompson, *Drawing the Witch's Ring of Art*, 28 January 2008)

A further section of that earlier argument focused on crowns (*Engaging with Globality through Cognitive Crowns*, 2009).

In terms of this argument, those indications with respect to "engaging with globality" take advantage of the conflation of insights with respect to "global" in its physical sense and that of "global" in its conceptual sense, as previously discussed (*Future Generation through Global Conversation*, 1997) Paper for the 15th World Conference (Brisbane, Sept-Oct 1997) of the World Futures Studies Federation (WFSF). Theme: *Global Conversations: what you and I can do for future generations*.

The fashionable use of "global" focuses on the geographical dimension: the planet as a whole. This emphasis is the culmination of a century of successful effort towards international understanding -- of "thinking globally and acting locally", of "global villages", of "global action plans", of "global ethics", of "global consciousness" and of "globalization".

What has been largely lost in this process is the other sense of global, namely some kind of comprehensible, integrative whole -- of which a geographically bounded planet is but one particular instance. "Global" is too readily taken to mean planet-wide and no more -- a recognition by certain regions that there are others on the planet. "Interdisciplinarity", "transdisciplinarity" and "integrative" have themselves evolved into holistic buzz words because of the essential failure of the initiatives they represented in responding to the fragmentation of knowledge. "Holistic" could even be considered as content-free. "Global understanding" in this integrative sense has become almost a myth in pursuit of which some heroes occasionally continue to quest.

Perhaps it is only in mathematics that the clearest, and most general, distinction is maintained between "global" and "local". Unfortunately that discipline is incapable of taking into account the essential psychological distinction between the two that is associated with broader (rather than narrower) processes of comprehension, communication and learning. It is possibly only in Q-analysis that powerful clarification is given to the **relationship between degrees of comprehension** (Atkin, 1981).

For those of psychoanalytical orientation, there is also the suspicion that the current fascination with "global" competitiveness could usefully be seen as a projection onto a world scale of the competition of the tiny sperm of the male to reach the much larger female egg to ensure reproduction. The struggle for "globalization" may be partially driven by the oldest of instincts. From this perspective what awareness do those competing to imprint their particular vision on the world have of their global goal? This perspective would completely undermine democratic processes in relation to global governance. It would be reassuring to discover that sperm "cooperate" like migrating geese or like teams of racing cyclists. It is ironic that the preoccupation with globalization should occur in a period of falling male fertility and concern at the "feminization of nature" (through widespread pollution by oestrogen substitutes).

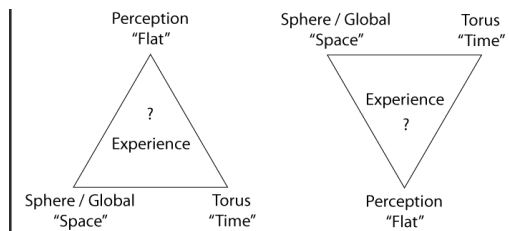
In this paper, "global" is explored in the sense of a potentially accessible cognitive whole rather than as an essentially inaccessible geographical one (although the latter may serve as a metaphor for the former). Just as one can travel around the globe without being able to see it as a whole from any one perspective, so one may perhaps be able to "circumnavigate" a cognitive whole without being able to "grasp" it. It is even possible that the understanding which tends to "grasp" cannot be fruitfully termed "global" -- or that what can be so grasped is not fruitfully understood as a whole of larger significance, or of requisite variety (cf. Ashby's Law).

In terms of the challenges of global governance, the ability of a particular discipline to grasp the challenges of society cannot in this sense be understood as "global". It is necessarily sub-global, namely local in some way which honours the particular, "local" insights of that discipline. A single finger cannot pick up and hold a ball, just as the ball cannot be completely viewed from a single perspective. In this metaphor, there is also a distinction between "clutching" and the many skills required to play with the ball through a variety of grips and actions. What does this then imply for global "conversation"?

In a very real sense **the past no long "exists"** -- especially in any "global" sense accessible to experience. Yesterday is only accessible through devices such as documents and images. As communicated and stored, these are all characteristically "flat" and require a special cognitive process to be "re-membered" as an experience which offers intimations of a "global" sense of coherence. Similarly, for a civilization at risk of disappearing, **tomorrow cannot be said to "exist" at this time** -- however much it is anticipated, most notably through planning articulated in documents which are all typically "flat" (calendars, spreadsheets, etc). Anyone may fail to wake up tomorrow.

Philosophers continue to address any notion of "existence" in new ways, suggesting that everyone is potentially free to do so (Markus Gabriel, *Why the World Does Not Exist*, 2015). Spherical understandings which might be associated with "global" have been the focus of similar studies (Peter Sloterdijk, *Bubbles: Spheres (Microspherology)*, *Globes: Spheres (Macrospherology)*, *Foams: Spheres (Plural Spherology)*, 2011-2016). The ephemeral nature of experience offers a similar focus (Raymond Tallis. *Of Time and Lamentation: reflections on transience*, 2017).

Alternating frameworks?



Such arguments highlight the sense in which experience of existence today is ephemeral to a radically dynamic degree -- readily obscured by unquestioning focus of the spatial reality of what is defined objectively. To the extent that reality is a direct experience of space-time, as physics would have it, there is potentially far greater invariance to temporal experience than to spatial experience -- as fruitfully framed in toroidal terms. Quantum reality may reinforce such comprehension ([Alexander Wendt, *Quantum Mind and Social Science: unifying physical and social ontology*, 2015](#); [Huan Wang, *The Toroidization of Quantum Matter*, *Advanced Science News*, 22 August 2019](#)).

As indicated above, the toroidal artefacts of such symbolic value could be understood as a somewhat desperate effort to enable access to the coherence of temporal reality -- in contrast to the ephemerally fragmented nature of its spatial complement.

Imagining life on a torus, or within it -- as lived in reality?

Both science and science fiction have extensively explored the possibility of dwelling on a torus (or within it) in the light of a variety of designs. An extensive indication of both is provided by [Wikipedia \(*Tori and annular habitats*\)](#). These have contributed to imaginative reflection on the matter.

The argument can be usefully clarified visually.

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

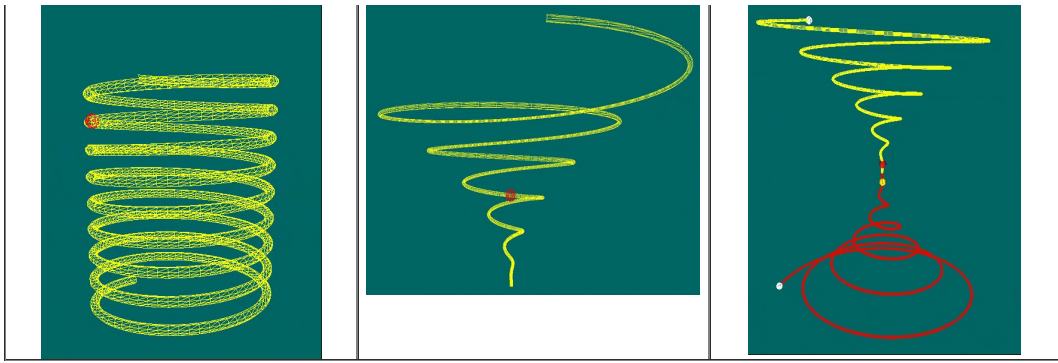
A succession of years could then be understood as a stack of toroidal pathways -- from the past to the future. The central animation offers a suggestion of this -- without offering any indication of how high the stack should be considered to be, namely how many toroidal annual cycles need to be stacked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

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

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


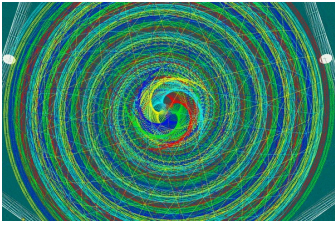
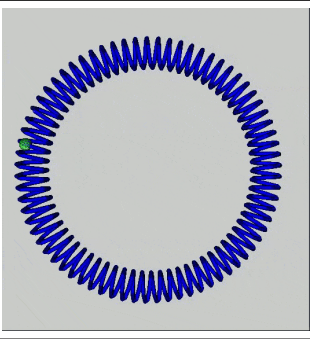
The animation on the right above could be understood as taking the form of a spring, more densely or more loosely packed -- as suggested by the animation below left. This invites reflection the potential cognitive significance of seeing a sequence of years as more compact or more loose -- or even that there is a subtle experience of "bounce" or "spring" in one's life. The succession of years can be considered quite differently, namely as a spiral -- of narrow radius in the early years to a far wider radius in later years. Whether experience shifts from "down" to "up" (as shown), or from "up" to "down", may be an individual matter. Possibly there could be alternation between the two worldviews, or one could be a shadowy reflection of the other, as might be suggested by the animation on the right below.

Indicative animations of annual movement of the globe -- suggestive perspectives on life		
Spring dynamic of helical pathway	Dynamic of spiral toroidal pathway	Double spiral dynamic of toroidal pathway



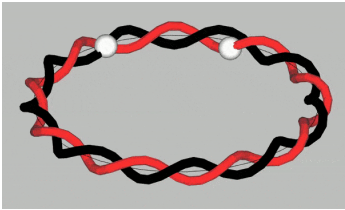
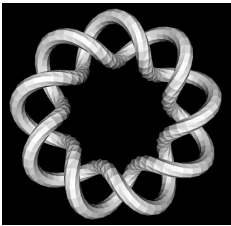
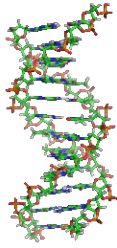
The model can be complexified by allowing for the presence of others who share one's experience to a degree -- friends, relatives, or colleagues. The animation on the left below has five distinctively coloured spirals -- using the double spiral possibility. Some of the complexity of experience in that context is possibly suggested by a view down the axis of the model in the central animation below.

If a human life is understood as some kind of complete cycle, another metaphor is suggested by the animation on the right below. Here, as an example, a life of 72 years -- each a torus -- is represented, by linking them together in a helical coil. Such a cycles is suggestive of the philosophy of eternal return.

Indicative animations of annual movement of the globe		
Helical movement with parallel multi-spirals	Axial view of animation on left	Torus of 72 tori -- an average lifetime
		
Reproduced from <i>Framing Cyclic Revolutionary Emergence of Opposing Symbols of Identity</i> (2017)		See alternative

In the animation on the left below, two intertwined helical coils are suggestive of either interlinked lives or of a shadowy alternative to one's conventional worldview -- an unconscious parallel. The central image shows a single continuous coil of 9 windings -- not separate coils -- which invites other interpretations, as with the variety of toroidal knots.

The animation on the right below recalls the extent to which all life is based on helically coiled DNA -- a double helix. This is itself understood to be a coiled coil.

Double helical spiral	Continuous 9-winding helical spiral	Double helix
		
Reproduced from <i>Visualization in 3D of Dynamics of Toroidal Helical Coils</i> (2016)		Source: Wikipedia: Richard Wheeler (Zephyris) 2006

Being "flat" -- or "global" and "well-rounded"?

Universal perspective: As noted above, a [Flat Earth](#) perspective is variously deprecated as the epitome of misunderstanding, although a variety of arguments can be presented in support of Flat Earth theory. *Wikipedia* notes, for example, that despite the scientific fact of Earth's sphericity, pseudoscientific flat Earth conspiracy theories are espoused by [modern flat Earth societies](#) and, increasingly, by unaffiliated individuals using social media. Unusually, *Wikipedia* includes a page on [Why Wikipedia cannot claim the Earth is not flat](#).

On the other hand, *Scientific American* includes an argument by [Davide Castelvecchi](#) (*What Do You Mean, The Universe Is Flat?*, Part I, 25 July 2011; Part II, 31 July 2011). This frames the conceptual dilemma through the following seemingly inconsistent statements which are associated with scientific theories:

- The universe is three-dimensional.
- The universe is four-dimensional -- three for space, one for time.
- The universe has nine, or ten or eleven dimensions
- Matter curves spacetime.
- The universe is flat.
- The universe is infinite.
- The universe is 84 billion light-years wide.
- The universe is a bubble, or an onion.
- Or a hall of mirrors, shaped like soccer ball.
- Or a shape out of Dante's Divine Comedy

The author argues that the subtlety lies in the word "universe" having different meanings in different contexts and implicitly assumes that we are referring to "everything that exists now". Also pointed out is that in the past decade there have been numerous references to the fact that cosmologists have found what they say is [rather convincing evidence](#) that the universe (meaning 3-D space) is flat, or at least very close to being flat. The author then proceeds to explain that flatness and curviness make sense in any number of dimensions.

Castelvecchi offers the clarification that when cosmologists say that the universe is flat they are referring to space -- the *nowverse* and its parallel siblings of time past. Spacetime is not flat. It can't be: Einstein's general theory of relativity says that matter and energy curve spacetime, and there are enough matter and energy lying around to provide for curvature. Besides, if spacetime were flat I wouldn't be sitting here because there would be no gravity to keep me on the chair. To put it succinctly: space can be flat even if spacetime isn't. Moreover, when they talk about the flatness of space cosmologists are referring to the large-scale appearance of the universe.

Personal implications: Of relevance to the argument here is the sense that this degree of confusion, and the opportunity for what can be understood as misunderstanding, is echoed to a surprising degree in personal comprehension of any distinction between the flat and the curved -- most notably as it applies to personal identity. There is therefore a sense in which people can experience themselves as "flat" -- rather than somehow well-rounded, if not "global". A form of Flat Earth thinking can then be recognized as a common experience when applied to individuals, and especially to oneself. The argument is reinforced by that of Nick Chater (*The Mind is Flat: the illusion of mental depth and the improvised mind*, 2018).

This appreciation of (and by) individuals is curiously echoed and reinforced by administrative procedures whereby the identity of citizens is defined and determined. This is evident in the use of "ID", especially "photo ID" and identity cards -- all flat, and typically stored flat, recalling the collections of specimens in museum drawers. This reinforcement extends to electronic representation on a screen -- typically flat (Sherry Turkle, *Life on the Screen: Identity in the Age of the Internet*, 1995)

As with the difficulty of recognizing and proving that the Earth is round, individuals could be understood to be as much challenged with how to prove and demonstrate that they are "round" -- or other than "flat". The challenge has experiential dimensions to the extent that an individual may feel "flat" -- not "well-rounded", as possibly implied by being "a person for all seasons". What enables someone to think they are round? To whom are they experienced as round and when? There are many references to well-roundedness and related notions (*What is a well-rounded person*, Quora, 2016; *What Activities and Character Traits Make a Well-Rounded Person?* Reference; Baldassare Castiglione, *The Ideal of the Well-Rounded Man*; Glen Stansberry, *How to Become a Modern Day Renaissance Man (or Woman)*, Gentlemint, 2017; Randy Lee, *Robert Bolt's A Man for All Seasons and the Art of Discerning Integrity*, 2000) .

The distinction in personal terms is only too evident in the preoccupation with physical roundedness -- with the extremes of the many references to being "[flat-chested](#)" or obese. Here however the concern with "feeling flat" -- or the sense that one is being "socially flattened", "economically flattened", "politically flattened", or "psychologically flattened" -- especially to the extent that this may be a consequence of violence, whether structural, cultural, intellectual, or spiritual (Alice Boyes, *13 Potential Causes for "Feeling Flat"*, *Psychology Today*, 13 September 2018; Jessica Davis, *Mid-point mental health: why are we all feeling so flat?* *Harpers Bazaar*, 14 May 2019).

Collective implications: Are there agendas whereby people are being deliberately "flattened" -- perhaps as one feature of [dumbing down](#)? (Jimmy Daly, *Is Higher Education at Risk of Being Flattened?* *EdTech*, July 2012). Clearly references to people being "crushed" through repressive policies are associated with approximations to being flattened. Of particular relevance are the issues for women in different cultures where their possibility of well-rounded lives is less obvious than the inference that they are effectively flattened by patterns of male dominance.

How do people recover from those experiences? An obvious clue is offered by recourse to psychoactive substances, alcohol, and the like. Sexual intercourse and procreation are another possibility. These could be said to offer an illusion of roundedness -- as with engagement in various forms of movement, including travel, dance, and sport (Mark Johnson, *The Body in the Mind: the bodily basis of meaning, imagination, and reason*, 1987; Maxine Sheets-Johnstone, *The Primacy of Movement*, 1999). A relevant argument has been made from a socio-economic perspective by Thomas Friedman (*It's a Flat World, After All*, *The New York Times*, 3 April 2005; *The World Is Flat*, 2005). The latter was given the first *Financial Times* and Goldman Sachs Business Book of the Year Award in 2005. The perspective of "falling flat" is of concern to business (J. P. Eggers, *Falling Flat: failed technologies and investment under uncertainty*, *Administrative Science Quarterly*, 30 April 2012).

Unexamined implications for identity: Part of the challenge lies in the experience of oneself and others over time. Where, and in what form, is the identity through which one lived yesterday -- as now recalled? Is the present sense of one's past identity recognized as more than flat -- as now recalled through photos? How does one "re-member" oneself and others -- and how is one "re-membered" by them? Is there a particular process through which roundedness and coherence is projected into documents from the past -- evoking a sense of roundedness or a memory of it, however faint and elusive?

This recalls the process of inflating a flat balloon -- with the challenge of how long it stays inflated and is susceptible to bursting. How indeed to "puff-up" wholeness from any sense of being flat -- recalling the genetic challenges of Jurassic Park? What of the desire to be "more rounded" in the future -- and sustainably so -- to embody fulfillment and coherence to a higher degree in some way?

Other relevant metaphors are offered by wire frames used to create [soap bubbles](#) (Megan Arnett, *Build the Best Big-Bubble Wand*, *Scientific American*, 6 April 2017). If a circular frame is a valued symbol of wholeness -- the sense of its flatness is reinforced when the frame is covered with a soapy film. Movement of the frame can result in the creation of bubbles -- typically well-rounded and a delight to see. Their evanescent nature is suggestive of the temporary nature of any sense of roundedness. Is a rounded sense of identity then to be understood as only momentary -- comparable with that of a [will-o'-the-whisp](#)? How do bubbles of identity get "pricked" and "collapse" (*Pricking the Bubble of Global Complacent Complicity: hyperdimensional insights from the physics of bubble blowing, bursting and collapse*, 2017)?

Yet another metaphor is offered by the Hindu system of [chakras of the human body](#) as a pattern of energy centres. These have been compared with the planets of the solar system. With each potentially understood and represented "globally", how does one identify with, or detach from, their respective perspectives -- recognized as challenge for mediation and other spiritual exercises? What of the situation in which they experienced as conceptually "flat"?

Far more problematic, especially for those experiencing it, is the sense of being ["flat broke"](#) -- in contrast to the sense of fulfillment associated with sufficiency and wealth. This is compounded by the response of others who may then conclude that one no longer "exists" -- other than as a "nobody". This is also true to a degree with collectives, even nations states.

Dubious conceptual juggling? Experiencing the globality of Earth could be usefully recognized as an exercise in conceptual "jiggery-pokery" -- especially when the emphasis is on experience rather than conceptualization. It would appear to be primarily a complex process of inference from various indications as to the limitations of flatness -- which few would be able to replicate. That said, it is far from clear how spherical and global emerge from such reflections -- except, for most, as an act of belief in the explanations of science. Arguably much the same can be said of any personal experience of wholeness and roundness -- on which so many processes of human development and individuation are focused. As with the experience of planetary globality, who can meaningfully describe and communicate individual globality in a coherent manner?

As discussed by Davide Castelvecchi, a key issue is the meaning to be associated with "exist" and "existence". How does a person exist in a flattened condition? This is a matter explored from fictional mathematical perspectives ([Edwin Abbott Abbott](#), *Flatland: a romance of many dimensions*, 1884; [Ian Stewart](#), *Flatterland*, 2001; [Dionys Burger](#), *Sphereland: a fantasy about curved spaces and an expanding universe*, 1965; [A. K. Dewdney](#), *The Planiverse*, 1984).

Given the challenge framed by "getting into orbit" around the globe, how does a person achieve the psychological equivalent? Discussion of existence is notably reframed by the suggestion from physics that reality calls for explanation in terms of quantum mechanics, with implications for international relations as ably argued by [Alexander Wendt](#) (*Quantum Mind and Social Science: unifying physical and social ontology*, 2015).

Such a perspective frames globality in a totally radical manner, as explored separately ([Encountering Otherness as a Waveform -- in the light of a wave theory of being](#), 2013; [Being a Waveform of Potential as an Experiential Choice: emergent dynamic qualities of identity and integrity](#), 2013). From a "toroidal perspective", it might then be provocatively asked whether a "global life" worth living?

Transforming the world into a doughnut: a vital clarification

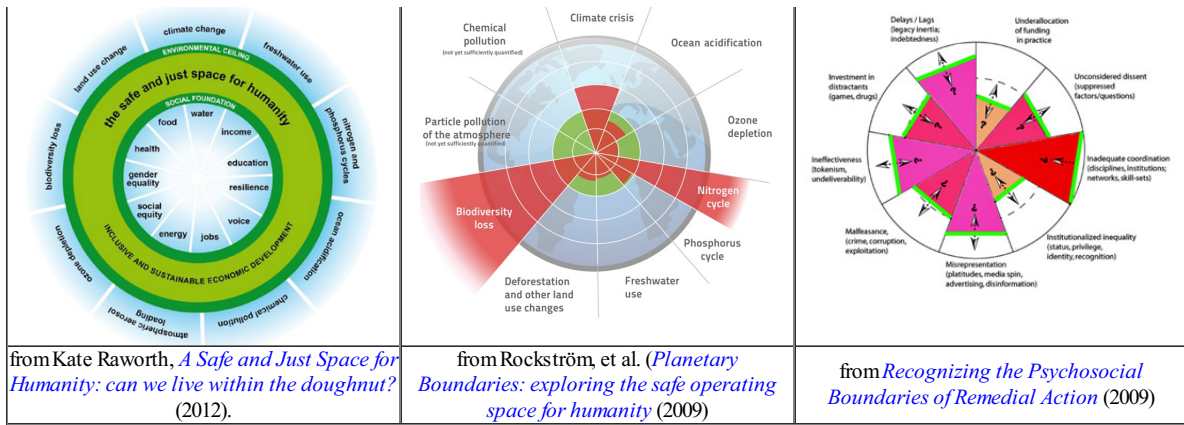
As noted by Les Narvasa ([Can We Transform The World Into a Doughnut? Brilliant](#), 2015): The world can be transformed into a doughnut (sphere becoming a torus, to be more generic) by the mathematics of what topologists now call: [surgery theory](#). This process, described as [Ricci flow with surgery](#), was invented by the mathematician [Grigori Perelman](#) -- awarded several distinguished mathematical prizes from 2006 in recognition for this outstanding work (but declined them).

As noted in the introduction, it should be strongly emphasized that **this argument is quite distinct from that envisaging the physical Earth as a torus**, as criticized by Beckett Mufson ([Apparently, Some People Believe the Earth Is Shaped Like a Donut](#), *Motherboard*, 13 November 2018) and to a related question and comments ([Is the earth a torus?](#) *Quora*, 2018; [Toroidal Earth Society](#) (*Reddit*, 2016; [Anders Sandberg](#), [What would the Earth be like if it was the shape of a donut?](#), *Gizmodo*, 2014). A 3D model of that possibility has however been produced ([Henry Segerman](#), *Torus Earth: Peirce quincuncial projection*, 2016).

Doughnut and boundaries: In a period of global crisis, there is considerable irony to the topological association of the world with a doughnut given the use of the metaphor by [Kate Raworth](#) (*Doughnut Economics: seven ways to think like a 21st-century economist*, 2017; *A Safe and Just Space for Humanity: can we live within the doughnut?* *Oxfam Discussion Papers*, 2017; *Introducing 'The Doughnut' of social and planetary boundaries for development*, *Oxfam International*, 10 February 2012). This has evoked a preoccupation with [doughnut economics](#) in relation to achieving the UN's 17 Sustainable Development Goals. The metaphor featured in a gathering of the World Economic Forum ([Kate Raworth](#), *How to do business with doughnuts*, 25 January 2018).

The irony is all the greater in that the reference to "planetary boundaries" derives from a presentation to the Club of Rome ([Johan Rockström](#), et al., *Planetary Boundaries: exploring the safe operating space for humanity*, *Ecology and Society*, 14, 2009, 2). Curiously the boundaries have been strictly defined in purely physical terms, as challenged in a commentary thereon ([Recognizing the Psychosocial Boundaries of Remedial Action: constraints on ensuring a safe operating space for humanity](#), 2009; [Exploring the Hidden Mysteries of Oxfam's Doughnut: recognizing the systemic negligence of an Earth Summit](#), 2012).

Contrasting the Earth-System boundaries with the boundaries of Remedial Action Capacity		
Oxfam Doughnut	Nine planetary boundaries	Nine remedial capacity boundaries



The question here is with respect to what understanding of "space-time" and the "planet" any such "boundaries" are to be found. In particular, **how is the "safe operating space" then to be understood when the representations are flat, in contrast to any requirement for a global perspective, or one related to time -- and possibly multidimensional in nature, however that is to be understood and comprehended?** With respect to a doughnut configuration, how are boundaries to be recognized and comprehended in framing such a space?

Given the toroidal insights explored here, and their association with knots (as discussed below), **is there the probability that these boundaries and spaces are highly vulnerable to being "twisted" in topological terms -- at least insofar as many are likely to comprehend them?**

Potential confusion: There is every possibility for unfruitful confusion in this complex of associations -- metaphorical and otherwise -- a confusion which may be fundamental to appropriate appreciation of both the challenge and the opportunities. Elements of the confusion include:

- the importance attached by mathematics to the distinction between a 2-sphere and a 3-sphere, where the former defines only the surface of a sphere and the latter includes what is within that surface. As noted by *Wikipedia*: a **2-sphere** is a two-dimensional **closed surface embedded** in a three-dimensional **Euclidean space**, whereas a "ball", is a three-dimensional shape that includes the sphere and everything *inside* the sphere (a *closed ball*), or, more often, just the points *inside*, but *not on* the sphere (an *open ball*). The distinction between **ball** and sphere has not always been maintained and especially older mathematical references talk about a sphere as a solid. This is analogous to the situation in the plane, where the terms "circle" and "disk" (of a certain thickness) can also be confounded.
- whether references to the planet, with mathematical implications, effectively assume that it is a 2-sphere or a **3-sphere** (or glome) -- as the first of a series of **n-spheres** (which may all be termed **hyperspheres**). The 3-sphere may be embedded in 4-dimensional Euclidean space as the set of points equidistant from a fixed central point. Analogously to how the boundary of a ball in three dimensions is an ordinary sphere (namely a two-dimensional **surface**, or 2-sphere), the boundary of a ball in four dimensions is a 3-sphere (an object with three **dimensions**). A 3-sphere is an example of a **3-manifold** and an n-sphere. A 3-sphere is a **compact, connected, 3-dimensional manifold without boundary**. It is also **simply connected**. What this means, in the broad sense, is that any loop, or circular path, on the 3-sphere can be continuously shrunk to a point without leaving the 3-sphere. The **Poincaré conjecture**, proved in 2003 by **Grigori Perelman**, provides that the 3-sphere is the only three-dimensional manifold (up to **homeomorphism**) with these properties.
- framed in this way, the question is under what conditions the planet can be usefully said to have "boundaries" -- and when is this inference dangerously misleading. It is said of the 3-sphere, especially when understood as embedded in 4-dimensional space, that it is finite but unbounded. In the continuing debate about the **shape of the universe**, one question is whether it should indeed be considered to be finite but unbounded, and closed.
- the seminal study by Rockstrom, et al (2009) specifically defines boundaries to be *human-determined values of the control variable set at a "safe" distance from a dangerous level (for processes without known thresholds at the continental to global scales) or from its global threshold. Determining a safe distance involves normative judgments of how societies choose to deal with risk and uncertainty... The choice of control variable for each planetary boundary was based on our assessment of the variable that on balance may provide the most comprehensive, aggregated, and measurable parameter for individual boundaries.* Does this imply a reference to a planet understood as a 2-sphere or a 3-sphere?
- there are potential comparisons to be made between human understanding of the shape of the universe and understanding of the shape of the "globe" in framing and containing planetary life as a whole -- especially . given the references above to the "flatness" of the Earth. Cosmologists distinguish between the observable universe and the global universe -- raising the question as to the extent to which planetary life can be understood to be observable, despite the extent of surveillance (and bearing in mind the unexplored ocean depths). Any reference to the global shape of the planet as a system, merits comparison with the distinction made by cosmologists as to whether the global universe is: finite or infinite; flat (no curvature), open (negative curvature), or closed (positive curvature); the degree of connectivity, namely how the universe is put together, i.e., **simply connected** (like a sphere) or multiply connected (like a torus). A **three-torus model of the universe** has been proposed (Evelyn Lamb, *A Few of My*

Favorite Spaces: the three-torus, Scientific American, 30 December 2015.

- even if the focus is on boundaries as understood by the natural sciences, it is clear that the study by Rockström, et al (2009) uses "human-determined values" in determining what amounts to the "radius" of the planet -- although clearly, since nine such boundaries are recognized by the study, this implies a complex situation of co-existing "spherical" boundaries of the planet. How do these relate in mathematical terms to the "globe" -- especially when the challenge of non-physical "boundaries" can be recognized by the "non-natural sciences"? A variant of this question was raised separately with respect to the challenge of the environment and climate change (*Are Environmentalists and Climate Scientists in Denial? Climate change recognized as primarily a psychological challenge*, 2019)

Extra dimensions? The question raised in this argument, especially given the metaphorical reference to "doughnut" and any implication that "planetary boundaries" are also metaphorical, is whether there is a much greater need for clarity. **The associated arguments call for recognition of the dangers of oversimplification in obscuring the extent to which the challenge could be more fruitfully understood as N-dimensional.** The "globe" and "planet" in question are then better recognized as being N-spheres, where N may well be as high as the 9 to 11 recognized with respect to the universe (as noted above), That the planet should be understood as having 9 boundaries is perhaps indicative of this -- in one sense at least.

The **number of dimensions**, the "extra dimensions", may even be more comprehensible with respect to the "planet" as a whole. As understood by physics, through **compactification** some of the extra dimensions are assumed to "close up" on themselves to form circles. In the limit where these curled up dimensions become "very small", a theory is obtained in which spacetime has effectively a lower number of dimensions.

Is it the case that the natural sciences applied to the challenges of the environment have adopted the convenience of ignoring extra dimensions -- as being so small as to be negligible? Are they however significant to the human experience of the environment, and to the credibility of strategic initiatives? This neglect is strangely mirrored in the comprehensible neglect by most of the many forms of movement in which the planet is understood to be engaged within the universe (Ethan Siegel, *Our Motion Through Space Isn't A Vortex, But Something Far More Interesting*, *Forbes*, 30 August 2018; *Considering the motion of the Earth, the solar system, and the galaxy, how fast am I moving while lying in bed asleep? Ask an Astronomer*).

Requisite flexibility: With respect to the argument here concerning human intuitive understanding of torus versus sphere, the clarification of the above arguments could well enable a fruitful shift in focus from a global to a toroidal perspective -- given the intimate topological relationship between the two (if appropriately understood with mathematical clarification). **Can the world indeed be transformed into a doughnut** -- as suggested above -- in order to address the complex of issues more effectively, as claimed by "doughnut economics", for example? Will history recognize the current approach to "planetary boundaries" as being tainted by what amounts to "flatterland" thinking?

Of some relevance is the following exchange on a blog maintained by Kate Raworth (*Doing the Doughnut at the G20?*):

David Needham (1 December 2018): I am fervent about your economic analysis but worry about the name Doughnut – a name with insufficient gravitas to be taken seriously by those who need to take it seriously and have the power to do something? ... In my mind it is Toroid economics.

Laura Kennett (2 December 2018): It's great to see the sharing of ideas to give all of humanity a map towards the doughnut/toroid – I agree the term "doughnut" may lack the credibility and health-consciousness that we need so I like the term "toroid"... Trying to squeeze humanity into a two-dimensional space could be improved by increasing the "volume" or height of the doughnut/toroid. The third dimension could represent the "adaptive capacity" of a nation/state/entity.

Kate Raworth (2 December 2018): Yes, torus is a far less silly name, but almost no one knows what one is!

Whilst **"doughnut" may indeed be silly, the issue is whether the manner in which it is so readily known avoids consideration of characteristics of a torus usefully clarified by topology** -- notably in the light of the confusion with regard to global, ball and sphere. Use of "doughnut" dangerously inhibits recognition of how these are related and the manner in which one may be transformed into the other -- if Raworth's arguments for "doughnut" are indeed a means of "safeguarding planetary boundaries".

Silly or not, a further concern is whether, such a metaphor is too simple to correspond to the requisite complexity of the situation. As such it lends itself to being characterized as insulting for a civilization dependent on far greater complexity, notably in the light of national enthusiasm for getting into orbit in order to escape the challenges of life on Earth. Given the acknowledged complex of skills required to get into orbit, is there a dangerous naivety in cultivating the illusion that getting strategies to "fly" is as simple as flying to Mars on a doughnut?

Toroidal conceptualization

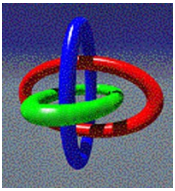
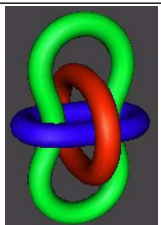
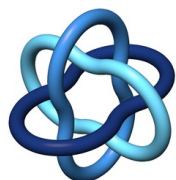
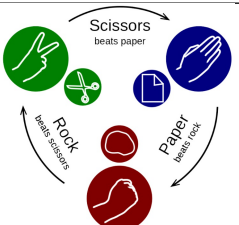
Conversation theory: Of particular relevance to this argument has been the manner in which **conversation theory** has been developed (Gordon Pask and Gerard de Zeeuw, *Interactions of Actors: theory and some applications*, 1992), with reference to the work of Beer (1994), notably as described by Nick Green (*Axioms from Interaction of Actors Theory*, *Kybernetes*, 33, 2004) with respect to triplets of concept resonance:

There are two parts to an interacting participant or Actor. First the P-individual which is a dynamic, productive and incidentally reproductive, adaptive, evolving and learning collection or entailment mesh of concepts. Dawkins' memes (Dawkins, 1976) are a

restricted form of P- individual. Second the M-individual which is a mechanical or biological medium e.g. a computer, a brain or a star, which supports the P-Individual and the strains its concepts produce....

The closed toroidal processes which comprise the concepts of P-individuals exist as stable triples in which any pair is analogous to the other and distinguished by the third. Any two concepts may generate the third because of their resonant similarities and differences. The resonance produced by an incident field produces an output radiative field. Knot theory was a matter of some concern to Pask. He coined the term "tapestry" making his entailment mesh structure of the concepts of a participant coherent with knot theory. Whilst loops are always permitted, indeed are the nature of concepts, the intersections of C[onversation] T[hory] become crossings in I[nteraction of] Actors Theory] where crossings up and down with loops define knots. The crossing up or down rule of the knots or links was not decided but a recursive and nested Borromean form seemed most likely. This seems coherent with the superstring theory interpretation of force. (pp. 1433-1435)

Orthogonal form of the Borromean link-isometric view. A putative model of Continuity, the equilibrium of void and not-void, around a void. Borromean rings, as a link of three unknotted loops (such that any two of the loops are unlinked) can therefore be understood as the closure of a braid, as discussed in some detail by Louis H. Kauffman (*Knot Logic and Topological Quantum Computing with Majorana Fermions*, arXiv, 2013; *The Borromean Rings: a tripartite topological relationship*, Bridges, 2006).

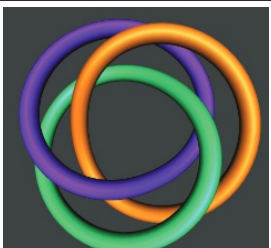
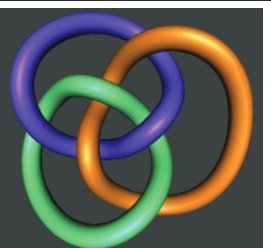
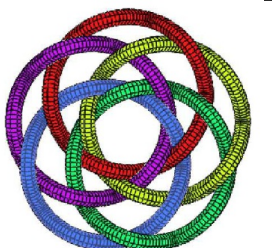
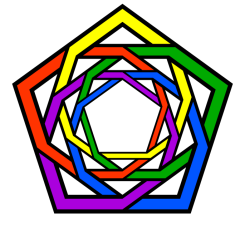
Representations of Borromean rings			
Pask's Stable Concept Triple as Borromean ring	Borromean ring in 3D	International Mathematical Union logo	Scissors-Rock-Paper game
			
Reproduced from Nick Green (<i>Axioms from Interactions of Actors Theory</i> , 2004)	Reproduced from Kauffman (2006)	Reproduced from Wikipedia	

Kauffman notes that as an ordered knot-set, the Borromean rings constitute a "scissors-paper-stone" pattern. Each component of the rings lies over one other component, in a cyclic pattern (left below). (with Red surrounds blue; Blue surrounds green; Green surrounds red)

Borromean rings as an ordered knot-set: Far more controversial is the comprehension of the Christian Trinity to which mystics allude, as discussed and illustrated separately (Vlad Alexeev, *Borromean Rings, Impossible World; Symbols of the Holy Trinity, Holy Trinity Amblecote; Borromean Rings, ThisIsChurch.com*). The question is whether its integrative function of 3-in-1 and 1-in-3 is best to be presented in terms of a Venn diagram or a Borromean condition.

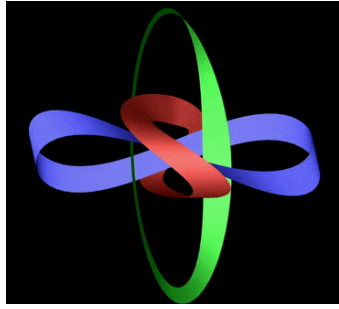
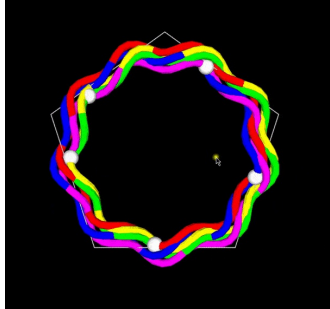

This distinction is most clearly made and illustrated in an extensive analysis of how Dante Alighieri describes the three rings (*tre giri*) of the Holy Trinity in *Paradiso* 33 of the *Divine Comedy* (Arielle Saiber and Aba Mbirika, *The Three Giri of Paradiso XXXIII, Dante Studies*, 131, 2013, pp. 237-272). The remarkable interdisciplinary exploration combines insights from speculative theology, geometry and knot theory. It is of particular relevance to the argument here, especially in relation to knots (as discussed further below).

The "scissors-paper-stone" metaphor has been extended to 5-ring and 7-ring Borromean configurations (Marc Chamberland and Eugene A Herma, *Rock-Paper-Scissors meets Borromean Rings*, Grinnell College, 2014).

Representations of Borromean rings (by contrast with misleading representations)			
(3,3)-torus link (circles do not need to bend to form the 3-link, non-Borromean)	3-fold Borromean rings (circles must bend to be able to be woven together)	5-fold Borromean rings	Discordian Mandala (misleading 5-fold interlinkage)
			
Reproduced from <i>The Three Giri of Paradiso XXXIII</i> (2013)		Reproduced from Chamberland and Herma (2013)	Reproduced from Wikipedia

With respect to any consideration of "9 planetary boundaries", to what extent is it fruitful to explore the possibility that the dilemmas they imply together may derive from the manner in which they are interlocked? Is the quest for the elusive condition of sustainable

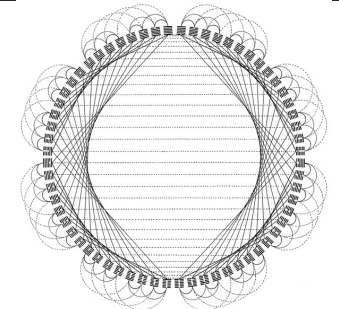
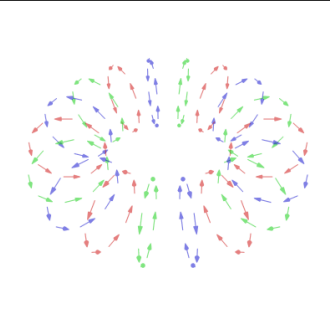
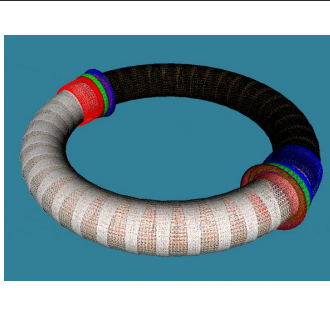
governance to be compared with that of achieving an interrelationship between them usefully understood in the light of Borromean rings? Such a framing evoked exploration of the possibility of a 5-fold dynamic configuration of 9-sided "toroids" -- provoked by the pattern of the *Discordian Mandala* as being emblematic of current incommensurabilities (*Concordian Mandala as a Symbolic Nexus: insights from dynamics of a pentagonal configuration of nonagons in 3D*, 2016; *Visualization in 3D of Dynamics of Toroidal Helical Coils -- in quest of optimum designs for a Concordian Mandala*, 2016). The following is one result.

Indicative experimental animations		
3 Möbius strips	Configuration 5 9-sided helical toroids	Triangular bonding within triple helix (embedded in octahedral great circles)
		
Video (mp4); Virtual reality (x3d; wrl)	Reproduced from <i>Visualization in 3D of Dynamics of Toroidal Helical Coils</i> (2016)	Reproduced from <i>Embedding the Triple Helix in a Spherical Octahedron</i> (2017)

Given the current focus on the Triple Helix model of innovation (as noted above), the experimental representations were extended to triple, quadruple and quintuple helices, of which the first is shown above (*Framing Cyclic Revolutionary Emergence of Opposing Symbols of Identity: biomimetic embedding of N-tuple helices in spherical polyhedra*, 2017).

System holders: Distinct from specific know-how and insights, one of the challenges of such meaning malas is to hold systems of insight as patterns, rather than solely in terms of their individual elements. How can whole systems be effectively held by such devices? How much insight can be rendered explicit in the design and how much must remain implicit? This is the distinction between the reminder dimension and the meditative catalyst dimension. As system holders, the level of understanding is shifted to a more integrative perspective -- the cultural rosary then functions somewhat like an enjoyable conceptual prosthetic! (*Designing Cultural Rosaries and Meaning Malas to Sustain Associations within the Pattern that Connects*, 2000).

The animation on the right below offers a reminder of the fundamental cyclic archetype of the *Ouroboros* -- of a snake (or dragon) eating its tail. The animation is a schematic exercise in representation of that process, as discussed separately (*Cognitive Osmosis in a Knowledge-based Civilization: interface challenge of inside-outside, insight-outsight, information-outformation*, 2017). The central animation illustrates the dynamics of a vortex sustaining a toroid -- as most readily recognized in a smoke ring.

Circular configuration of hexagrams	Animation of vortex ring	Schematic Ouroboros animation
		
Animated variant at <i>Dynamic Exploration of Value Configurations</i> (2008)	By Lucas V. Barbosa - Own work, Public Domain, Link	Reproduced from: <i>Experimental animations in 3D of the ouroboros pattern</i> (2017)

Toroidal embodiment, knottedness and being a torus?

In the light of the challenge of experiencing oneself as well-rounded, as argued above, is experiencing oneself as a torus just as feasible (if not more so) as experiencing oneself as global or spheroid in some way? The arguments of an earlier section suggest that there is an intuitive appreciation of circlets and ring formation. These could be said to have as much credibility as a global form -- if not more. It could be useful to explore the history of the discovery, appreciation and use of the ball in comparison with the necklace or bracelet -- especially given the importance attached to that of the wheel.

Multidimensionality: This argument has further implications in the light of the assumptions too readily made regarding personal human experience of "globality" and "wholth" (*Wholth as Sustaining Dynamic of Health and Wealth: cognitive dynamics sustaining the meta-pattern that connects*, 2013).

To the extent that one assumes oneself to be "rounded", is this as a 2-sphere -- superficially, as with a bubble? Or is there an

understanding of depth for which a 3-sphere would be more appropriate? More challenging -- if not inspiring -- is human identity better understood in terms of an N-sphere, with N being commensurate with the insights of physics? Such topological considerations could clarify the manner in which spherical experience of coherence could be transformed into toroidal experience -- with corresponding topological distinctions between **2-torus** and **N-torus**.

Are human aspirations to "freedom" far more usefully recognized as being associated with such multidimensionality, as implied by arguments from various perspectives:

- Ron Atkin: *Multidimensional Man: can man live in 3-dimensional space?* (1981)
- Antonio de Nicolas: *Meditations through the Rg Veda: four-dimensional man*, (1978)
- P. A. Heelan: *The Logic of Changing Classificatory Frameworks* (1974)
- Malgorzata Czarnocka: *Two-level, Open, Plastic and Multidimensional Human Nature: an ontological riddle (Dialogue and Universalism, 26, 2016, 1)*
- Ivan Petricevic: *Scientists Find 'Evidence' of a Multidimensional Universe Inside Our Brain (Uplift, 20 September 2017)*
- Arturo Tozzi: *Why and How the Human Brain is Multidimensional (ResearchGate, May 2018)*
- Raya Fidel, et al: *A Multidimensional Approach to the Study of Human-Information Interaction (Journal of the American Society for Information and Technology, 55, 2004, 11).*


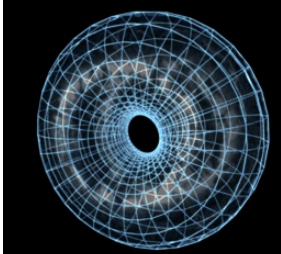
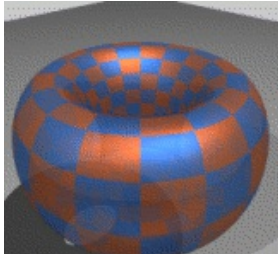
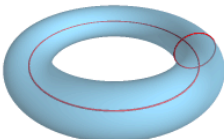
For some, speculation extends to the nature of "multidimensional humanity" and to "transdimensional humanity" (Alice Bryant and Linda Seebach, *Multidimensional Potential of Human Beings*).

Such language merits comparison with the results of recent neuroscience research which indicates the remarkable possibility of cognitive processes taking up even up to 11-dimensional form in the light of emergent neuronal connectivity in the human brain. As summarized:

Using mathematics in a novel way in neuroscience, the **Blue Brain Project** shows that the brain operates on many dimensions, not just the three dimensions that we are accustomed to. For most people, it is a stretch of the imagination to understand the world in four dimensions but a new study has discovered structures in the brain with up to eleven dimensions - ground-breaking work that is beginning to reveal the brain's deepest architectural secrets.... these structures arise when a group of neurons forms a clique: each neuron connects to every other neuron in the group in a very specific way that generates a precise geometric object. The more neurons there are in a clique, the higher the dimension of the geometric object. ...

The appearance of high-dimensional cavities when the brain is processing information means that the neurons in the network react to stimuli in an extremely organized manner. It is as if the brain reacts to a stimulus by building then razing a tower of multi-dimensional blocks, starting with rods (1D), then planks (2D), then cubes (3D), and then more complex geometries with 4D, 5D, etc. The progression of activity through the brain resembles a multi-dimensional sandcastle that materializes out of the sand and then disintegrates. (*Blue Brain Team Discovers a Multi-Dimensional Universe in Brain Networks Frontiers Communications in Neuroscience 12 June 2017*)

With respect to "being a torus" in any way, to what extent are the following animations suggestive of dynamics which could be associated with such understanding?

Turning a punctured torus inside-out	A stereographic projection of a Clifford torus performing a simple rotation through the xz plane.	4D <i>flat torus</i> projected into 3-dimensions and rotated on a fixed axis.	Ring torus becomes a horn torus, then a spindle torus, and finally degenerates into a sphere.
			
By w:en>User:Surot - English Wikipedia, Public Domain, Link	Created by Jason Hise with Maya and Macromedia Fireworks.	Claudio Rocchini [CC BY-SA 3.0] , via Wikimedia Commons	User:Kieff [Public domain], via Wikimedia Commons

Topological semiotics? Any relevance of the torus to this argument is significantly framed both by topology and semiotics. This perspective was introduced by **Algirdas Julien Greimas** (*Toward a Topological Semiotics*), however, it is less evident from the following how the role of time is to be understood as complementing the role of space:

Space as form is therefore a construction that chooses only certain properties of "real" objects and only one or other possible levels of its own pertinence, to signify. It is obvious that all construction is an impoverishment and that the emergence of space makes most of the richness of expanse disappear. What it loses in concrete and lived fullness is compensated for, however, by multiple increases in signification: by becoming signifying space, it simply becomes another "object"...

Hence, contrary to what happens in the production of nonscientific discourse, where, for example the temporalization and the spatialization of the models are procedures of normal enunciation, semiotic models are considered to be achronological, realizable at all times and in all places, but independent of their realization. (Extract from *The Social Sciences: a semiotic view*, 1976-1990)

Greimas is especially known for his introduction of the [Greimas semiotic square](#), discussed separately with respect to its possible three-dimensional implications (*Square of opposition and Crossed quadrilaterals: the cognitive challenge?* 2019).

Psychoanalytic appreciation of torus: Arguably the greatest attention to any sense of "being a torus" has been the focus of [Jacques Lacan](#) as a psychiatrist and psychoanalyst. His understanding in that respect is most accessibly articulated by Owen Hewitson (*From the Bridges of Königsberg: why topology matters in psychoanalysis*, *LacanOnline.com*, 9 January 2015; *Why Topology Matters in Psychoanalysis*, *LacanOnline.com*, 1 March 2015). Points made there of relevance to this argument include:

- Throughout the 1970s he busied himself with rings of string, weaving knots and lattices in an attempt to construct a topological model that represented the human soul. Referring to one topological form which especially fascinated him during these years – the [Borromean knot](#) – his biographer Elisabeth Roudinesco wrote that these were the years that Lacan lived on "planet Borromeo".
- Topology offers a way of thinking about any particular space whatsoever. The human reality of our everyday lives can be considered as a topology, composed of points, arranged into neighbourhoods, within sets.
- He was trying to represent the unconscious -- topographically, structurally, dynamically -- solely with recourse to models based on the purely two-dimensional and three-dimensional spaces of Euclidean geometry.
- The hallmark of topology is that it deals with figures which retain their properties regardless of their deformations. You can bend and stretch and manipulate topological space as much as you like but it still retains its essential topologically significant characteristics.
- For Lacan: "*A torus... is the structure of neurosis, in as much as desire can, from the indefinitely innumerable repetition of demand, be looped in two terms. It is on this condition at least that the contrabanding of the subject is decided – in this saying that is called interpretation.*" (*L'Étourdit*, 1972)
- Human suffering itself exhibits the characteristics of a toric loop: "*Man goes round in circles because the structure, the structure of man, is toric*"... adding yet another extension to his proposition: "*The world is toric*" (*Seminar XXIV*, 14 December 1976).
- For Lacan: "*Topology is not 'designed to guide us' in structure. It is this structure.*" (*L'Étourdit*, 1972). Topology is about a delimitation of space. This could be signifying space, physical space, relational space – its topological properties persist regardless of the nature of the components of that space, or the deformations that space undergoes. We are instead talking about a space that can be conceived regardless of the elements that compose it.
- This is perhaps what Lacan's legacy means in psychoanalysis today. At the end of his life, and at the end of his adventures in topology, we are left the "knots programme"; as the new therapeutic paradigm.

More recently a very careful exploration of the significance of the torus, partially in the light of the above, has been made by the psychologist and philosopher [Steven Rosen](#) (2004, 2006, 2008, 20014), as discussed below in the concluding section.

Toroidal organization of music perception? Music is much valued for the coherence it offers in the lives of people. Of interest is therefore the degree to which this relates to engagement with the challenges of the times, as discussed separately (*Implication of Toroidal Transformation of the Crown of Thorns: design challenge to enable integrative comprehension of global dynamics*, 2011). Of particular relevance to this argument is the discussion there of *Musical facilitation of integrative comprehension* (2011), noting the rich consideration given to the cognitive role of music by [Douglas Hofstadter](#) (*Gödel, Escher, Bach: an Eternal Golden Braid*, 1979).

The earlier discussion noted the manner in which the torus may be used as a representation of harmonic space. The results of psychoacoustic experiments of the inter-key relations of all major and minor keys can be represented geometrically on a torus (Carol Krumhansl and Edward Kessler, *Tracing the dynamic changes in perceived tonal organization in a spatial representation of musical keys*. *Psychological Review*, 89, 1989, 4, 334-368; Benjamin Blankertz, et al, *Constant Q Profiles and Toroidal Models of Inter-Key Relations -- ToMIR*, 1999). The keys are located on the surface of a torus, in which the circle of fifths and the parallel and relative relations between major and minor keys are represented.

As noted by [Roger Shepard](#) at that time::

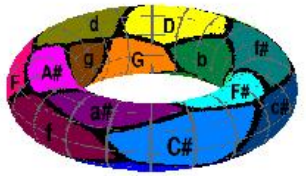
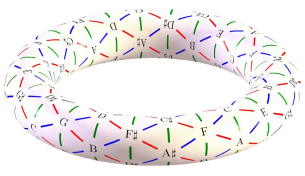
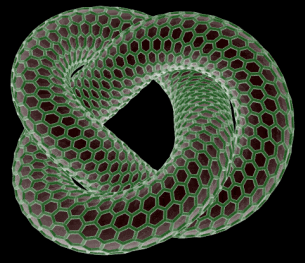
Increasingly adequate accounts of musical pitch are provided by increasingly generalized, geometrically regular helical structures: a simple helix, a double helix, and a double helix wound around a torus in four dimensions or around a higher order helical cylinder in five dimensions. A two-dimensional "melodic map" of these double-helical structures provides for optimally compact representations of musical scales and melodies. A two-dimensional "harmonic map", obtained by an affine transformation of the melodic map, provides for optimally compact representations of chords and harmonic relations; moreover, it is isomorphic to the toroidal structure that Krumhansl and Kessler (1982) show to represent the psychological relations among musical keys (*Geometrical Approximations to the Structure of Musical Pitch* *Psychological Review*, 89, 1982, 4)

More relevant to the toroidal clarification sought here is the remarkable subsequent work of [Dmitri Tymoczko](#) (*The Geometry of Musical Chords*. *Science*, 313, 2006, pp. 72-74; *A Geometry of Music*, 2011). This focuses on the *Tonnetz* (tone-network) of musical tuning and harmony, namely a conceptual lattice diagram representing tonal space (Dmitri Tymoczko, *The Generalized Tonnetz*, *Journal of Music Theory*, 56, 2012, 1). In the latter he questions whether the (equal-tempered) *Tonnetz* is in fact truly toroidal, as argued in terms of [Neo Riemannian music theory](#), among others. For Tymoczko:

Previous theorists have unanimously answered this question affirmatively, to the point where one would almost court ridicule to suggest otherwise. But our discussion has given us reason to be more circumspect... The assumption that the *Tonnetz* is toroidal is an example of music theorists implicitly attributing structure to their models over and above that contained in their mathematical formalism.

Neo-Riemannian theory typically assumes enharmonic equivalence, which wraps the planar *Tonnetz* graph into a torus. In the generalization of Tymoczko, many of the geometrical representations associated with neo-Riemannian theory are unified into a more general framework representing the voice-leading *Tonnetz* as a more complex "nontoroidal, three-dimensional structure whose individual octahedra are the duals of the cubes in "Cube Dance", and in which major, minor, and augmented triads are all on an equal footing". This is far from constituting an increase in comprehensibility in comparison with the relative simplicity of the images below (left and centre). That in the centre reflect reference in the literature to a "chicken wire" pattern of tones of the *Tonnetz*. One complexification, for example, potentially consistent with the arguments of Tymoczko, is the twisted toroidal knot of a hexagonal "chicken wire" (below right). The question is how the human brain is able to recognize coherence in complexity, whether consciously or intuitively in some way.

Emmanule Amiot. *The Torii of Phases*. International Conference on Mathematics and Computation in Music, 2012 *** chain mail

Inter-key relations of all major and minor keys (toroidal representation)	Neo-Riemannian Tonnetz (animation of a toroidal view)	Toroidal knot (animation)
		
<p>Derived from psychoacoustic experiments by Krumhansl and Kessler (1989)</p>	<p>By Davidwbulger - Own work, Public Domain, Link</p>	<p>Adaptation of a model developed by Adrian Rossiter with Antiprism</p>

Orbifolds, moonshine and wallpaper: Given the role of an orbifold in ordering musics (Dmitri Tymoczko, *The Geometry of Musical Chords*, *Science*, 313. 5783, 7 July 2007, pp. 72 - 74), it is intriguing that orbifolds have a recognized role with respect to the connectivity of "moonshine", as in the mathematics of moonshine theory (Michael P. Tuite, *Monstrous Moonshine from Orbifolds*, 1992) -- indeed a key figure in its development has been John Conway, who developed the notation by which orbifolds are characterized, as noted separately (*Potential Psychosocial Significance of Monstrous Moonshine: an exceptional form of symmetry as a Rosetta stone for cognitive frameworks*, 2007).

With the challenge of such "monstrous" symmetry to comprehension, is it possible that folk intuitions of "taming monsters" through music are indicative of powerful truths -- as discussed separately in relation to a possible periodic table of beliefs (*Systematic Visual Representation of Musical Possibilities on an Orbifold*, 2007)? Beliefs are then perhaps to be understood as the most generic forms of cognitive property. Curiously the animation on the right above, given the association to musical scales, is suggestive of the kind of archetypal "scaly monster" which is anathems to some religions (another example being even more suggestive in this respect).

Similarly intriguing is the potential role of orbifolds in justifying the improbable coherence of the UN's 17 Sustainable Development Goals. There is a strange possibility that the coherence of such a 17-fold pattern might be related, if only unconsciously, to the so-called wallpaper group (or plane symmetry group). This is a mathematical classification of a two-dimensional repetitive pattern, based on the symmetries in the pattern (orbifold notation of wallpaper groups). Such patterns occur frequently in architecture and decorative art, especially in textiles and tiles as well as wallpaper. It has been proven that there are only 17 distinct groups of possible patterns. Cynically it could however be argued that the 17 SDGs can be understood as "global wallpaper" for decorative purposes.

Collective relevance? Most curious is the seeming degree of irrelevance of the toroidal thinking of both psychoanalysts and musical theorists to the collective challenges of society and to comprehension of their representation. Despite the preoccupation with the unconscious in the case of some, there is no link (especially in topological terms!) to the space of discourse of such as John Ralston Saul (*The Unconscious Civilization*, 1995). In the case of psychoanalysis this neglect presumably follows from that of Freud in relation to Carl Jung's concerns with the collective unconscious. It could be argued that the irrelevance of the non-natural sciences to the natural sciences is echoed to a degree by the irrelevance of the collective to the psychological sciences with their focus on the individual.

A similar argument can be made with regard to the remarkable insights of music theorists in a period when music is proving ever more valuable to the lives and experience of people who have little interest in music theory and geometric representation of tones. If indeed humans order their engagement with music through a toroidal form of some kind, is this indicative of the possibility of using such insight to enable new modes of engagement with the strategic challenges of the times?

The value of being able to engage more fruitfully with strategies through music has been argued separately (*A Singable Earth Charter, EU Constitution or Global Ethic?* 2006). Why is this not envisaged in relation to the UN's 17 Sustainable Development Goals -- or to "doughnut economics"? How might the emerging insights of music theory contribute to this?

Seemingly also neglected in both cases is the experiential dimension -- beyond the capacity to provide "academic" explanations of the challenge for the individual. Whilst the world can be held to be "toric", the challenge is how the individual is able to experience reality in such terms -- however clear the topological modelling. This recalls the challenge for the individual (described above) of relating Flat Earth experience to the subtle understanding of global reality. It is in this sense that the elusively intuitive associations to the torus (through symbolic artefacts such as rings, circlets, and the like) hold such insights to a valuable degree. How is toroidal embodiment to be comprehended -- namely "being a torus"?

The sophistication of the arguments for various forms of representation of music itself offers a metaphor for the distinctions individuals may be free to make with regard to imagining "global" organization. The professional disagreements, whether between psychoanalysts or music theorists, also lend themselves to representation by the distinctions made by music theorists -- as distinctive tones and chords in a "polyphony" elusively and ironically echoing recognition of the traditional [music of the spheres](#) -- encompassing (professional) "discord". How are "discordantly" contrasting perceptions held by a representation, of greater or lesser sophistication, which must necessarily vary in dimensionality to accommodate the perceiver?

Even a planar *Tonnetz* would not constitute a meaningful framework for engagement with music by many. How might the higher dimensional representations -- whether toroidal or not -- be recognized as matching with that engagement? On the other hand is music unconsciously organized by the brain in such higher dimensional terms -- as suggested by the research noted above? Such questions are relevant to the meaning purportedly offered by "doughnut economics" and the credibility it is hoped to inspire (without any effort to enable this)?

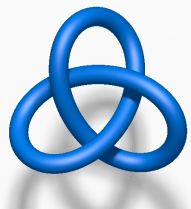
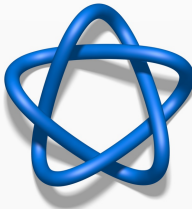
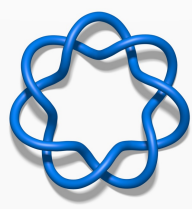
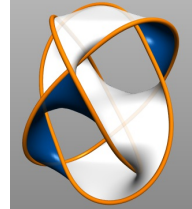
So framed, imagining toroidal living may be an option for an individual. How might such toroidal embodiment be extended to the collective -- as has been done in a questionable manner, and to a strange degree, with respect to "global" and "globalization"? More challenging is how fundamental such toroidal organization might be (D. K. F. Meijer and J. H. Geesink, *Is the Fabric of Reality Guided by a Semi-Harmonic, Toroidal Background Field?* *Neuroquantology*, 17, 2019, 4; *International Journal of Structural and Computational Biology*, 2018).

Knottedness: The significance for Lacan of the Borromean rings with respect to individual pathology can be related to that of the legendary [Gordian knot](#) with which Alexander the Great was confronted. The Borromean-like form of the so-called [Discordian Mandala](#) could be said to exemplify such a knot, as argued separately (*Mapping grossness: Gordian knot of governance as a Discordian mandala?* 2016). The legend has been used by other authors:

- Ryan M. Irwin: *Gordian Knot: apartheid and the unmaking of the liberal world order* (Oxford University Press, 2013)
- Reinhard Wagner: *The Gordian Knot of Global Collaboration* (International Project Management Organization)
- Bernard Harborne: *Cutting through the Gordian Knot: analysis of conflict and violence* (World Bank)
- Andreas Bieler and Adam David Morton: *The Gordian Knot of Agency--Structure in International Relations: a Neo-Gramscian perspective*, *European Journal of International Relations*, 7, 2001, pp. 5-35).
- Gabriela Lemus: *Severing the 'Gordian Knot': defying conventional wisdom and reversing current trade policy* (*The Huffington Post*, 2 June 2015)
- Pawel Opala and Krzysztof Rybinski: *Gordian Knots of the 21st Century* (Paper presented on the occasion of the 20th anniversary of the Polish Association of the Club of Rome, 2007)
- Leonardo Baccini and Johannes Urpelainen. *Cutting the Gordian Knot of Economic Reform: when and how international institutions help* (Oxford University Press, 2015)

Commenting on a session of the World Economic Forum, [John Jullens](#) argues that: *It's as if the global economy is being strangled by a gigantic Gordian knot from which it cannot untangle itself* (*The Gordian Knot of Global Economic Growth, Strategy-Business*, 15 October 2013).

In the absence of depictions of such a knot in cognitive terms, the implication that the dilemmas of global management might be explored topologically as a knot merits consideration in the light of the mathematical interest in the [endless knot](#), the [trefoil knot](#), the [cinquefoil knot](#), and the [septfoil knot](#) (as shown below). This would be consistent with the psychological significance associated with knot topology by Jacques Lacan and [R. D. Laing](#) -- in respect of individual "self-governance". (R. D. Laing, *Knots*, 1972; Jean Michel Vappereau, *Knot: the theory of the knot outlined by Jacques Lacan, Lacanian Works*, July 1996). Especially intriguing with respect to the higher dimensionality of [string theory](#), is the choice of "string" as a metaphor, given the contrasting importance attached to "knot" as a metaphor by psychoanalysis.

Challenges to imagining toroidal life?			
Trefoil knot	Cinquefoil knot	Septfoil knot	Seifert surface bounded by a set of Borromean rings
			
By Jimbelk Animation: MichaelFrey (talk) - Own work, Public Domain, Link	By Jimbelk - Own work, Public Domain, Link	By Jimbelk - Own work, Public Domain, Link	Reproduced from Wikipedia [more images]

Given the widespread understanding of knots, and their widespread use as metaphors of strategic and existential challenges, their representation is of interest in enabling imaginative reframing -- especially if a toroidal form is understood as twisted into a knot. It is in that sense that a [Seifert surface](#) is of potential interest as a representation of the Gordian knot of sustainable development, especially in the light of the "planetary boundaries". The boundary of such a surface is a given knot or link. A range of more complex illustrations is offered by Carlo H. Séquin (*Torus Immersions and Transformations*. University of California at Berkeley, 2011).

Could the simple representation of "doughnut economics" be more appropriately addressed in strategic terms if its degree of knottedness was recognized -- if only in experiential terms? It is surely appropriate to argue that society is in a "knotted" condition for which insights from Lacan and others would offer indicators (whatever their limitations). More challenging is the possibility that collective organization of "global governance" merits understanding in the light of the Borromean ring condition -- as argued separately (*Engaging with Elusive Connectivity and Coherence: global comprehension as a mistaken quest for closure*, 2018). The argument was adapted there to the symbolic Flag of Europe (*Imagining the Flag of Europe otherwise?; Borromean challenge to comprehension of any trinity?*).

Knot vs Torus: The interplay between "knot" and "torus" merits recognition in the light of the earlier argument regarding the distinction between 2-sphere and 3-sphere. **Is the knotted thread to be considered as one-dimensional, 2-dimensional, or 3-dimensional -- namely is it a hollow tube, potentially of toroidal form?** If that torus is effectively a container or conduit, however knotted, what circulates in experiential terms within that conduit? The question can be variously discussed (*Circulation of the Light: essential metaphor of global sustainability?* 2010; *Enactivating a Cognitive Fusion Reactor: Imaginal Transformation of Energy Resourcing (ITER-8)*, 2006).

A particular focus to the institutional challenge is given by widespread interest in the [Triple Helix model of innovation](#), namely to the set of interactions between academia, industry and governments, to foster economic and social development. Curiously little attention within that framework is given to the extent to which the three helical threads could be "tubular" rather than notionally thread-like. More curious is that little attention is given to what happens at the two "ends" of the helix -- an important consideration in the case of the double-helix form of DNA, by which the model was originally inspired. Of particular value however is the focus on enabling "innovation" -- with its cognitive and experiential implications, otherwise divorced from the preoccupations of the natural sciences.

An obvious question is how any reconciliation of the "doughnut economics" perspective with the Triple Helix perspective is to be comprehended -- if the latter is itself to be understood as toroidal in some manner. Both are necessarily susceptible to various forms of knottedness, at least as (mistakenly) perceived and/or experienced. Aspects of the question are addressed separately (*Requisite curvature: reconciling the Triple Helix, the Triskelion and the Borromean condition*, 2018).

Toroidal embodiment: Of some relevance is the sense in which an individual necessarily embodies toroidal forms, if only through the [human digestive system](#), and most notably the [gastrointestinal tract](#). In that sense a human being is very much a torus -- or rather a segment of a torus. Other portions of the torus are external to the human body, appropriately indicative of the manner in which the human being is embedded in the environment, giving reality to preoccupation with recycling and dependence on it. Many animals can be seen in such terms, especially the simplest -- as with the earthworm most obviously.

Missing is insight into the psychosocial analogue, given the manner in which "digestion" of information is part of the process of "innovation". A human being, as conventionally conceived, is then a "slice out of a cycle" -- a cyclic which tends to go unrecognized.

It is appropriate to note that references to "toroidal embodiment" are typically totally divorced from psychosocial considerations -- as might be expected. Ironically, most of the many references are to patents. At another extreme, that insight is however echoed in poetic terms (Antonin Tuynman, *Technovedanta: a technological meta-knowledge philosophy beyond science and religion*). In addition to its real world correlations, the torus has also been used speculatively to illustrate certain concepts of the so-called "subtle energy" worlds, most notably in the esoteric study of sacred geometry (*The Torus in Metaphysics, Harmonic Resolution; The Metaphysics of Our Spirituality within the Universal Toroidal Field, OpenHand*, 2018).

Mistaken recognition of holes repressed by a global focus?

The indications in the previous section clarify the extent to which the "hole" characteristic of toroidal forms is widely recognized, if not associated with the highest values -- as with crowns, halos, wedding rings, and prayer beads. By contrast, in the case of the global form, any central hole is relegated to deep underground at the centre of the Earth -- a realm readily associated with hell and a source of threat from volcanic eruptions.

In a separate argument the more mysterious nature of holes, characteristics of halos and rings, was highlighted to a greater degree (*Is the World View of a Holy Father Necessarily Full of Holes? Mysterious theological black holes engendering global crises*, 2014). That included the following sections:

Necessary incompleteness
Cognitive mystery of holes, lacunae and incompleteness
Nature of metaphysical and theological holes
Cognitive and experiential black holes
Holiness and unholiness -- an unholy complementarity?

Holiness framed by a triangulated configuration of holes
Cultivating "holiness" and "unholiness" in all their forms?
Vital hole dynamic: embracing error, otherness and neglect
Missing linking process to enable the global resolutique

With reference to [Necessary incompleteness](#), that argument notes the consequence of deliberately omitting, or unconsciously missing, a dimension essential to systemic viability can be reviewed and further justified by the work of the biological anthropologist [Terrence Deacon](#) (*Incomplete Nature: how mind emerged from matter*, 2012; *The Symbolic Species: the co-evolution of language and the brain*, 1997). He explores the paradoxical incompleteness of semiotic and teleological phenomena in terms of information to demonstrate how specific absences (or constraints) play the critical causal role in the organization of physical processes that generates these properties.

For Deacon, in introducing his argument:

The problem is this: *Such concepts as information, function, purpose, meaning, intention, significance, consciousness, and value*

are intrinsically defined by their fundamental incompleteness. They exist only in relation to something they are not.... The "something" that each of these is not is precisely what matters most. But notice the paradox in this English turn of phrase. To "matter" is to be substantial, to resist modification, to be beyond creation or destruction -- and yet what matters about an idea or purpose is dependent on something that is not substantial in any obvious sense. So what is shared in common between all these phenomena? In a word, nothing -- or rather, something not present. (p. 23, *emphasis in original*)

The fundamental value of focusing on what is "absent" from conventional explanation is introduced by Deacon by comparing it to the vital role of **zero** in the number system -- itself a great discovery (cf. Charles Seife, *Zero: the biography of a dangerous idea*, 2000; Robert Kaplan and Ellen Kaplan, *The Nothing that Is: a natural history of zero*, 2000). For Deacon:

Basically, it means that our best science -- that collection of theories that presumably comes closest to explaining everything -- does not include this one most defining characteristic of being you and me. In effect, our current "Theory of Everything" implies that we don't exist, except as collections of atoms. So what's missing? **Ironically and enigmatically, something missing is missing.** (p. 1, *emphasis added*)

He uses this analogy to zero to demonstrate how a form of causality dependent on specifically absent features and unrealized potentials can be compatible with the best of science. Deacon sees this approach as offering a *glimpse of the qualitative outlines of a future science that is subtle enough to include us and our enigmatically incomplete nature, as legitimate forms of knotting in the fabric of the universe* (p. 17)

Deacon places great emphasis on the vital constraining role of absence in systemic organization. It is in this sense that the "hole" recognized in the new metaphor proposed by Oxfam offers vital insights into the possibility of more viable strategic organization (Kate Raworth (*A Safe and Just Space for Humanity: can we live within the doughnut?*, Oxfam, February 2012). This possibility is separately considered (*Exploring the Hidden Mysteries of Oxfam's Doughnut: recognizing the systemic negligence of an Earth Summit*, 2012).

In concluding, Deacon argues:

We are what we are not: continually, intrinsically, necessarily incomplete in our very nature. Our sense of self, our experience of being the originative locus of agency, our interior subjective isolation, and the sense of emerging out of nothing and being our own prime mover -- all these core characteristics of conscious experience -- are accurate reflections of the fact that self is literally *sui generis*, emerging each moment from what is not there. (p. 535)

In his concluding paragraph Deacon notes:

In the title to one of his recent books, [Stuart Kauffman](#) [*At Home in the Universe: the search for laws of self-organization and complexity*, 1995] succinctly identifies what has been missing from our current blinkered metaphysical worldview. Despite the power and insights that we have gained from this powerful way of conceiving of the world, it has not helped us to feel "at home in the universe". Even as our scientific tools have given us mastery over so much of the physical world around and within us, they have at the same time alienated us from these same realms. **It is time to find our way home.** (p. 545) [*emphasis added*]

The challenge of thriving in this cognitive environment is then less a question of locating relevant literature, learning the knowledge it contains, or citing it to justify positions to others. Nor is it a question of who has been there before, or any criticism from some other perspective of "rediscovering the wheel". The question might even be the validity of the external frame from which that question could be asked. By whom is one to be persuaded, about what and why -- and why should one seek to persuade? To what extent is any essential incommunicability a matter of [Ludwig Wittgenstein's](#) concluding phrase: *Whereof one cannot speak, thereof one must be silent* (*Tractatus Logico-Philosophicus*, 1921).

As discussed previously (*Evolutionary influence of the absent*, 2011), with respect to the argument of Deacon, a key factor with respect to the emergence of knowledge may be intimately associated with what is missing -- a point succinctly made in the contrast between the print and online summaries of his argument (*The importance of what is missing*, *New Scientist*, 26 November 2011; *Consciousness is a matter of constraint*, *New Scientist*, 30 November 2011). For Deacon:

... **have we been looking in the wrong places for clues?** ... brain researchers and philosophers of mind have focused on brain processes, neural computations and their correspondences with the material world. But what if we should be focusing on what is not there instead? ... I believe that in order to overcome this stalemate **we need to pay more attention to what is intrinsically not present in everything** -- from life's functions and meanings to mind's experiences and values. [*emphasis added*]

As he concludes in *Incomplete Nature*:

Perhaps the most tragic feature of our age is that just when we have developed a truly universal perspective from which to appreciate the vastness of the cosmos, the causal complexity of material processes, and the chemical machinery of life, we have at the same time conceived the realm of value as radically alienated from this seemingly complete understanding of the fabric of existence. In the natural sciences there appears to be no place for right/wrong, meaningful/meaningless, beauty/ugliness, good/evil, love/hate, and so forth.... By rethinking the frame of the natural sciences in a way that has the metaphysical

sophistication to integrate the realm of absential phenomena as we experience them, I believe that we can chart an alternative route out of the current existential crisis of the age... (p. 544)

Although the initial chapter of Deacon's thesis is entitled "(W)HOLES", ironically he has nothing to say about "holes", as it possible to explore them in relation to his focus on what is missing in any understanding of incompleteness.

With respect to the *Cognitive mystery of holes, lacunae and incompleteness*, the argument notes those producing models are faced with the reality of their competitive deprecation by those of other persuasion -- without offering any way forward beyond "I am Right, You are Wrong". The issue has been described by [Nicholas Rescher](#) as the conclusion to his study of *The Strife of Systems: an essay on the grounds and implications of philosophical diversity* (1985):

For centuries, most philosophers who have reflected on the matter have been intimidated by the strife of systems. But the time has come to put this behind us -- not the strife, that is, which is ineliminable, but the felt need to somehow end it rather than simply accept it and take it in stride.

What is the "well" or "hole" of ignorance that underlies conventional knowledge, sustaining Rescher's "strife", and inhibiting fruitful reconciliation in the light of conventional model building? (cf. *Unthought as Cognitive Foundation of Global Civilization*, 2012). What is the implication of the provocative insight of [Ambrose Bierce](#): *The small part of ignorance that we arrange and classify we give the name of knowledge*.

Of particular relevance is the remarkable exploration by [Roberto Casati](#) and [Achille C. Varzi](#) (*Holes and Other Superficialities*, 1994) -- with respect to the borderlines of metaphysics, everyday geometry, and the theory of perception (reviewed by Steven A. Gross, *What's in a Hole? The Harvard Review of Philosophy*, 1994). They seek to answer two basic questions: Do holes really exist? And if so, what are they? As they indicate in an extensive [entry on holes](#) in the *Stanford Encyclopedia of Philosophy*:

Hole representations -- no matter whether veridical -- appear to be commonplace in human cognition. Not only do people have the impression of seeing holes; they also form a corresponding concept, which is normally lexicalised as a noun in ordinary languages... Moreover, data from developmental psychology and the psychology of perception confirm that infants and adults are able to perceive, count, and track holes just as easily as they perceive, count, and track paradigm material objects such as cookies and tins... These facts do not prove that holes and material objects are on equal psychological footing, let alone on equal metaphysical footing. But they indicate that the concept of a hole is of significant salience in the common-sense picture of the world, specifically of the spatiotemporal world.

Conundrums noted by the authors include:

1. It is difficult to explain how holes can in fact be perceived.... a causal theory of perception would not apply to holes. Our impression of perceiving holes would then be a sort of systematic illusion, on pain of rejecting causal accounts of perception...
2. It is difficult to specify identity criteria for holes -- more difficult than for ordinary material objects. As holes are immaterial, we cannot account for the identity of a hole *via* the identity of any constituting stuff. But neither can we rely on the identity conditions of its material host... And we cannot rely on the identity conditions of its guest, for it would seem that we can empty a hole of whatever might partially or fully occupy it and leave the hole intact.
3. It is equally difficult to account for the mereology of holes. Take a card and punch a hole in it. You have made one hole. Now punch again next to it. Have you made another hole?... what prevents us from saying that we still have one hole, though a hole that comes in two disconnected parts? After all, material objects can be disconnected... Perhaps holes may be disconnected, too? If so, perhaps we have just punched a single, disconnected hole?
4. It is also difficult to assess the explanatory relevance of holes. Arguably, whenever a physical interaction can be explained by appeal to the concept of a hole, a matching explanation can be offered invoking only material objects and their properties.... Aren't these latter explanations enough?

The focus of that argument is on holes as they may be perceived in tangible objects. The argument is not extended to the implications for intangible holes -- for which tangible holes are used so frequently as a metaphor. However tangible they may be considered to be, hole is the metaphor of choice for atomic physics and astrophysics.

Torc-bearing, Playing-ball, Scoring and Nesting

Torc-bearing: The possibility of any form of "toroidal embodiment" calls for examination in the light of the remarks above with respect to familiarity with the torc, ring, necklace, bracelet and the like. Whereas these are variously worn, there is a curiously vital distinction to be made between:

- "torc-bearing" as an indicator of honour, high office, holiness, or the like
- "torc-bearing" as a mark of servitude, property, bondage, and even slavery (in the past)

There is a strange conflation of these distinctions in that a sash may be worn both by the president of a country and by a doorman -- with the former declaring a degree of servitude to the people, and the latter being "in service". A chain may be worn as a "chain of office", but also by a "prisoner in chains". This conflation is also evident in the use of rings as an indication of high office (the Pope, royalty -- or a Mafia chieftain) as well as being an indication of exclusive property and eternal fealty, as with a wedding ring or a fraternity ring.

Further confusion is evident in enthusiasm for the use of rings in the ear, nose, lips, and otherwise -- through piercing -- possibly as an indication of membership of an exclusive group. visibly distinctive from others and as such a strong affirmation of identity.

Torc-bearing may thus be recognized as a means of holding, containing and possessing value, whether in monetary or symbolic terms (as honour and a mark of respect). There is however little sense of what might "flow" within such devices as a toroid, a ring of toroids, or a chain of toroids -- with the possible exception of their use as circlets of prayer beads. As static, solid devices they can only potentially echo what might be otherwise associated with a halo. Even in the form of a tiara or crown, there is little sense of the dynamics between what is symbolized by its component parts (however extensively bejewelled), as argued separately (*Imagining further implications: helical coil, toroidal knot or crown?* 2019).

To the extent that torc-bearing is an indication of "high-flyers", it is far from clear what cognitive functions associated with its structure do indeed "enable flight" -- or how the significance with which they are imbued might do so. This empowerment does however continue to be explored in science fiction and fantasy.

More problematic is the case in which servitude requires some form of torc-bearing. In such cases the individual wears it much as with the classic reference to an "[albatross round the neck](#)". A "chain of office" may also be experienced as indistinguishable in many respects from imprisonment "in chains".

Playing-ball and "being in the loop": Torc-bearing suggests a curious relationship to playing-ball -- especially in a toroidal framework. Whatever the sense of of torc-bearing, the bearers are expected to "play ball", namely to conform to a particular pattern of behaviour (and an associated pattern of thinking) usefully indicated in this case by the circularity of the toroidal form.

In both cases the dynamics are effectively constrained by the torus as a "playing field" -- especially when it takes the form of a circular running track in an arena. Also of relevance to that understanding is the sense of "being in the loop" (*Keep Me in the Loop, TalkEnglish; How to Stay "in the Loop", MindTools; Feedback Loops: All About Being "In the Loop"e;*, *ReturnPath*, 29 December 2015).

Failure to "play-ball", and to be constrained by the implicit rules, is then perceived as systemically threatening to the integrity of the collective -- even dangerously so. Being "out of the loop" may be a consequence of systemic failures (P. Shanley and C. Lopez, *Out of the Loop: why research rarely reaches policy makers and the public and what can be done*, *Biotropica*, 41, 2009, 5; Mark Gongloff, *Trump's Iran Plan: everyone's out of the ILoop*, *Bloomberg*, 21 June 2019).

Sexual connotations of "scoring": The form of the torus is then especially suggestive of the focus on "scoring" in that context. This may be transformed into a focus on scoring goals, as in the many ball games having as objective to get the ball into a goal -- whether a net, ring, or otherwise (*Baseball metaphors for sex, Wikipedia*). There are only too obvious parallels to the sexual analogue for which "scoring" is a very common metaphor -- if not "balling" (*69 Common Phrases In Sports That Sound Like Sex Terminology, PGP*, 30 September 2014; *The 19 Greatest Sports-Related Sex Euphemisms, TotalProSports*, 21 July 2010). Widely recognized in many contexts is the sense of being "scored against", typically framed as having been "fucked" -- a process determining psychosocial dynamics thereafter in the priority given to "settling old scores". Of some relevance are the number of references to people being "raped with a baseball bat" an to its use in other forms of torture.

Given the manner in which sporting metaphors are also used with respect to war (scoring against the enemy), together with the sexual implications of war, this complex of associations has been variously examined and criticized:

- David G. Winter and Otto Rank: *Circulating Metaphors of Sexuality, Aggression, and Power: Otto Rank's Analysis of "Conquering Cities and 'Conquering' Women"*, *Political Psychology*, 31, 2010, 1 pp. 1-19)
- Valentina Georgieva: *Military Language and Sexual Language (Research Work of the Russian Universities*, 54, 2015, 11)
- Kelly Oliver: *Women as Weapons of War Iraq, Sex, and the Media* (Columbia University Press, 2010)
- Maria Eriksson Baaz and Maria Stern: *Sexual Violence as a Weapon of War?: Perceptions, prescriptions, problems in the Congo and beyond* (Zed Books, 2013)
- Lisa Wade: *War as Sexual Domination (Sociological Images*, 14 June 2008)
- Deborah Roffman: *The Power of Language: baseball as a sexual metaphor in American culture (SIECUS Report*, 19, 1991, 5)

As described by Roffman (1991), the baseball metaphor is "insidiously powerful, singularly effective, and very efficient...as a vehicle for transmitting and transferring to successive generations of young people all that is wrong and unhealthy about American sexual attitudes". As noted by Malcolm Potts and Thomas Hayden (*Sex and War, ReadHowYouWant*, 2011):

Explicitly sexual metaphors also often emerge in accounts of warfare... It's no wonder some authors suggest that warfare sometimes seems to be a surrogate for sex, but we suspect the connection is more basic: Both sex and war fulfill profound male evolutionary drives, so it's not surprising they might come to serve as metaphors for one another. (p. 109)

Obvious correspondences are to be recognized between "shooting" in ball-games and metaphoric use of that term to refer to the ejaculation of sperm -- then readily to be compared to firing bullets in any conflict situation and the "transformation" they are anticipated as accomplishing in the other.

"Pizza" versus "Doughnut": The extensive preoccupation with such use of baseball metaphors for sex has evoked consideration of the desirability of alternatives of greater subtlety (Carly Dreyfus, *To Slide or to Slice? Finding a Positive Sexual Metaphor, Scarleteen*, 4 May 2009). This concern has been given a particular focus through a TED Talk by Al Vernacchio (*Sex Needs a New Metaphor, here's one TED Talk*, March 2012) evoking much further commentary (*Sexual-Intimacy Metaphor to Abandon Baseball Terminology, Embrace Gymnastics Every Three Weekly*, 25 February 2013).

As an alternative to baseball as a framing of sexual intercourse, one widely discussed metaphor has been the pizza (Helen Walters, *Let's*

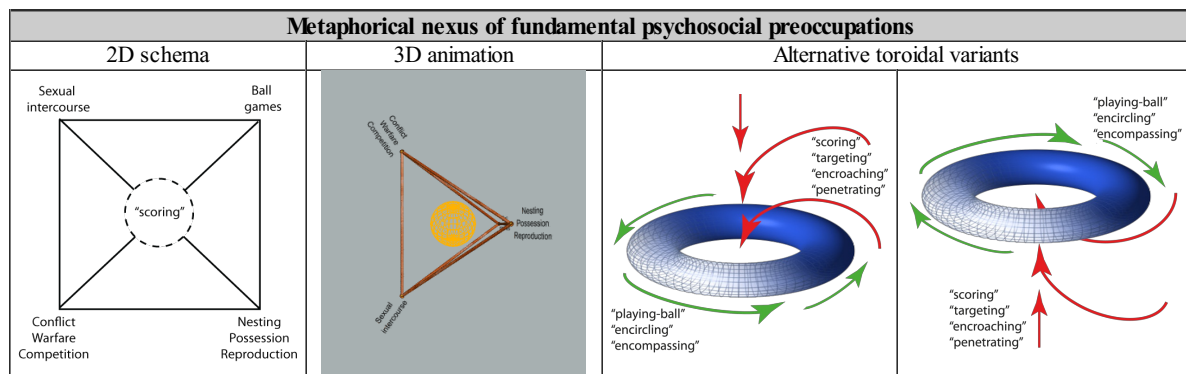
talk about sex -- and pizza: *Al Vernacchio at TED2012*, *TED Blog*, 2 March 2012; *Why Pizza (Not Baseball) Should Be the Metaphor We Use for Sex*, *HelloFlo*; *Sex and Pizza: sex needs a new metaphor -- not baseball*, Roger Williams University). Given the importance associated with the doughnut metaphor in framing the strategic challenges of the times (as discussed above), history may recognize that **it is more than extraordinary that the pizza metaphor should have been proposed within months of the promotion (via Oxfam) of the doughnut metaphor for economics.** (*Let them eat cake?*)

Given the extent to which sport, notably as exemplified by baseball, has also infiltrated the framing of warfare -- especially the associations to targetting -- it could then be asked whether it is imagined that warfare should also be framed in term of the joys of pizza consumption (Bruce Mazlish, *The Joy of War and the Future of Humanity*, *New Global Studies*, 4, 2011, 3; Julia Welland, *The Joy of War: Embodied, Affective and Everyday Pleasures*, Balsillie School of International Affairs, 2017; John-Paul Jordan, *Joys of War*, 2018).

The choice of two of the primary junk food products as metaphors for the fundamental processes and challenges of society arguably merits extensive reflection. Especially curious is the choice of the one without a central hole as being more appropriately representative of sex. Are a doughnut and a pizza the best that humanity can be offered in order to engage with the challenges of the present and the future?

With respect to the argument above, the unexamined toroidal associations highlighted with respect to the segmented doughnut also merit consideration with respect to the geometry of the pizza -- notably as a consumer product, given the challenges of consumption framed by the doughnut model.

Toroidal attractor underlying sex, sport and war? This conflation of associations, so fundamental to psychosocial dynamics, suggests that the dynamics could be fruitfully configured together, as suggested by the images on the left below. Given the argument for toroidal representation, those on the right are more suggestive of the dynamics -- with any notion of "nesting" then suggested by the form of the torus as a whole.

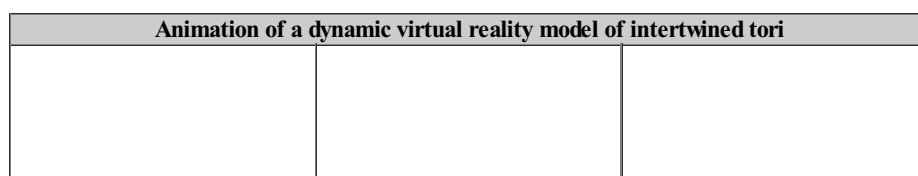


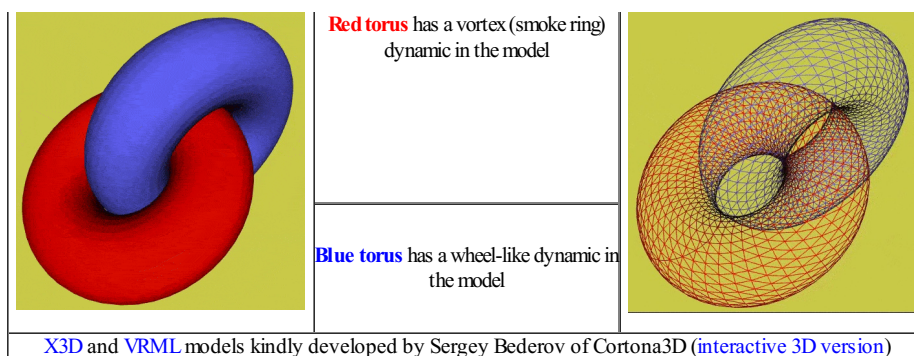
As a symbolic nexus, the images on the right are also consistent with the preoccupation of space exploration and the associated space race -- targetting features of the solar system to establish possession thereof. Reaching the Moon and the planets can be readily understood as "scoring" in sexual terms, especially given the phallic associations of rocketry, as indicated by the poet **W. H. Auden** (Edward Mendelson, *'So Huge a Phallic Triumph': Why Apollo had little appeal for Auden*, *New York Review of Books*, 12 August 2019).

Nesting: As noted above, the toroid also conveniently recalls one design for a space habitat -- effectively a new "nest" for the reproductive commitment of humanity, consistent with the strategic quest for a "safe operating space for humanity" -- at least for a highly selected proportion. The metaphors associated with the images on the right are necessarily only indicative of psychodynamic functions in relation to the toroidal dynamics -- recognizing that these are of dimensionality greater than three. In evoking attraction of the most fundamental kind, those dynamics are usefully recognized as a **strange attractor**. More strange ironically is the lack of comprehension as to how it functions as an attractor, and the simplistic explanations presented in that regard.

The toroidal dynamic, and the attraction it evokes, is therefore indicative of a complex relationship between achievement of "scoring" in the short-term (through possessive encroachment and penetration) and "encompassing" (namely possessing otherwise through "enclosure") such as to enable "nest building" and "reproduction" in the longer-term. The processes are necessarily instinctual to a high degree and as such elusive to conscious comprehension -- whether with regard to their manifestation in sex itself, in competitive sport, or in conflictual interactions. Advocacy of peace is then only attractive as a relief from such dynamics which tend to be inherently more engaging. How to compete with internet porn and media violence?

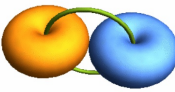
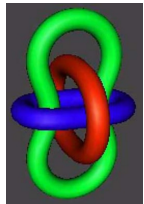
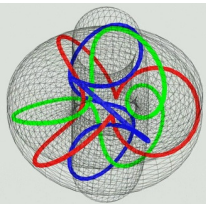
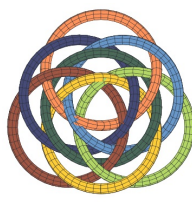
Mutual constraint by interlocking tori: The co-existence of two metaphors, lending themselves to recognition as toroids, suggests that they may be complementary in ways which merit careful examination. Specifically it could be asked whether the processes in each case suggest that the two tori are dynamically interlocked as suggested by the following animations. The dynamic could be recognized as representing a fundamental form of "intercourse" between two frameworks which are typically not appropriately associated. -- enabling further "pizza consumption"





The animations derive from a separate discussion (*Comprehension of Requisite Variety for Sustainable Psychosocial Dynamics: transforming a matrix classification onto intertwined tori*, 2006; *Implication of Toroidal Transformation of the Crown of Thorns: design challenge to enable integrative comprehension of global dynamics*, 2011; *Engaging with Elusive Connectivity and Coherence: global comprehension as a mistaken quest for closure*, 2018).

The argument can be further developed in the light of other ways of understanding interlocking. That on the left below is self-explanatory -- raising the question of the "bond" between the two tori. Those in the centre follow from the requisite complexity associated with 3-fold Borromean rings (as discussed above) -- however, in depicting a 7-fold equivalent, the point is raised as to whether a 9-fold interlinkage is required for the 9 planetary boundaries required for a "safe operating space for humanity". A wide variety of such links of various complexity is discussed by Slavik V. Jablan (*Are Borromean Links So Rare? Forma*, 14, 1999, pp. 269–277; *coloured illustrations*).

Alternative forms of interlocking?				
Interlocked tori	Borromean rings in 3D	3 mutually orthogonal tori with a 3-loop helix moving over each	7-fold Borromean rings	9-fold Borromean rings
				Requisitely complex interlocking for the 9 planetary boundaries of the doughnut model ? and the pizza model
Michael Schreiber (<i>Wolfram Demonstration Project</i> , 2011)	Reproduced from Kauffman (2006)		Reproduced from Chamberland and Herma (2013)	

Boundaries and limits: Curiously both the doughnut metaphor and the pizza metaphor call for attention to boundaries -- otherwise to be specifically recognized as limits, if not constraints, whether with respect to collective or individual behaviour. Strangely neither metaphor evokes sensitivity to the subtlety of limits in enhancing the attraction which would render them viable. As a representation of sex, the pizza metaphor only suggests a constraint on greed to enable a degree of sharing. The doughnut metaphor is primarily a technical device -- which might well be compared with a chastity belt for human civilization.

Of particular relevance is the sense in which the doughnut and the pizza dynamics, as systemically understood in collective terms, might well be mutually constraining. Excessively overriding the boundaries of one could well constrain the other in unforeseen ways -- like it or not. Thus does "too much pizza" endanger planetary boundaries; and does too much doughnut inhibit creativity?

The distinctive dynamics associated with the torus as represented above suggest that -- from a longer-term perspective -- they correspond to the balance widely extolled as the symbolic ideal of the relation balance between "Fatherhood" and "Motherhood" in the dynamic of the family. That obvious abuses in both cases are variously called into question at this time is relevant to this commentary and to the inadequately formulated understanding of that dynamic. The depiction of the Borromean rings in 3D is intriguingly suggestive of the greater complexity of a viable marital bond than is potentially implied by the simplicity of the conventional wedding ring -- especially given the contrast to what only appears in 2D to be such a Borromean bond (as indicated earlier).

Post-Jouissance? There is a strange and ironic sense in which attachment to "scoring" in any manner (including pizza consumption) lends itself to the criticism by Lacanian psychoanalysis of the preoccupation with *jouissance* -- and especially with its sexual connotations. As emphasized by the pizza metaphor, this could then be considered comparable to consumerism *par excellence* -- in a quest for the growth on which the economy of the collective is so dependent within the constraints of the doughnut metaphor.

However *jouissance* is to be understood, as articulated by Jacques Lacan, its further implications derive from his interpretation of the work of Sigmund Freud (*Beyond the Pleasure Principle*, 1920). This in particular is widely recognized as highly confusing in its own right. *Jouissance* has achieved a degree of appreciation in the radical arguments of Slavoj Zizek, (*Lacan's Formulas of Sexuation*, 1995; *Metastases of Enjoyment: six essays on woman and causality*, Verso, 1994) -- arguments which are themselves complex, confusing and

highly controversial, perhaps appropriately so, given the subtlety of the matter -- "too close to the existential bone". The understanding has been further developed in a cross-cultural analysis in philosophical and psychoanalytic terms (Ashmita Khasnabish, *Jouissance as Ananda: Indian philosophy, feminist theory, and literature*, 2003).

The questions raised by *jouissance* are however relevant to imagining the nature of a "safe operating space for humanity" according to the doughnut metaphor -- challenged by the primary preoccupation of humanity with "scoring" as framed by the pizza metaphor. Is "post-jouissance" indeed especially associated with a **death drive**, whether individual or collective -- understood as "opposition between the ego or death instincts and the sexual or life instincts".

Scoring own goals? Strangely, when framed in this way, it could be said that the problem for humanity and strategic governance is the extent to which the "scoring" -- in which there is such a heavy investment -- can be understood as a process of enthusiastically **scoring "own goals"**. (Rowan Williams *Amazon fires are a shameful indictment of our lust for excess* *The Guardian*, 6 September 2019).

Given that metaphor, also of interest is the extent to which a player may try to **throw a game** by deliberately attempting an own goal -- suggesting that some may be endeavouring to do precisely that. A further irony is the extent to which the stitching pattern of **balls used in association football** is that of a truncated icosahedron -- a pattern of considerable significance to cognitive organization, as noted separately (*Projective geometry of discourse: points, lines, frames and "hidden" perspectives*, 2018).

Aesthetic reconciliation of contrasting toroidal metaphors?

Missing with respect to both metaphors are the insights offered by the classic study by Gyorgy Doczi (*The Power of Limits: proportional harmonies in nature, art, and architecture*, Shambhala, 1981). Whether with respect to the preoccupation of the doughnut metaphor or the pizza metaphor, variants are to be recognized in the attraction of restraint in contrast to excess, as variously expressed, most notably in poetry (Richard Hoffpauir, *The Art of Restraint: English Poetry from Hardy to Larkin*, University of Delaware Press, 1991; Elaine P. Miller, *Harnessing Dionysos: Nietzsche on rhythm, time, and restraint*, *Journal of Nietzsche Studies*, 17, 1999, Spring; Arthur J. Clark, *Culture and Restraint*, *Saint George*, 13, 1910, 51).

There is a strangely appropriate possibility that the mutual constraint is fundamentally aesthetic, notably in the light of the arguments above regarding the cognitive organization of music -- intuitive, unconscious or not. Curiously it is "pizza consumption" which is far more closely associated with music than the planetary boundaries framing a "safe operating space" according to the doughnut metaphor. In poetic terms, the policy challenge could be framed in terms of "engagement" otherwise understood (*Poetry-making and Policy-making: Arranging a Marriage between Beauty and the Beast*, 1993; *Poetic Engagement with Afghanistan, Caucasus and Iran: an unexplored strategic opportunity?* 2009).

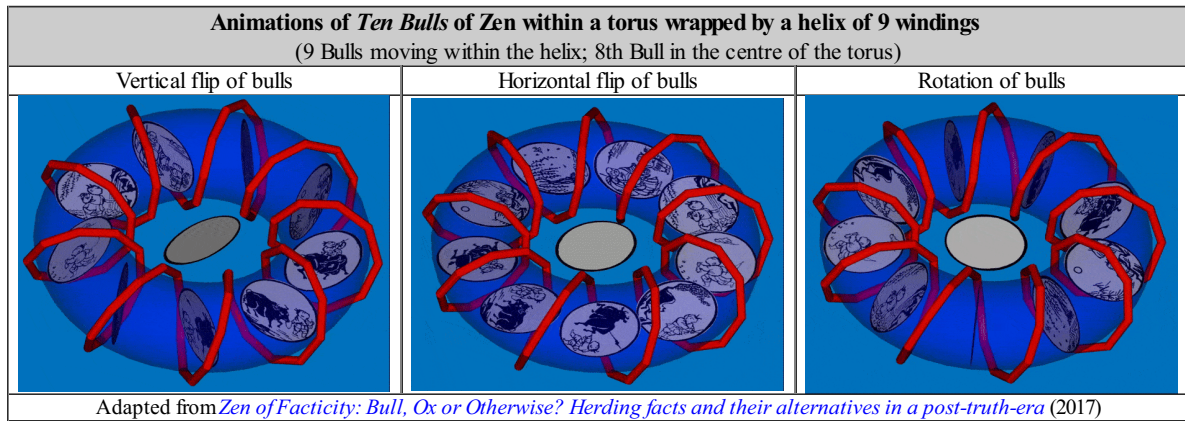
It is less than clear how the "planetary boundaries" were determined to be ninefold, but there is a strong case for associating them with mnemonic reminders to render them memorable to the widest audience. Examples might include:

- The extensive significance of **nine in Norse mythology**, most notably the nine worlds that are supported by **Yggdrasil** as the "World Tree" (Joshua J. Markby, *Nine Realms of Norse Cosmology*, *Ancient History Encyclopedia*, 20 December 2018). Ironically the Stockholm music label **Acronym** has separate recordings for both "Planetary boundaries" and "Yggdrasil" -- reinforcing any argument that the **Stockholm Resilience Centre** may have been influenced in some way in originally distinguishing nine such boundaries.
- The **Nine Rings** in the mythological fantasy of J. R. R. Tolkien (*The Lord of the Rings*, 1954), namely those of the Rings of Power that Sauron used to corrupt Men to his service; with those taking the Nine Rings becoming the Nazgul -- the "ringwraiths". Otherwise described in a poetic line as: *Nine for Mortal Men doomed to die*.
- **Chinese Nine Linked Rings Puzzle** (*jiulianhuan*), to which reference is made over centuries, with its current form requiring 341 moves (Albrecht Heffer and Andreas M. Hinz, *"A difficult case": Pacioli and Cardano on the Chinese Rings*, *Recreational Mathematics Magazine*; Carolyn Pe Rosiene, et al, *The Nine Rings Puzzle, 3 ways: a Rosetta Stone for programming paradigms*, *Research Gate*, January 2012)
- **Nonagonal symbol** of the penultimate degree of Freemasonry
- Nine-ringed astrolabe (Károly Simonyi, *A Cultural History of Physics*, CRC Press, 2012, p. 167)
- The manner in which nine rings are presented as key to deriving power from nuclear fusion (*Nine rings to cope with ITER's powerful magnetic fields*, *Fusion for Energy*, 13 November 2017; *Magnetic System: nine rings to counter the force*, *ITER*, 20 November 2017)
- Nine **celestial spheres of heaven**, notably as described in *The Divine Comedy* by Dante Alighieri, complemented by 9 circles of Inferno, and 9 rings around Mount Purgatory
- In the *Samatha* practice, common to many Buddhist traditions, there are nine stages of training the mind (**nine mental abidings**), by which to achieve appropriate concentration. These are understood as corresponding to the *Ten Bulls* of Zen tradition.

In the light of proposals for a pizza metaphor for intercourse, it is curious to note -- if not simply amusing -- a comparable 9-fold "segmentation", although **10 are listed** by *Wikipedia* (*The Nine Jade Dragon Exercises* of Taoism; *9 Sex Positions That Will Get You Out Of Your Comfort Zone, Bustle*; *The 9 Best Sex Positions that Practically Guarantee an Orgasm*, *Women's Health*).

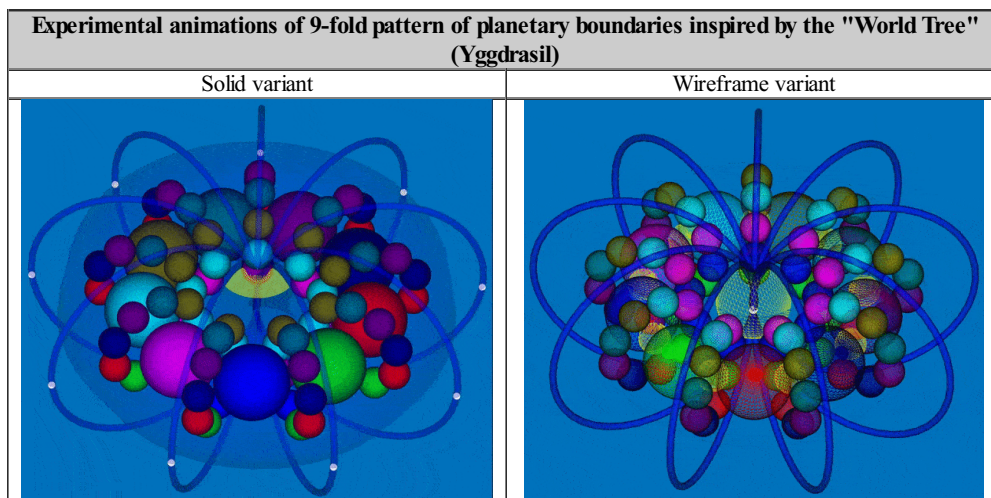
Bluntly stated, **the "Nine Rings" popularized worldwide by *The Lord of the Rings* are far more memorable to many than the "9 Planetary Boundaries"**. Many colourful depictions (available on the web) have been imaginatively presented regarding the relationship between Yggdrasil and the 9 realms of the gods -- notably in support of online gaming (for which the name Yggdrasil is used). A case could then be made for building the "Planetary Boundaries" into a comprehensive epic to be more widely appreciated -- as with the *Kalevala* or the *Mahabharata*. With respect to the argument above, the imagery of the *Ten Bulls* can be experimentally incorporated into toroidal animations to evoke imaginative reflection, as shown below. In the light of the above, there is some irony to the continuing

debate over the classification of life into "kingdoms" or "domains" (Cavalier-Smith, *Eukaryote Kingdoms: seven or nine?* *Biosystems*, 14,1981) and to continuing debate over the eight or nine modes of intelligence to be recognized in [theories of multiple intelligence](#).



The animations above are clearly based on a particular design metaphor with regard to colour, rate of movement, nature of movement and directionality, helical windings and dimensions. Of the 10, the 8th Bull ("*Both Bull and Self Transcended*") has no image and was therefore placed in the centre; it could be removed. The helix of 9 windings is continuous -- but is potentially suggestive of both the distinctiveness of the 9 planetary boundaries and their connectivity. As interactive models in virtual reality, these parameters could be readily modified. In the earlier experimental animations, the classic images of the bulls were replaced by the trigrams of the Chinese *BaGua* system. Clearly the approach would allow the images to be replaced by the runes which denote the realms of the gods in Norse mythology.

Winding a torus as shown above is reminiscent of arguments regarding the *Potential implications of alternation and rotation in psychosocial fields* in the light of the remarkable insights of Nikola Tesla (*Reimagining Tesla's Creativity through Technomimicry Psychosocial empowerment by imagining charged conditions otherwise*, 2014). In any quest for widespread popular comprehension of the "planetary boundaries", the argument above emphasized the intuitive (if not instinctual) appeal of toroidal motion. To what extent is this reflected in the appeal of many carousel-like fairground rides -- "[merry-go-rounds](#)" -- to which the animations above then bear a fruitful resemblance? It is probable that carousels in Nordic countries would use the 9 gods of Norse mythology in their rides.



Design metaphors used in the above are a large blue torus opening and closing, with a circle of 9 spheres rotating through it. In addition, rings of 9 smaller spheres (similarly coloured) rotate around them -- suggestive of a form of recursion. A set of 9 thinner tori pass through a tenth sphere in the centre, with white spheres travelling through them. The design variously echoes arguments made above with respect to the requisite complexification of the doughnut metaphor (for the constraints on the planetary dynamic) and of the pizza metaphor (for the individual sexual preoccupation with scoring). The experiment frames the question of what alternative designs could be usefully explored, especially in the case of interactive virtual reality models.

Transformative interplay between flat, global and toroidal?

The above argument can be considered relatively simplistic in academic terms. It focuses on how the space on which one imagines oneself to be living can be understood. The subtle complexity of the shift between "flat" and "global" has been emphasized -- and how one believes in explanations regarding "global" in the light of personal experience. The suggestion is that people are free to believe otherwise in the light of their experiences and engagement with much valued symbols. Extensive use is therefore made of images and animations, especially given increasing familiarity with unusual geometry and topology. Hence the focus on the torus. The concern is how to render complex subtly comprehensible through imagery which is more succinct than text -- "an image being worth more than a thousand words".

The question raised is whether people are as free to engage with experiences to be understood as "toroidization" (or "toroidification") as

has been the case with their dubious engagement with "globalization". Rather than imagining themselves to live "on a globe", can people imagine themselves as living "on a torus"? More intriguing is the manner in which global experience is conflated with coherence and higher orders of integrative experience -- suggesting a sense in which individuals can both think globally and be global in some way, if only as a "global citizen". How might it be possible to think "toroidally" -- even to "be toroidal", and to "toroidify" oneself?. The title of this article suggests the possibility of imagining "toroidal life" -- however that might be understood. The irony is that many forms of life are effectively toroidal in physical terms -- if the digestive tract is understood as a segment of environmental cycles on which the body is dependent.

One valuable indication of this possibility is offered by the proposal by Sabrina Presti for a [Torus Governance Network](#) (*P2PWiki*, 2015).

Although simplistic, the argument above offers fairly comprehensible images and animations suggestive of ways of being otherwise. It endeavours to establish relationships with new metaphors that have been promoted for particular purposes, notably the doughnut and the pizza -- reframing them from a toroidal perspective and indicating insights from their complementarity. Since the emphasis is on individual choice, there is clearly every reason to continue to think in "Flat Earth" terms when convenient, or to switch to "global" when it suits. The question is whether there are advantages to switching to "toroidal" under some circumstance -- and how the transformation of topology can itself be understood. That challenge was addressed in a previous discussion using vehicle transmission systems as a metaphor -- given the widespread familiarity with "changing gear" (*Shifting between strategic patterns: transmission systems and gearing*, 2019).

The argument could be seen as consistent with insights from molecular biology which could inform its further development, notably the study of [topological ring currents](#). Physics offers arguments which bear an intriguing relationship to the "directionalities" of the 8-fold pattern of the *BaGua* (J. Hlinka, *Eight types of physical "arrows" distinguished by Newtonian space-time symmetry*, *Physical Review Letters*, October 2014). For the latter:

The octet of symmetrically distinct "directional quantities" can be exemplified by two kinds of polar vectors (electric dipole moment P and magnetic toroidal moment T), two kinds of axial vectors (magnetization M and electric toroidal moment G), two kinds of chiral "bidirectors" C and F (associated with the so-called true and false chirality, respectively) and still another two bidirectors N and L, achiral ones...

This argument is somewhat consistent with the much more sophisticated presentations with respect to the torus, as variously developed by [Steven Rosen](#) (*Topologies of the Flesh*, 2006; *Dimensions of Apeiron: a topological phenomenology of space, time and individuation*, 2004). His argument focuses on the relevance to the shift in perspective offered by the [Klein bottle](#) and the [Möbius strip](#) in the light of their topological relationship to the torus -- carefully showing the consistency with preoccupations of physics. He notably argues for the primacy of perception:

The upshot is that physics and philosophy alike must learn to start their work not from the lofty abstractions of Cartesianism, but from the lived experiences of subjects who share a common world. Perception has primacy in such a lifeworld. But isn't ordinary perception repelled by the ambiguities of modern physics? Merleau-Ponty notes that despite this widespread belief, in actuality ordinary perception is itself filled with quantum-like ambiguities -- provided that it is not idealized in the Cartesian way. Though the conventional idea of "common sense" may eschew such apparent anomalies, to the common sense or shared sensibility of the intersubjective world, they are neither unfamiliar, nor are they denied. Merleau-Ponty concludes that "physics destroys certain prejudices of philosophical and non-philosophical thought...The internal critique of physics leads us to become aware of the perceived world" (*Bridging the 'Two Cultures': Merleau-Ponty and the crisis in modern physics*, *Cosmos and History: the journal of natural and social philosophy*, 9, 2013, 2, p. 2-3)

Rosen extends his argument both to a univocal perspective (*The Self-evolving Cosmos: a phenomenological approach to nature's unity-in-diversity*, 2008) and to the nature of individual being (*How can we Signify Being? Semiotics and topological self-signification*, *Cosmos and History: the journal of natural and social philosophy*, 2014). The latter evoked a useful clarification by Lisa Maroski (*An Emergent Language of Paradox: riffs on Steven Rosen's Kleinian signification of being*, *Cosmos and History: the journal of natural and social philosophy*, 13, 2017, 1).

Whereas such arguments endeavour to render credible a possible shift in perspective from an academic perspective, the bias in the focus above on "imagining toroidal life" is towards engaging with extant metaphors of individual or collective significance. Arguably the case made by Rosen and Maroski is less concerned with empowering the individual in "living toroidally" whatever that might mean -- and the challenge of communicating that possibility more widely through succinct non-textual mnemonic aids. Maroski concludes, for example:

In order for a sociocultural shift to happen, individual shifts must occur. Thus it might be useful to turn to oneself, to one's lived sense of paradox in order to appreciate it in the broader context. How does the Kleinian awareness/ intuition/ comprehension/ aperspectivity presentiate in your everyday life? Facing personal paradoxes usually involves the experience of cognitive dissonance, a sense that who I think I am is not who I appear to be. The psychologist Carl Jung, for example, calls this facing and accepting of otherness in oneself "integrating the shadow". To own your psychologic shadow, dwell with the irony in your life.

More controversially, the bias here is to challenge the simplistic understanding of metaphors such as the doughnut and the pizza -- to the extent that they obscure recognition of the insights to which Rosen and Maroski draw attention

References

Christopher Alexander:

- A Pattern Language: towns, buildings, construction. Oxford University Press, 1977 [[summary](#)]
- Harmony-Seeking Computations: a science of non-classical dynamics based on the progressive evolution of the larger whole. *International Journal for Unconventional Computing (IJUC)*, 5, 2009 [[text](#)]

Antonio de Nicolas. Meditations through the Rg Veda: four-dimensional man. Shambhala, 1978

Ron Atkin:

- Multidimensional Man: can man live in 3-dimensional space? Penguin, 1981 [[comment](#)]
- Combinatorial Connectivities in Social Systems; an application of simplicial complex structures to the study of large organizations. Basel, Birkhauser, 1977

William Goldbloom Bloch. The Unimaginable Mathematics of Borges' Library of Babel. Oxford University Press, 2008

Joseph Campbell. The Inner Reaches of Outer Space: metaphor as myth and as religion. Alfred van der Marck Editions, 1986

Nick Chater. The Mind is Flat: the illusion of mental depth and the improvised mind. Penguin, 2018

Mihaly Csikszentmihályi. Flow: The Psychology of Optimal Experience. Harper and Row, 1990

Markus Gabriel. Why the World Does Not Exist. Polity, 2015

Martin Gardner. Knotted Doughnuts and Other Mathematical Entertainments. W H Freeman, 1986 [[text](#)]

Algirdas Julien Greimas. The Social Sciences: A Semiotic View. Minneapolis University of Minnesota Press, 1990

Stephen Hawking (Ed.). The Dreams That Stuff Is Made Of: the most astounding papers of quantum physics--and how they shook the scientific world, Running Press, 2011

P. A. Heelan. The Logic of Changing Classificatory Frameworks. In: J. A. Wojciechowksi (Ed), Conceptual Basis for the Classification of Knowledge, K G Saur Verlag, 1974, pp. 260-274

Douglas Hofstadter:

- I Am a Strange Loop. Basic Books, 2007 [[summary](#)]
- Gödel, Escher, Bach: an Eternal Golden Braid. Basic Books, 1979 [[summary](#)]

Mark Johnson:

- The Body in the Mind: the bodily basis of meaning, imagination, and reason. University of Chicago Press, 1987
- The Meaning of the Body: aesthetics of human understanding. University of Chicago Press, 2007

Jozef Keulartz. Using Metaphors in Restoring Nature. *Nature and Culture*, 2, 2007, 1, pp. 27-48 [[abstract](#)]

Ashmita Khasnabish:

- Humanitarian Identity and the Political Sublime: intervention of a postcolonial feminist. Lexington Books, 2009
- Jouissance as Ananda: Indian philosophy, feminist theory, and literature. Lexington Books, 2003

Carol Krumhansl. Cognitive Foundations of Musical Pitch. Oxford University Press, 1990

George Lakoff and Mark Johnson:

- Philosophy in the Flesh: the embodied mind and its challenge to Western thought. Basic Books, 1999
- Metaphors We Live By. University of Chicago Press, 1980

Thomas Moore:

- The Planets Within: the astrological psychology of Marsilio Ficino. Lindisfarne Books, 1990
- Original Self: living with paradox and originality. Harper Perennial, 2001

Gabriel Pareyon, et al. (Eds.). The Musical-Mathematical Mind: patterns and transformations. Springer, 2017

Kate Raworth:

- Doughnut Economics: seven ways to think like a 21st-century economist. Random House, 2017
- A Safe and Just Space for Humanity: can we live within the doughnut? Oxfam Discussion Papers, 2017 [[text](#)]

Steven M. Rosen:

- How can we Signify Being? Semiotics and topological self-signification. *Cosmos and History: the journal of natural and social philosophy*, 10, 2014, pp. 250-277
- Dreams, Death, Rebirth: a multimedia topological odyssey into alchemy's hidden dimensions. Chiron, 2014 [[summary](#)]
- The Self-evolving Cosmos: a phenomenological approach to nature's unity-in-diversity. World Scientific, 2008 [[summary](#)]
- Topologies of the Flesh. Ohio University Press, 2006 [[summary](#)]

- Dimensions of Apeiron: a topological phenomenology of space, time and individuation. Value Inquiry Book Series of Editions Rodopi, 2004 [[summary](#)]

John Ralston Saul. The Unconscious Civilization. Free Press, 1995

Carlo H. Séquin. Torus Immersions and Transformations. University of California at Berkeley, UCB/EECS-2011-83, 2011 [[text](#)]

Henryk Skolimowski. The Participatory Mind: a new theory of knowledge and of the universe. Penguin/Arkana, 1994

Maxine Sheets-Johnstone. The Primacy of Movement. John Benjamins, 1999

Peter Sloterdijk:

- Bubbles: Spheres (Microspherology). Semiotext(e), 2011
- Globes: Spheres (Macrospherology). Semiotext(e), 2014
- Foams: Spheres (Plural Spherology). Semiotext(e), 2016

Edward W. L. Smith. The Echo of Odin: Norse mythology and human Consciousness. McFarland, 2018

Ian Stewart. Flatterland. Perseus, 2001

Nassim Nicholas Taleb:

- The Black Swan: the impact of the highly improbable. Random House, 2007 [[contents](#)]
- Antifragile: Things That Gain from Disorder. Random House, 2012 [[contents](#)]
- Skin in the Game: hidden asymmetries in daily life. Random House, 2018 [[contents](#)]

Raymond Tallis. Of Time and Lamentation: reflections on transience. Columbia University Press, 2017

Sherry Turkle. Life on the Screen: Identity in the Age of the Internet. Simon and Schuster, 1995

Dmitri Tymoczko. A Geometry of Music. Oxford University Press, 2011.

Ludger van Dijk. Laying down a path in talking. *Philosophical Psychology*, 29, 2016, 7 [[abstract](#)]

Francisco Varela, F. E. Thompson, and E. Rosch (Eds). The Embodied Mind: cognitive science and human experience. MIT Press, 1991

Francisco Varela. Laying Down a Path in Walking: essays on enactive cognition. Zone Books/MIT Press, 1997

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

J. P. Wolf. Building Imaginary Worlds: the theory and history of subcreation. Routledge, 2012



This work is licensed under a [Creative Commons Attribution-NonCommercial 4.0 International License](#).

For further updates on this site, [subscribe here](#)