



# laetus in praesens

Alternative view of segmented documents via Kairos

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## Engendering Invagination and Gastrulation of Globalization reconstructive insights from the sciences and the humanities

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### Introduction

The process of [invagination](#) continues to be widely studied in relation to biological development of the human embryo at a critical stage in its transformation from a spherical assemblage of cells to toroidal form, as noted by Harald Jockusch and Andreas Dress (*From Sphere to Torus: a topological view of the metazoan body plan*, *Bulletin of Mathematical Biology*, 2003). In the humanities, the topological transformation of such development has inspired a quite distinct range of insights into invagination as it relates to descriptions of communication processes, notably as originated in the [deconstruction](#) of literary texts by Jacques Derrida (*The Law of Genre*, *Critical Inquiry*, 1980). These are presented in a separate literature review ([Annex A](#)).

The concern here is to highlight both sets of insights in relation to their potential significance for a transformation of the widely-discussed process of ["globalization"](#) -- understood as a topological process of morphogenesis.

Use of the term "global", and an associated process of "globalization", is assumed here to be isomorphic to an interesting degree with the evolution of the embryo at that critical early stage. This involves transformation of the [blastosphere](#) (blastula) through the process of [gastrulation](#). Invagination is an initial phase in this morphogenetic process of massive reorganization of the embryo from a simple spherical ball of some 128 cells into a multi-layered organism (described in [Annex B](#)). The implication is that the degree of development of human civilization can be usefully considered as "embryonic" -- at least from a future perspective -- rather than "mature", as is so readily assumed. Globalization might then be better understood as being currently at a "blastulation" stage, prior to "gastrulation". Further "civilization" -- as notoriously suggested by Gandhi in response to that assumption -- could well be a "good idea". As a form of self-referential question, "invagination" then heralds psychosocial evolution beyond spheroidal "globality".

This study is produced on the occasion of the [Millennium Development Goals](#) review summit (New York, 2010). It is appropriate to ask whether the "points" made there, the "lines" of argument, the "cycles" of concern, the "spheres" of influence, and the "volume" of discourse all suggest (yet again) the need for attentive reassessment of the adequacy of the geometric metaphors used to the challenges faced -- in the light of as yet unexplored possibilities (*Metaphorical Geometry in Quest of Globality*, 2009; *Geometry of Thinking for Sustainable Global Governance*, 2009). If "straight" talk no longer "carries much weight" in global discourse, then engaging with the "curves" and "loopholes" merits more assiduous examination -- as with the function of the "pockets" of dissent.

### Isomorphism of globalization and embryogenesis: summary

**Isomorphism and morphogenesis:** This possible topological and developmental isomorphism is understood here in the light of [general systems theory](#), the topological arguments of [Rene Thom](#) (*Structural Stability and Morphogenesis*, 1972), and their psychosocial implications.

The processes involved merit reflection in both purely cybernetic terms and in those of the emerging disciplines of knowledge cybernetics and the cybernetics of human knowing (Maurice Yolles, *Knowledge Cybernetics: a new metaphor for social collectives, Intellect*, 2006; Maurice Yolles and Paul Iles, *The Knowledge Cybernetics of Culture: the case of China, International Journal of Knowledge and Systems Sciences*, 2006). In this sense the scope of "globalization" is extended beyond its most frequent use in socio-economic terms in order to include understandings of the globalization of communications, knowledge, awareness and consciousness -- namely such as to include concerns with respect to integrative understanding, "[planetary consciousness](#)" and emergence of a "[global brain](#)". More generally, "globalization" might be considered a synonym of "integration" (cf. *Future Generation through Global Conversation*, 1997).

**Pattern recognition:** This exploration is based on the assumption that, with respect to any one domain of human preoccupation, the capacity and requirement for relatively complex [pattern recognition](#) (and the associated degree of abstraction) may well correspond to that which is required and applicable in another domain.

Rather than imply a controversial direct relation between the two domains, this highlights the determining role of human cognitive capacity with respect to emergence and use of abstract patterns as adaptable tools. It also suggests that failure to apply subtler emergent cognitive tools, in other domains faced with challenging dynamics, may signal dysfunctional development between domains.

This assumption does not deny the further possibility that there may be a more fundamental relationship between cognition and any reality treated as external, following the arguments of [Gregory Bateson](#) (*Mind and Nature: a necessary unity*, 1979) and others, as previously noted (*Existential Embodiment of Externalities*, 2009), or the earlier argument of [Carl Jung](#) and Wolfgang Pauli (*The Interpretation of Nature and the Psyche*, 1955), as discussed in [Annex C](#).

**Globalization:** There is a degree of confusion in promotion of the use of "global" in different sectors, especially in the case of implications of "universal". An especially problematic sense is that in which it is implicitly associated with "growth", leading to an assumption that, irrespective of geographic constraints, "globalization" necessarily involves getting "bigger" or "expanding" -- as might be assumed with a continuing increase in the diameter of the planet understood in socio-economic terms (best recognized as inflation).

This assumption can be associated with the legal notion of [puffery](#) -- understood as a legitimate form of self-promotion of humanity and its global strategies, as previously discussed (*Globallooning: strategic inflation of expectations and inconsequential drift*, 2009; *Sins of Hot Air Emission, Omission, Commission and Promission*, 2009). But, as with the UN's Millennium Development Goals, the concern of commentators regarding the intergovernmental track record of "empty promises" merits consideration. Nevertheless it is indeed appropriate to assume that "globalization" is a developmental process -- which (as with embryos) may however reach a critical stage at which transformation is appropriate, if not essential, for collective survival.

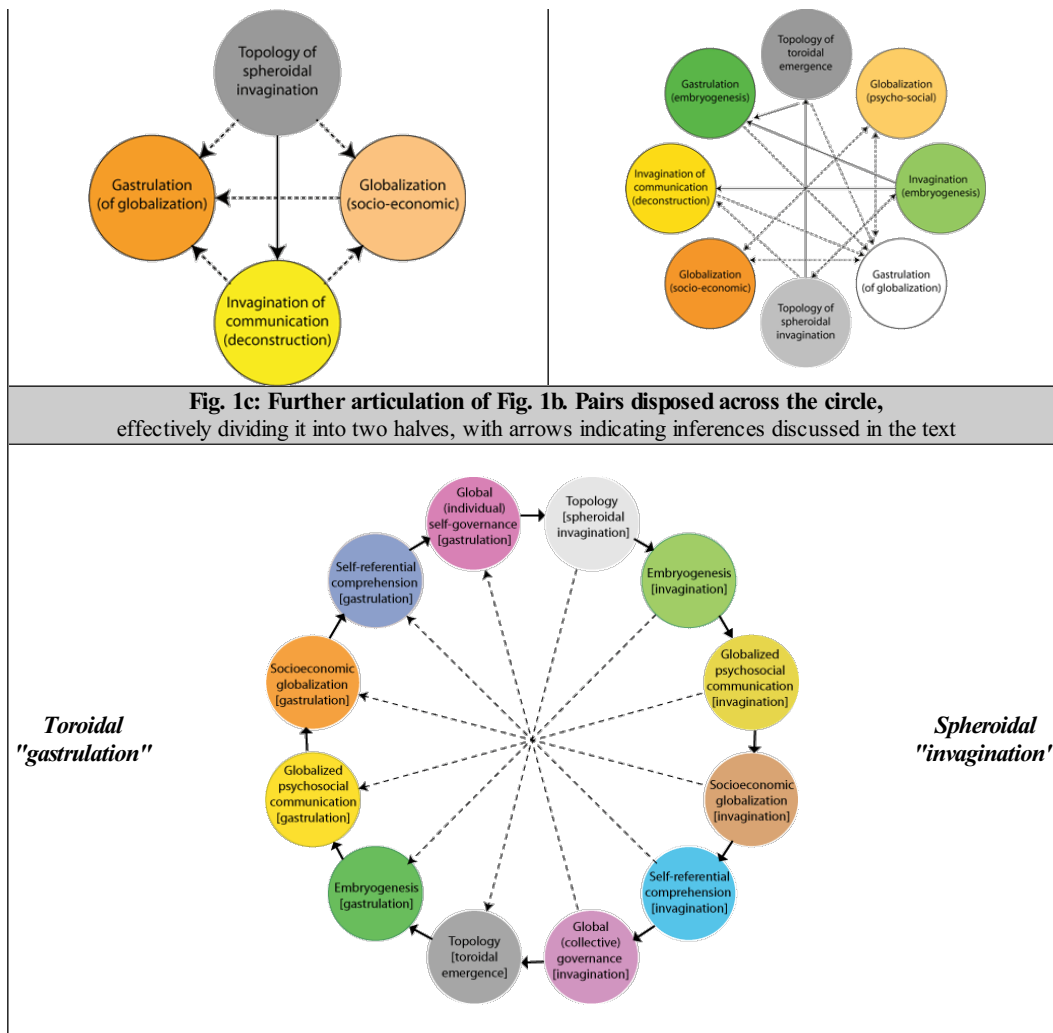
**Governance:** Arguments in support of the possibility of a transformation from "global governance" to "toroidal governance" have been developed in previous papers (*Enabling Governance through the Dynamics of Nature: exemplified by cognitive implication of vortices and helicoidal flow*, 2010; *Warp and Weft of Future Governance: ninefold interweaving of incommensurable threads of discourse*, 2010).

The question raised here is whether human civilization is to be considered as being at a critical point of its "embryonic" development into whatever it has the potential to become in the future. The issue is whether civilization has reached such a critical point -- even a singularity -- in the organization and distribution of resources of every kind. As with the embryo, this then necessitates -- in cybernetic terms -- some form of transformation to enable development and survival.

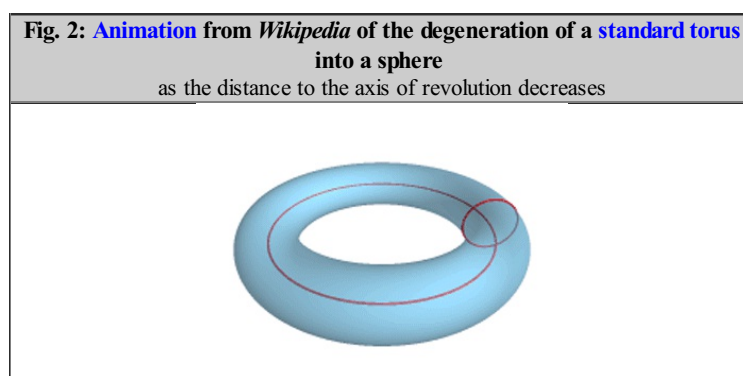
**Invagination:** The purpose here is to go beyond the selective citation of texts referring to "invagination" in the non-biological case (as made in those earlier papers). Of particular interest is the reformulation of the significance of "invagination" by those inspired by the deconstructionist insights of Derrida and others (see [Annex A](#)). Whilst these texts seldom (if ever) make reference to "globalization", or to other large-scale societal processes of communication and organization, they are suggestive of relevance and merit reflection (as indicated in [Annex B](#)). Invagination of the blastosphere initiates gastrulation in the process of embryogenesis. Coincidentally the blastosphere, also known as the [blastocyst](#) in the case of the human embryo, is currently the focus of controversy over the potential of [stem cell](#) research. Arguably, in the light of the the issues raised by the analogue discussed here, a degree of current controversy regarding globalization may be considered comparable.

**Overview:** The following argument endeavours to weave together threads whose mirroring of one another is in part a symptom of the requisite complexity and of its challenge to comprehension. The following figures offer one integrative overview, presented progressively to enable understanding of the argument as subsequently expanded.

<b>Fig. 1: Overview of relationship between aspects of the argument</b> -- each reconfigured with respect to the precedent	
Fig. 1a: Disparate processes tending to engender "gastrulation" of globalization	Fig. 1b: Partial articulation of Fig. 1a, introducing colour-coding of pairs of processes



The above figures can be interpreted as one tentative visual summary of the argument which follows. Essentially, as the following animation suggests, the world cannot "breathe" when confined to a spheroidal geometry. **The transformation into a torus (and back) points to a possibility of cycling through a pattern of geometric forms variously supporting understandings of "globality".** To be consistent, maps such as those above call for articulation on such patterns -- a matter also discussed below. In particular, Fig. 1b merits reconsideration in the light of the work of William S. Huff (*Homonym, Homonym and Homonym, and Other Word Pairs*, 1992), as previously discussed in relation to the *Ba Gua* coding scheme (*Conditions of Objective, Subjective and Embodied Cognition: mnemonic systems for memetic coding of complexity*, 2007).



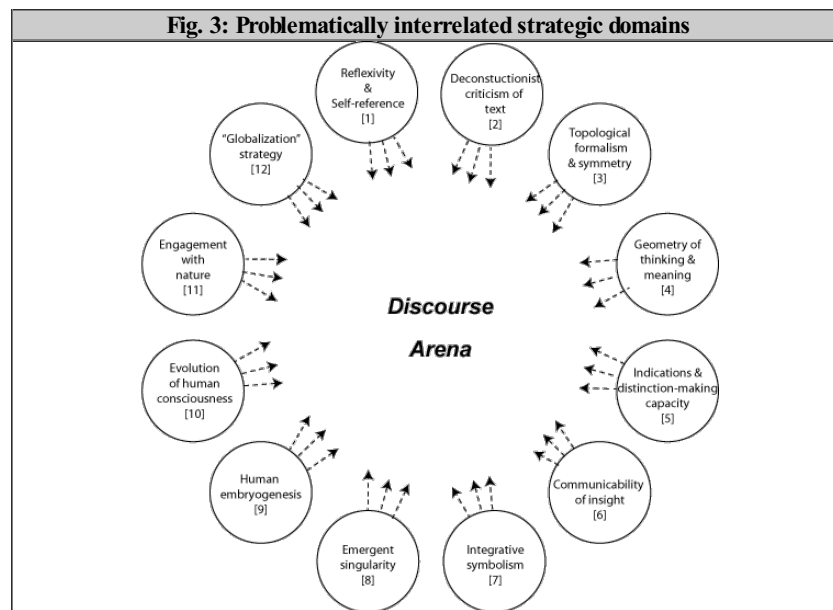
## Invagination as a postmodern "quagmire": methodological preamble

There is a major challenge in seeking to benefit from the insights relevant to any integrative reframing of "globalization". These have previously been partially discussed (*Self-reflexive Challenges of Integrative Futures*, 2008).

Briefly stated (as for many), a number of seemingly (or potentially) complementary "waves" are being made in quite distinct domains of knowledge (in "my" universe), leaving it to others (or, in their absence, to "me") to enable some form of "global" comprehension, at least of relevance for "me" (*Existential Embodiment of Externalities*, 2009; *In Quest of Radical Coherence*, 1995). However none of the representatives of such initiatives want much to do with each other, often to the extent of condemning others to a cognitive netherworld of dangerous irrelevance. There they may be visited under authoritarian guidance -- at the visitor's own peril, especially given the increasingly questionable credibility of such authorities (*Abuse of Faith in Governance*, 2009).

The representatives are typically much esteemed in their own domains within the current global civilization. The domains may however

be usefully understood as "conceptually gated" (*Dynamically Gated Conceptual Communities*, 2004). For convenience with respect to the following discussion, a selection of such gated domains might be configured together as follows.



**Problematic dynamics:** This static diagram obscures the highly problematic dynamics between the domains, often undermining (or appropriately calling into question) conventional assumptions regarding coherent discourse. As a comment on the diagram, the following might be stressed (in no particular order, although such might be fruitful):

1. self-reference and reflexivity as variously explored through the logical exposition of [Kurt Gödel's incompleteness theorems](#) and the nature of paradox, as extensively discussed by [Douglas Hofstadter](#) (*Gödel, Escher, Bach: an Eternal Golden Braid*, 1979; *I Am a Strange Loop*, 2007).
2. deconstructionist criticism of self-referential text and meta-narrative, as instigated by Jacques Derrida and further developed in relation to the socio-economic and psychocultural challenges framed by feminist scholars, notably [Gayatri Chakravorty Spivak](#) (*The Post-Colonial Critic*, 1990; *A Critique of Postcolonial Reason*, 1999). In this context, "invagination" may be associated with "self-reference" and "reflexivity". And, however it may be disparaged, Derrida's undermining of conventional [logocentric discourse](#) may be fruitfully compared to Gödel's undermining of the logical edifice of mathematics -- as notably disparaged by its principal exponent Bertrand Russell.
3. topological formalism and group symmetry through which disparate structures may be interrelated, although typically meaningful only to the few in a psychosocial context (as with the complexity sciences in general), as previously argued (*Dynamics of Symmetry Group Theorizing*, 2008).
4. geometry of thinking and meaning as explored by various authors ([R. Buckminster Fuller](#), *Synergetics: Explorations in the Geometry of Thinking*, 1975; [Arthur M. Young](#), *The Geometry of Meaning*, 1976), notably through the configuration of categories, as previously summarized (*Geometry of Thinking for Sustainable Global Governance*, 2009)
5. distinction-making capacity, variously following from the work on the calculus of indications by [George Spencer-Brown](#) (*Laws of Form*, 1969) as discussed by [Michael Schiltz](#) (*Form and Medium: a mathematical reconstruction, Image [&] Narrative*, 6, 2003) (cf *Beyond the plane: form and medium in terms of the calculus of indications*, 2006).
6. communicability of insights, notably in the light of the work of [Ron Atkin](#) on simplicial complexes (*Multidimensional Man; can man live in 3-dimensional space?* 1981), as previously summarized (*Social organization determined by incommunicability of insights*, 1995).
7. symbolism enabling a degree of "global" comprehension, notably exploiting basic geometric forms of aesthetic significance (*Dynamic Exploration of Value Configurations: Interrelating traditional cultural symbols through animation*, 2008).
8. emergent or imminent singularity, variously associated with the development of technology, constraints on resources, or the capacity to communicate "global" meaning (*Emerging Memetic Singularity in the Global Knowledge Society*, 2009). Aspects of the case have been given significant focus by [Nicholas Carr](#) (*The Shallows: what the internet is doing to our brains*, 2010).
9. developmental embryology as offering insight into a fundamental topological transition ("invagination") in a configuration of organic entities ([Harald Jockusch and Andreas Dress](#), *From Sphere to Torus: a topological view of the metazoan body plan*, *Bulletin of Mathematical Biology*, 2003)
10. evolution of human consciousness, as fruitfully summarized by [Jennifer Gidley](#) (*The Evolution of Consciousness as a Planetary*

*Imperative: an integration of integral views. Integral Review: A Transdisciplinary and Transcultural Journal for New Thought, Research and Praxis*, 2007); again the problematic relations between the iconic representatives of such insight merits reflection, as previously discussed (*Warp and Weft of Future Governance: ninefold interweaving of incommensurable threads of discourse*, 2010).

11. engagement with nature and the environment, as variously understood ([Gregory Bateson](#), *Mind and Nature: a necessary unity*, 1979), and previously discussed (*Psychology of Sustainability: embodying cyclic environmental processes*, 2002).
12. "globalization" strategy and socio-political organization, as variously strongly promoted and challenged with respect to the survival of civilization

Comprehension of the relevance of each domain is (necessarily) constrained and challenged from the perspective of the others. These are represented together in the above diagram as complementary sets of insights -- potentially:

- enabling embodiment of comprehension to the extent their interrelationship is supportive (possibly in the fractal sense implied symbolically by [Indra's Net](#))
- ensuring disabling dissociation to the extent their interrelationship is problematic or incomplete

**Psychoactive debate:** Any process of discussing "engendering invagination of globalization" (a theme of this paper) evokes the preoccupations of each of the above clusters. Whilst use of "invagination" in development embryology may be neutral (in the sense favoured by the natural sciences), its use with respect to meta-narrative by the humanities is highly charged. The former is considered by the latter to be a reflection of a logocentric mode of discourse challenged by the self-referential enfolding of any discourse into that discourse, notably as embodied in text. Texts sensitive to the challenge of meta-narrative may well be necessarily unusual, as exemplified by the structure of Spivak's *A Critique of Postcolonial Reason* (1999) and one commentary based thereon (Stephen G Dewyer, *Threading a needle thanks to Gayatri Spivak*). Remarks of (appreciative) critics include comments such as:

- ...the text that we are confronted with seeks to escape its confines by repeatedly transforming the writer into a reader of her own text in footnotes that takeover, turnover and traceover the text as such. (Sangeeta Ray, *Politics and Culture*, 2010)
- Spivak, following the "impossible model" undertaken by Jacques Derrida and Geoffrey Bennington in *Jacques Derrida* (1993), puts in play a structure of "invagination" between footnote and text, one which threatens the stability of both. As if partaking in this essential instability, the four chapters seem to bleed into one another: philosophy and culture open on to literature and history without clear disciplinary limitations (clearly a strength of the book). (Amit S. Rai, *Criticism*, Winter 2000)

Possible synonyms for invagination in this conceptually "sticky" context might then include: introversion, self-reference, complicity (even implying corruption, impurity or contamination), imbrication and entanglement. Invagination introduces "echoes" and "mirrorings" into the communication process -- analogous to those abhorred in electronic communication. It is difficult to imagine a term more capable of acting as a template for problematic sexual fantasies and more provocative of the sensitive concerns articulated by feminists. The point is well made by [Eve Ensler](#) (*The Vagina Dialogues*, *The Guardian*, 1 December 2010) in a discussion of violence against women:

Vagina is the most terrifying word, the most threatening word, in any language of any country I have ever been to. Even when the vagina is worshipped in theory, as the yoni is in India, it is denigrated in practice. It is more reviled and feared than words like plutonium, genocide and starvation. In many countries the word for female genitalia is so derogative or disgusting, it cannot be spoken in public. In a few places, there is no word in the language for vagina at all.

Discourse regarding "invagination" might then be said to be psychoactive -- effectively a cognitive minefield, meriting the precautions discussed with respect to overpopulation, as being a primary constraint on the current strategy of "globalization" (*Overpopulation Debate as a Psychosocial Hazard: development of safety guidelines from handling other hazardous materials*, 2009; *Population taboo stokes doubt over Millennium Development Goals*, *Agence France Presse*, 20 September 2010). The psychoactive nature of the debate regarding stem cell research also merits consideration in the light of the argument developed here.

**Copyright:** There is a delightful irony to the lack of self-referential consideration by many relevant authors to the significance of the intellectual copyright they (or their followers) so firmly associate with their insights. For example, given her strong position on the socio-political implication of invagination, are the copyrighted texts of Spivak (1990, 1999) all invaginated within the globalization discourse she criticizes -- as with many in the debate? (cf *Future Coping Strategies: beyond the constraints of proprietary metaphors*, 1992).

[Especially relevant to the themes evoked here, of which various traces are to be found on the web, is the tragic litigation between Stan Tenen and Dan Winter (regarding copyright claims made by Stan Tenen and their infringement by Dan Winter). Also of relevance are the claims made regarding the intellectual legacy of R. Buckminster Fuller and of Stafford Beer.]

Curiously one can only peruse many texts concerning invagination if one has a legally binding contract as purchaser or user -- and even then one's rights to "fair use" and "reproduction" of any portion of such texts are constrained. More curiously one may only be legally able to communicate such insights by rewording them -- irrespective of whether the memes are correctly replicated. A memetic reprise of the marriage contract? Invaginated authors for invaginated readers? Invaginated academics faced with a memetic analogue to DNA to safeguard their intellectual heritage?

Every process of conception and engagement with text is grist for the mill of deconstruction -- except that both the text and the commentary are subject to copyright, ensuring restricted access to the discourse (cf. *Einstein's Implicit Theory of Relativity -- of Cognitive Property? Unexamined influence of patent office procedures*, 2007). The issue of property and territory is of course one of the most fundamental in global governance. The implication of intellectual copyright in relation to any form of civilizational self-transcendence has been discussed separately (*Transcending Duality: epistemological panic of nonduality?* 2010). There it is argued that

this seemingly abstract and sterile consideration has extremely concrete implications -- well-recognized by the indigenous peoples of the world with their unique relationships to the land, as documented by [Darrell A. Posey](#) (*Cultural and Spiritual Values of Biodiversity*, 1999).

This is most evident in the case of the Aborigines of Australia, whose "unconventional" relationship to the land is not in terms of "property" but through the [Dreaming](#). This gave rise to the controversial, "conventional", legal assumption of *Terra Nullius* -- territory which has never been subject to the sovereignty of any state, or over which any prior sovereign has expressly or implicitly relinquished sovereignty. Some would argue that cognitively most people are "Aborigines" whose "land" has been misappropriated ([Paul Feyerabend](#), *Conquest of Abundance: a tale of abstraction versus the richness of being*, 1999). Again there is a curious association between the "origins" with which Aborigines have been associated and research on the cells from which humans "stem". This reinforces the case for exploring metaphors associated with cultural "roots", as made by [Susantha Goonatilake](#) (*Toward a Global Science: mining civilizational knowledge*, 1999).

Current efforts to assert ownership of the genetic makeup of individuals -- ridiculous in the eyes of a very recent past -- may be replicated in some way in the future in relation to "memetic makeup".

**Emergent singularity:** Consideration of the "invagination" of "globalization" may therefore be usefully described as a self-referential vortex, potentially to be modelled by fluid dynamics (*Enabling Governance through the Dynamics of Nature: exemplified by cognitive implication of vortices and helicoidal flow*, 2010). In the latter paper the vortex was intimately related to that of a torus -- consistent with the topology of the embryological development from a spherical (global) form to a torus.

As a psychosocial vortex, the preoccupation in meta-narrative with invagination can be considered indicative of an emergent singularity. This may be understood in (logocentric) technological terms, as a consequence of the cybernetic pressures on the development of civilization, or in the light of those of embryological development. However, as participants in the latter process, it does not lend itself readily to "objective" discourse -- which may anyway become impossible (*Emerging Memetic Singularity in the Global Knowledge Society*, 2009). Hence the potential merit of the insights of such as [Hofstadter](#) (articulating and developing those of Gödel) or [Spivak](#) (articulating and developing those of Derrida). The fact that neither cites the other might be said to be par for the course -- although a valuable comparison is made in a lengthy blog ([Stavrogin](#), *Derrida and Hofstadter: Soul vs. Meaning*).

**Comprehensibility:** The special challenge of a self-referential vortical discourse is its relative incomprehensibility. In nature a vortex is intuitively comprehensible as a dynamic pattern but -- as with the traditional example of a spiral staircase -- it is difficult to communicate successfully through a text description. There is therefore a gap between the biologists' understanding of the transition of the embryo from a spheroidal to a toroidal form through invagination -- and how "invagination", in that light, might transform a global civilization, from "global governance" to "toroidal governance". In the psychosocial case it is the self-referential processes themselves which are engendering the vortex central to that transformation.

It is therefore perhaps not to be expected that the preoccupations of the humanities would give rise to an integrative symbol enabling comprehension of that psychosocial transition and its outcome -- especially when any such enterprise is associated with the modality of logocentrism characteristic of the form to be superseded. Hence there is a fundamental challenge to comprehension, although it can be argued that symbolism and topology offer fruitful pointers -- especially when interpreted dynamically as is consistent with comprehension of a process (*Animation of Classical BaGua Arrangements*, 2008).

**Enclosure:** Appropriately, but also problematic in the avoidance of any insightful "global" pattern, is the association of invagination in meta-narrative with a multiplicity of convoluted "folds" and foldings -- indicative of self-referential imbrication and cognitive entanglement. These are understood as engendering "pockets" of externality folded in, whose external authority derives from its place inside. Given the deliberate association of invagination with the female anatomy in such discourse -- echoing the later implication of invagination in embryo development -- a degree of closure is privileged. Discourse effectively has a secretive quality -- echoing that of the traditionally symbolic "secret garden" ([Mahmud Shabistari](#), *The Secret Rose Garden*, 1311; [Nancy Friday](#), *My Secret Garden: women's sexual fantasies*, 1973).

This contrasts with the "openness" acclaimed by current enthusiasm for globalization, undermined by ("pockets" of) ever-increasing degrees of surveillance and secrecy. In this respect there is a curious irony to the French academic instigation and cultivation of the deconstructionist approach (through Derrida) as compared to the legislation passed in France (at the time of writing) regarding prohibition of the *burkha* -- at the instigation of a president unique in being married to a person whose nude image as a model has been available on the web (*Burkha as Metaphorical Mirror for Imperious Culture?* 2009).

**Deprecation:** In seeking to derive insight from the widespread interest in the deconstructionist approach, it is of course appropriate to note the degree to which it is deprecated by the schools of thought more closely associated with, and supportive of, the current logic of "globalization". Two well-articulated examples may be cited:

- the widely-publicized hoax perpetrated in 1996 by the physicist and mathematician [Alan Sokal](#) (*Transgressing the Boundaries: toward a transformative hermeneutics of quantum gravity*, *Social Text*, 1996). It was purportedly done to highlight the nonsensical nature of [postmodernism](#) and of the argumentation of deconstructionists (and despite Gödel's incompleteness theorems). This has been extensively documented as the [Sokal Affair](#) -- on which Sokal himself has subsequently commented (*Beyond the Hoax: science, philosophy, and culture*, 2008).

The challenge by Sokal was indeed healthy -- worthy of a *No Bull Prize for Literature*, rather than the *Nobel Prize in Physics* he may yet merit (cf *Transformation of Global Governance through Bullfighting*, 2009). Unfortunately it fails to demonstrate that conventional science is able to respond more appropriately to the depredations of the globalization logic in which it is so widely complicit. The logic effectively advocates "more of the same", whilst (inconsistently) physicists in particular are encouraged to

indulge in theoretical fantasies regarding the illusory nature of space, time and gravity -- completely disassociated from the conditions in which people are expected to live and survive, and to whom such fantasies are seemingly irrelevant. "Nonsense" of a much higher order -- seemingly incapable of reframing fruitfully the daily reality with which the underprivileged are obliged to deal, a reality considered to be too complex systemically for theoretical convenience.

Science has of course, most unfortunately, been significantly incompetent in engendering any transdisciplinary framework, or in fruitfully modelling the problematic discourse between mutually disparaging disciplines (*End of Science: the death knell as sounded by the Royal Society*, 2008). Many in these disciplines hold those in others to be "not even wrong", although together they "profess" their discordant beliefs within the "faculties" of the same "university" -- lacking even the pretence to any integrative conceptual framework, whilst implying a "universal" worldview. Perhaps this is to be recognized as the architectural analogue to the *Buchbindersynthese* of multidisciplinary publications? Any animal with so many faculties -- so poorly coordinated -- would be in the direst of straits. The condition is of course reflected in the United Nations "system".

More intriguing is the possibility that Sokal's hoax exemplifies a double (or triple?) invagination -- effectively making the case he abhors.

- for [Johann Hari](#) it is hard to understand the popularity of Derrida's philosophy amongst academics except as a symptom of decadence (*Why I won't be mourning for Derrida*, 13 Oct 2004). Hari argues:
  - *Western intellectuals have never been more safe, more comfortable or more free - so they have turned to a wild, often absurd philosopher who trashes the intellectual foundation of the humanities (and any coherent political project) in a search for intellectual stimulation....This is, at its core, the assumption that language describes the world in a fairly transparent way.....The thing out there...is almost impossible to grasp; we are lost in a sea of opposing words that prevent us from actually experiencing reality directly.....He tried to hack apart the very basis of our thought - language, reason and the attempt to tell big stories about how we became as we are.*  
But might it not be argued that this could also be said of [Gödel's incompleteness theorems](#)?
  - *Derrida wants to break down the naive belief that there is an objective external reality connected to our words that can be explored through language, science and rationality. Any narrative we construct to understand the world will inevitably be built on suppressed violence and exclusion*  
But could it not be said that this corresponds to the concerns of such as [Johan Galtung](#) with respect to the implicit nature of [structural violence](#) and [cultural violence](#)? And what of the fantasies of physicists?
  - *So there are, Derrida concluded, no universal truths, no progress and ultimately no 'sense', only "decentred", small stories that are often silenced by a search for rationality and consistency. The search for intellectual coherence is 'violent' and must be shunned.*  
But is this not the case, which such as [Nicholas Rescher](#) have noted, of the continuing and unresolved strife between systems of philosophy and belief -- each with their aspirations to universal truth and each with demonstrable incapacity to relate meaningfully to those holding to other "universal" truths? (*The Strife of Systems: an essay on the grounds and implications of philosophical diversity*, 1985). Ironically this was a theme explored by Immanuel Kant (*The Contest of Faculties*, 1798), a title used by Wolfgang Coy (*The Contest of Faculties: Cybernetics vs. Informatik in German Universities*, 2004) and Christopher Norris (*The Contest of Faculties: philosophy and theory after deconstruction*, 1985). Society is faced with a reprise of the feudal turf wars -- complete with elegant (often remote) mountain fortresses for defence against conceptual barbarians.

Hari offers examples of angry, vituperative responses to his criticism from deconstructionists, thereby usefully making the point that deconstructionism is not unique in failing to have fruitful processes for handling divergent views. It is such vituperation between worldviews which one might have hoped that science or postmodernism would fruitfully transform (cf *Guidelines for Critical Dialogue between Worldviews*, 2006). Derrida is cited as an example of [obscurantism](#), with his work described as 'pseudophilosophy' and 'sophistry' by Rene Thom (in turn to be deprecated by [Ilya Prigogine](#)).

Faced with critics such as Soka, Hari and Thom, deconstructionists might usefully agree with them in part. Many would argue, more generally, that a hoax of massive scale is being perpetrated on humanity. Many of the processes of globalization can be seen as a [Ponzi scheme](#) -- skillfully disguised by spin, effectively creating a Potemkin society in whose dynamic all are complicit (*Entangled Tales of Memetic Disaster: mutual implication of the Emperor and the Little Boy*, 2009; *Globalization within a Global Potemkin Society: a strategic challenge to proactive participation in society*, 2000).

References to "universal" frameworks and "fundamental" truths, as promoted, lend themselves to consideration in this light -- as with criticism of [Earth Charter Summits](#) (William F. Jasper, *The Potemkin global villages: far from representing "global civil society," the Earth Charter Community Summits were tiny gatherings of ultra-left activists financed by wealthy, one-world elitists*, *The New American*, 4 November 2002). However, it is difficult to prove otherwise without recognizing a degree of complicity.

Of potentially more fundamental relevance to the deconstructionist position are the challenging questions asked:

- through physicists concerning the nature of reality as contrasted with conventional assumptions
- through various understandings of consciousness as explored by spiritual disciplines and their associated schools of thought

**Catastrophe:** Unfortunately, presented as a circular array in [Fig. 3](#), the set as a whole effectively defines what might be caricatured as the catastrophic "bullfighting arena" -- a blame game of current discourse (*Transformation of Global Governance through Bullfighting*,

2009). Hopefully at some stage the complexity sciences will be able to address such issues as a complex in its own right, together with the questions they imply (*Conformality of 7 WH-questions to 7 Elementary Catastrophes: an exploration of potential psychosocial implications*, 2006).

Catastrophe theory, for example, would appear to offer many relevant tools (Timothy Poston and Ian Stewart, *Catastrophe Theory and its Applications*, 1996). Especially relevant to what follows is the original argument of **Rene Thom**, who had in 1969 put forward a much-cited topological description of embryogenesis (*Structural Stability, Catastrophe Theory, and Applied Mathematics*, *SIAM Review*, 1976):

Hence this general idea that **there are "unavoidable" catastrophe situations**, and that it is of fundamental importance to know all of them; whereas control theory up to now tries to avoid them (not always, as in fact control theory knows the need of shifting strategies discontinuously). It seems clear that if we want to understand biological phenomena, we have to understand these catastrophic effects: for life itself shows a great mastery in dealing with these phenomena, as shown by physiological events such as heart beat, nerve influx, and by **morphological events, such as gastrulation, in embryology**. (emphasis added)

Thom's approach has been recently summarized by David Aubin (*Forms of Explanations in the Catastrophe Theory of Rene Thom: topology, morphogenesis, and structuralism*, 2004). Its relevance to globalization has been highlighted by **Guillaume Faye**, writing under the pseudonym Guillaume Corvus (*La convergence des catastrophes*, 2004). The concept of resilience, now recognized as important to the **adaptive cycle** and the emerging challenges of governance, can be traced back to the qualitative mathematics of Thom's provision of an account, in mathematical terms, of how a set of continuous events can undergo a sudden transition, or threshold jump, into a different dynamic.

Ironically catastrophe theory, as conceived by Thom, has been deprecated in the more recent developments of the complexity sciences, but with no indication that their evolution is enabling a more meaningful discourse capacity in handling the disagreements between the clusters identified in [Fig. 2](#). Despite its apparent potential, only passing references to catastrophe theory are made with respect to globalization.

## Invagination in psychosocial terms: understandings from web resources

In an effort to clarify the nature of the quagmire, as a context for the subsequent discussion, a literature survey of web-accessible literature on "invagination" was conducted (presented separately as [Annex A](#)). Unfortunately it is difficult to make such literature searches because of the predominance of material on invagination in the biological case, however relevant its psychosocial considerations may be.

The survey therefore constitutes an effort to highlight the sophisticated preoccupations of deconstructionists in a language often as inaccessible as that required by fundamental physicists in their domain. The cognitive challenges of comprehensibility by the human brain are not integrated into the considerations of either deconstructionists or physicists -- other than as popularizing texts (notably with the objective of ensuring and guaranteeing further funding). Whether the appropriate **collective noun** for deconstructionists should be caricatured as a "confusion of deconstructionists" is another matter.

The references and quotes are clustered into three groups in an **annex** (*Invagination in Psychosocial Terms: understandings from web resources*, 2010)

- Items referring only to "invagination" or "invaginated"
- Items referring to "double invagination" or "doubly invaginated"
- Items referring to "chiasm" or "chiasmatic" invagination

The quoted remarks are in each case selected to provide a context for understanding the language in which "invagination" (or "invaginated") is discussed in the psychosocial domain -- potentially in relation to "globalization". The purpose is to determine what might be derived from current use of the term in contexts associated with keywords related to globalization.

## Complexification of globalization and toroidal transformation

Details of the argument are presented separately (in [Annex B](#)) under the following headings:

- Globalization: from "invagination" to "gastrulation"
  - Globalization and invagination | "Psychotopology" | Metaphorical geometry and topology
  - Globalization as isomorphic with embryogenesis? | Dunbar number
- Complexification of "globalization": atemporal context
  - Transformation of holons | Transformation: anticipated and lived
  - Inhabiting distinct temporal realities | Frozen in time | "Eternal hope"
- Complexification of "globalization" through fractal embedding
- Complexification of "globalization" through "gastrulation"
  - Blastulation as a pre-gastrulation phase | Gastrulation processes
  - Modes of gastrulation | Dynamics of gastrulation | Double invagination
  - Animations and simulations
- Complexification of "globalization: experiential implication
- Beyond spheroidal "globality"
  - Application of mathematics | Transition to more viable forms of "globality"
- Psychosocial implications of toroidal geometry

- [Toroidal habitats](#) | [Experiential implications](#) | [Pressures for "toroidal governance"](#)
- [Comprehending the formal transformation from sphere to torus](#)

## Morphogenesis of globalization: enabling topological transformation

During gastrulation, through which a toroidal form emerges from the spheroidal blastosphere, the emergent embryo is effectively responding to the topological opportunities represented by such animations. The question is, **if the ("humble") human embryo "knows" how to achieve such a transformation, how can the transition be enabled for a "sophisticated" knowledge-based society in process of ("arrogant") "globalization"** -- especially when imagination continues, seemingly, to be constrained by spheroidal "growth" in a "blastosphere mode"?

**Communication protocols:** There is every possibility of facilitating such a transition through development of suitable communication protocols and algorithms of the style already in use by search engines and social networking facilities, as argued for a previous era (*Spherical configuration of interlocking roundtables: internet enhancement of global self-organization through patterns of dialogue*, 1998). Significant in that respect is the possibility of enabling such a transition for those who find advantage in functioning in toroidal mode. As noted above, the requisite topological development calls for a fractal organization of organizational innovation, such as the emergence of toroidal forms -- with a corresponding development in self-reflexive discourse. This should not preclude preferences for continuing use of spheroidal forms and those based on polyhedra (*Polyhedral Empowerment of Networks through Symmetry: psycho-social implications for organization and global governance*, 2008)

More desirable in fact is the emergence of an ability to switch to enabling protocols and algorithms corresponding to even more complex topologies, rather than simply adopting the toroidal form as the "ultimate" response to current pressures. Indeed, as a three-dimensional form like the sphere, use of the toroidal template calls for continuing challenge in the light of the question highlighted by the title of the study by mathematician Ron Atkin (*Multidimensional Man; can man live in 3-dimensional space?* 1981). "Globalization logic", as currently conceived, can be fruitfully seen as imprisoning civilization as a whole, and people individual, in a 3D framework obstructing their development. **How is it that humanity has lost connection with, and comprehension of, the "topological guidelines" encoded in its own embryogenesis?**

Given the excitement of mathematicians at the fundamental implications of the most complex mathematical objects yet discovered (Monster Group, Lie E8, etc), what forms might a knowledge-based civilization yet evolve into? Given the continuing struggle of governance to reconcile "global" with "local", how is it that no account whatsoever is taken of the range of sophisticated mathematical insights into their relationship? Toroidal governance offers new possibilities for relating "global" and "local" -- at a more appropriate level - - in contrast to what is offered by spherical geometry ([great circles](#), [small circles](#)).

In this respect the process of metazoan development, including embryogenesis, has given rise to the suggestion of a **topological imperative** (Valeria Isaeva, et al., *Topological Patterns in Metazoan Development*, *Bulletin of Mathematical Biology*, 2006):

The present paper provides a topological interpretation of some developmental events through the use of well-known mathematical concepts and theorems; the relationship between local and global orders in metazoan development, i.e., between local morphogenetic processes and integral developmental patterns, is established. Thus, this methodology reveals a 'topological imperative': A certain set of topological rules that constrains and directs biological morphogenesis.

**Design: toroidal, helicoidal, vortical?** The challenge of toroidal governance can be understood as one of design. The possibility was previously introduced in the light of designs evident in nature (*Enabling Governance through the Dynamics of Nature: exemplified by cognitive implication of vortices and helicoidal flow*, 2010). This noted the extensive work in that respect of Christopher Alexander (*The Nature of Order: an essay on the art of building and the nature of the universe*, 2003-4; *Harmony-Seeking Computations: a science of non-classical dynamics based on the progressive evolution of the larger whole*, *International Journal for Unconventional Computing (IJUC)*, 2009).

The potential implications for governance have been previously explored (*Harmony-Comprehension and Wholeness-Extending: eliciting psychosocial transformational principles from design*, 2010; *Aesthetics of Governance in the Year 2490*, 1990).

Inherently helicoidal, a widely appreciated pattern from nature is that of the **Fibonacci spiral** which has been suggested as a template to order patterns of interaction characteristic of governance (*Tao of Engagement -- Weaponised Interactions and Beyond: Fibonacci's magic carpet of games to be played for sustainable global governance*, 2010; *Designing Global Self-governance for the Future: patterns of dynamic integration of the netherworld*, 2010).

The irony of the failure to derive insights from nature, of relevance to appropriate "development" models, is curiously matched in the quest for social "harmony" -- marked as it is by the total incapacity to draw on insights from musical harmony to which so many relate in their daily lives (*A Singable Earth Charter, EU Constitution or Global Ethic?* 2006). Significantly the metaphor has been explored by Judith Butler and Gayatri Spivak (*Who Sings the Nation-State?* 2007) as reviewed by Jen Kosakowski (*Singing the State in all Its Forms*, *Journal of Global Change and Governance*, 2007). (see [Annex C](#))

## Enactivating "gastrulation" of "globalization"

There would seem to be a poorly explored relationship between:

- **governance** of "globalization" at whatever scale and in whatever form
- **design** of structures and processes appropriate to such governance, as indicated above

- **comprehensibility** of the system to be governed and of whatever is designed to ensure appropriate governance
- **communicability**, including memorability, of the relatively complex issues to be governed and of correspondingly complex designs through which they are governed

Together these combine to constitute a **credibility challenge**, both in their acceptance by the governors and by those mandating them -- the governed in a democratic society. Whilst various disciplines may elaborate "theories of everything" -- appropriate to models of "global" governance as they choose to understand it -- if **design, comprehensibility and communicability factors are not taken into account then such models will not be viable in practice**. Overly simplistic models will be used in their place -- typically those based on the worst of binary logic (*Us and Them: relating to challenging others*, 2009). A key to richer apprehension of complexity is highlighted by the "correspondences" considered credible in any explanation, whether in the sciences or in the cultural realm (*Theories of Correspondences -- and potential equivalences between them in correlative thinking*, 2007).

The tendency, however, is to assume that whatever the complexity of the theory, it can be "repackaged" after formulation for communication purposes such as to circumvent difficulties of comprehension. What is not considered is the extent to which these considerations need to be designed into the models in the first place. **Comprehension of complexity is the neglected key constraint in the adequacy of any theoretical explanation.**

The process of "designed ignorance" is itself curiously exemplified by the exponential expansion of knowledge of whose details ever increasing numbers are increasingly ignorant -- as with the expansion of any "universe of knowledge". This form of "globalization" echoes the expansion of the blastosphere -- and the constraining memetic singularity it can be expected to encounter.

**Requisite "mindbending"**: Much is made of the limitations of linearity, perhaps acceptably challenged by calls for "**lateral thinking**". The increasing difficulty is that many of the challenges are recognized as taking, often "vicious", cyclic form (*Examples of vicious problem cycles and loops*, 1995; *Feedback loop analysis in the Encyclopedia Project*, 2000). Strategic solutions, such as recycling, are increasingly defined in cyclic terms -- if only as a desperate effort to return to comprehensible linearity (*Web resources on "breaking the cycle"*, 2002).

Whilst the "circle" holds the cognitive challenge to a degree, this is more subtly evident in any spheroidal understanding of "globalization". Civilization remains challenged by any "other" inhabiting the unenlightened "side" of the "globe" -- whatever the degree of explanation regarding the movement of the planet in relation to the Sun and the manner in which each periodically dwells beneficially in a condition of endarkenment with respect to an enlightened other elsewhere. The cognitive significance, and potential value, of this condition is understood to be highly problematic (*Enlightening Endarkenment: selected web resources on the challenge to comprehension*, 2005). Ironically there is little recognition of what might be termed "voluminous thinking", despite its extremely practical implications (*From Lateral Thinking to Voluminous Thinking: unexplored options for subterranean habitats in dense urban areas*, 2007).

It is in this context that the cognitive challenge of toroidal organization appears daunting, despite the apparent facility with which the toroidal form is achieved through the dynamics of human embryogenesis -- a pattern "known" instinctively to all and heralded cognitively by the ubiquitous nature of "invagination". It is therefore appropriate to explore this in terms of toroidal self-governance.

**Ring composition**: Whilst "gastrulating globalization" may well be an alienating notion, there are widespread indicators to the mode of understanding that may be involved. Most common is the circle of beads, notably as "**worry beads**" (*kombolói*) or as an aid to prayer, as previously discussed (*Designing Cultural Rosaries and Meaning Malas to Sustain Associations within the Pattern that Connects*, 2000).

The cognitive implications of loops as rings benefit from the studies of "**ring composition**" in literature, as reviewed by **Anthony Blake** (*Decoding the Past: ring composition and sacred number*), notably with respect to the work of anthropologist **Mary Douglas** (*Thinking in Circles: an essay in ring composition*, 2007). The potentially more complex implications are separately explored (*Sustaining a Community of Strange Loops: comprehension and engagement through aesthetic ring transformation*, 2010).

Of special interest is the manner in which the toroidal form is reflected in such rings. The "beads" are independent circular segments (of the "doughnut") linked by the single circular thread through their centres. As mnemonic devices each bead may be associated with a particular theme, typically part of a prayer. **Despite the relative complexity of the issues involved, no such mnemonic circlets seem to have been developed for issues relating to globalization or the environment** -- where it might be assumed there was much to "worry" about, much to "pray" for, and much to "re-member" with respect to environmental cycles and "recycling".

Clearly the study by **Mary Douglas** (2007) offers many pointers of potential relevance to engaging with toroidal thought, especially as it is reflected in many aspects of tradition (circle dancing, etc.). Of special interest is the actual design and composition of a ring expected to "hold" a relatively complex pattern of insight and to facilitate engagement with it. These possibilities are potentially associated with the emergence of a dynamic, "cyclic" identity in keeping with the times and the value attached to music as a vehicle for identity (*Emergence of Cyclical Psycho-social Identity: sustainability as "psychically" defined*, 2007).

Other relevant sources with which the process of "gastrulating globalization" might then be associated include the many kinds of cycles with which people engage and are variously familiar:

- periodic routines (daily routines, weekly, annually, etc)
- business and reporting cycles, factory cycles, product cycles
- gardening and agricultural cycles
- bodily cycles
- cycle of hours, especially as celebrated in intentional communities (monasteries, ashrams, etc)
- recycling patterns
- cybernetic feedback loops
- web rings of associates

With respect to career and life planning, there is the intriguing notion of how toroidal ring composition might relate to any perspective on "composing a life" -- and conceiving life as a "ring cycle" (Mary Catherine Bateson, *Composing a Life*, 1990). Within the Chinese cultural framework, the *Ba Gua* pattern, notably as extended into a circular pattern of hexagrams of the *I Ching*, offers another sense of toroidal processes (*Transformation Metaphors -- derived experimentally from the Chinese Book of Changes (I Ching) for sustainable dialogue, vision, conferencing, policy, network, community and lifestyle*, 1997).

**Chiasm:** The deconstructionist literature on invagination notably makes occasional mention of chiasmic or chiasmatic structure, as noted in the survey (Annex A). In traditional rhetoric, **chiasmus** is the figure of speech in which two or more clauses are related to each other through a reversal of structures -- a form of cross-over or criss-cross -- in order to make a larger point. As noted in Annex A, an example of such use is given by Robert Gibbons (*Transatlantic perspectives on America, The Atlantic Community*, 12 January 2008):

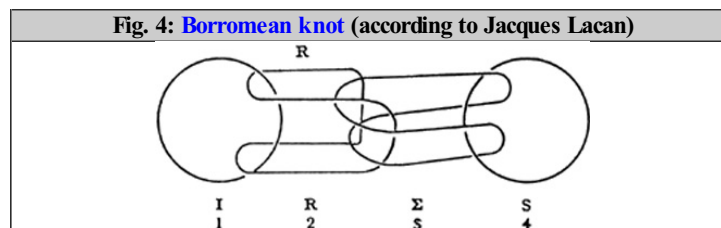
Poems such as these that are created through the process Jacques Derrida has dubbed 'double invagination' possess so much energy within their folded boundaries that text alone threatens to be unable to contain it for long. Unfolding such an invagination can in fact also be dangerous both for the author and for the unwary reader, as *the chiasmic relations concealed behind the double fold may turn out to be highly charged and potentially explosive*. (emphasis added)

In his summary, Stephen Morton (*Gayatri Chakravorty Spivak*, 2003) refers to the use of chiasmus by Theodor Adorno:

... the grammatical figure whereby the order of words in one clause is inverted in a second clause, aims to provide readers with a glimpse of the concrete historical conditions and material relations which are distorted by western knowledge and cognition. For example, the statement, *the subject is the object, the object is the subject* demonstrates how the object of thought is determined by the investigating subject. In the case of western knowledge produced about the non-western world the object of thought disappears under the weight of western representation (p. 55) (emphasis added)

Another focus of the challenge to deconstructionists of obscurantism, Jacques Lacan variously makes use of Rene Thom's topological insights. With respect to chiasm, for example, as noted by Louis Armand (*Symptom in the Machine: Lacan, Joyce, Sollers*, 2002):

For Lacan, when we attempt to untie the knot of the Real (R), the Symbolic (S), Imaginary (I), and *le sinthome* ( $\Sigma$ ), and thus divide it into four separate parts, the following figure is invariably formed:



The topological entanglement of these four elements is consequently regarded as describing (by a process of metonymy) the radical condition of language as such (and exemplified for Lacan by the paronomasia of *Finnegans Wake*). In this way, the chiasmatic perversion of symptom and **sinthome** also marks a form of transversal, across which each of the relations described above is expressly interchangeable. Mirroring the subjective determinacy of the "dialectic of identification," the movement from position 1 to position 2 can be reversed, as 2 to 1, while 3 to 4 can be reversed, as 4 to 3--just as the imaginary identification of the mirror stage operates a reversal mechanism across the Other-locus in the emergence of the signifier as marking the subject's "entrance" into the symbolic order. In other words, both the symbol and the symptom present themselves in such a fashion that either of the two terms (S or  $\Sigma$ ) takes them in their entirety, "so that the other passes over the one which is above and under the one which is below." Following from Rene Thom's theory of topological folds, Lacan argues that this doubled chiasmus is thus accorded an immanence as "the figure we regularly obtain when we attempt to separate the Borromean knot into its four parts."

What this might seem to suggest, at least in part, is that the machine in some way "returns" something to the subject. At the moment when Lacan asserts that there is not the "shadow of an ego" in the machine, he gives to the subject a recursive figuration as the I who is nevertheless "up to something in it." That is, in the machine--or we might say, as the spectral counterpart to what is left in the mirror (as its "symptom," for which the machine, as a "topological" figure, describes what Lacan will later term the sinthome): "The machine is the structure detached from the activity of the subject. The symbolic world is the world of the machine".

In the above articulation, "machine" might be usefully be understood as "global society", as typically experienced. Beyond the literary and psychoanalytical focus of Lacan, the "imaginary" and the "symbolic" can be explored as a dimension of considerable significance to global strategies (*Imagining the Real Challenge and Realizing the Imaginal Pathway of Sustainable Transformation*, 2007; *Relevance of Mythopoeic Insights to Global Challenges*, 2009).

Known also as **chiastic structure** (or ring structure), chiasm is a feature of ancient literatures including epic poetry and scriptures. Curiously the potential of epic poetry remains significantly unexplored with respect to the "global" challenges of the present time (*Poetry-making and Policy-making: arranging a marriage between Beauty and the Beast*, 1993). Concepts or ideas are placed in such ring structures in a special symmetric order or pattern to emphasize them.

Clearly chiasmic structures then have a powerful mnemonic role and are appropriately described as psychoactive -- in ways previously considered (*Psychoactive Text Warning: enneagram of precautionary attitudes*, 2007). The question is whether incorporation of chiasm into toroidal mnemonic devices can enable new modes of engagement with toroidal processes. Of potential relevance in the "cross-over" characteristic of chiasm, as employed in [optic chiasma](#), is the association it offers to the transformative switch between the two halves of [Fig. 1c](#). This particularly calls for reflection in the light of the widespread predilection for "vision" metaphors in strategic development and presentation.

More provocatively, could any life cycle -- whether of a discussion thread, an individual, a web ring, any collectivity, or a government -- be reframed in a more integrative manner through designing chiasmic structure into it? How might this relate to the cross-over characteristic of [enantiotropia](#) (*Psychosocial Energy from Polarization: within a cyclic pattern of enantiotropia*, 2007)? Also of relevance is the nature of the "cognitive twist" discussed with respect to "strange loops" (*Sustaining a Community of Strange Loops: comprehension and engagement through aesthetic ring transformation*, 2010).

## Engendering holistic integration: Borromean knots and Klein bottles?

The above arguments merit reconsideration within the context of long-standing challenges. As described separately ([Annex C](#)), these are highlighted by the improbable collaboration between psychoanalyst [Carl Jung](#) and physicist [Wolfgang Pauli](#) in co-authoring (*The Interpretation of Nature and the Psyche*, 1955 -- including *Synchronicity: an acausal connecting principle* by Carl Jung, and *The influence of archetypal ideas on the scientific ideas of Kepler* by Wolfgang Pauli). As noted above, this preoccupation is consonant with the later arguments of biologist [Gregory Bateson](#) (*Mind and Nature: a necessary unity*, 1979).

However, as noted in [Annex C](#), particularly symptomatic is the failure of communication between scientists -- even of the same discipline and with related preoccupations. This is recognized as having been especially disturbing to the physicist David Bohm, for whom the fundamental breakdown in communication between Albert Einstein and Niels Bohr was especially significant. He recognized it as a failure pervasive in modern society, engendering dangerous fragmentation (Naomi Gryn, *David Bohm and Group Dialogue -- or the interconnectedness of everything*, *The Jewish Quarterly*, Autumn 2003, pp. 93-97).

In an account of the collaboration between Jung and Pauli, physicist [Arthur I. Miller](#) (*137: Jung, Pauli, and the Pursuit of a Scientific Obsession*, 2009, and *Deciphering the Cosmic Number: the strange friendship of Wolfgang Pauli and Carl Jung*, 2009) notes Pauli's extraordinary conclusion, as one of the most eminent physicists of the century, that:

- "even the most modern physics lends itself to the symbolic representation of psychic processes"
- that there are "deeper spiritual layers that cannot be adequately defined by the conceptual concept of time" (Miller, p. 162)

Whether mathematics, physics or numerology, the problematic temptation is to generate complex "logical" correspondences inaccessible to cognitive experiential significance (*Dynamics of Symmetry Group Theorizing*, 2008).

It is in this sense that Pauli's own statement ("*even the most modern physics lends itself to the symbolic representation of psychic processes*") calls for a cautionary reservation. Any potentially sterile capacity of "**representation** of symbolic processes" does not by that token correspond to meeting the need for psychoactive **engagement** with those processes -- as discussed above in relation to enactivating "gastrulation" of "globalization". There is a corresponding reservation with respect to tendencies to imbue physics, numbers or geometry with experiential significance rendered inaccessible to others by questionable mystification. It is in this respect that, as noted above, Alan Sokal has challenged the obscurantism of deconstructionists.

**Borromean knot:** On the other hand, individuals and collectives are necessarily obliged to work with what they have and with what offers a meaningful, memorable degree of coherence -- however incomplete -- namely with explanations that "work", at least apparently to them. Of particular interest in this respect is [enactivism](#) -- what is known is brought forth, in contraposition to the more classical views of either cognitivism or connectionism -- as articulated by [Francisco Varela](#) (*The Tree of Knowledge: the biological roots of human understanding*, 1998; *Laying Down a Path in Walking: essays on enactive cognition*, 1997).


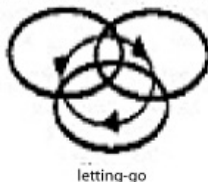

Varela's associated interest in [neurophenomenology](#) has focused on giving an explicitly naturalized account of the present nowness (in which people live) based on two complementary approaches: phenomenological analysis and cognitive neuroscience (*The Specious Present: a neurophenomenology of time consciousness*, 1997). Recognition of a "specious present" is of course consistent with Spivak's recognition of a "vanishing present" in a context of globalization (as noted in [Annex B](#)).

Varela's work has resulted in further research by neuroscientists and philosophers. As previously discussed, this involves an articulation of a [phenomenological epoché](#) using a Borromean knot (*Present Moment Research: exploration of nowness*, 2001). Whether as used by Lacan in relation to chiasm (as noted above), by Varela, or otherwise, it is tempting to see the [Borromean knot](#) as related to the challenges of contemporary governance as traditionally represented by the [Gordian knot](#) -- a metaphor for an intractable problem, only to be resolved by action whose radical nature is yet to be understood. Such a knot may be understood as corresponding to the "incompatible knot" described by psychiatrist [R. D. Laing](#) (*Knots*, 1970) -- expanding on the "double bind" hypothesis put forth by Bateson and other anthropologists. It can be readily argued that globalization has brought civilization into a double bind situation.

As discussed separately with regard to variants of the Borromean knot (*Cognitive Cycles Vital to Sustainable Self-Governance*, 2009), Varela provides a valuable review of Edmund Husserl's extensive philosophical studies of "intimate temporality", noting Merleau-Ponty's concern that "Time is not a line but a network of intentionalities" (1945, p. 479). Varela presents a four-fold model of nowness based on flows and dynamical trends.

With respect to the argument above, Varela's representation of the [phenomenological epoché](#) may be fruitfully compared compared to two other representations as in the following table (from *Present Moment Research: exploration of nowness*, 2001).

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Comparison of 3-fold articulations		
<p><b>Borromean rings</b> (notable for their topological implications, in Lacanian psychoanalysis and as an early depiction of the Christian Trinity)</p>	<p><b>Phenomenological epoché</b> (explored by Francisco Varela)</p>	<p><b>Traditional Celtic knot pattern</b> (and its associations to the mythopoeic of the megalithic period)</p>
	<p>suspension      redirection</p>  <p>letting-go</p>	

The relationship between the three cognitive "sensibilities" to which Robert Romanyshyn refers -- those of the poet, the philosopher, and the scientist -- are then usefully understood as intertwined or entangled as suggested by these representations (*Psychology is Useless; Or, It Should Be, Janus Head*, Fall 2000). Especially interesting is the sense in which any sense of a "ring" is then better understood as a dynamic or process "cycle" (see also discussions in *Psychosocial Energy from Polarization within a Cyclic Pattern of Enantiodromia*, 2007; *Conditions of Objective, Subjective and Embodied Cognition: mnemonic systems for memetic coding of complexity*, 2007).

**Personal "globalization"**: One possibility, consistent with the above arguments, is to frame the challenge of engendering holistic integration as a "personal" initiative (*Personal Globalization*, 2001), as explored under the following headings:

- Conceptual prosthetics and surrogates
- Conceptual traps and Ponzi schemes
- Globalization of experience
- Conceptual de-regulation
- Conceptual dimensions of globalization
- Reflecting the environment
- Recognizing the 'cultural rainforests' of the globalized person
- Universe, solar system, cell and atom
- Technology as metaphor
- Planetary thinking and human experience
- Globalized experience as nonlocal consciousness
- Patterns that connect
- Clues to the pattern that connects

This is then consistent with the understanding of the nested embedding of integrative initiatives, as described in [Annex B](#). This might be understood as a morphogenetic catalyst of "globalization" on a larger scale (*Future Generation through Global Conversation*, 1997)

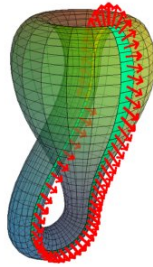
**Klein bottle**: The cognitive twists and mirrored complexity, as highlighted by the preoccupations of deconstructionists, suggest the need to go further than any such personal appropriation of "globalization", the question is then how to enactuate and engage with "invagination" and "gastrulation".

The **Klein bottle** is recognized as offering a means of giving visual expression to the paradoxical cognitive challenges of self-reflexivity and to the psychodynamics of "knowing thyself". It has been held to be the most unifying topological structure by various authors, including David Bohm and Steven Rosen (*What is Radical Recursion?*) -- as clarified by Melanie Claire Purcell (2006). Its role in this respect is consistent with arguments originally made by the psychoanalyst Jacques Lacan. Purcell, for example, sees it as integrating the characteristics of wholeness, formative causation, and an ontological bridge for comprehending consciousness through an epistemology that invokes pantheism as the most universal spiritual; construct.

From a topological perspective, the paradoxical nature of the **Klein bottle** offers interesting guidance to a more fruitfully complex process. It is characterized as having no identifiable "inner" and "outer" sides (as with the related **Möbius strip**). A representation of bottle, a 4-dimensional structure, highlights its resemblance to the invaginated embryo in which some "outside" cells have migrated to become the "inside" during gastrulation -- with a degree of continuity between inside and outside. However in the case of the Klein bottle a self-intersection is apparent in 3-dimensions which disappears in 4-D.

It is in this respect that the Klein bottle is capable of appropriately holding a degree of self-reflexivity which is not otherwise possible -- effectively a fourth "cognitive dimension". It is in this sense that "invagination", and "gastrulation" are complexified in the emergence of self-aware "globalization". This is discussed further with respect to the traditional injunction to "know thyself" (*Knowing Thyself: embodying engagement with otherness*, 2009; *Intercourse with Globality through Enacting a Klein bottle: cognitive implication in a polysensorial "lens"*, 2009). The following figures are reproduced from the latter paper.

**Fig. 5: Klein bottle**  
Konrad Polthier (*Imaging Maths: inside the Klein bottle*, +Plus Magazine, September 2003)  
View Polthier's [animated version](#) (997K) or explore his [java applet](#)



**Fig. 6: Klein bottle video**  
developed by University of Hannover ([available](#) on YouTube)

As noted there the discussion is taken further by Melanie Claire Purcell (*Towards a New E.R.A.: epistemological resolution analysis in, from and through Klein bottle wholeness and transdisciplinary education*. 2006; *Imperatives for Unbiased Holistic Education: the Klein bottle, a universal structure: an archetypal image*, 1999).

Ironically the comprehension challenge of self-reflexive globalization, represented visually by the Klein bottle, is potentially rendered far more intimately and accessibly through use of snoring as a metaphor (*Snoring of The Other: a politically relevant psycho-spiritual metaphor?* 2006).

In terms of both the Indian tradition of Advaitic philosophy and of European phenomenology, Peter Wilberg (*The Nature and Shapes of the Awareness Body*, 2006) offers interesting schematic visualizations based on "invagination", commenting as follows:

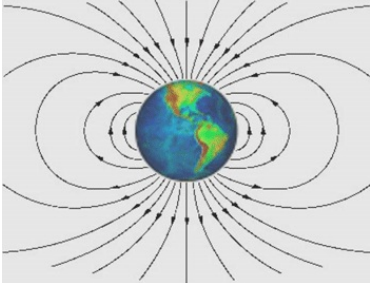
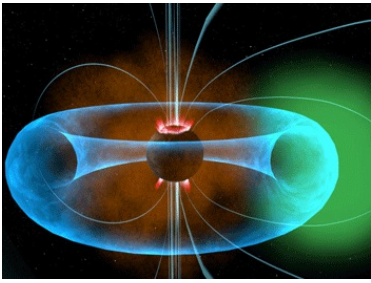
The human form of the awareness body can be best visualised by imagining a spherical balloon whose surface has been pushed in by a finger or hand to create an inner protrusion or 'invagination' of its surface - one that remains when the finger is withdrawn. It is only this inwardly protruding part of the spherical capsule - our Awareness Body as a whole - that can take the shape and form of the human body as we know it. Yet its inner awareness field is not a space fully contained and encapsulated by our physical form.... it is inwardly unbounded - leading into an unbounded field of awareness... which actually surrounds the entire circle, or spherical capsule of awareness as a whole.

It is of course in that tradition of Hindu practice that a degree of recognition is given to a toroidal-helicoidal-vortical emergence of *kundalini* (meaning coiled) -- an unconscious, instinctive or libidinal force that may, through meditation, be "raised" through various *chakras*, each mapping a particular vortex pattern of energy as a form of mandala.

It is also curious the degree to which symbolic logos -- notably of international institutions -- echo visually configurations that might be associated with the blastosphere and its invagination, as highlighted separately with respect to dialogue arenas (*Transformation of Global Governance through Bullfighting: visual symbols and geometric metaphors*, 2009). To the extent that these are representative of "global" value systems, such associations raise interesting questions about the implied attractors for any "raising" of human awareness, and the requisite of morphogenesis of such systems (*Human Values as Strange Attractors: coevolution of classes of governance principles*, 1993; *Topology of Valuing: dynamics of collective engagement with polyhedral value configurations*, 2008).

## From global to helicoidal -- from pi to phi?

The central argument above challenges the adequacy of conventional "logical" explanations inadequately supported by visual or other renderings attentive to the challenge of comprehension. Hence the inspiration of the forms and processes of nature. It is in this sense that the physical form of the globe embedded in the toroidal dynamics of an electromagnetic field offers further support for reframing "globalization" beyond the spheroidal. Integrity is then associated with a larger pattern as illustrated in the following figures.

<b>Fig. 7: Reframing the context of globalization</b>	
Indication of relationship between spheroidal and toroidal in terms of electromagnetic fields	
<p><i>Origin of the Earth's Magnetic Field</i> (Reproduced from Google Knol)</p> 	<p>Earth's magnetic field (Image by NASA)</p> 

**Fibonacci spiral:** "Global", understood as based on a sphere, is however defined geometrically by use of  $\pi$  ( $\pi$ ) -- as is any sense of circle or cycle (as discussed above). The toroidal form into which the sphere may be transformed is based on  $\pi^2$ . This association with  $\pi$  is intimately related to the cognitive sense of integration of the forms respectively represented. This has long been recognized in design and considerations of aesthetic appreciation. It is fundamental to the design of many integrative symbols and architectural forms intended to convey a sense of coherence.

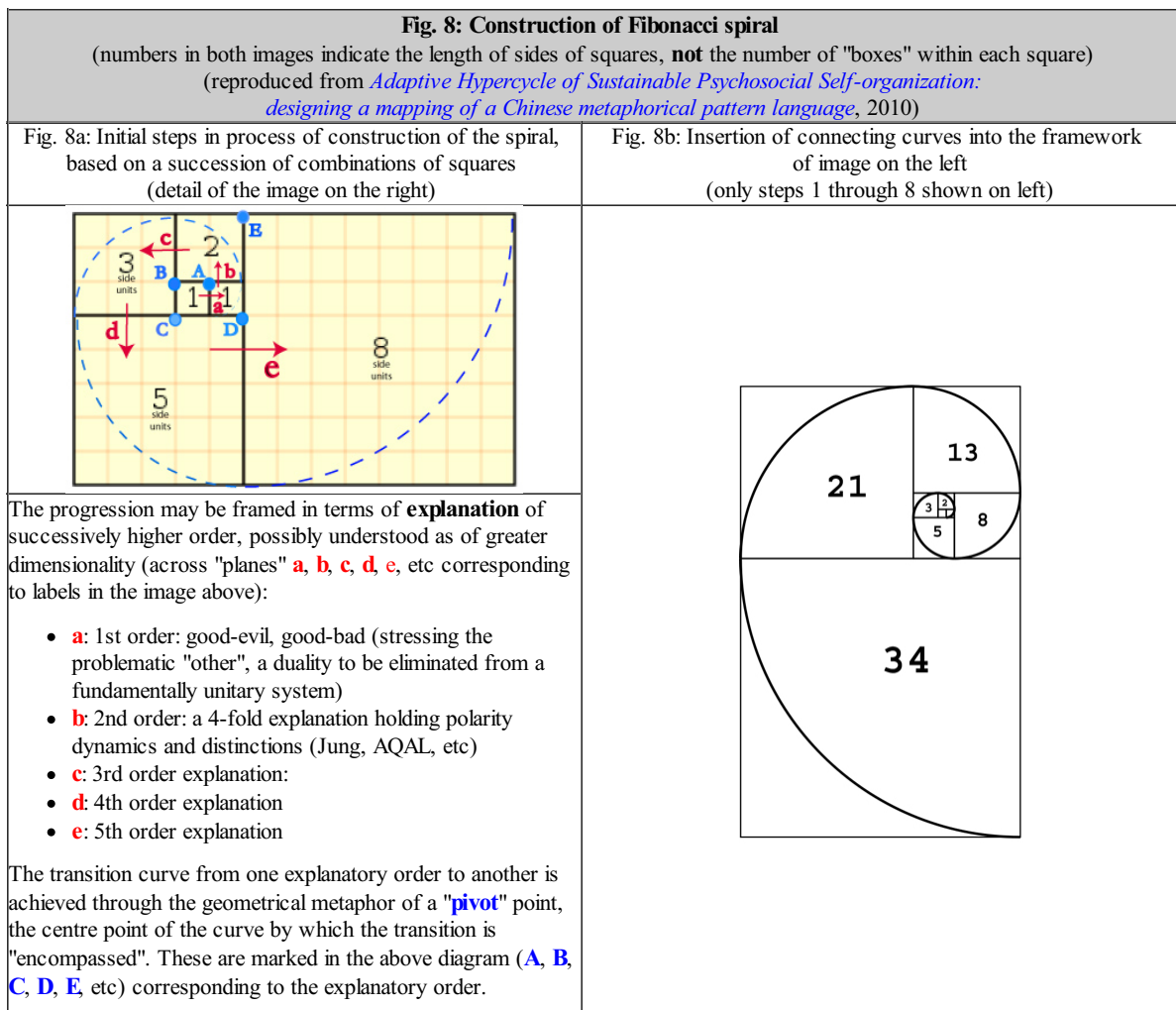
Seemingly missing from any design repertoire restricted to  $\pi$  is the well-recognized psychoactive power of design based on the [golden ratio](#) (golden mean) proportion. It is this ratio which is associated with the sense that proportions are "right" -- that they "fit" appropriately. The ratio is often denoted by the Greek letter  $\phi$ , usually lower case ( $\phi$ ). This is absent from equations defining the torus as such but is evident in helicoidal and vortical dynamics which may be intimately related to the torus (*Enabling Governance through the Dynamics of Nature: exemplified by cognitive implication of vortices and helicoidal flow*, 2010). As noted there, whilst difficult to "describe", spirals in the form of whirlpools, whirlwinds, or tornados are widely recognized in terms of their global dynamic. Spiraling structures, such as representations of the caduceus or DNA, are acceptable despite their complexity (*Climbing Elven Stairways: DNA as a macroscopic metaphor of polarized psychodynamics*, 2007).

As a proportion,  $\phi$  is fundamental to the Fibonacci spiral (mentioned above) with which design considerations for global governance might be fruitfully associated, as previously discussed (*Tao of Engagement -- Weaponised Interactions and Beyond*, 2010; *Designing Global Self-governance for the Future*, 2010). The possibility to be explored is whether  $\phi$  (unlike  $\pi$ ) is basic to a form of "conceptual packaging" constraint which is fundamental to the formulation and credibility of viable governance designs.

In this context, what is being "packed" are categories, conceptual clusters or holons as understood in the argument above as forming a "blastosphere". "Globalization" at that stage is then a process of "packing". The argument earlier is that this packing process reaches a point of psychosocial instability in its spherical "inflation". The instability can be mitigated or postponed by recluster holons into a smaller number of larger holons -- effectively detaching attention from the detail of the original holons, limiting it to the "general" and avoiding the specific. However this detachment progressively introduces a new form of instability, namely loss of credibility from the perspective of the more "local" holons. The "global" perspective thereby becomes increasingly unreal and incomprehensible from a "local" perspective.

The Fibonacci spiral may then serve as an aid to understanding this packing constraint in relation to the critical point at which the "blastosphere" is forced to undergo transformation through "invagination" and "gastrulation". In considering this possibility it is appropriate to recall that the Fibonacci spiral is associated with a diversity of patterns in nature, most notably as seen in the [nautilus shell](#). If the accumulation of holons in the "blastosphere" is understood as building up in a manner mapped by construction of a Fibonacci spiral, the question is at what stage in that accumulation (understood in terms of the development of that spiral) does the process of packing become unstable?

How, for example, might this relate to [Dunbar's number](#) -- a theoretical cognitive limit to the number of people (hypothesized at 150) with whom a person can maintain stable social relationships -- notably through "social grooming" (as discussed in [Annex B](#)).





better known point-to-set notions that characterize [topological spaces](#) (S. A. Naimpally and B. D. Warrack, *Proximity Spaces*, 1970). The quest for least energy configurations is known as the [Thomson problem](#) (in the case of electrons), or more generally as the Generalized Riesz Problem. From a psychosocial perspective, such configurations might be related to [proxemics](#), namely the study of the set measurable distances between people as they interact, as introduced by biologist anthropologist [Edward T. Hall](#).

**"Shells" of "globality"?** The possibility of instability with progressive "globalization" is also remarkably modelled by the build-up of the [electron shells](#) of atoms, as represented in the [periodic table of chemical elements](#). Of interest is the cognitive appreciation of "shell" as a geometric metaphor -- shared with the nautilus "shell" -- but especially the concentric nature of such shells with the increase in complexity of the atom. Usefully to be understood as "degrees of globality"?

One effort to generalize the pattern to encompass the psychosocial domain is that of [Edward Haskell](#) (*Generalization of the Structure of Mendeleev's periodic table*, 1972). It is also discussed in relation to a possible [periodic table of human sciences](#). An argument for using this pattern in understanding the constraints on cognitive organization has been developed separately (*Periodic Pattern of Human Knowing: implication of the Periodic Table as metaphor of elementary order*, 2009).

Of relevance are mathematical efforts to deduce the form of the periodic table (Denis H. Rouvray et al., *The Mathematics of the Periodic Table*, 2005) and even the implications for a (self-reflexive) possibility (*Towards a Periodic Table of Ways of Knowing -- in the light of metaphors of mathematics*, 2009).

Of particular interest in this periodic metaphor are the constraints on the complexity of atoms, with the build up of electron shells. With respect to such instability (and Dunbar's number), in one use of the metaphor (*Periodic Pattern of Human Life: the Periodic Table as a metaphor of lifelong learning*, 2009) the extraordinary fact is noted that:

The total number of those elements confirmed is currently 111, with unconfirmed claims made with regard to elements up to 122 (see *Timeline of chemical elements discoveries*). The oldest person in history, whose age has been verified, is [Jeanne Calment](#) (1875-1997) -- 122 years. Consideration has been given to the [extension of the Periodic Table beyond the seventh period](#), with an eight-period table suggested by [Glenn T. Seaborg](#) in 1969 -- with elements up to 210 hypothesized. These concerns parallel those of [life extension](#) into a similar number of years, notably using [strategies for engineered negligible senescence](#).

Also of interest is the seemingly controversial proposal of [Jean-Claude Perez](#) (*Mendeleev Periodic Table Prediction Equation*, 1997-2008). He sought a single mathematical equation which would organize the information of the most heterogeneous table of science -- generating and predicting its structure. Perez integrated this with explorations of a possible numerical structure of DNA, genes and genomes, the golden ratio and Fibonacci numbers laws, and subsequently proposed an *Equation of Life* (2008), as summarized in book form (*Codex Biogenesis; les 13 codes de l'ADN*, 2009).

One interesting insight in the case of chemical elements is the probable existence of so-called [islands of stability](#), namely the possibility of elements with particularly stable "magic numbers" of protons and neutrons. The numbers currently recognized include 2, 8, 20, 28, 50, 82, 126. This would allow certain isotopes of some transuranium elements to be far more stable than others; that is, to decay much more slowly -- with [half-lives](#) of possibly even of the order of millions of years. [Methuselah?](#) Enduring global civilization?

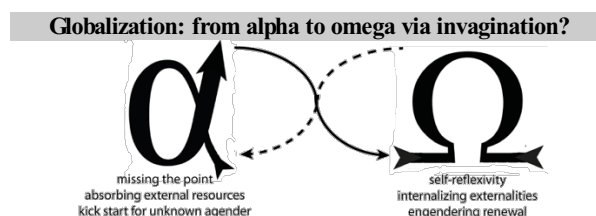
With respect to this argument, these possibilities merit consideration in the light of the [Dunbar number](#) -- a theoretical cognitive limit to the number of people (hypothesized at 150) with whom a person can maintain stable social relationships -- notably through "social grooming" (as discussed in [Annex B](#)). Might "shells of globality" correspond in some way to the "magic numbers" constituting "islands of stability"? The extensive representation of possible isotopes, suggests a means of analyzing and representing possible stable configurations of groups of different size (see the *Wikipedia Table of nuclides* and *Table of nuclides combined*).

Again however, it is the experiential comprehension of instability in "globalization" which is readily obscured by any such potentially adequate "periodic" description -- the focus on spherical shells and *pi*. With respect to any set of holons, the key issue is how many are recognizable in the sense highlighted by Dunbar's cognitive constraint -- as a partial repackaging and circumvention of the constraint of [George Miller](#) (*The Magical Number Seven, Plus or Minus Two*, *Psychological Review*, 1956)?

Again this points to some kind of self-referential constraint potentially embodied in a helicoidal structure -- the function of *phi* in the Fibonacci spiral. It is especially intriguing that the number of cells in a blastosphere is asserted to be typically 128, namely  $2^7$  -- consequent on a 7-fold process of cell division. Simulations of that process already show a degree of instability at  $2^6$  -- namely 64, upheld as significant in the Chinese binary coding system of the *I Ching* (appreciated by both Jung and Pauli, as discussed below). It is possible that the Dunbar constraint varies to a degree with the conditions of stability -- as potentially modelled by the higher shells of the periodic table.

## Quest for a "universal constant" of globalization?

As a possible further development of the above argument, some questionable insights from physics are presented separately as [Annex C](#)



## References

Andrew Abbott. *Chaos of Disciplines*. University of Chicago Press, 2001

Arun Agrawal. Sustainable Governance of Common-Pool Resources: context, methods, and politics. *Annual Review of Anthropology*, 32, October 2003, pp. 243-262 [[abstract](#)]

Christopher Alexander:

- Notes on the Synthesis of Form. 1964 [[summary](#)]
- The Nature of Order: an essay on the art of building and the nature of the universe. Center for Environmental Structure, 2003-4. [[summary](#)]
- New Concepts in Complexity Theory: an overview of the four books of the Nature of Order with emphasis on the scientific problems which are raised. 2003 [[text](#)]
- 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](#)]

Ellen T. Armour. *Deconstruction, Feminist Theology, and the Problem of Difference: subverting the race/gender divide*. University of Chicago Press, 1999

Ron Atkin:

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

David Aubin. Forms of Explanations in the Catastrophe Theory of Rene Thom: topology, morphogenesis, and structuralism," in *Growing Explanations: Historical Perspective on the Sciences of Complexity*, ed. M. N. Wise, Durham: Duke University Press, 2004, pp. 95-130. [[text](#)]

Gregory Bateson. *Mind and Nature: a necessary unity*. 1979

Nathan D. Bos, N. Sadat Shami and Sara Naab. A Globalization Simulation to Teach Corporate Social Responsibility: design features and analysis of student reasoning. *Simulation and Gaming*, 37, 1, March 2006, pp. 56 - 72 [[abstract](#)]

Judith Butler and Gayatri Chakravorty Spivak. *Who Sings the Nation-State?* Seagull Books, 2007 [[review](#)]

Nicholas Carr. *The Shallows: what the internet is doing to our brains*. W. W. Norton and Company, 2010

Alcides Castro-E-Silva and Américo T. Bernardes. Gastrulation as a Self-organized Symmetry Breaking Process. *Physica A: Statistical Mechanics and its Applications*, 352, 2-4, 15 July 2005, pp. 535-546 [[doi](#)]

Sara Cobb. Violence Invaginated: the semiotics of mass arrest in Chile. *Law and Critique*, 4, 1993, 2, pp. 131-154, [[text](#)]

Guillaume Corvus. *La convergence des catastrophes*. Diffusion International, 2004

Lance A. Davidson, M. A. R. Koehl, Ray Keller and G. F. Oster. How do sea urchins invaginate? Using biomechanics to distinguish between mechanisms of primary invagination. *Development*, 121, 2005, pp. 2005-2018.

Edward de Bono. *I Am Right, You Are Wrong: from Rock Logic to Water Logic*. Penguin, 1990

Jacques Derrida:

- Globalization, Peace, and Cosmopolitanism. In: E. Rottenberg (Ed.). *Negotiations: Interventions and Interviews 1971-2001*. Stanford University Press, 2002, pp. 371-86.
- The Law of Genre. *Critical Inquiry*, 7, 1, 1980, pp. 55-81 [[text](#)]
- Edmund Husserl's: "Origins of Geometry": an introduction. University of Nebraska Press, 1978

Jacques Derrida and Geoffrey Bennington. *Jacques Derrida*. University of Chicago Press, 1993

Jared Diamond. *Collapse: how societies choose to fail or succeed*. Viking Books, 2005 [[summary](#)]

Robin Dunbar. *Grooming, Gossip, and the Evolution of Language*. Harvard University Press, 1998 [[text](#)]

Paul Feyerabend:

- *Conquest of Abundance: a tale of abstraction versus the richness of being*. University of Chicago Press, 1999
- *Against Method: outline of an anarchistic theory of knowledge*. Verso, 1975

D. Drasdo and G. Forgacs. Modeling the Interplay of Generic and Genetic Mechanisms in Cleavage, Blastulation and Gastrulation. *Developmental Dynamics*, 219, 2000, pp. 182-191.

Thomas Friedman. *The World Is Flat: a brief history of the Twenty-First Century*. Farrar, Straus and Giroux, 2005 [[summary](#)]

Malcolm Gladwell. *The Tipping Point: how little things can make a big difference*. Little Brown, 2000 [[summary](#)]

Susantha Goonatilake. *Toward a Global Science: mining civilizational knowledge*. Indiana University Press, 1999

Richard Grossinger, Phoebe Gloeckner, Jillian O'Malley. *Embryogenesis: species, gender, and identity*. North Atlantic Books, 2000

Kathy Hall. Richard Milner and Stuart Pivar. *Self-Organization and Gene Regulation*. In Stuart Pivar. *On the Origin of Form: evolution by self-organization*. North Atlantic Books, 2009. pp. 81-106

Edward Haskell. Generalization of the Structure of Mendeleev's periodic table. In: E. Haskell (Ed.), *Full Circle: The Moral Force of Unified Science*. New York, Gordon and Breach, 1972 [text]

N. J. Hitchin. Harmonic Maps from a 2-Torus to the 3-Sphere. *Journal of Differential Geometry*, 31, 1990, pp. 627-710 [text]

Douglas Hofstadter:

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

Nancy J. Holland. *Feminist Interpretations of Jacques Derrida*. Penn State Press, 1997

Thomas Homer-Dixon. *The Upside of Down: catastrophe, creativity, and the renewal of civilization*. Knopf, 2006 [summary]

William S Huff. Homonym, Homonym and Homonym, and Other Word Pairs. *Symmetry: Culture and Science*, vol 3, 1. (Paper to the Second Symposium of the International Study of Symmetry, Hiroshima, 1992)

Valeria Isaeva, Eugene Presnov and Alexey Chernyshev. Topological Patterns in Metazoan Development. *Bulletin of Mathematical Biology*, 68, 2006, pp. 2053-2067 [abstract]

Jamie James. *The Music of the Spheres: music, science and the natural order of the universe*. Grove Press, 1993

Carl G. Jung:

- The Archetypes and the Collective Unconscious. Princeton University Press, 1981
- Synchronicity: an acausal connecting principle. Princeton University Press, 1973

Carl Jung and Wolfgang Pauli. *The Interpretation of Nature and the Psyche*. Routledge and Kegan Paul, 1955

Ray Keller, Lance A. Davidson and David R. Shook. How We are Shaped: the biomechanics of gastrulation. *Differentiation*, 71, 2003, pp. 171-205 [text]

Albert Khazan. On the Geometry of the Periodic Table of Elements. *Progress in Physics*, 4, 2010, October, pp. 64-65 [text]

Myung-Soo Kim and Kyungho Oh. Torus/Sphere Intersection Based on a Configuration Space Approach. *Graphical Models and Image Processing*, 60, 1, January 1998, pp. 77-92 [abstract]

Jen Kosakowski. Singing the State in all Its Forms (Review of: Judith Butler and Gayatri Spivak, Who Sings the Nation-State?) *Journal of Global Change and Governance*, 1, 2, Winter 2007 [text]

Philippe Lacorre. Sur un nouveau type de représentation catastrophiste pour les modélisations en biologie et sciences cognitives. *Intellectica*, 1997/1, 24, pp. 109-140 [text]

George Lakoff and Mark Johnson. *Philosophy in the Flesh: the embodied mind and its challenge to western thought*. Basic Books, 1999

Ervin Laszlo. *Planetary Consciousness: our next evolutionary step*. Club of Budapest [text]

Hilary Lawson:

- Reflexivity: the post-modern predicament. HarperCollins, 1986
- Closure: a short history of everything, Routledge 2002 [summary]

Chaorong Li, Ailing Ji, and Zexian Cao. Stressed Fibonacci spiral patterns of definite chirality. *Applied Physics Letters* 90, 2007, 164102

Chaorong Li, Xiaona Zhang and Zexian Cao. Triangular and Fibonacci number patterns driven by stress on core/shell microstructures. *Science*, 309, 2005, 909 2005.

Victor Li. Elliptical Interruptions Or, Why Derrida Prefers Mondialisation to Globalization. *CR: The New Centennial Review*, 7, 2, 2007, pp. 141-154 [text]

David Lindorff. *Pauli and Jung: the meeting of two great minds*. Quest Books, 2004

Bruce H. Lipton. *The Biology of Belief: unleashing the power of consciousness, matter and miracles*. Hay House Inc, 2005

Arthur I Miller:

- 137: Jung, Pauli, and the Pursuit of a Scientific Obsession. W. W. Norton, 2009
- Deciphering the Cosmic Number: the strange friendship of Wolfgang Pauli and Carl Jung. W. W. Norton, 2009

Stephen Morton. *Gayatri Chakravorty Spivak*. Routledge, 2003 [text]

S. A. Naimpally and B. D. Warrack. *Proximity Spaces*. Cambridge University Press, 1970

Stuart Pivar. *On the Origin of Form: evolution by self-organization*. North Atlantic Books, 2009

- Timothy Poston and Ian Stewart. *Catastrophe Theory and its Applications*. Courier Dover Publications, 1996
- Graham Priest. Derrida and Self-reference. *Australasian Journal of Philosophy*, 72, 1, March 1994, pp. 103 - 111
- Melanie Purcell. Imperatives for Unbiased Holistic Education: the Klein bottle, a universal structure: an archetypal image. 1999 [text]
- Nicholas Rescher. *The Strife of Systems: an essay on the grounds and implications of philosophical diversity*. University of Pittsburgh Press, 1985
- Guillermo Restrepo, Héber Mesa, Eugenio J. Llanos, and José L. Villaveces. Topological Study of the Periodic System, *J. Chem. Inf. Comput. Sci.*, 2004, 44 (1), pp. 68-75 [abstract]
- Magnus Röding. *Monte Carlo Studies of Blastulation and Gastrulation*. 2007 [text]
- Steven M. Rosen:
- *Topologies of the Flesh: a multidimensional exploration of the lifeworld*. 2006 [text]
  - *Dimensions of Apeiron: a topological phenomenology of space, time, and individuation*. 2004 [text]
- Denis H. Rouvray and R. Bruce King (Eds.). *The Mathematics of the Periodic Table*. Nova Science Publishers, 2005 [contents]
- Ian R. Sanderson and W. Allan Walker. *Development of the Gastrointestinal Tract*. PMPH-USA, 1999
- John Ralston Saul. *The Unconscious Civilization*. Free Press, 1995
- Alan Sokal:
- *Transgressing the Boundaries: toward a transformative hermeneutics of quantum gravity*. *Social Text*, 46/47, 1996, pp. 217-252 [text]
  - *Beyond the Hoax: science, philosophy, and culture*. Oxford University Press, 2008 [summary]
- George Spencer-Brown. *Laws of Form*. Allen and Unwin, 1969
- Gayatri Chakravorty Spivak:
- *A Critique of Postcolonial Reason: toward a history of the vanishing present*. Harvard University Press, 1999 [review]
  - *Other Asias*. Wiley-Blackwell, 2007
  - *In Other Worlds: Essays in Cultural Politics*. Routledge, 1987
  - *The Post-Colonial Critic: Interviews, Strategies, Dialogues*. Routledge, 1990.
  - *Displacement and the Discourse of Woman*. In: Mark Krupnick (Ed.). *Displacement: Derrida and After*. Indiana University Press, 1983, pp. 186-189
- Garrison Sposito. Does a generalized Heisenberg Principle operate in the social sciences? *Inquiry*, 12, 1969, 3, pp. 356-361
- Claudio D. Stern. *Gastrulation: from cells to embryo*. CSHL Press, 2004
- Ian Stewart. *Broken Symmetries and Biological Patterns*. Sanjeev Kumar and Peter J. Bentley (Eds.). Elsevier Academic Press, 2003, pp. 181-183
- E. R. Swart. The Philosophical Implications of the Four-color Problem. *American Mathematical Monthly*, 87, 1980, (9), pp. 697-702 [doi]
- Ulrich Technau and Corinna B. Scholz. Origin and Evolution of Endoderm and Mesoderm. *International Journal of Developmental Biology*, 47, 2003, pp. 531-539 [text]
- Rene Thom. *Structural Stability and Morphogenesis*. W. A. Benjam, 1972
- Francisco Varela:
- *Laying down a path in walking*. In W. Thompson (Ed.), *Gaia: A way of knowing*. (pp. 48-64). Lindisfarne Press, 1987.
  - *Laying Down a Path in Walking: essays on enactive cognition*. Zone Books/MIT Press, 1997
- Francisco Varela and Humberto Maturana. *The Tree of Knowledge: the biological roots of human understanding*, Shambhala, 1998
- Francisco Varela, E. Thompson and E. Rosch. *The embodied mind: Cognitive science and human experience*. MIT Press, 1991.
- B. Vasiev, A. Balter, M. Chaplain, J. A. Glazier and C. J. Weijer. Modeling Gastrulation in the Chick Embryo. *PLoS ONE* 5(5), 2010 [abstract]
- B. L. Underwood. *The Lost Symmetry of the Blastosphere* [audio]
- L. Wolpert. Gastrulation and the Evolution of Development. *Development*, 1992, Supplement, pp. 7-13 [text]
- Maurice Yolles. *Knowledge Cybernetics: a new metaphor for social collectives*. *Intellect*, 3, 2006 [text]
- Maurice Yolles and Paul Iles. The Knowledge Cybernetics of Culture: the case of China. *International Journal of Knowledge and Systems Sciences*, 3, 4, December 2006 [text]
- E. C. Zeeman. *Catastrophe Theory: Selected Papers 1972-1977*. Addison-Wesley, 1977
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