



# laetus in praesens

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23rd December 2007 | Draft

## In Quest of Mnemonic Catalysts for comprehension of complex psychosocial dynamics

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Annex to *Imagining the Real Challenge and Realizing the Imaginal Pathway of Sustainable Transformation* (2007)

### Afterthoughts

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## Introduction

The diagrams (Figure 1, elaborated in Figure 2) in the main paper are an effort to hold within a single framework a number of strategic dimensions and dynamics descriptive of the contemporary challenge. They endeavour to interrelate the problematique, resolutique, "imaginatique" and "irresolutique". This poses a challenge to comprehension.

The arguments for identifying the following mnemonic aids were articulated for a meeting on Forms of Presentation (Geneva, 1980) of the Goals, Processes and Indicators of Development project of the United Nations University (*Minding the Future: thought experiment on presenting new information*, 1980). It is to be expected that different aids would appeal, or not, to different people to a different degree. The items included below are therefore necessarily indicative of possibilities rather than definitive. The principal criterion is the ability to facilitate understanding.

## Fish-pond dynamics

The operation of each of the four attractors may be visualized in an interesting manner by hundreds of fish circling continuously throughout their lives in a circular (salmon) pond (or tank). It might be argued that:

- in engaging in that movement each fish "imagines" it is getting somewhere in pursuit of an "imagined" objective -- as in the **imaginatique** attractor [It has been noted that even with the smallest carp pond with only a single fish, placing a rock in the middle of the pond provides the fish with the illusion that by continuing to swim "between the banks" it is moving along a stream, around the rock -- whereas without the rock it remains unhealthily unmoving at the centre of the pond]
- in their actively competitive relationship with each other in the course of that movement, jostling for a degree of competitive advantage -- as in the game-playing of the **irresolutique**. [Of potential significance is the mathematical modelling of thematic academic discussion groups and institutional committees by Ron Atkin (*Combinatorial Connectivities in Social Systems: an application of simplicial complex structures to the study of large organizations*, 1977), in which a central undiscussed point functions like the rock in the carp pond -- as a focus around which unresolved communication circles, *Social organization determined by incommunicability of insights*]

By extension it might be argued that this circular dynamic is evident:

- in the "vicious" feedback loops (cf *Vicious cycles and loops; Examples of vicious problem cycles and loops*), and the associated dynamic, intrinsic to the **problematique**, and well-characterized by the complex of interrelated problems that emerge in intensive fish farming. [Again appropriately modelled by the cognitive avoidance analyzed by Atkin, ensuring that they function like a psychodynamic tunnel whose pattern as a whole is not recognized as meaningful]
- in the "serendipitous" feedback loops (cf *Feedback loops and co-arising*) potentially intrinsic to the **resolutique**, both as a strategic response to the problematique and in the "spin" with which the response may be imaginatively reframed to imply its success -- perhaps well-characterized by the marketing "spin" associated with the widespread promotion of farmed salmon for consumption, despite concerns regarding the unhealthy qualities of the product so produced.

As a mnemonic aid, intensive fish farming raises useful questions regarding the extent to which human populations may be increasingly understood as "intensively farmed" -- in relation to the pattern of four attractors. Of particular interest are the implications of susceptibility to disease (cf *Scare over farmed salmon safety*) and of imbalance arising from difficult-to-control systemic interdependencies.

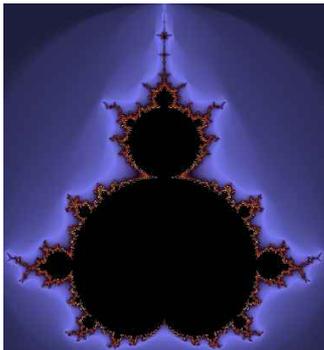
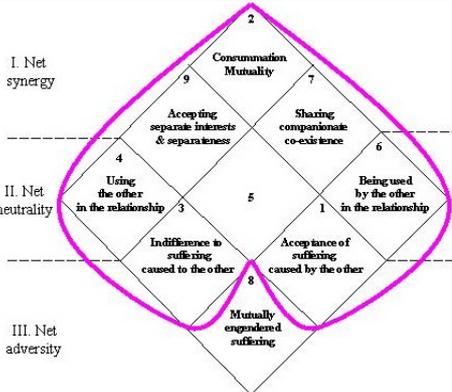
Are there other strategic options to transform and transcend such psychodynamics -- or is this a pattern into which humanity is entrapping itself? It is sobering to note the recognition of this pattern before the fall of the Roman Empire through the expression "**bread and circuses**" -- a phrase curiously reflected in fish-tank dynamics -- with **Figure 2** then to be understood as a "four ring circus", rather than the traditional "three ring circus".

Ironically parallels with contemporary energy dependencies in the Roman Empire have been admirably documented by **Thomas Homer-Dixon** (*The Upside of Down: catastrophe, creativity, and the renewal of civilization*, 2006). In cybernetic terms, such an analysis could be reframed in terms of information dependencies of which the degree of information overload and information underuse is symptomatic. Inadequacies of vaunted "feedback" loops, whether in the "checks and balances" of democratic processes or of interactions with bureaucratic systems, are epitomized by waiting times on help lines for commercial products and emergency services. **Fault intolerance** is increasingly undermining the capacity of systems to degrade gracefully under conditions of failure -- as required by the resilience for which Homer-Dixon argues so strongly.

## WH-questions and non-linear dynamics

In terms of the distinct types of **WH-questions**, and an exploration of the correspondence of three of them to the umbilic catastrophes (**hyperbolic**, **elliptic** and **parabolic**) of **catastrophe theory**, the "hyperbolic" feature of **Figure 2** ("what" question?), may be understood as a base for a potentially emergent "ellipsoid" zone of sustainability ("who" question?) in the upper-right quadrant -- itself a base for a "paraboloid" zone ("why" question?) as discussed in *Toward a new typology of dialogue -- based on the "Grail chalice" proto-model* (2006).

Whether such speculative explorations are of greater than mnemonic significance or not, they may imply intriguing relations to the logic of set theory -- framing the challenge "imaginatively" in a manner that honours the complexity of non-linear dynamics. In that spirit **Figure 2** might be associated mnemonically with the challenges implied by the following formal representations -- to which people may variously relate as symbols.

Fig. 3: Comparison of Mandelbrot set, transactional games and a chalice format		
Fig. 3a: Rendering of Mandelbrot set	Fig. 3b: Transactional game patterns defining a coercion cardioid	Fig. 3c: "Chalice" representation
<p>(from <i>Sustainability through the Dynamics of Strategic Dilemmas in the light of the coherence and visual form of the Mandelbrot set</i>, 2005).</p> <p>[This representation raises useful questions regarding the relationship between "real" and "imaginary". NB; Each of the types of protrubance corresponds to an attractor of different periodicity: cardioid, 1; upper "bulb", 2; extreme left and right, 3; etc]</p>	<p>(from <i>Cardioid Attractor Fundamental to Sustainability: 8 transactional games forming the heart of sustainable relationship</i>, 2005, notably based on the work of Edward Haskell on the coercion cardioid and its adaptation by Timothy Wilken, <i>The Relationship Continuum</i>, 2002)</p>	<p>(from <i>Interrelating Cognitive Catastrophes: implications of WH-questions for self-reflexivity and dialogue</i>, 2006)</p>
		

## Martial arts

In the quest for interesting mnemonics, the five ring structure of [Figure 2](#) may link to the strategic insights for combat on any scale offered by the famed *Book of Five Rings: the classic guide to strategy* (*Go Rin No Sho*) of [Miyamoto Musashi](#). This may point to ways of understanding the interwoven pathways between the different elements of [Figure 2](#) in terms of other martial arts such as aikido -- or some forms of dance. The cognitive significance of such disciplines has been discussed elsewhere (*Ensuring Strategic Resilience through Haiku Patterns: reframing the scope of the "martial arts" in response to strategic threats*, 2006).

## Symbol systems and playing cards

The formal structure of [Figure 2](#) is also closely related to that of the [lauburu](#) (or Basque cross) as discussed in relation to climate change (*Playful exploration of ecopsychological embodiment of climate change pathways*, 2005). They may offer ways of holding what has been described as the "cognitive twist" associated with the process of enantiodromia (*Psychosocial Work Cycle: beyond the plane of Möbius*, 2007).

The challenge of widespread communication of the pattern of four attractors might be usefully associated with the symbols characteristic of widely used sets of playing cards. There is even a case for recognizing their degree of resemblance to the [fold](#), [cusp](#), [swallowtail](#) and [butterfly](#) catastrophes. This would respect popular legends according religious or metaphysical significance to four-fold systems of fundamental categories through [playing cards](#) (cf International Playing-Card Society, *History of Playing-Cards*, 2000). A case might then also be made for recognizing the "court cards" as representing the umbilic catastrophes ([hyperbolic](#), [elliptic](#) and [parabolic](#)) of catastrophe theory. The four "suits" might then conveniently represent the contrasting perspectives on the "higher order" umbilic catastrophes.

The merit of associating fundamental strategic challenges with widely understood popular processes of play has been argued elsewhere (*Playfully Changing the Prevailing Climate of Opinion: climate change as focal metaphor of effective global governance*, 2005).

## Resilience

Such structures point to interesting ways of representing the [adaptive cycle](#), notably as promoted by the Resilience Alliance. The precautionary strategic importance of resilience has recently been stressed in the synthesis by [Thomas Homer-Dixon](#) (*The Upside of Down: catastrophe, creativity, and the renewal of civilization*, 2006). The development of the concept is summarized by [Aura Reggiani](#), [Thomas De Graaff](#) and [Peter Nijkamp](#) (*Resilience: an evolutionary approach to spatial economic systems, Networks and Spatial Economics*, June 2002).

Also of interest are discussions of the relationship between resilience (as "jumping back") and [consilience](#) (as "jumping together") raised by [Mark Safranski](#) and [Stephen F. DeAngelis](#) (see *Discussion of Resilience and Consilience in Social Networks*, 2005; *SOA, Resiliency and Consilience*, 2006) which make the points:

- **Survivability:** Like resilience, a high degree of consilience in a network would be likely to improve the network's longitudinal prospects by adapting efficient non-zero sum Rule-sets.
- **Influence:** By adapting principles, practices and concepts that other networks find analogous to their own, the message of the network has more memetic appeal by virtue of being more readily comprehensible.
- **Compatibility:** As with communication and influence, common Rule-sets make potential cooperation, alliances and mergers with other networks more likely as well as more harmonious.
- **Adaptability:** Members of networks with a consciously consilient culture are more apt to themselves become better horizontal and creative thinkers. Their [OODA cycle](#) (*Observe, Orient, Decide and Act*) may be faster because they are all -- collectively and individually -- seeing farther and to wider horizon.

## Consilience

The term consilience may be understood as a form of unity of knowledge (literally a "jumping together" of knowledge) with its roots in a classical Greek concept of the intrinsic orderliness that governs the cosmos, inherently comprehensible by appropriate logical processes. It highlights the challenge of the form of understanding capable of interrelating the sciences both amongst themselves and with the humanities. It responds to the challenge of the degree of coherence and connectivity required for credibility as variously explored by theories of correspondences, separately within the sciences and the humanities, and between them (*Theories of Correspondences -- and potential equivalences between them in correlative thinking*, 2007)

Use of the term was revived by [Edward O. Wilson](#) (*Consilience: the unity of knowledge*, 1998) in the quest for the basis of "a conviction, far deeper than a mere working proposition, that the world is orderly and can be explained by a small number of natural laws." In relation to the seemingly incommensurable processes framed by [Figure 2](#), consilience might then be described as the challenging mode of understanding the "pattern that connects" them together. In this sense it is a requisite mode of insight for enactivating the pattern that connects such as to sustain a form of cognitive integrity in travelling through the twists of the adaptive cycle necessary for resilience (*Walking Elven Pathways: enactivating the pattern that connects*, 2006). More speculatively, faced with systemic collapse, it might be related to the sense of "grokking" (cf *Authentic Grokking: emergence of Homo conjugens*, 2003).

## Five-fold pattern

Again this requirement may confirm the importance of a "fifth perspective" as some form of attractor through whose associated processes "value" or "quality" is recognized or imbued in the "pattern that connects".

Figure 2 emphasizes a pattern of processes necessitating a form of [process thinking](#) rather than a static mode of understanding. Hence the merits of the insights from flow in the Eastern martial arts and in the OODA loop (*Observe, Orient, Decide and Act*) of military strategy and team sport (Toby Edison, *Rugby and the OODA Loop*). The latter suggests a potentially interesting correspondence to the traditional Chinese philosophical understanding of the five elements or phases (*Wu Xing*), as mentioned above, where these are descriptors of dynamic interactions and relationships between phenomena -- and as such are significant to Eastern martial arts. Reed Burkhart (personal communication) suggests that the cognitive processes of aikido might be understood as the action verb of consilience -- otherwise inappropriately understood statically as a noun.

Of potentially related significance is the experimental adaptation of the work of [Christopher Alexander](#) (*A Pattern Language*, 1977) into a *5-fold Pattern Language* (1984).

## Beyond two-dimensional representations

The fact that [Figure 2](#) has four "axes" also suggests the need to think beyond their projection into two dimensions as a flat map. Clearly the interrelated processes are better understood as being represented on a complex surface. Hence the merit of the pointer above to catastrophe theory (and [Figure 3c](#)) -- especially given the possibility of civilizational catastrophe resulting from various kinds of overshoot and resilient inadequacy for the challenge of smoothly navigating the later phases of the adaptive cycle. There are several potentially useful ways of understanding the cognitive challenge:

- the insights into fundamental polarities offered by the conventional symbol of the Tao can be considered as a two-dimensional projection of a more complex relational surface, notably the [Klein bottle](#), as holding the higher dimensionality probably required for sustainable sharing (cf discussion in *Snoring of The Other: a politically relevant psycho-spiritual metaphor?* 2006). Of particular interest in this connection is the understanding of the "eyes" of that symbol as cognitive "wormholes" through to the reversed condition. The 4 attractors of [Figure 2](#) might then function in some respects in this way: resolutique  $\diamond$  problematique and imaginatique  $\diamond$  irresolutique (game-playing).
- given the role of particular mathematical forms, termed [orbifolds](#), in ordering musics in human cognition (Dmitri Tymoczko, *The Geometry of Musical Chords*, *Science*, 313. 5783, 7 July 2007, pp. 72 - 74), it is intriguing that orbifolds have a recognized role with respect to the subtleties of connectivity within group theory (Michael P. Tuite, *Monstrous Moonshine from Orbifolds*, 1992). Elsewhere these mathematical forms were explored as a key to ordering patterns of (typically incommensurable) beliefs (*Systematic Visual Representation of Musical Possibilities on an Orbifold*, 2007)? The challenge of those subtleties of connectivity -- whether from a perspective of the sciences, the humanities or both -- has been summarized separately (*Theories of Correspondences -- and potential equivalences between them in correlative thinking*, 2007)

## Möbius transformations

For mathematicians, [Möbius transformations](#) are functions that send each point on a complex plane (with real and imaginary axes) to a corresponding point somewhere else on the plane, either by rotation, translation, inversion, or dilation (see illustrative java applets: [transformation of fixed points](#), [iterated application to a circle](#)). Douglas N. Arnold and Jonathan Rogness have developed a widely appreciated video to illustrate these processes (*Möbius Transformations Revealed*, 2007), awarded in the annual *Science and Visualization Challenge* (*Science*, 2007). This took advantage of the fact that a Möbius transformation may be achieved by performing a [stereographic projection](#) from a plane to a sphere, rotating and moving that sphere to a new arbitrary location and orientation, and performing a stereographic projection back to the plane.

As helpfully discussed by Julie J. Rehmeier (*A Video That's Worth a Million Words*, *MathTrek*, 2007), the video clearly illustrates how the processes transform a square grid, but as she says:

Next comes the video's magical step. The mathematicians move into the third dimension to provide a way of visualizing the Möbius transformations. They suspend a sphere above the plane and use it a bit like a slide projector. They put a picture onto the sphere, and a light at the top of the sphere shoots an image of the picture down onto the plane. The picture on the sphere is shaped in such a way that when the light projects the image onto the plane, it forms the original square.

The key to the success of the explanation lies in the understanding then enabled through various different movements of the sphere. The sphere is in this case a representation of the [Riemann sphere](#), namely the complex number plane wrapped around a sphere through stereographic projection. The Riemann sphere is important in mathematics as a way of extending the plane of complex numbers with one additional point at infinity (cf David Mumford, Caroline Series and David Wright, *Indra's Pearls: The Vision of Felix Klein*. Cambridge University Press, 2002).

Of relevance to the above argument is whether such a video effectively provides a powerful way of understanding the subtle relationships between the features of [Figure 2](#) (as "the square") in the light of the role of a third dimension (a "fifth perspective"), from which those features are viewed (the "sphere"). It is the particular "movements" of that sphere that transform the relations between the elements of [Figure 2](#) -- thereby indicating how they may be variously understood. **Can such transformations then be understood as cognitive transformations in understanding of the various possible relationships between "problematique", "resolutique", "imaginatique" and "irresolutique"?** The sphere also then suggests interesting ways of understanding the coherence of the "identique".

Of related interest are the explorations of the relationship between such transformations and the classical studies of biologist [D'Arcy Wentworth Thompson](#) (*On Growth and Form*, 1917/1961) regarding animal forms (see for example *Using a computer to visualise*

*change in biological organisms*, 2000). These suggest the possibility of using such transformations to distinguish between cognitive frameworks as variously perceived to be "distorted" with respect to one another.

## Catastrophe revisited

It is interesting that the Möbius transformations are classified into four forms: hyperbolic, loxodromic (a special case of hyperbolic), elliptic and parabolic. This classification recalls that of **elementary catastrophes**: those of one active variable or behavioural axis (fold, cusp, swallowtail and butterfly) and those of two active variables or behavioural axes (hyperbolic, elliptic, parabolic). As noted above, the cognitive implications of catastrophe theory are separately discussed in relation to WH-questions (*Conformality of 7 WH-questions to 7 Elementary Catastrophes: an exploration of potential psychosocial implications*, 2006). That concern with "questions" might be usefully extended to the cognitive implications of the strategic challenges (and dilemmas) associated with the "problematique", "resolutique", "imaginatique" and "irresolutique" as variously understood.

The dimensions common to catastrophe theory might be understood as significant given the probability of **societal catastrophe** and civilizational collapse (Thomas Homer-Dixon, *The Upside of Down: catastrophe, creativity and the renewal of civilization*, 2006; Jared M. Diamond, *Collapse: How Societies Choose to Fail or Succeed*, 2005) and the possibility that their precursor might take the form of a "cognitive catastrophe" of some kind, perhaps as intimated by John Ralston Saul (*Unconscious Civilization*, 1995). As noted above, Homer-Dixon in particular calls for recognition of the importance of resilience in the adaptive response to any such collapse. The question is how best to understand its cognitive requirements.

An initial exploration of the cognitive implications of the Möbius transformations might include associating:

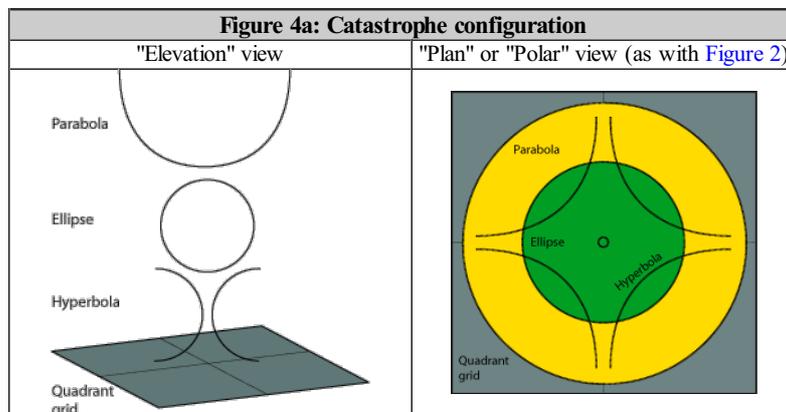
- **hyperbolic transformations** with the two mirrorings "in the plane" between problematique and resolutique and between imaginatique and irresolutique, especially where the dynamics of any such mirroring or shadowing were not consciously (collectively) recognized (as is characteristic of the mirror self-recognition criterion of consciousness) -- such an association might be fruitfully associated with one kind of cognitive catastrophe
- **elliptic transformations** with the more integrative perspective -- "within the sphere" (of an identique) -- in which the four attractors of [Figure 2](#) (problematique, resolutique, imaginatique and irresolutique) are then consciously held (collectively) within a polarized context, especially in terms of the dynamics of the dilemmas associated with them
- **parabolic transformations** with the flexibility of the perspective of the "point at infinity" in terms of which the sphere may be moved to engender (and interrelate) different projections on the plane.

The distinction between elliptic and parabolic transformations points to contrasting cognitive challenges of understanding the integrative dynamics that are a requisite of sustainability. More (potentially dangerous) simplistic understandings -- of any of the attractors in isolation -- might be associated with the simpler catastrophes (fold, cusp, butterfly and swallowtail). These distinctions, symbolized in [Figure 3c](#), are separately explored (*Interrelating Cognitive Catastrophes: implications of WH-questions for self-reflexivity and dialogue*, 2006)

**The question is however to what degree the association of Möbius transformations with elementary catastrophe facilitates individual and collective understanding of cognitive discontinuities -- notably as required by the resilient phase of the adaptive cycle.**

## Configuring catastrophes

The cognitive catastrophes might be usefully configured in [Figure 4](#) to indicate various challenges to understanding the dynamics, notably by positioning them in relationship to (and in contrast with) Ken Wilber's **AQAL** framework.



**Figure 4b: Bases for presentation of insights (incomplete)**

class of	insights variously based on	Dimensionality / Rotation			
		2D	3D (rotation of 2D)	4D (hyper)	nD (hyper)
quadrant	<a href="#">Figure 2</a> ; AQAL	cube	hypercube	.	.
hyperbolic	complementarity; (axes of) symmetry; polarization ("demonisation"); challenges of "unconscious" implications and " <b>hyperreality</b> "	hyperbola	hyperboloid	.	.

elliptic	integrative "struggle" ("jostling", <a href="#">syntegration</a> ) between perspectives; <a href="#">viable system model</a> (VSM); inter-faith, inter-sectoral, interdisciplinary; polyhedral configuration (circular pathways); systemic integrity; emergence of bounded identity (cf <i>Emergence of Cyclical Psycho-social Identity: sustainability as "psychically" defined</i> , 2007; <i>Hyperspace Clues to the Psychology of the Pattern that Connects</i> , 2003)	ellipse, circle	sphere	hypersphere.
parabolic	extradimensional "union" and focus; meta-perspective; faith-based (fundamentalist); transdisciplinary; transcendental; <a href="#">Theory of Everything</a> ; self-awareness, intentionality	parabola	paraboloid	.

Positioning the AQAL quadrant system as shown, makes the point that comprehension of its features (looking downwards) may occur from different "levels": from a "hyperbolic" perspective (emphasizing complementarity); from an "elliptic" perspective (endeavouring to integrate all 4 quadrants); or from a parabolic perspective -- with external integrative (even transcendental) referents.

## Wu Xing (5-element theory) revisited

It is from the complexity of the parabolic perspective that, within a Chinese cultural metaphor, the integrative dynamics of the 5 *Wu Xing* elements mentioned above might be most fluidly interrelated -- as opposed to the more "cumbersome" management of a set of polarized relationships within the elliptical context. All the transformations might then be understood in terms of the subtleties of holding (containing), transforming and enhancing [qi energy](#) and the possibility of its loss, degradation or quenching. This might then be understood as one example of a non-western understanding of sustainability.

An insightful discussion of these issues, and the challenge of associated poorly informed fantasies, is provided by N. J. Girardot, James Miller, and Liu Xiaogan (*Religions of the World and Ecology Series: Daoism and Ecology Volume*, Center for the Study of World Religions of Harvard Divinity School, 2001) who note:

Too much has been simply, and sometimes fantastically, taken for granted about what is finally quite elusive and problematic -- both concerning the wonderfully "mysterious" tradition known as Daoism and, in this case, the "natural" confluence of Daoism and contemporary ecological concerns.

As one experimental attempt to relate the complex subtlety of such traditional insights to current policy concerns, note the set of 64 insights (and their 384 relationships) adapted from the *I Ching* (*Documents relating to Sustainable Policy*, 2006) -- linked to equivalent sets elaborated for sustainable: [lifestyle](#), [community](#), [networking](#), [dialogue](#), [conferencing](#), and [vision](#). Hypergraphs have been used as one possibility of exploring these complexes of relationships (*Mapping Songlines of the Noosphere: use of hypergraphs in presentation of the I Ching and the Tao te Ching*, 2006)

Could the non-linear dynamics of such transformational relationships be fruitfully understood as different kinds of (cognitive) catastrophe that require particular skills to "surf" in order to avoid being trapped by their discontinuity? It is appropriate to recall the insight of [Geoffrey Vickers](#) (*Freedom in a Rocking Boat; changing values in an unstable society*. 1970): "A trap is a function of the nature of the trapped".

## 4-wheeled drive vehicle

Another mnemonically useful approach is to associate the elements of [Figure 4](#), and of [Figure 2](#), with the construction and operation of a vehicle:

- **wheels**: the four attractors of [Figure 2](#) may be seen as the "wheels" of such a vehicle;
- **axles**: the relationship between pairs of opposite attractors, as suggested by the hyperbolic elements, may be seen as the "axles" necessary to support a superstructure;
- **engine**: the relationship between the alternatively attractive and repulsive function of the four distinct attractors, is indicative of a cyclic relationship of which the elliptic element is usefully indicative as an "engine" performing work -- a "work cycle" typically fundamental to any engine and notably to the generation of energy through sustainable consumption of fuel and waste products; a distinction might be made between the transmission of drive power to two or four wheels paired by axles
- **direction**: directing the movement of any such "motorised" vehicle requires a capacity to sense direction usefully suggested by the parabolic element whether projecting light in a direction (as typical of a headlight) or resolving information through bringing it to a focus (as with parabolic antennae). Any change in direction might also then be fruitfully associated with a fifth wheel -- a "steering wheel", whether it acts on two or four wheels paired by axles.

The relationship between these clarifies a shift in function, especially in the form of a progressive "dematerialisation", through which a higher degree of order is successively imposed on the preceding "levels" by, for example:

- constraining "wheels" into pairs through "axles" -- through recognition of an axis of symmetry;
- reframing the attractors as necessary components (or phases) of a work cycle, requiring that each attractor alternate between an attractive and repulsive mode in some synchronized manner;
- reframing "wheels", "axle", and "engine" into elements of a [learning-action cycle](#) necessary to the management of a vehicle by an operator -- notably as extensively analyzed by Arthur Young (*The Geometry of Meaning*, 1978), developer of the Bell helicopter

**This example suggests the need appropriately to juxtapose metaphors based on those various technologies that are devised in society -- in order appropriately to sustain the cognitive frameworks capable of counteracting issues arising from those**

technologies or from their interaction.

More generally **this highlights how specific technologies are effectively developed ("explicated") in a manner "unconscious" of their future problematic implications -- but how nevertheless, as metaphors, they imply the corresponding cognitive insights necessary to enhance appropriately a collective, conscious resolutique.** The technologies thus "prefigure" the insights required to integrate them into a sustainable psychosocial system.

## Musical epistemology

The epistemological challenge of each of the attractors -- prior to any perspectives of a higher order -- may be usefully seen in the light of the work of Ernest G McLain (*The Myth of Invariance: the origins of the Gods, Mathematics and Music from the Rg Veda to Plato*, 1976; *The Pythagorean Plato: prelude to the song itself*, 1978). McLain (1976) notably remarks on the study by Antonio de Nicolas (*Meditations through the Rg Veda: four-dimensional man*, 1978) :

The four Rgvedic "languages" de Nicolas defines have their counterparts in the foundation of all theories of music. His "language of Non-Existence" (Asat) is exemplified by the pitch continuum within each musical interval as well as by the whole undifferentiated gamut -- chaos - - from low to high. His "language of Existence" (Sat) is exemplified by every tone, by every distinction of pitch, thus ultimately by every number which defines an interval, a scale, a tuning system, or the associated metric schemes of the poets, which are quite elaborate in the Rg Veda.

The "language of Images and Sacrifice" (Yajna) is exemplified by the multitude of alternate tone-sets and the conflict of alternate values which always results in some accuracy being "sacrificed" to keep the system within manageable limits. The "language of Embodied Vision" is required to protect the validity of alternate tuning systems and alternate metric schemes by refusing to grant dominion to any one of them". The embodiment of Rg Vedic man was understood... as an effort at integrating the languages of Asat, Sat and Yajna to reach the **dhih**, the effective viewpoint, which would make these worlds continue in their efficient embodiment.

Given the extensive focus of Steve Farmer, John B Henderson and Michael Witzel (*Neurobiology, Layered Texts and Correlative Cosmologies: a cross-cultural framework for pre-modern history*. *Bulletin of the Museum of Far Eastern Antiquities*, 72, 2000 [2002], pp. 48-90) on neurobiology, the subsequent work of de Nicolas (*The Biocultural Paradigm: the neural connection between science and mysticism*, *Experimental Gerontology*, 33, 1997, 1/2), in collaboration with Maria M. Colavito (*The Heresy of Oedipus and the Mind/Mind Split: a study of the biocultural origins of civilization*, 1995), suggests the expansion of the focus of the study by Farmer *et al.* The **biocultural paradigm** notably relates these Vedic languages to 5 epistemologically invariant styles (maia, mythos, right brain mimesis, left brain mimesis, and logos), themselves associated with 5 features of the brain (reptilian, limbic, right and left hemisphere, and the interpreter module).

Clearly the question is whether and how the four languages, and their corresponding neurological modules, could be related to the four attractors. Presumably characteristics suggestively associated with the parabolic form could be usefully associated with what, in Rg Vedic terms, is named (above) as the **dhih**. This might otherwise be understood as analogous to a **triple point phase transition**.

## Optical systems

If, as implied above, the geometry of the curves of the fundamental catastrophes (hyperbola, ellipse and parabola) is indicative of various perspectives on the complexity and interrelationships of the four attractors (problematic, resolutique, irresolutique and imaginaire), then insights may be gained from comparisons with optical systems for the various (corrective) lenses based on such curves. This possibility suggests several fruitful approaches to any comparison:

- **lens design:** as required to enable higher resolution of patterns that are:
  - cognitively "distant" or "larger" (by analogy with the telescope). (cf Joël de Rosnay. *The Macroscope: a book on the systems approach*, 1979)
  - cognitively "closer" or "smaller" than normal (by analogy with the microscope)
- **corrective lens design:** as required to correct vision (for myopia, presbyopia, astigmatism, etc), extended by analogy to the correction of defective "vision" as articulated in support of strategies, policies and future goals and achievements, notably in the promises so universally made by political and religious leaders as well as by futurists and artists
- **optical systems design:** as required in more complex variants of the above, in which a series of lens may be used to correct for distortions to achieve the degree of augmented resolution sought

Any such comparative exercise would clearly need to take account of the distinct properties of **lenses** based on the hyperbola, the ellipse and the parabola, or combinations thereof (see **list of lens designs**). It is also appropriate to note how, in mathematical terms, these curves are themselves understood as **conic sections** -- each being formed by intersecting a cone (namely a right circular conical surface) with a plane, but in different ways. The more obvious defining conditions that distinguish them can be combined into one condition that depends on a fixed point **F** (the focus), a line **L** (the directrix) not containing **F**, and a nonnegative real number **e** (the eccentricity). These suggest ways of distinguishing both distortions of cognitive perspective (possibly associated with "eccentricity") and the corresponding means by which they may be corrected, if appropriate. They also suggest relationships to the **Möbius transformations** discussed above.

Of particular interest is the role played by mirrors in optical system design, especially with respect to the high tolerances required for the successful manufacture of those required for the largest astronomical telescopes. Such design challenges are indicative of those that may

be required in their cognitive analogues -- as well as raising the question of what patterns might be resolved by "cognitive instruments" of such exceptional nature. Curiously the mirror metaphor has been a theme of centuries of dialogue between the "sudden" and the "gradualist" approaches to enlightenment in Chinese thought (Peter N Gregory (Ed) *Sudden and Gradual; approaches to enlightenment in Chinese Thought*, 1991). This dialogue was notably triggered by two very simple contrasting poems based on a mirror -- by Shen-hsiu (606-706) and Hui-neng (638-713) in the *Platform Sutra* [texts] and whether it needed "cleaning".

Given the parallels, both mathematically and in design terms, between achieving resolution (and elimination of distortion) in processing information through optical systems with those based on electromagnetic radiation, two further possibilities merit consideration:

- **radiotelescope design:**
- **electron-microscope design:**

The technology developed for both very large radiotelescopes, and in order to focus light in very large solar power generators, is very suggestive in terms of the role and design of arrays of panels through which focus is achieved in each case. In the case of such radiotelescopes, this may be done through a single large parabolic array of reflecting panels or through an array of interconnected smaller parabolic arrays (possibly separated by a considerable distance to achieve a longer baseline). In the case of power generation, a very large number of flat mirrors may be arrayed parabolically (and continually moved) to focus sunlight on a central boiler unit.

The strategic challenge faced by humanity in managing the problematique, the resolutique, the imaginatique and the irresolutique may be understood as dependent on the insights of the many "disciplines" that have emerged in response to particular concerns. If this is the case, it may be fruitful to consider how appropriate "interdisciplinarity" or "transdisciplinarity" could be understood in terms of the appropriate configuration of "cognitive arrays" analogous to those required for radiotelescope or solar power generators. In both cases the challenge is how to bring insights to a common "integrative" focus -- whether to achieve understanding of larger patterns or to mobilize human energy resources. **One of the merits of this approach is that it allows for the "linear thinking" natural to many disciplines, cognitive frameworks and modelling preferences -- whilst ensuring that these many "flat" perspectives are appropriately arrayed in response to the non-linear knowledge management requirements of the larger strategic challenge.** "Non-linear" would here be contrasted with "flat" in the epistemological shift to [self-reference](#) as notably argued by [Douglas R. Hofstadter](#) (*Gödel, Escher, Bach: an Eternal Golden Braid*, 1979).

Such a possibility challenges the adequacy of efforts to configure sets of topics (and their associated disciplines, problems and strategies) as a tabular matrix rather than a nested list (cf *Functional Classification in an Integrative Matrix of Human Preoccupations*, 1982). These may be essentially inadequate because of the absence of "curvature" required for an integrative focus as argued elsewhere (*Comprehension of Requisite Variety for Sustainable Psychosocial Dynamics: transforming a matrix classification onto intertwined tori*, 2006; *Spherical configuration of categories to reflect systemic patterns of environmental checks and balances*, 1994). Such a need for some form of integrative "curvature" may be of even greater relevance where the "disciplines" are understood as belief systems (cf *Tuning a Periodic Table of Religions, Epistemologies and Spirituality -- including the sciences and other belief systems*, 2007).

## "Dual-use" technologies

These cognitive pointers from well-developed technologies emphasize more strongly the point made above. It would seem that in the development of technology of any kind there are two contrasting but complementary processes:

- the explicit development of the application ("explication"?) for processing material to create particular products, exemplified by "research and development" and typically resulting in registration of some form of "intellectual property"
- the implicit cognitive development ("implication"?) associated with successful research on material applications, through which patterns are recognized, potentially as a cognitive resource to be subsequently applied metaphorically in relation to creative innovation other domains; this process might be described as epistemological development

Explicit technological development, as conventionally understood, may in this sense be systematically "mirrored" in implicit epistemological or cognitive development. Ironically **the many technologies developed by humanity may then be fruitfully understood as "dual-use technologies" -- not in the sense of their relevance to weapons development and military strategy but rather in an, as yet, ill-defined sense of cognitive modalities relevant to more appropriate strategic responses to the problematique.** One articulated example is that associated with the technology of nuclear fusion (*Enactivating a Cognitive Fusion Reactor: Imaginal Transformation of Energy Resourcing (ITER-8)*, 2006). Through the challenge of containing plasma instability so as to generate energy, fusion technology exemplifies the challenge of containing disciplined attention appropriate to sustainability in a society that might well be characterized as strategically challenged by a collective form of [Attention-Deficit Hyperactivity Disorder](#) (ADHD or Hyperkinetic Disorder). Such hyperactivity ("busy-ness"?) might be understood as occluding recognition of subtler patterns vital to collective well-being.

Whilst consistent with the argument of [Robert Romanyshyn](#) (*Technology as Symptom and Dream*, 1989), this point suggests a complementary approach to that outlined by Susantha Goonatilake (*Toward a Global Science: mining civilizational knowledge*, 1999) who argues the merits of exploring non-western cultures for metaphors that might frame new theoretical and technological developments. However, the "dual-use" argument suggests the possibility of "mining" existing and emergent technologies as metaphors for new cognitive and epistemological frameworks that might prove significant to new strategies -- especially those significant for sustainability.

This approach suggests that any technology may also be understood in terms of its "wisdom component", with the further possibility of mapping each technology onto a form of "complex plane" with:

- the "real" component characterized by the technology as conventionally understood (irrespective of the potentially destabilizing consequences of its use)

- the "imaginary" component (the "wisdom component") being the emergent epistemological reframing implicit in that technological innovation (and fundamental to the cognitive development through which any material disruption by the "real" component might be fruitfully contained)

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References (in [main paper](#))

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