21st October 2011 | Draft

Eliciting a 12-fold Pattern of Generic Operational Insights

Recognition of memory constraints on collective strategic comprehension

-- / --

Introduction

This follows the argument for (*Engendering a Psychopter through Biomimicry and Technomimicry: Insights from the Process of Helicopter Development*, 2011) in the light of the quest of Arthur M. Young. He was the designer of Bell Helicopter's first helicopter, the Model 30, and inventor of the stabilizer bar used on many of Bell's early helicopter designs. The approach is inspired by his subsequent aspiration, through generalizing from those technical challenges, to envisage the design of a "psychopter" -- a "winged self" (*The Bell Notes: A Journey from Physics to Metaphysics*, 1979).

Prior to building on the 12-fold pattern of insights of Young, the concern here is with the manner in which memory and comprehension constrain the scope of any set of operational insights. Given the experiential nature of such insights -- as illustrated by the case of piloting a vehicle -- the forms through which they may be variously identified and communicated are recognized as a potential barrier to individual and collective learning and to communication.

The exploration, relates at the time of writing, to the pressures and concerns regarding the capacity and need for any articulation of a collective strategy by the Occupy Wall Street movement and its assocated initiatives worldwide. A feature of the conventional mode of discourse, enabling the current crisis, is a simplistic approach to engendering sets of values, demands and strategic concerns, as noted in an annex (*Checklist of 12-fold Principles, Plans, Symbols and Concepts*, 2011). It is argued here that it is this oversimplification of the challenge which handicaps the emergence of appropriately self-reflexive initiatives capable of responding to the turbulence of change (*Consciously Self-reflexive Global Initiatives: Renaissance zones, complex adaptive systems, and third order organizations*, 2007).

Commentary on the Occupy Wall Street movement has noted the experimentation with decision-making processes. A concern here is the need for new ways of thinking to enable emergence of new options in such situations -- metaphorically to enable them to "take off" and "fly", as suggested by the helicopter model and its inspiration for a hypothetical psychopter. The implications for dialogue are the theme of another annex (*Enabling a 12-fold Pattern of Systemic Dialogue for Governance*, 2011.)

Constraints on comprehension and communication of sets of principles

The argument here follows from earlier initiatives (*Representation, Comprehension and Communication of Sets: the Role of Number*, 1978). This had resulted in analysis of a wide range of examples (*Examples of Integrated, Multi-set Concept Schemes*, 1984; *Patterns of N-foldness: Comparison of integrated multi-set concept schemes as forms of presentation*, 1980). These initiatives were themselves presented with a set of related papers (*Patterns of Conceptual Integration*, 1984). This included an exercise in generalizing the qualitative distinctions between insights in sets of a given number -- in sets of size from 1 to 20 elements (*Distinguishing Levels of Declarations of Principles*, 1980).

A major consideration was the importance to be attached to the much-cited study of George Miller (*The Magical Number Seven, Plus or Minus Two*, *Psychological Review*, 1956) -- and subsequent research on human working memory capacity. A related concern was the challenge of the erosion of collective memory (*Societal Learning and the Erosion of Collective Memory: a critique of the Club of Rome Report: No Limits to Learning*, 1980; *Pointers to the Pathology of Collective Memory*, 1980). The argument was then developed in relation to new ways of articulating collective principles and the quest for mnemonic facilitation (*In Quest of Mnemonic Catalysts -- for comprehension of complex psychosocial dynamics*, 2007; *Structuring Mnemonic Encoding of Development Plans and Ethical Charters using Musical Leitmotivs*, 2001; *Structure of Declarations Challenging Traditional Patterns*, 1993).

The question here relates to the argument of Young inspired by a 12-fold set of "insights" essential to the complex task of controlling a helicopter -- as being indicative of a corresponding 12-fold set essential to the control of a "psychopter", however that is to be understood. The first case being conventionally **tangible** and objective, with the second essentially **intangible** and implying a degree of subjectivity. Understanding the second is seen as potentially vital to future psychosocial organization.

The focus is then on how to elicit the nature of these "insights" given that the process of attaching conventional labels to them is itself potentially problematic, through the manner in which labels evoke distracting associations. They may imply a degree of concreteness and premature closure on an experience which subsequently acquires greater depth and connnectivity to related insights. Use of particular labels may reinforce dogmatic assumptions regarding the nature of deeply and inexplicable experiential insights -- as is evident in acquiring the skill of riding a bicycle, for which book-learning and explanation may only be helpful at best. Such insight may be vital in the encounter with strategic challenges (*Engaging with the Inexplicable, the Incomprehensible and the Unexpected*, 2010).

"Insight" itself may be usefully challenged, given its dependence on the vision metaphor -- thereby precluding the implications potentially to be associated (metaphorically) with other senses (*Developing a Metaphorical Language for the Future*, 1994; *Metaphor and the Language of Futures*, 1992). The point is appropriately emphasized, in relation to the intuitive piloting of an aircraft -- and especially a helicopter -- in the expression "flying by the seat of one's pants" (*Strategic Challenge of Polysensorial Knowledge: bringing the "elephant" into "focus"*, 2008). -- notably significant with respect to mnemonics / synesthesia ***

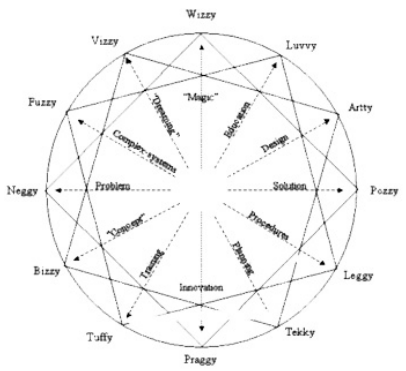
Collective comprehension and communication of a 12-fold set

The learning challenge of a 12-fold set of insights -- as highlighted by Young -- can therefore be considered in the light of Miller's "magical number seven" (plus or minus two). The set of 12 could, for example, be configured in two ways: as a circle or as a rectangle. The binary choice made, comprehensibility is enhanced by clustering the 12 into 3-fold and 4-fold patterns. Primary attention could then be given to either the 3-fold or the 4-fold.

The argument is that it is difficult for most to fully understand, remember and communicate 12 distinct qualities -- recognizing that the operational understanding required is of a higher order than that required to distinguish 30 or 100 acquaintances, plants, foodstuffs, soundtracks, or other matters. Whilst expertise may enable this number to be of a much higher order, the larger that number the more difficult it becomes to communicate those distinguished and to ensure the memorability of those distinctions over time (*Minding the Future: Thought experiment on presenting new information*, 1980). This may well become a major issue in an agining population where a coherent set of mnemonic clues may be vital.

The point can be emphasized in a potentially significant way in that "operating oneself", may be understood in terms of 3-fold organization (head, thorax, abdomen) or 4-fold (4 limbs). Their coordination is typically unconscious rather than conscious. This has direct implications for the control of a vehicle, such as a helicopter for example, when each may have a role. Their appropriate engagement with the operation of the vehicle may require considerable training and experience. Again this is not to deny that control panels on complex installations may have hundreds of switches and indicators. The argument is that "driving" such a configuration calls for polysensorial engagement appropriately related to the implications of the slang term "grok".

Fig. 1: Example of a tentative elaboration of a 12-fold array of clusters of complementary options
from a larger variant in *Reframing the Game of Strategic Dilemmas* -- caricaturing the "languages" of governance
[the two tables on the right provide access to earlier and later interpretations of the " languages"]



12 Complementary Languages for Sustainable Governance (2003)			
Luvvy	Fuzzy	Tuffy	Leggy
Tekky	Artty	Vizzy	Bizzy
Neggy	Praggy	Pozzy	Wizzy

***

Reframing the Game of Strategic Dilemmas (2009)			
Symbolism	Dynamics	Simulation	Creativity
Design	Patterning	Rhythm	Self-reflexivity
Paradox	Technology	Transformation	Insight

The following numeric properties of 12 (from *Wikipedia*) merit very careful research with respect to their potential implications for the memorability and communicability of a pattern beyond human working memory capacity (and irrespective of whether the mathematical formalization is meaningful):

- as a composite number, the smallest number with exactly six divisors, its proper divisors being 1, 2, 3, 4, 6 and 12.
- as a highly composite number, the next one being 24. It is the first composite number of the form $p2q$; a square-prime, and also the first member of the (p2) family in this form. 12 has an aliquot sum of 16 (133% in abundance).
- as the first abundant number (in fact a superabundant number) and demonstrates an 8 member aliquot sequence; {12,16,15,9,4,3,1,0} 12 is the 3rd composite number in the 3-aliquot tree. The only number which has 12 as its aliquot sum is the square 121. Only 2 other square primes are abundant (18 and 20).
- as a sublime number, a number that has a perfect number of divisors, and the sum of its divisors is also a perfect number. Since there is a subset of 12's proper divisors that add up to 12 (all of them but with 4 excluded), 12 is a semiperfect number. If an odd perfect number is of the form $12k + 1$, it has at least twelve distinct prime factors.
- as a superfactorial, being the product of the first three factorials. Twelve being the product of three and four, the first four positive integers show up in the equation 12 = 3 4, which can be continued with the equation 56 = 7 8.
- as the number of edges of regular cubes and octahedrons, with regular icosahedrons having 12 vertices.
- as a pentagonal number.
- as the number of spheres touched by a central sphere in the densest three-dimensional lattice sphere packing, and this is almost certainly true for *any* arrangement of spheres (the Kepler conjecture held to be 99% proven)
- as a kissing number (or Newton number) in three dimensions, namely the number of unit spheres that touch another given unit sphere.
- as the smallest weight for which a cusp form exists. This is related to a constellation of interesting appearances of the number twelve in mathematics ranging from the value of the Riemann zeta function function at -1 i.e. ?(-1)=-1/12, the fact that the abelianization of SL(2,Z) has twelve elements, and even the properties of lattice polygons.
- as the number of Jacobian elliptic functions
- as the number of finite trivalent (cubic) distance-transitive graphs.

Of potential relevance for similar reasons are the following reflections of Peter Collins, in a private communication in the light of his own earlier work (*Some Observations on Perfect Numbers*):

- 12 as the first and most important "double perfect number" on the assumption that in summing the divisors of a perfect number the number itself is included (rather than excluded). So, rather than excluding 6 from the proper divisors of 6 (as 1, 2 and 3), it is included, then the sum of all the divisors of 6 gives 12 (i.e. double the perfect number in question). Thus a double perfect is simply double that of 6 as a perfect number.
- summing the reciprocals of all the divisors of a perfect number always equals 2. In the case of 6 we have 1/1 + 1/2 + 1/3 + 1/4 + 1/6 = 2. And of course 2 * 6 = 12 (i.e. the first double perfect number).
- every double perfect number can be expressed as two consecutive natural numbers. So once again, for example 12 = 3 * 4. This implies that if we obtain the difference of the reciprocals of these latter two numbers that we obtain the reciprocal of the corresponding double perfect number. Thus 1/3 - 1/4 = 1/12.
- from a qualitative perspective the nature of the two consecutive numbers is very revealing in that they relate to what are in an important sense at opposite extremes from each other.
    - the first number is always a (Mersenne) prime with of course no factors and therefore symbolic of the highest level of independence.
    - the second number is always a power of 2 therefore making it the most composite possible for its size. In other words the maximum number of factors possible arises with numbers raised to the power of 2.

  Thus this composite number is symbolic of the highest level of interdependence, so the double perfect, combining both of these quantities, itself in qualitative terms represents the marriage of two extremes (i.e. both differentiation and integration). Another equivalent way of looking at this would be in terms of the marriage of linear and circular notions. It is interesting in this context that the year is divided into 12 months. From one perspective these follow each other in linear fashion. Yet there is clearly a circular cycle in that we arrive back at the end of the year at the point from which we started!

With respect to the Monster Group first constructed by Bob Griess in 196,884 dimensions, Collins further notes in the light earlier reflections (*Monstrous Moonshine - 24 dimensional space*) :

- this is split into 3 subspaces (98,304 + 300 + 98,280 = 196,884) all having an intimate connection with 12:
    - 98,304 = (2^12)*(2*12).
    - 300 = 12*{(2*12) +1}).
    - 98,280 = 98,304 - 24 = (2^12)*(2*12) - (2*12).
- the minimum number of dimensions in which the Monster can be constructed is 196,883 (= 196,884 - 1):
    - 196,883 = 47 * 59 * 71, with the difference between 47 and 59 is 12; likewise the difference between 59 and 71 is 12.
        - 47 = (4*12) - 1
        - 59 = (5*12) - 1
        - 71 = (6*12) - 1

Collins concludes regarding the qualitative rationale as to why 12 should be so important in the context of the Monster Group, arguing that symmetry necessarily requires a relationship as between parts and whole. Perfect symmetry would thereby entail the perfect harmony of (differentiated) parts with the (integral) whole. The significance attributed to the Monster Group in mathematics as the ultimate form of symmetry, calls for reflection on its potential psychosocial implications, as discussed separately (*Potential Psychosocial Significance of Monstrous Moonshine: an exceptional form of symmetry as a Rosetta stone for cognitive frameworks*, 2007).

Sets of symbols adequate to the distinction of complementarity within a 12-fold set

Numeric "preferences": It is appropriate to note that number may be symbolically associated with the above patterns:

1. Namely the 12-fold pattern understood as a whole -- the circle or the rectangle -- considering its parts as subsumed
2. The choice between focusing on:
    1. The 3-fold or 4-fold patterns
    2. The 3+4 pattern, namely a 7-fold pattern -- characteristic of 7-fold symbols systems
3. Within the 3-fold:
    1. Focus on the 3-foldness of the 12-fold set -- characteristic of trinitarian / triplicity symbol systems
    2. Focus on a single 3-fold column
    3. Focus on 2 3-fold columns, namely a 6-fold set -- characteristic of hexagram-based symbols systems
    4. Focus on 3 3-fold columns, namely a 9-fold set -- characteristic of enneagram-based symbol systems
4. Within the 4-fold:
    1. Focus on the 4-foldness of the 12-fold set -- characteristic of 4-element quadruplicity systems
    2. Focus on a single 4-fold row
    3. Focus on 2 4-fold rows, namely an 8-fold set -- characteristic of 8-fold symbol systems

The suggestion here is that comprehension of any set of 12 fundamental generic insights tends to be elusive. It may be partially "grasped" by alternating between several modalities, raising the question as to whether these different "takes" can be successfully integrated into a comprehensible whole -- as may be vital in piloting a vehicle "non-spastically". Especially problematic is when an "insight" framed as vital is articulated using a simple slogan such as to imply recognition of the necessary complementary insights required for any coherent approach.

Nature of a generic set: Young's insights (presented below) are used as an example. They have the considerable advantage of being an attempt to articulate the distinct qualities of the elements of the 12-fold set as a whole in relation to the challenge of piloting a vehicle in the light of those "functions". The more fundamental issue is what is implied generically by such a set with respect to the possibility of driving a psychosocial vehicle. Ways of understanding such a generic set include:

- the systemic pattern of largest scope within collective cognitive capacity, readily comprehensible and communicable
- its function as a "pattern that connects" as highlighted by Gregory Bateson ***
- it ability to hold requisite variety as suggested from a (cognitive) cybernetic perspective
- the importance of any such set to the longer-term sustainability of any collective initiative

Checklist of 12-fold principles, plans, symbols and concepts

Nearly 200 such sets are presented separately as an Annex with links to relevant web resources.

Given the constraints on working memory capacity, it is is unlikely that the elements of these 12-fold sets would be appropriately "re-membered" to enable the integrated strategic response for which the set was envisaged. Who has the time or inclination to recall 12 points -- especially leaders? Few, if any, of the sets have their points clustered and interlinked to offer mnemonic clues to facilitate such recall. **If they have been systemically conceived, this is typically not apparent from current articulatiosn. Consequently any vital systemic checks and balances provided by the set elements are liable to be forgotten, if not lost.**

Engaging with the symmetry of "bloodless categories"

The nature of the patterns above, and the often elusive distinctions within the sets, suggests further contrasting considerations with respect to how they may be "grokked" as a whole in practice:

Abstraction: Irrespective of the symbol system used, there is a sense in which the pattern can readily be understood as a contemporary equivalent of sets of "bloodless categories" felt to be essentially empty of meaning --the "*unearthly ballets of bloodless categories*" challenged by Francis Herbert Bradley.

Errol Harris, for example, argues that by sublating into the absolute idea the very negativity of finitude, appearance and error, only dialectical logic can disclose a logical universe that is not simply an aggregate of "bloodless categories, "*but is rather a fully actual, self-sufficient and self-conscious Whole*". It is however the case that some categories may well elicit belief through a process which merits careful attention, as separately argued (*Mathematical Theology: Future Science of Confidence in Belief*, 2011).

Symmetry: There is an extremely active exploration of symmetry and supersymmetry in fundamental physics in relation to the quest for the Theory of Everything, most notably in relation to 10 dimensions and to the 12-fold rotational symmetry associated with the Standard Model. Many variants of supersymmetry have been proposed or are under consideration.

The "language" used by string theorists is especially helpful in offering insight into how parts of a 12-fold set might be "cognitively ignored" -- focusing attention (in what is effectively a "blinkered" manner) on a smaller part of the pattern, whether 2x2, 2x3, 2x4 or 3x3.

String theory attests that we live in a ten-dimensional universe, but that only four are accessible to our everyday senses. According to theorists, the missing six are curled up in bizarre structures known as Calabi-Yau manifolds -- whose "existence" was proved by Shing-Tung Yau. By a process of "symmetry breaking", the remaining parts of the pattern are then considered to be "hidden" as a result of compactification. This is evident in the explanation by Shing-Tung Yau and Steve Nadis (*The Shape of Inner Space: string theory and the geometry of the universe's hidden dimensions*, 2010):

> In the heterotic version of string theory we've been discussing, the ten-dimensional spacetime from which we start is endowed with what's called E_8 x E_8 symmetry. E_8 is a 248-dimensional symmetry group that can be thought of, in turn, as a gauge field with 248 components... E_8 x E_8 is an even bigger symmetry group of 496 (248 + 248) dimensions, but for practical purposes, **we can ignore the second E_8. Of course, even the 248 symmetry dimensions pose a problem for re-creating the Standard Model, which has only twelve symmetry dimensions**.
>
> Somehow, **we've got to "break" the 248-dimensional symmetry of E_8 down to the twelve we want. Let's go back to our example of a... sphere or globe, which has rotational symmetry in three dimensions**... You can take that sphere and spin it around any of three axes... and it will still look the same. But we can break that symmetry in three dimensions by insisting that one point must always stay fixed. On our planet, we could single out the north pole as that point. Now only one set of rotations, those that happen around the equator...will keep that point...fixed and unwavering. In this way, the threefold symmetry of the sphere has been broken and reduced to a one-dimensional symmetry..
>
> .In order to get down to four dimensions and the Standard Model with its twelve-dimensional symmetry group, we have to find some way of breaking the symmetry of the E_8 gauge group. In the E_8 case, we can break symmetry by choosing a particular configuration in which some of the 248 components of the big gauge field are turned on or turned off. In particular, **we'll find a way to leave twelve of those little fields turned off**, which is kind of like insisting that one spot on the sphere, the north pole, is not going to move. But they can't be just any twelve fields; they have to be the right ones...
>
> In other words when you're done breaking down the massive E_8 group, what you'll have left in four dimensions are just the gauge fields of the Standard Model. **The other fields, which correspond to the broken symmetries, don't disappear entirely. By virtue of being turned on, they'll reside at a high-energy regime that puts them far beyond our reach, totally inaccessible to us.** You might say the extra symmetries of E_8 are hidden away in the Calabi-Yau [manifold]. (pp. 206-207)
>
> The tangent bundle of a six-dimensional Calabi-Yau, similarly, is a twelve-dimensional space, with six degrees of freedom in the tangent space and another six degrees of freedom in the manifold itself. (p. 208) *[emphasis added]*

Angels on pin heads? The quality of thinking devoted to the range of string theories tends to obscure the fact that these theories, as exercises in constructivism, lack any experimental support. The possibility that they will remain untestable is acknowledged -- as with the the sense in which physics appears disconnected from reality (Lisa Randall, *Knocking on Heaven's Door*, 2011). It is however difficult to avoid the impression that the dynamics of this quest for order of higher dimensionality and subtlety -- a Theory of Everything beyond normal human ken -- is a modern variant of the vigorous debates of the eminent medieval scholastics with their focus on angelology (and a "Theory of Heaven").

These debates of the past have long been ridiculed with the question: *How many angels can dance on the head of a pin?* This question has now been raised in relation to supersymmetry by Matt Strassler (*Supersymmetry - What Is It?* 2011):

> But if the superpartners are made heavy, isn't it likely that they are so heavy that we won't be able to make any of them for decades or even centuries? in which case, aren't we on the verge of counting angels on the head of a pin?

Curiously it might be said that the "belief" elicited in "angels" amongst medieval theologians is usefully to be compared with the current "belief" in "higher dimensions" and the credibility of 248-dimensional manifolds -- despite criticism of the string theory approach (Peter Woit, *Not Even Wrong: the failure of string theory and the search for unity in physical law*, 2007). As challenges to comprehension and credibility, again this suggests that "mathematical theology" merits attention (*Mathematical Theology: Future Science of Confidence in Belief*, 2011; *Dynamics of Symmetry Group Theorizing*, 2008).

The "numbers game" between 10 and 12 is intriguing given the role of 10 in the organization of sets of many kinds -- and especially in the relation between them in the Tree of Life, most notably the 10-pointed version central to the Kabbalah. However Yitzkak Hayut-Man argues that: *It is instructive to note that the Sefer Yezirah, which was the first to make explicit the principle of "The Ten Sephirot", does not deal with accounts of tens, but prefers counts of 3, 7 and especially 12* (*The Twelve fold Pattern Enfolded in Parashat Bereshit Genesis*, *IsraelSeen.com*, 20 May 2010). Are the two extra Sephirot effectively "curled up" in the "Calabi-Yau"?

Whether "angels", "dimensions", "symmetry groups" or "manifolds", the essentially constructivist nature of the belief in their "existence" increases the relevance of the argument from the perspective of cognitive psychology (George Lakoff and Rafael Núñez, *Where Mathematics Comes From: how the embodied mind brings mathematics into being*, 2000). This human propensity to attribute existence to the insubstantial has implications for the formulation of strategic initiatives (*Cultivating Global Strategic Fantasies of Choice*, 2010). More generally it also raises questions regarding the future potential of the formulation and dissemination of memes in a knowledge society (*Re-Emergence of the Language of the Birds through Twitter?* 2010).

Correspondences: There is a long-standing tendency to seek equivalences and correspondences between categories clustered into sets of the same number. This is evident in the ancient example given above relating to the "12 Elementals" of the *Sepher Yetzirah*. Correspondences acquired surprising significance in relation to symmetry groups with respect to the connectivity recognized through the so-called "moonshine theory" of mathematics by which the Monster Group was discovered (*Theories of Correspondences -- and potential equivalences between them in correlative thinking*, 2007; *Potential Psychosocial Significance of Monstrous Moonshine: an exceptional form of symmetry as a Rosetta stone for cognitive frameworks*, 2007).

The challenging cognitive nature of "correspondences" emphasizes the question of the nature of the pattern of connectivity indicated by

Gregory Bateson (*Mind and Nature: a necessary unity*, 1979):

> The pattern which connects is a meta-pattern. It is a pattern of patterns. It is that meta-pattern which defines the vast generalization that, indeed, it is patterns which connect.

And it is from this perspective that he warned in a much-cited phrase: *Break the pattern which connects the items of learning and you necessarily destroy all quality.* How is this to be understood in relation to the symmetry breaking mentioned above -- where it is the higher degrees of symmetry which are essential to the pattern, its memorability, and its communicability over time? How does this relate to governance of sustainability?

A challenging test is offered by the work of designer Christopher Alexander (*A Pattern Language*, 1977) who identified 254 interlinked "patterns" for building and planning at both the macro and the micro level. It is tempting to seek a "correspondence" with the 248-dimensional symmetry group discussed above, especially in the light of Alexander's other preoccupations (*Notes on the Synthesis of Form*, 1964; *The Nature of Order: an essay on the art of building and the nature of the universe*, 2003-4). An experiment was undertaken, using those patterns, to seek "correspondences" between Alexander's focus on the physical environment and patterns in a socio-organizational environment, a conceptual environment, and an intra-personal environment (*5-fold Pattern Language* , 1984). Alexander has now reframed his work in terms of "geometry" (*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).

More provocative, especially following the notorious Sokal Affair (1996) and the Bogdanov Affair (2002), would be to experiment with a "translation" of a theological text on angelology into the terms of string theory. This could be accompanied by a "translation" of a string theory text into the terms of medieval angelology -- perhaps using as source the text of Antony Lisi (*An Exceptionally Simple Theory of Everything*, 2007) otherwise known as "E8 Theory". The purpose would be to discover how credible such translations could be made and to whom. Such possibilities have even be documented in a delightful trap for the unwary (Ray Girvan, *The Mandelbrot Monk*, 1999).

Discovering correspondences between "bloodless categories" does not make them any less "bloodless". It is in this sense that the focus on the insights from piloting a helicopter, in the considerations which follow, offers a "discipline" for what might otherwise be considered totally intangible.

Embodiment as key to effective understanding -- the role of musical harmony

The poorly explored cognitive significance of embodiment has been notably highlighted by George Lakoff and Mark Johnson (*Philosophy in the Flesh: the embodied mind and its challenge to Western thought*, 1999). The theme has been further developed by Johnson (*The Body in the Mind: the bodily basis of meaning, imagination, and reason*, 1987; *The Meaning of the Body: aesthetics of human understanding*, 2007). The latter is introduced as follows:

> When philosophy ceases to further our quest for meaning -- when it stops addressing the recurring problems that define the human condition -- it loses its relevance to human existence. Unfortunately, meaning is a big, messy, multidimensional concept that is applied to everything from grandiose notions like the meaning of life to the specific meanings of single words or even morphemes.... meaning grows from our visceral connections to life and the bodily conditions of life... I now see that that the structural aspects of our bodily interactions withy our environment... were themselves dependent on even more submerged dimensions of bodily understanding. It was an important step to probe below concepts, propositions, and sentences into the sensorimotor processes by which we understand our world, but what is now needed is a far deeper exploration into the qualities, feelings, emotions, and bodily processes that make meaning possible. (p. ix)

Johnson concludes:

> Philosophy needs a visceral connection to lived experience. Unfortunately, muh of the philosophy of mind and language of the pst century lost this visceral engagement, chiefly because it focused on only a small and highly intellectualized part of meaning. leaving out much of what goes into human meaning-making... The necessary remedy for our current problematic state must be a non-dualistic, embodied view of meaning, concepts, mind, thought, language, and values. (pp. 263-4)

Music: In contrast with the arguments regarding "bloodless categories", there is a profoundly significant irony to the fact that widely-appreciated contemporary music uses a 12-fold octave division with 12 distinct pitch classes or categories per octave [see representation below as a chromatic circle]. Most of the musical instruments of the orchestra are constrained to produce 12 distinct pitch classes or categories per octave. This makes it rather easy to realize music based on a 12-fold octave division with such instruments but next to impossible to realize a piece of music based on any other pitch system (Gerald J. Balzano (*The Group-Theoretic Description of 12-Fold and Microtonal Pitch Systems*, *Computer Music Journal*, 4, 4, 1980, pp. 66-84).

Most of the sets described above are essentially inaccessible to sense perception, other than through use of vision in reading about the categories identified. Music clearly engages other senses, notably hearing, and is capable of eliciting movement in the form of dance. More intriguing still is the fact that, whereas the memorability of a 12-fold pattern of distinctions is much challenged over time, the 12-fold distinctions are readily embodied in memorable musical forms to which the ear is typically very sensitive. **This distinguishing capacity is not limited to the highly trained specialists who debate many of the ("bloodless") sets cited, it is a capacity widely shared by people throughout the world**.

A degree of reconciliation through correspondences -- between the cognitive propensity for set organization and musical theory -- is the notable focus of the work of Ernest G. McClain (*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; *Meditations Through the Quran: tonal images in an oral culture*, 1981). For McClain:

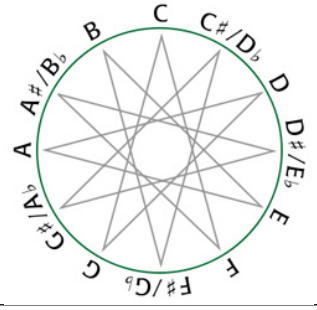
> The central geometrical image in the *Rg Veda* is the mándala of the "single- wheeled chariot of the Sun," harmonizing moon months with solar years and the signs of the zodiac: "Formed with twelve spokes...one wheel, navels three..." If the "twelve spokes" are the twelve tones of an octave tonal-zodiac, then the three "navels" may be powers of three prime numbers 2,3, and 5, each rotating in a sense at its own speed, correlated by any terminating number which includes all three among its factors....In a sense, this essay will be finished when we understand how the Vedic poets arrived at the twelve "spokes" for the Sun's chariot within the number field generated by our yantras....We need not wait...to sense the relevance of our yantra. Notice that...the only tonal meanings which remain invariant under reciprocation are those along the central horizontal axis (of the yantra)...."The Gods are later than this world's production" in the sense that our number field must grow systematically to some larger limit in order to produce twelve tones along this axis." (McClain, 1976, p. 9, 35, 49, and 52)

Other relevant explorations of cognitive implications are those of Dmitri Tymoczko (*The Geometry of Musical Chords*, *Science*, 2006; *A Geometry of Music*, 2011). In the above-cited study, Mark Johnson (2007) has a chapter on *Music and the Flow of Meaning*.

Given the argument relating to music, it is intriguing that a renowned physicist, Richard Feynman, was also famed for his drumming and the manner in which he sought to relate it to physics -- notably proposing use of a drumhead to demonstrate Chladni patterns. He was a close collaborator of physicist Murray Gell-Mann who named as the Eightfold Way a theory organizing subatomic particles (baryons and mesons) into octets leading to the development of the quark model.

With respect to the elements of any strategic plan, it might be said that their memorability, and their role in the credibility of its integrity and viability, is dependent on some form of "resonance" between the parts (Cycles of dissonance and resonance, 1995). This is far better recognized in music and poetry (*A Singable Earth Charter, EU Constitution or Global Ethic?* 2006; *Poetry-making and Policy-making: arranging a marriage between Beauty and the Beast*, 1993; *Structuring Mnemonic Encoding of Development Plans and Ethical Charters using Musical Leitmotivs*, 2001).

Fig. 2: Chromatic Circle
Showing the circle of fifths drawn as a star dodecagon
(reproduced from *Wikipedia*)



Dance: Mark Johnson (2007) highlights the philosophical work of Maxine Sheets-Johnstone (*The Primacy of Movement*, 1999; *Kinesthetic experience: understanding movement inside and out*, *Body, Movement and Dance in Psychotherapy*, 2010). A 12-part Standard Scale is a feature of the movement analysis of the Laban dance notation (Rudolf Laban, *Choreutics*, 1966):

> The standard scale is especially useful as it can be shown to contain a series of shapes which are the basic elements of almost all trace-forms employed in movement. Each chain of twelve links can be divided into six, four, three or two parts. The points of these divisions when joined together form regular polygons, that is, hexagons, quadrangles, and triangles, and in the case of two parts, a straight line....These polygons...are related to the trace-forms of certain characteristic movements. (p. 72-33)
>
> The twelve movements towards the twelve points of the kinesphere not only make a division of space possible, but also are in themselves units of harmonic interrelations. The criterion by which harmonic relations can be evaluated are the standard scales, which connect and accentuate the twelve points... (p. 82)
>
> The influence of a flow of forms which disturbs a simple symmetry leads to asymmetric movements which must necessarily be completed by other asymmetric tensions or moves. The (12-part) standard scale has two parts. The first series of six movements is situated in the opposite area of the kinesphere to that of the second series of six movements. The inclinations of the two series are parallel but they are followed in reversed directions. The standard scale, being the prototype of a chain which has equilibrium in its flow of forms, is the basis for the experience of spatial harmony. (p. 90)

A very powerful exploration of the *Rg Veda* (cited by McClain) is by the philosopher, Antonio de Nicolas, using the non-Boolean logic of quantum mechanics. This opens up valuable approaches to integration. The unique feature of the approach is that it is grounded in tone and the shifting relationships between tone. It is through the pattern of musical tones that the significance of the *Rg Veda* is then to be found:

> Therefore, from a linguistic and cultural perspective, we have to be aware that we are dealing with a language where tonal and arithmetical relations establish the epistemological invariances... Language grounded in music is grounded thereby on context dependency; any tone can have any possible relation to other tones, and the shift from one tone to another, which alone makes melody possible, is a shift in perspective which the singer himself embodies. Any perspective (tone) must be "sacrificed" for a new one to come into being; the song is a radical activity which requires innovation while maintaining continuity, and the "world" is the creation of the singer, who shares its dimensions with the song. (Antonio de Nicolas, *Meditations through the Rg Veda: Four Dimensional Man*, 1978, p. 57)

12-fold pattern of 12-fold sets? There is the interesting possibility of an initiative to cluster or classify the 12-fold sets, as variously recognized, within a 12-fold pattern -- suggestive of a degree of fractal organization.

Given the 12-fold set of insights regarding the piloting of a helicopter, it is worth noting the possibility that the 3x4 articulation of those skills can be considered a response to the 3+4 types of potential catastrophe (according to catastrophe theory) -- calling for the 3+4 sets of insights characteristic of various traditions. These are understood here as a preferred organization of meaning, however arbitrary. In that respect it is also interesting that the 3+4 corresponds to the "axes of bias" characteristic of debate on any issue, as identified with respect to definition of the "romantic period" by W. T. Jones (*The Romantic Syndrome; toward a new methodology in cultural anthropology and the history of ideas*, 1961) and previously summarized (*Axes of Bias in Inter-Cultural Dialogue*, 1993).

The assumption made in the following argument is that (to some degree at least) **satisfaction with a set of 12 has much to do with distinguishing a set of issues whose totality (especially as a complex psychosocial system) is somewhat beyond human ken and conventional modes of reflection**. Any given set may then be seen as composed of different "lenses" through which particular forms of complexity may be viewed at a preferred level of abstraction.

Adapting psychosocial insights from learning/action cycles

In the light of the separate argument regarding "technomimicry" (*Technomimicry as analogous to biomimicry*, 2011), the approach taken by Arthur Young's *Geometry of Meaning* (1978) could be understood in those terms. His focus was on generalizing from the learning required to control a helicopter -- subsequent to his development of the Bell helicopter. This resulted in the identification of 12 interrelated conditions forming the body of the table in the light of distance (L), time (T) and mass (M) as they are variously combined. Thus, for example, distance/time (L/T) is velocity and mass x distance (ML) is momentum. His articulation was presented separately as (*Characteristics of phases in 12-phase learning-action cycle*, 1998). See commentary on learning cycles in *Cycles of dissonance and resonance*.

Fig. 3: Learning via time-bindng and space-binding

	Time-binding	Unconscious (In-volution)	Unconscious registration of information	Homeostatic equilibrium Unconscious adaptation	Auto-catalytic response Self-impulsion	Uncoordinated action Victim of discontinuity
Space-binding		Conscious (Re-volution)	Timeless awareness Non-duration	Conscious adaptive response Awareness	Comparison with norms or memory of previous experience Self-awareness	Comparison with previous comparisons Awareness of self-awareness Transendental discontinuity
Unconscious (In-volution)	Conscious (Re-volution)	Symbol	T^0	T^1	T^2	T^3
Unintended shift of: - perspective - position - reference Displacement of focus	Intentional shift of - perspective - position - reference Range of conscious attention span "Distance" from object of focus	**M** **ML** Acts Abstract Schematic	**L** Observation; act of considering; position determination; reactive learning based on immediate registration of phenomena; assessment of distance; "sizing up"	**L/T** Adaptive change; reaction; passive adaptation or change of position in response to changing circumstances	**L/T²** Spontaneous initiation of transformative action; commitment to a new course of action	**L/T³** Control of transformative action
Unconscious impression of significance	(see MLT^0)	**ML** States Motivated Considered	**ML** Recognition of moment(ousness), relevance (as related to leverage), significance (as in "matters of great moment"); weight of facts; bringing matters into focus	**ML/T** Recognition of the momentum (of an issue) resulting from a change, namely the consequential transformation of awareness or perspective	**ML/T²** Forcefulness engendered, experienced or embodied as a result of transformative action; constructive (or disruptive) action potential; enhanced sense of being	**ML/T³** Establishment of disciplined pattern of response; consolidated or harmonious control of action potential; holding forces in check
Subject to an unintended shift of perspective	Projection of an intended shift of perspective into reality	ML^2 Relationships Application Follow-through Commitment	ML^2 Faith in current paradigm or perception of reality; unexamined or habitual commitment to a process projection or understanding, irrespective of inconsistent disturbing factors	ML^2/T Decision or impulse to act or initiate a process determining the future	ML^2/T^2 Achievement of a desired result by application of understanding (and adjustment of implicit beliefs) in response to external factors; working action on reality	ML^2/T^3 Power of acquired knowledge; know-how; integrated or embodied experience; capacity (including that of not acting); non-action
Unexplained problems Imponderables External constraints	Mass of information Amissed experience Internal constraints Mass of evidence "Matter of fact"	**M**				

See also adaptation of the above framework to *Typology of 12 complementary strategies essential to sustainable development* and to *Typology of 12 complementary dialogue modes essential to sustainable dialogue*.

Experimental clues to a memorable 12-fold systemic pattern of governance

Various approaches to the attribution of memorable significance to the 12 modes can be explored experimentally. It is useful to recall that the experiential signifiance of the 12 does not facilitate definitive labelling. The focus is therefore on mnemonic clues to their cognitive significance -- not on any final closure as to their meaning. Young's own initiative in initially attributing a 12-fold set of insights from helicopter movement and control can be seen in such terms, especially since fundamental science continues to explore the nature of the "mass", "time" and "distance" represented in those 12 formulae. Many of the traditional 12-fold sets of symbols can be explored in this way (see *Checklist of 12-fold Principles, Plans, Symbols and Concepts*, 2011).

This is the case of the 12 Olympian Gods, for example, as employed by Charles Handy (*The Gods of Management: who they are, how they work and why they will fail*, 1979). He uses four Greek deities to characterize the different styles of management: Zeus (club), Apollo (role), Athena (task) and Dionysus (existential), noting:

> Each of the four gods gives its name to a cult or philosophy of management and to an organizational culture. Each of these cultures has also got a formal, more technical name, as well as a diagrammatic picture. The names, picture and Greek God each carries its own overtones, and these overtones combine to build up the concept I am trying to convey. They also help to keep the ideas in one's memory. These names and signs and Gods do not amount to definitions, for the cultures cannot be precisely defined, only recognized when you see them... It is important to realize that each of these cultures, or ways of running things is good -- for something. (pp.25-26).

Of relevance to the 12-fold focus here, is Handy's selection of only four Gods within the pattern of 12. Not only does unremitting dependence on any one of them result in failure, but this is arguably also the case with use of a 4-fold subset when greater variety is required -- as might be said of the current global crisis. within that metaphor, it could be said that a "pantheon" is required since appropriate comprehension of a singular integrative "deity" is questionable -- as with vain efforts to articulate a singular global strategic initiative. It is such concerns which merit new consideration of "mathematical theology" (*Mathematical Theology: Future Science of Confidence in Belief*, 2011).

A primary requirement, expressed metaphorically, is the capacity to change "cognitive gear". Rather than as a "pantheon", the set of 12 modalities is then understood as a "gearbox" -- given the inability to design a single "gear" for all circumstances (see Conceptual gearboxes in *The Future of Comprehension: conceptual birdcages and functional basket-weaving*, 1980). Young himself later used the 12-fold pattern of astrological signs as a mnemonic (Arthur M. Young, *On the Value of Astrology for a Science of Life*, 1992). Given the clues to be derived from movement itself, as explored by Maxine Sheets-Johnstone (*The Primacy of Movement*, 1999), such clues might even be (appropriately) sought in patterns of sexual interaction (*Reframing the Dynamics of Engaging with Otherness: triadic correspondences between Topology, Kama Sutra and I Ching*, 2011).

The following are presented as separate Annexes:

- *Enabling a 12-fold pattern of systemic dialogue for governance*
  - Languages of governance
  - Thinking tools for dialogue
  - Clues to patterns of dialogue from competing personality typing schemes
  - Clues to patterns of dialogue from myth and metaphor
  - Clues to patterns of dialogue from song
  - Imagining a 12-fold dialogue process
  - Possible procedures for a 12-fold dialogue process

  The clues offered by distinct "voices" in multipart singing and polyphony are especially fruitful in offering readily comprehensible of the possible interplay between a variety of perspectives -- and the emergence of viable patterns of significance of a higher order (*All Blacks of Davos vs All Greens of Porto Alegre: reframing global strategic discord through polyphony?* 2007; *A Singable Earth Charter, EU Constitution or Global Ethic?* 2006; *Structuring Mnemonic Encoding of Development Plans and Ethical Charters using Musical Leitmotivs*, 2001).

- *Map of Systemic Interdependencies None Dares Name: 12-fold challenge of global life and death*

  This tentative mapping exercise is a further effort to highlight what is typically designed out of political and academic agendas. It follows a previous exercise (*Mapping the Global Underground*, 2010). The latter was a partial response to conventional strategic analysis focused on less controversial issues -- typically structured so as to omit any recognition of issues arising from the demonstrable track record of inability to "deliver" in response to strategic challenges (*Recognizing the Psychosocial Boundaries of Remedial Action*, 2009)

- *Topological clues to a memorable 12-fold systemic pattern* (in process of completion)

Interlocking cycles enabling psychopter operation

Learning/action cycles: The articulation of Arthur Young focuses on learning/action cycles inspired by operation of the helicopter. R. Buckminster Fuller stresses the importance of a minimum set of interlocking cycles essential to a viable system -- which he represents by a polyhedron.

The pilot of a hypothetical psychopter is then to be understood as operating within a dynamic framework of cycles by which the psychopter is constituted. The question is how to comprehend and embody such cognitive-systemic cycles in practice.

Systemic functions: Despite their highlighting of the 12-fold, it is unfortunate that neither the work of Young (*The Geometry of Meaning*, 1976), nor that of Fuller (*Synergetics: Explorations in the Geometry of Thinking*, 1975) has been successfully interpreted in relation to the psychosocial dimension, as argued separately (*Geometry of Thinking for Sustainable Global Governance: cognitive implication of synergetics*, 2009). Especially tantalizing are the 12 "paired" Archimedean spherically symmetrical polyhedra, defined by interlocking circles, and potentially close-packed around a 13th (the truncated tetrahedron).

Is there a correspondence to be found with the cyclic articulation of Young -- with the "truncated tetrahedron" as the M factor (in the bottom row of the table above)? What might be the cognitive relevance of their duals -- ignored as with one part of the $E_8 \times E_8$ symmetry group?

Also intriguing is the so-called Twelvefold Way of Combinatorics as a systematic classification of 12 related enumerative problems concerning two finite sets, which include the classical problems of counting permutations, combinations, multisets, and partitions either of a set or of a number. These merit consideration in relation to the articulation by Steven H. Cullinane (*The Geometry of Logic: finite geometry and the 16 Boolean connectives*, 2007). How might these be related to the 12 (of 16) "complex" archetypal interaction morphologies identified by Rene Thom (*Structural Stability and Morphogenesis:an outline of a general theory of models*, 1975, p. 307): capturing, sending, crossing, "almost", fastening, giving, rejecting, failing, taking, stirring, emitting, cutting?

Potentially of great relevance to this argument is the approach of Steve Palmquist (*The Circle of Twelvefold Systematization*. In: *The Geometry of Logic: a treatise on the perspectival transformations of logic and life through the systematic mapping of geometrical symbolism*, 1986):

> Twelvefold systemization is the operation of combining four sets of simple synthetic (threefold) relations in such a way that they form a second level analytic relation. Any system which exemplifies this pattern (viz. "3.4 = 12"), whether it be natural or theoretical, can be described as a perfectly balanced logical system, inasmuch as it makes equal use of the two types of fundamental logical operation, analysis and synthesis.

Palmquist brings out the formal similarity between all such systems by specifying the twelve compound forms of relation and by exploring the various ways in which they can be mapped onto geometrical figures. He offers several examples of such systems, taken from both natural and theoretical constructions.

Especially fruitful are the explorations of Maurice Yolles from a cybernetic perspective (*Knowledge Cybernetics: a metaphor for post-normal science*, 2010; *Organisations as Complex Systems: an introduction to knowledge cybernetics*, 2006), identifying patterns of fundamental cycles. These were tentatively related to Chinese insights in his earlier collaboration with Ye Zude (*Oriental Viable Systems and Feng Shui*, 2005; *Cybernetics of Tao*, 2008). The latter explores "Autonomous Agentic Properties" associated with each of 9 domains in a 3x3 matrix:

- Socioeconomical (Kinematics); Cultural (Direction); Political (Latency)
- Phenomenal/ conscious Behavioural Interest; Noumenal/ subconscious Minded Purpose; Existential/ unconscious Dispositional Influences

Archetypal functions: The systemic functions may be suggested through myth as by George Trevelyan (*Twelve Seats At The Round Table*, 1976), as with understandings of the Olympian Dodekatheon or its Roman equivalent -- and the felt need for effective engagement with such deities. The tales of the relationships between the gods then offer an understanding of the systemic mapping of the functions. The credibility of the approach is currently evident in the widespread popularity of astrological typing -- but typically with little sense of why, or how, the full set of such types would be essential to a viable collective initiative. Rare are the initiatives which seek to ensure that they engage a complete palette of such types. (*Consciously Self-reflexive Global Initiatives: Renaissance zones, complex adaptive systems, and third order organizations*, 2007).

Echoing the mythical approach, a set of archetypal roles is discussed by Paul Moxnes (*Deep Roles: Twelve Primordial Roles of Mind and Organization*, *Human Relations*, 1999*):*

> These "deep roles" have their origin in the roles of the essential family-father, mother, son, and daughter. In groups and organizations, each of these images of family roles will-through the basic defense mechanisms of splitting and projection-be polarized into a good and bad part: The father as *God* or *devil,* the mother as *queen* or *witch,* the son as *crown prince* or *black sheep,* and the daughter as *princess* or *whore.* In addition to these eight primary deep roles, there come two secondary ones: the *helpers-Shaman* and *Slave-whose* function are to help the family survive spiritually and materially, respectively. The two last deep roles are of a transcendental nature: the *hero* (winner) and the *clown* (loser), i.e., the one who has won a good family role, and the one who has lost it-or never gained it. These 12 deep roles are well known from such cultural artifacts as fairy tales and mythology. In groups and organizations, deep roles are attended with power and interest. Those who are attributed a deep role in their organization will have a similar symbolic power as characters in fairy tales and mythology.

This approach is reminiscent of the classic familial metaphors through which the Chinese *I Ching* may be interpreted.

Cognitive modalities: Many examples were given above of sets of "principles", and the like, which are indicative of distinct cognitive modalities. The generic articulation by which they are variously subsumed is necessarily elusive and challenges any effort to label an essentially experiential operational modality.

One valuable approach to the nature of these modalities is offered by the collective case, when it is effectively a team of pilots which is required to operate the psychopter. When attempts are made to distinguish the number of "roles" appropriate in such a team, a sense is given of the distinct modalities.

There are seemingly few indications of a twelve-fold articulation of roles. One example is R. Bruce Williams (*Twelve Roles of Facilitators for School Change*,, 2008). Exceptionally intriguing therefore, as an apparent illustration of a high order of self-reflexivity, is the analysis of systems engineering (from a systems engineering perspective) by Sarah A. Sheard (*Twelve Systems Engineering Roles*, *Proceedings of the INCOSE Sixth Annual International Symposium*, 1996; *Twelve Roles and Three Types of Systems Engineering*, Software Productivity Consortium, 2003).

Strategic possibilities: As noted above, the articulation of Young can be adapted experimentally to a more strategic focus (*Typology of 12 complementary strategies essential to sustainable development*; *Typology of 12 complementary dialogue modes essential to sustainable dialogue*). Again, however, it is not through any "typology" that "operacy" is ensured -- using the criterion of Edward de Bono (*The Principle of Operacy*, 2010).

One approach was to look at what are effectively three archetypal challenges, namely the possible bonding of "Empire" + "Alternatives", "Global " + "Local", and "Behavioural" + "Depth psychology" (*Planetary Challenge of 12-fold Strategic Marriage*, 2003). As noted there:

> These three marriages -- perhaps to be understood as a six-fold marriage -- are however considered impossible in the real world. As marriages of radical incommensurables, they indeed justify the need to be "made in heaven".
>
> The approach here is initially to look tentatively at these "impossible marriages" by first exploring some fundamental contrasts between "Empire" and "Alternatives. This relationship is then explored first in relation to "Global" and then in relation to "Local". Finally these four are explored in relation to "Behavioural and "Depth psychology". A structured overview is sought through the use of a tabular presentation that clusters "baskets" of indicative terms.

As presented above, in a subsequent exercise (*Reframing the Game of Strategic Dilemmas: a 12-fold interplay of possibilities of otherwise*, 2009) a *12-fold Array of clusters of complementary options* was explored as a further development of a circular diagram used to interrelate *12 Complementary Languages for Sustainable Governance* (2003). The argument notably considered:

- Reframing through "tuning" a matrix representation -- highlighting the integrative function of musical sensitivity
- Self-reflexive reframing
- Eliciting new thinking
- Comprehension of comprehensible patterns
- Reframing through structural configuration of strategic options -- highlighting the function of polyhedral representation

Compensating for "subunderstanding": Exploiting the vision metaphor, it might be assumed that each of the twelve cognitive or systemic modalities could be understood as an "eye". The question is then the possibility of "twelve-fold stereoscopic vision" -- extending the argument of Magoroh Maruyama (*Polyocular Vision or Subunderstanding? Organization Studies*, 2004), celebrated for his work on "mindscapes" (Michael Caley, *Mindscapes: the epistemology of Magoroh Maruyama*, 1994).

Failing that, the issue is then how to understand any "subunderstanding" -- if the pilot of the vehicle is "blind" in various sets of the 12 "eyes". This argument can be related to that presented earlier with respect to the "symmetry breaking" used to reduce from a 248-dimensional reality to that of the 12-fold Standard Model of physics. The other "eyes" are then effectively "hidden" in a complex "Calabi-Yau manifold", inaccessible other than by implication and inference -- cognitively "under the radar" in "stealth mode". This is suggestive of the arguments regarding the implicate and explicate order formulated by David Bohm (*Wholeness and the Implicate Order*, 1980). As the domain of the collective unconscious, it is consistent with the argument of John Ralston Saul (*The Unconscious Civilization*, 1995).

By analogy with this "procedure" (of physicists), the symmetry of a 12-fold "pattern that connects" might then be broken down into (sub) "Standard Models" exemplified by:

- Belbin Team Inventory, currently a 9-fold (3x3) pattern, although originally an 8-fold (2x4) pattern
- *Yi Jing*, namely a 6-fold (2x3) hexagram pattern (each line either broken or unbroken), engendering a 64-fold (8x8) pattern
- *T'ai Hsüan Jing*, namely a 4-fold (2x2) quadgram pattern (each line broken once or twice), engendering a 81-fold (9x9) pattern
- Enneagram of personality, a 9-fold (3x3) pattern
- 2x4 patterns as with the Beatitudes or the Ba Gua
- 2x2, namely a 4-fold pattern
- 3x1, namely the "eternal triangle"

Such subunderstanding then only enables the "piloting" of what might be termed "lesser vehicles" -- each according to what might be appropriately termed a sub-Standard Model. This applies to the extent that the pattern constituting the 12-fold cannot be comprehended as a whole in practice -- whatever the serial, "spastic" comprehension of its parts. The issue is most acute, and best illustrated, when reduced to the pattern of the 2-fold binary "Standard Model" so characteristic of decision-making is the current global civilization (*Us and Them: Relating to Challenging Others*, 2009). The connectivity of most modalities is then effectively lost -- "curled up" in an "inaccessible, complex Calabi-Yau manifold".

The limitations are "circumvented" to a degree by engendering larger patterns whose comprehensibility as a whole is necessarily questionable -- whatever the mnemonic devices (*9-fold Magic Square Pattern of Tao Te Ching Insights -- experimentally associated with the 81 insights of the T'ai Hsüan Ching*, 2006; *Sustainability through Magically Dancing Patterns: 8x8, 9x9, 19x19 -- I Ching, Tao Te*

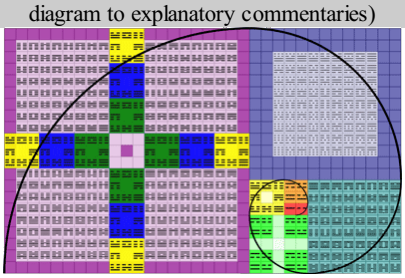
Ching / T'ai Hsüan Ching, Wéiqí (Go), 2008; *Triangulation of Incommensurable Concepts for Global Configuration*, 2011).

Of particular strategic relevance is a certain tendency to the formulation of 16-fold schemas. If the integrity of the schema is only manifest at that level of complexity then symmetry breaking to a comprehensible level effectively destroys the vital quality of the pattern -- ensuring dangerous subunderstanding of the whole.

Integrating "subunderstanding" within a Fibonacci spiral of learning: The Fibonacci spiral is a well-known pattern of progressive ordering, embodied in the shell of the marine nautilus -- successfully denoting its developmental journey with a remarkable pattern of nacre. As an indication of its relevance to the learning process, this spiral theme has become the symbol of *The New Zealand Curriculum Framework*. With respect to governance, its symbolism is a key to the Pacific-based Nautilus Institute for Security and Sustainability. The nautilus might be said to have demonstrated the capacity to navigate the adaptive cycle that is now a challenge to governance (*Adaptive Hypercycle of Sustainable Psychosocial Self-organization: designing a mapping of a Chinese metaphorical pattern language*, 2010).

The possibility of integrating sets of different sizes within the Fibonacci pattern has been explored in detail separately. Potentially this implies a developmental increase in comprehension capacity. (*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). A reduced version of the pattern in the first paper is presented below.

Fig. 4: Use of Fibonacci spiral to interrelate sets of different sizes
(see enlarged version with active links from portions of the diagram to explanatory commentaries)



Conclusion

As noted in the introduction, the argument is a development of the concern for new ways of articulating collective principles and the quest for mnemonic facilitation in their comprehension and memorability (*In Quest of Mnemonic Catalysts -- for comprehension of complex psychosocial dynamics*, 2007; *Structuring Mnemonic Encoding of Development Plans and Ethical Charters using Musical Leitmotivs*, 2001; *Structure of Declarations Challenging Traditional Patterns*, 1993).

The widespread use of 12-fold patterns to "hold" insights of significance to psychosocial considerations is presented as a clue to the operation of a hypothetical "psychopter". Emphasis has been placed on the memorability of a 12-fold generic set of modalities, integrated in interlocking learning/action cycles, through which such a "vehicle" could be piloted individually or collectively. The challenge to effective comprehension to that end -- of sets of size larger than the "magic number seven" (plus or minus two) -- is seen as limiting the capacity of working memory to sets which then constitute "subunderstanding" in relation to the requisite variety of cognitive modalities for the operation of such a psychopter.

The argument highlights the possibility that **current frustration with the quest for sustainable global governance may derive from such subunderstanding**. Within the table above (Fig. 3), as adapted from Young, the challenge to effective control over time is represented by $1/T^3$ (the right-most column). If the three associated modalities are ignored -- say in a "global plan" of 6 to 9 elements -- the resulting subunderstanding would ensure that sustainability remains elusive, as with the "political will to change". This suggests the merit of exploring a new engagement with time -- a form of cognitive "embodiment" understood experientially by the pilot of a helicopter (*Strategic Embodiment of Time: configuring questions fundamental to change*, 2010; *The Isdom of the Wisdom Society: Embodying time as the heartland of humanity*, 2003).

To the extent that a human individual is effectively a "vehicle", the original inspiration of the psychopter as the "winged self" -- potentially to be related to the winged Eye of Horus -- suggests that a 12-fold pattern is vital to the capacity to "get off the ground". It could be further argued that the interlocking learning/action cycles of the requisite modalities are fundamental to "health" in a larger sense. In the terms of Gregory Bateson, breaking this meta-pattern of 12 modalities necessarily destroys "all quality" -- perhaps to be understood as leading to physical death, whether in the case of an individual, a group, or even possibility a civilization aspiring to "immortality". The challenge was expressed in terms of how a 12-fold set might be appropriately "grokked". This framing can be related to the possible future cognitive evolution of humanity (*Authentic Grokking: emergence of Homo conjugens*, 2003).

The argument emphasized the complementary challenge of communicability over time. This is increasingly evident in the face of information overload and limited attention span, as recognized in the concern with the "zapping" of advertising (*The Sound of Many Hands Zapping*, *Bloomberg Businessweek*, 22 May 2006).

The relevance of a 12-fold pattern lies in the reinforcement of its integrity through the constitutive 2-fold, 3-fold and 4-fold patterns. This is emphasized by research on the robustness of polyhedral forms (*Polyhedral Empowerment of Networks through Symmetry: psycho-social implications for organization and global governance*, 2008). This suggests the relation of a "psychopter" to the design of a "wizdome" (*Transforming Static Websites into Mobile "Wizdomes": enabling change through intertwining dynamic and configurative*

metaphors, 2007).

(*Patterns of N-foldness: Comparison of integrated multi-set concept schemes as forms of presentation*, 1980) **

References

Christopher Alexander:

- Notes on the Synthesis of Form. 1964 [summary]
- A Pattern Language. Oxford University Press, 1977 [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]

Ron Atkin. Multidimensional Man; can man live in 3-dimensional space? Penguin, 1981 [summary]

Gregory Bateson. Mind and Nature: a necessary unity. Hampton Press, 1979

Susan Baur. The Dinosaur Man: tales of madness and enchantment from the back ward. Perennial, 1992 [review]

Stafford Beer:

- Cybernetics and Management. English Universities Press, 1959
- Decision and Control. Wiley, 1966
- Designing Freedom. CBC Learning Systems, 1975.
- Platform for Change. Wiley, 1978.
- The Heart of Enterprise. Wiley, 1988.
- Brain of the Firm. Wiley, 1981

Janine Benyus. Biomimicry: innovation inspired by nature. William Morrow / Quill, 1998

David Bohm. Wholeness and the Implicate Order.Routledge, 1980 [summary]

Jayne Bolsover. Dancing with Dinosaurs. Primrose Education Resources, 2001 [text]

Thomas Homer-Dixon. The Upside of Down: catastrophe, creativity, and the renewal of civilization. Island Press, 2006

Kenneth Boulding:

- Toward a General Social Science. Colorado Associated University Press. 1974.
- Ecodynamics: a new theory of societal evolution. Sage, 1978

Michael Caley. Mindscapes: the epistemology of Magoroh Maruyama. Routledge, 1994

Mihaly Csikszentmihalyi:

- Finding Flow: the psychology of engagement with everyday life. Basic Books, 1998
- Flow: the psychology of optimal experience. Harper and Row, 1990

Mihaly Csikszentmihalyi, Howard Gardner and William Damon. Good Business: leadership, flow, and the making of meaning. Basic Books, 2002

Luc de Brabandère:

- Le Latéroscope: systèmes et créativité, Bruxelles, La Renaissance du Livre, 1989
- The Forgotten Half of Change: achieving greater creativity through changes in perception, Kaplan Business, 2005

Antonio T. de Nicolas. Meditations through the Rg Veda: Four Dimensional Man. Shambhala, 1978

Joël de Rosnay. The Macroscope. Harper and Row, 1979 [text]

William Easum. Dancing with Dinosaurs: Ministry in a Hostile and Hurting World. Abingdon Press, 1993

R. Buckminster Fuller with E. J. Applewhite:

- Synergetics: explorations in the geometry of thinking. Macmillan, 1975 [contents]
- Synergetics 2: further explorations in the geometry of thinking. Macmillan, 1979 [contents]

Clare Graves. Human Nature Prepares for a Momentous Leap. *The Futurist*, April 1974, pp. 72-87 [text]

Charles Handy. The Gods of Management: who they are, how they work and why they will fail. Pan, 1979

Yitzkak Hayut-Man. The Twelve fold Pattern Enfolded in Parashat Bereshit Genesis. IsraelSeen.com, 20 May 2010 [text]

Mark Patrick Hederman. Dancing with Dinosaurs: a spirituality for the 21st Century. Columba Press, 2011 [introduction]

Chris Hedges. Dancing with Dinosaurs. *The New Humanist*, 122, 2, March/April 2007 [text]

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

Antony Jay. Corporation Man. Jonathan Cape, 1972

Mark Johnson:

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

Rosabeth Moss Kanter. When Giants Learn To Dance. Free Press, 1990

James Patrick Kelly. Think Like a Dinosaur. *Asimov's Science Fiction*, June 1995 [comment]

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

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

J. G. Leishman. Principles of Helicopter Aerodynamics. Cambridge University Press, 2000

Pierre Lévy. The Semantic Sphere: computation, cognition and information economy. Wiley-ISTE, 2011

Geshe Gedün Lodrö. Calm Abiding and Special Insight: achieving spiritual transformation through meditation. Snow Lion Publications, 1998

Dudley Lynch and Paul L. Kordis. The Strategy of the Dolphin: scoring a win in a chaotic world. William Morrow, 1989

Magoroh Maruyama:

- Polyocular Vision or Subunderstanding? *Organization Studies*, 25, 2004, pp. 467-480
- Metaorganization of Information: information in a classificational universe, relational universe, and relevantial universe. *Cybernetica*, 1965, 8(4) 224-236.

Stefan Marinov. Eppur Si Muove: axiomatics, fundamentals and experimental verification of the absolute space-time theory. Est-Ovest, 1981

Stanley S. McGowen. Helicopters: an illustrated history of their impact. ABC-CLIO, 2005

Steve McIntosh. Integral Consciousness and the Future of Evolution. Paragon Press, 2007

Ernest G. McClain:

- Myth of Invariance: The Origins of the Gods, Mathematics and Music from the Rg Veda to Plato. Nicolas-Hays 1976
- The Pythagorean Plato: Prelude to the song itself. Nicolas-Hays 1978
- Meditations Through the Quran: Tonal Images in an Oral Culture. Nicolas-Hays 1981

Donald Michael. On Learning to Plan and Planning to Learn. Jossey-Bass, 1973

Paul Moxnes. Deep Roles: Twelve Primordial Roles of Mind and Organization. *Human Relations*, 1999, 52 (11), pp. 1427 -1444 [abstract]

Nathaniel Alexander Nicholson. E Pur Si Muove: essays. General Books, 2009

Etienne Oehmichen:

- Nos maîtres les oiseaux, étude sur le vol animal et la récupération de l'énergie dans les fluides. Dunod, 1920
- Mécanismes naturels et Technique Humaine. Hermann et Cie, 1938

Steve Palmquist. The Circle of Twelvefold Systematization. In: The Geometry of Logic: a treatise on the perspectival transformations of logic and life through the systematic mapping of geometrical symbolism. 1986 [text]

Monique Pommier. The Twelvefold Archetype of the Human Soul: insights into the cosmic ground of philosophical imagination. Xlibris Corporation, 2009

Frank Ross Jr. Flying Windmills: the story of the helicopter. Lothrop Lee and Shepard, 1953 [extract]

John Ralston Saul. The Unconscious Civilization. Simon and Schuster, 1995

Sarah A. Sheard:

- Twelve Systems Engineering Roles. *Proceedings of the INCOSE Sixth Annual International Symposium*, 1996 [text]
- The Value of Twelve Systems Engineering Roles. *Proceedings of the INCOSE Sixth Annual International Symposium*, 1996
- Twelve Roles and Three Types of Systems Engineering. Software Productivity Consortium, 2003 [ppt]

Maxine Sheets-Johnstone:

- The Primacy of Movement. John Benjamins, 1999
- Kinesthetic experience: understanding movement inside and out. *Body, Movement and Dance in Psychotherapy*, 5: 2, pp. 111-127 [text]

Henryk Skolimowski. The Participatory Mind: a new theory of knowledge and of the universe. 1995 [review]

Rene Thom. Structural Stability and Morphogenesis:an outline of a general theory of models. Benjamin, 1975

Dmitri Tymoczko:

- The Geometry of Musical Chords. *Science*, 313, 5783, 7 July 2006, pp. 72-74 [text]
- A Geometry of Music. Oxford University Press, 2011

Ludwig von Bertalanffy:

- Robots, Men and Minds: Psychology in the Modern World. George Braziller, 1967
- General System Theory: foundations, development, applications. George Braziller, 1969
- The Organismic Psychology and Systems Theory (Heinz Werner lectures). Clark University Press, 1968.
- Perspectives on General Systems Theory. Scientific-Philosophical Studies. In: E. Taschdjian (Eds.), George Braziller, 1975
- A Systems View of Man: Collected Essays. Westview, 1981

M. M. Weil, and L. D. Rosen. The Psychological Impact of Technology From a Global Perspective: a study of technological sophistication and technophobia in university students from 23 countries. *Computers in Human Behavior*, 1, 1995, 1, pp. 95-133 [text]

R. Bruce Williams. Twelve Roles of Facilitators for School Change. Sage, 2008

Peter Woit. Not Even Wrong: the failure of string theory and the search for unity in physical law. Basic Books, 2007

Shing-Tung Yau and Steve Nadis. The Shape of Inner Space: String Theory and the Geometry of the Universe's Hidden Dimensions. Basic Books, 2010

Maurice I. Yolles:

- Knowledge Cybernetics: a metaphor for post-normal science. In: Steve Wallis (Ed), Cybernetics and Systems Theory in Management: Tools, Views and Advancements, IGI Global, Hershey, 2010
- Organisations as Complex Systems: an introduction to knowledge cybernetics. Information Age Publishing, Inc, 2006

Maurice Yolles, B.R. Frieden and G. Kemp. Toward a formal theory of socioculture: a yin-yang information-based theory of social change. *Kybernetes*, 37, 2008, 7, pp. 850 - 909 [abstract]

Arthur M. Young:

- Geometry of Meaning. Delacorte Press, 1976
- The Reflexive Universe: evolution of consciousness. Anodos Foundation, 1976 [excerpt]
- The Bell Notes: A Journey from Physics to Metaphysics. Delacorte Press / Seymour Lawrence, 1979
- On the Value of Astrology for a Science of Life.Anodos Foundation, 1992 [text]