Geometry, Topology and Dynamics of Identity

Cognitive implication in fundamental strategic questions and dilemmas

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Introduction

The concern here is with the interplay between a sense of identity and the forms through which identity is expressed and patterned by psychological processes of identification. The focus is on how the range of simpler forms identified by geometry and topology function in support of articulation of individual or group identity -- in the moment and dynamically over time. In particular the concern is with implicit forms serving this function and the degree to which they are rendered conscious and explicit, notably through their use in guiding, key and generative metaphors (Guiding Metaphors and Configuring Choices, 1991).

The collective emphasis follows from arguments in a set of papers (Metaphorical Geometry: in quest of globality in response to global governance challenges, 2009; Geometry of Thinking for Sustainable Global Governance, 2009). The individual emphasis follows from exploration of the challenges of embodiment, especially their dynamic implication (Existential Embodiment of Externalities: radical cognitive engagement with environmental categories and disciplines, 2009; Emergence of Cyclical Psycho-social Identity: sustainability as "psyically" defined, 2007).

A range of authors and disciplines have explored aspects of the possibilities highlighted here. A primary concern is however to show the intuited cognitive importance of geometrical forms as accessible to all -- independently of the sophisticated descriptions offered by such studies. These arguments follow from those of George Lakoff and Mark Johnson (Metaphors We Live By, 1980) and of George Lakoff and Rafael Núñez (Where Mathematics Comes From: How the Embodied Mind Brings Mathematics into Being, 2000).

Of particular interest here is how people (or groups of any size) may variously comprehend such forms and the support they offer for identity and cognition -- whether or not any more sophisticated explanations are experienced as being of assistance in this process (or a source of confusion). Identity is understood as highly dependent on the construct with which, or through which, that identity is patterned by a process of identification and embodiment.

The approach has notably been inspired by the arguments of Ron Atkin with respect to comprehension of the geometry through which communication and comprehension take place (Multidimensional Man: can man live in three dimensions? 1981; Combinatorial Connectivities in Social Systems; an application of simplicial complex structures to the study of large organizations, 1977). Their implications have been summarized with respect to Social organization determined by incommunicability of insight (1995).

Simpler forms offering a support for identity
Extensive use is made of geometrical metaphor in the articulation of identity and strategy. With respect to the latter, for example, a forthcoming book by Robert W. Keidel (The Geometry of Strategy: concepts for strategic management, 2010) uses the following chapter structure:

1. Decoding complexity by isolating form
2. Point thinking and organizational persona
3. Linear thinking and organizational performance
4. Angular thinking and organizational puzzle
5. Triangular thinking and organizational pattern

As noted previously (Metaphorical Geometry: in quest of globality in response to global governance challenges, 2009; Geometry of Thinking for Sustainable Global Governance, 2009), such simple geometry is most evident in the "points" made in any "line" of argument. This is notable in strategic presentations made with "bullet points", and in the emphasis on value "pillars", "axes" and "poles" in terms of which strategies and belief systems are structured. The bullet points may be associated with budget lines appropriately configured together into a coherent structure -- or not. Comprehending that coherence may constitute a real challenge for policy-makers and their constituencies -- being able to "see the wood for the trees" and the "pattern that connects". Similarly, in any creative process, emergence of an idea or insight may be understood as a point -- with the challenge of eliciting related points and developing each, effectively as a line of argument in a configuration. (Polly Toynbee, We needed revolution from Gordon Brown but we got triangulation, The Guardian, 29 September 2009).

Discourse within the European Union often focuses on the appropriate "geometry" and the necessity for "variable geometry" (cf Alternation between Variable Geometries: a brokeship style for the United Nations as a guarantee of its requisite variety, 1985).

Whilst most evident in mainstream initiatives, "geometry" has also been significant to the coherence of alternative initiatives. Pierre Rousset (The World Social Forum: a sustainable model?, Global Research, 2009) writes:

Some new features have been tried out in recent years to ensure a more efficient process: meetings of thematic assemblies in the forums, the definition of 'axes' around which the initiatives are grouped, proposals for the 'clustering' of workshops to increase exchanges between constituents and improve the visibility of the programme, the call for 'strategic' reflection, etc... But interesting as these experiments are, a politics which has become out of date cannot be addressed solely by dealing with the operating procedures of the WSF.

Individual and collective identity may be variously given sustainable form through identification with such geometric elements. Individuals en masse are readily reduced to "points" -- variously "aligned" in the pursuit of a collective agenda. Dialogue and debate are characterized by "polarization", identifying with one "pole" or the other. There is a quest for "angles" to make a case convincingly or to exploit an opportunity.

From a psychological perspective, a key question is the geometric metaphor with which one might associate one's own identity -- consciously or unconsciously. To what extent does one frame one's own identity as a point (as with one's other contacts), a collection of points, a line (perhaps as being on a career path or journey), caught in an "eternal triangle" of relationships, as a node in a network of relationships, or as a focal point of a circle of friends? More conventionally importance may be attached to a kinship network or to one's place in a social hierarchy of relationships.

**Eliciting cognitive implications of formal relationships**

Central to this argument is the degree to which people have ready experiential access to geometric forms that are fundamental to their thinking and sense of identity. The following indication of disciplines, which have explored this connection, is inserted here primarily to reinforce the legitimacy of this perspective for those uncertain of the validity of the geometric argument. These indications are not however central to this argument. This section may be skipped as the kind of unnecessary reference to external authority which is the subject of the next section.

The following examples derive from earlier work on Patterns of N-foldness: comparison of integrated multi-set concept schemes as forms of presentation (1980) as related to Representation, comprehension, and communication of sets: the role of number (1978). The issue here however is the extent to which such sets and patterns are represented geometrically, whether explicitly or implicitly.

**Mathematics and physics:** The range of geometric elements and their relationships is the subject of an extensive literature in mathematics. Mathematics also has an interest in the mathematical identity of mathematical objects, with the latter abstractions also of interest to philosophy. Geometrical form is also of concern in

- conception of space as highlighted by Antonio M. Battro (Visual Riemannian space versus cognitive Euclidean space, 1977) with respect to the question of Adolf Grünbaum: How do human beings manage to get about so easily in a Euclidean physical environment even though the geometry of visual space is presumably hyperbolic?
- the Erlangen Program initiated by Felix Klein proposing a new solution to the problem of how to classify and characterize geometries on the basis of projective geometry, group theory, and their characteristic groups of transformations (rotations, translations and reflections); the entities of the geometry were the invariants of these transformations. Barbara Landau (Spatial Cognition, Encyclopedia of the Human Brain, 2002) stresses that the importance of the approach for understanding the nature of spatial cognition derives from the fact that it provides a formal, testable theory that can be used to understand the nature of spatial representations. Questions about the links between different spatial cognitive systems can then profitably be organized around the issue of how different geometric properties can be converted or translated into others. However it is an open question whether all
spatial cognitive functions that engage reference systems also represent location in terms of metrically specified coordinates for distance and angle
- Mark C. Chu-Carroll. From Sets to Groups: deep meaning in simple constructs, 2007
- the geometrization of theoretical physics (Luciano Boi, Geometrical and Topological Foundations of Theoretical Physics: from gauge theories to string program, 2003)
- visualization of mathematics, and a range of cognitive implications, have been a focus of the The Visual Math Institute, notably through the work of Ralph Abraham (Dynamics: the geometry of behavior, 1992; The Evolutionary Mind, 1997).

**Philosophy and religion:** Principles fundamental to belief systems may well be represented in geometric form, most notably through the triangle, the square and the circle. A striking historical example is provided by early Christian understanding of the Trinity as challenged by the heretical doctrines of Arianaism, subsequently used to refer by contrast to other nontrinitarian theological systems (Wade Cox, The Unitarian/Trinitarian Wars, Christian Churches of God, No. 268). Trinitarian warfare is a topic of continuing religious preoccupation (Gregory A. Boyd, Satan and the Problem of Evil: Constructing a Trinitarian Warfare Theodicy, 2001). Polygons may be valued by some belief systems as with the use of octagonal forms in Sufism and the Ba Gua of Taoism or some yantras of Hinduism.

These forms may all be used in spiritual practices as being conducive to fruitful meditation. A notable advocate of geometrical representation was Giordano Bruno using a qualitative approach to mathematics, applying spatial paradigms of geometry to language (Arielle Saiber, Giordano Bruno and the Geometry of Language, 2005; Alessandro G. Farinella and Carole Preston, Giordano Bruno: Neoplatonism and the Wheel of Memory in the 'De Unbris Idearum', 2002).

Gaetano Rametta (Fichte: El dominio de la razón: quintuplicità e individualità -- la costruzioni dell'Io in WL 1807, Daonin, 9, 1994) indicates that Johann Fichte sets the problem of individuality within a twofold concept of quintuplicity. On the one hand, quintuplicity is seen as the fundamental structure of intuition. On the other hand, quintuplicity is opened by the free acts through which the thinking I project itself on that appearance. Individuality is thereby set within five possible kinds of vision (Einsicht).

A valuable elaboration of the cognitive implications of geometrical representation, termed **systematics**, is offered by J. G Bennett (The Dramatic Universe, 1956-1966) with regard to sets involving from 1 to 12 elements. It notably focuses on the enneagram. (A. G. E. Blake, The Intelligent Enneagram, 1996).

The system of anthroposophy developed by Rudolf Steiner has given much attention to projective geometry as a means of working in a precise manner with aspects of reality which cannot be described in terms of ordinary physical measurements. George Adams took his descriptions of how this space is experienced and found a special geometric representation (George Adams, The Lemniscatory Ruled Surface in Space and Counterspace, 1979; Lawrence Edwards, Projective Geometry, 1985).

**Design and symbolism:** The possibilities of a "geometry of thinking" were central to the two-volume magnum opus of R. Buckminster Fuller (Synergetics: Explorations in the Geometry of Thinking, 1975; Synergetics 2: Further Explorations in the Geometry of Thinking, 1979). However, as noted previously, the experiential nature of his insights is perhaps necessarily implicit rather than explicit given his design and architectural preoccupations (Geometry of Thinking for Sustainable Global Governance, 2009).

Whether in the form of architecture or illustration, design is necessarily based on the configuration and manipulation of geometric elements -- especially as inspired by nature (Christopher Alexander, The Nature of Order, 2003-2004). This is most evident in the design options specifically offered by the vector graphic software packages used (Adobe Illustrator, CorelDRAW, etc.). The interface between art and mathematics is notably explored in the annual international events of The Bridges Organization (Reza Sarhangi, Bridges: Mathematical Connections in Art, Music, and Science, 1998). Importance may be attached to particular geometric forms in sacred geometry and its embodiment in sacred architecture. Importance is also attached to polygonal forms in various traditions of esotericism and magic as cultivated by secret societies whose insights and ritual practices are associated symbols of special significance.

Especially challenging, in terms of their potential significance for comprehension and communication, are the complex geometric forms regularly observed in crop circles worldwide. The controversy over the origins of crop circles also serves the purpose of highlighting the extent to which purported significance associated with geometric forms is subject to abuse and fraud, as with the use of such symbols in greenwashing the image of multinational corporations. This pattern follows the appropriation of the Greek pantheon by the fashion industry (Religious "Plastic Turkeys" -- Hermes vs. the Hijab, 2003).

**Psychology:** As noted by Paul Talar (Geometry of Thinking, 2001), in addition to the approach of Fuller:
- Kurt Lewin (Principles Of Topological Psychology, 1936), argues that: “if we want to derive actual psychological events conceptually, we have to try to represent not only the spatial relationships but also the dynamic ones in a mathematical way.” (p.64)
- Jean Piaget has focused on the logico-mathematical experience in psychological development (Psychology and Epistemology: towards a theory of knowledge, 1972; The Grasp of Consciousness, 1977), and with E. W. Beth (Mathematical Epistemology and Psychology, 1966).
- Paul Churchland and Patricia Churchland have developed theories of cognition which they term neurocomputational, and which integrate mathematical notions with neuropsychological research.
- William H. Calvin, a neuropsychologist, has developed theories expressed in geometrical terms, with hexagonal arrays of neurons (How Brains Think, 1996), arguing: And what does this tendency to synchronize have to do with copying spatiotemporal patterns? Happily, it's all a matter of simple geometry, the kind that the ancient Greeks discovered while staring at the tile mosaics of their bathhouse floors (and that many of us have rediscovered in wallpaper patterns).

**Psychoanalysis and psychotherapy:** Geometric forms have been of interest to the therapeutic professions as exemplified by:

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**Greenwashing:** The extent to which purported environmental benefits are exaggerated or misrepresented, often by multinational corporations, as a strategy to enhance their public image and sales. This practice is often associated with the image of multinational corporations. This pattern follows the appropriation of the Greek pantheon by the fashion industry (Religious "Plastic Turkeys" -- Hermes vs. the Hijab, 2003).
• Carl Gustav Jung, who as a psychoanalyst highlighted the importance of the *mandala* in individuation, notably as recognized in a variety of traditions (*Mandalas*, 1955; *Mandala Symbolism*, 1973). He saw the mandala as a representation of the unconscious self, and believed such symbols enabled him to identify emotional disorders and work towards wholeness in personality

• Jacques Lacan, as a psychoanalyst, demonstrated how the logic of the unconscious relates to *topological forms*. The hypothesis that the unconscious is structured like a language in two dimensions, led Lacan to the topology of surfaces. He argues that topology is not simply a metaphorical way of expressing the concept of structure, it is structure itself. He used the topology of surfaces (torus, Moebius strips, Klein bottles, crosscaps) and that of *knots* (Borromean, the sithnome). Lacan showed that bodily and mental life function topologically (Ellie Ragland, *Lacan: Topologically Speaking*, 2004)

**Political and military strategy**: As noted above, much reference is made to the "pillars", "axes" and "poles" in terms of which strategies and belief systems are structured (Coherent Value Frameworks: pillar-ization, polarization and polyhedral frames of reference, 2008). Political systems polarized into political parties ("government" and "opposition") may on occasion be reconfigured for purposes of "bipartisan" initiatives. Relatively little is heard of "tripartisan", "quadrupartisan", or more complex configurations, especially on a global scale where it might be assumed that they were essential. One exception is the tripartite International Labour Organization.

A contrast with geometric connotations (strangely echoing the early Christian preoccupation) is currently made between trinitarian and nontrinitarian concepts of warfare (notably in the light of the continuing debate regarding *just war* and the response to "insurgency"). As formulated by Carl von Clausewitz (*On War*), the former consisted of three elements: the government, the army and the people, with the government having the ultimate authority over the army, which functions as its instrument with the support of the population (Edward J. Villacres and Christopher Bassford, *Reclaiming the Clauswitzian Trinity*, Parameters, Autumn, 1995).

Trinitarian warfare is therefore understood to be between states, prosecuted by professional military, with the people off-limits. In non-trinitarian warfare the people are the military and the state. War is total and absolute. Nontrinitarian wars therefore tend to involve non-state entities, notably warlords (T. S. Westhusing, *American Pre-emption, Trinitarian and Nontrinitarian War, and Justice*, 2005). As articulated by Martin Levi van Creveld (*The Transformation of War*, 1991) the non-trinitarian theory of warfare identifies five key issues of war:

1. By whom is war fought -- whether by states or by non-state actors
2. What is war all about -- the relationships between the actors, and between them and the non-combatants
3. How war is fought -- issues of strategy and tactics
4. What war is fought for -- whether to enhance national power, or as an end to itself
5. Why war is fought -- the motivations of the individual soldier.

In Sun Tzu's classic *The Art of War*, the five traditional elements of Chinese philosophy are replaced by the five strategic elements that define the competitive world: mission (path), ground, climate (timing), command (leadership), and methods. As a martial art *Ba Gua Zhang* is based on the theory of continuously changing in response to the situation at hand in order to overcome an opponent with skill rather than brute force.


It is Stafford Beer and his collaborators who endeavoured to give functional significance to polyhedral representation of psychosocial systems -- with his focus on the icosahedron through syntegrity. Associated with this work has been the further development of his management cybernetics into the elaboration of a *viable system model* (VSM). However the psychosocial implications of this are much diluted, except in the extension into knowledge cybernetics by Maurice Yolles (*Knowledge Cybernetics: a new metaphor for social collectives*, Organisational Transformation and Social Change, 2006; Exploring Cultures Through Knowledge Cybernetics, Journal of Cross-Cultural Competence and Management, 2007).

With the development of internet-enabled networks, further possibilities become apparent (*Polyhedral Empowerment of Networks through Symmetry: psycho-social implications for organization and global governance*, 2008; *Sacralization of Hyperlink Geometry*, 1997).

**Prediction, divination and gambling**: In many of the traditional forms of prediction, great significance is associated with geometric configuration. This is most obvious in astrology (triplicities and quadruplicities) but also to some degree in those processes involving casting a set of objects and the psychological engagement with the result for purposes of interpretation. Traces of the associated psychological engagement are to be found in many forms of gambling.

**Music and dance**: Beyond the relationship traditionally recognized between mathematics and music, a new way of analyzing and categorizing music has recently been developed to take advantage of the deep, complex mathematics seen to be enmeshed in its very fabric (*Music Has Its Own Geometry, Researchers Find*, ScienceDaily, 18 April 2008; Marc West, *Geometrical music theory*, Plus, 19 May 2008; Clifton Callender, Ian Quinn and Dmitri Tymoczko, *Geometrical Music Theory*, Science, 18 April 2008, 320, 5874, pp. 328 - 329).

The language of musical theory has been translated into that of contemporary geometry. A sequences of notes, like chords, rhythms and scales, are categorized so they can be grouped into "families." to which a mathematical structure can be assigned. They can then be represented by points in complex geometrical spaces. The basis of geometrical music theory is that it provides a unified mathematical
framework for musical events that are described differently depending on the scenario, but are fundamentally the same. This work is indicative of the complex ways in which music is understood and is supportive of identity, notably in traditional sacred music.

The many patterns of dance (including breakdancing) may also be understood as expressions of geometrical relationships, again especially in the case of the patterns of sacred dance.

**Games and puzzles:** Geometrical forms are fundamental to engagement in positional games. This is notably evident in *board games* such as chess and go. In *ball games*, such as football, passing patterns are of great significance (Mark Weston, *Passing Patterns*, 2006; Athalie Redwood-Brown, *Passing patterns before and after goal scoring in FA Premier League Soccer*, *International Journal of Performance Analysis in Sport*, 2008; Association for Soccer Education and Teaching, *Passing Patterns and Small Sided Games*, 2008; Alan Reifman, *Network Analysis of Basketball Passing Patterns II*, 2006).

Pattern completion is fundamental to the engagement with such as sudoku, crossword puzzles, and Rubik's cube, as previously discussed (*Rethinking Rubik's Cube: a mnemonic device for ways of knowing and engagement?* 2009; *Augmenting the psychoactive function of a mnemotechnical device*, 2009).

### Indicative clustering of domains implying various degrees of identification through geometric forms

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<th>Domain</th>
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<th>Philosophy</th>
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<td>Management Strategy</td>
<td>Psychology</td>
<td>Policy/Strategy</td>
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<td>Games (playing)</td>
<td>Mathematics (physics)</td>
<td>Design</td>
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<td>Prediction</td>
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### Appropriation of geometry as a support for development of identity

The argument here might be framed through an adaptation of the classic phrase of Georges Clemenceau: *War is too important to be left to the generals (Issues Too Important to Be Left to Specialists: selected web resources*, 2004). The adaptation might take the form of: *Geometry is too important to be left to mathematicians*. A commentary regarding the *Bourbaki Archives* notes: I've sometimes had the feeling that differential geometry is too important to be left to people with background too much in analysis...([Blog of Peter Woit, Not Even Wrong, 2009](https://blog.math.columbia.edu/2009/03/22/not-even-wrong-geometry-is-too-important/)).

The point might be made more strongly in the light of the huge development of the field of mathematics and a degree of pride in the irrelevance of many of its implications for a struggling world. It is indeed difficult to detect any application of mathematics, and especially to enable new forms of psychosocial organization -- in contrast to its applications for exploitation, surveillance and destructive purposes (as primarily funded for purposes of "defence").

Most pathetic is the failure to apply mathematical insight to simplistic territorial claims -- as in the challenge of the Middle East, as previously argued (*And When the Bombing Stops? Territorial conflict as a challenge to mathematicians*, 2000). Equally pathetic is the inability to propose alternatives to the simplistic mathematics on which "democracy" is so problematically based (at the expense of lives and cultures), or to elaborate new understandings of collective "harmony" and "unity" for which appeals are so plaintively made.

Curiously the understandings of the complexity sciences have been most assiduously applied to develop the toxic financial derivatives market and not to the possibility of more fruitful forms of organization (*Consciously Self-reflexive Global Initiatives: Renaissance zones, complex adaptive systems, and third order organizations, 2007*).

### Viability of cognitive engagement with geometrical objects

Various constraints on access to knowledge have been previously discussed (*Emergent characteristics of knowledge-based society*, 2009; *Emerging Memetic Singularity in the Global Knowledge Society*, 2009; *Memetic and Information Diseases in a Knowledge Society: speculations towards the development of cures and preventive measures*, 2008). Constraints are also associated with the effective use of knowledge (*Coherent Policy-making Beyond the Information Barrier: circumventing dependence on access, classification, penetration, dissemination, property, surveillance, interpretation, disinformation, and credibility*, 1999; *Recognizing the Psychosocial Boundaries of Remedial Action: constraints on ensuring a safe operating space for humanity*, 2009).

As a feature of this emerging context, various interrelated factors inhibit or constrain cognitive engagement with geometrical objects. These include:

- the *competitive advantage* to be gained by exploring and identifying with more complex geometrical objects of which the Mandelbrot fractal, the E8 group and the Monster group are the ultimate examples (*Potential Psychosocial Significance of Monstrous Moonshine: an exceptional form of symmetry as a Rosetta stone for cognitive frameworks*, 2007; *Psycho-social Significance of the Mandelbrot Set: a sustainable boundary between chaos and order*, 2005):
To the extent that their value is recognized, any such exploration may be inhibited or deprecated to preserve that advantage, whether by belief systems with insights into sacred geometry or by intelligence services interested in the operation and destabilization of networks and collective initiatives.

- the expert condemnation of the validity of any understanding or insight considered to be inappropriately formed:
  - But the criterion in any such elaboration by an individual is not whether it is "correct" from an authoritative, judgmental perspective but rather whether the person can engage with it. This highlights the issue of what might be considered "authoritative" and why one should "subscribe" to some other perspective for that reason. The key to "correctness" for an individual is the degree to which it is possible and fruitful to look or feel "through" the geometry -- engaging through it, stepping cognitively through it, as through a door or into a room.

- the restrictive access to relevant insight and the challenge to recognition of its relevance and value. This is evident in the quantity of (secret) classified information, commercial barriers to easy access to information effectively rendering such information "secret" (notably when subject to copyright restrictions), the challenge of knowledge discovery (search engine skills, etc.), and problematic constraints of access (physical distance or electronic facilities). In a period in which much hope is associated with human ingenuity for surviving foreseeable crises, the challenge of ensuring inputs of such as Srinivasa Ramanujan has not been addressed (Thomas Homer-Dixon, The Ingenuity Gap, 2000).

- the increasing time pressure under conditions of increasing pace of life and competitive busyness, whether in terms of attention time, processing (reading) time, learning time, or time required to confirm authenticity (or correctness of any claimed proof) (Jeremy Rifkin, Time Wars: the primary conflict in human history, 1987). Symptomatic of the conflict between knowledge and time is the period of three months required in 2009 for expert determination of the gender of the athlete Caster Semenya.
  - Time pressure is especially significant to any assumption that insight can be universally communicated and comprehended. Relative ignorance is currently being engendered at a greater rate than relevant knowledge.

- the pressure to conform to conventional methodologies or modes of presentation if there is a commitment to disseminating insights such as to attract appreciation and legitimacy from within those contexts.
  - This may significantly denature the engagement with those forms that have triggered or sustained the creative insight and any new sense of identity

- the proprietary claims on insights into the geometry by particular disciplines and schools of thought, even taking the form of intellectual property claims, as notably highlighted in the more general argument of John Sulston (How science is Shackled by Intellectual Property: ownership rights pose a real danger to scientific progress for the public good, The Guardian, 26 November 2009) in commenting on Who Owns Science? The Manchester Manifesto (2009) produced by an interdisciplinary and international group of experts. There may even be a tendency to extend such claims to underlying metaphors (Future Coping Strategies: beyond the constraints of proprietary metaphors, 1992):
  - The experience for the individual wandering through global knowledge society is of a range of territories ("fields of knowledge") to which various groups have laid claim and which they vigorously protect from "fortified" institutions that bear every metaphoric resemblance to fortresses -- replicating a condition of centuries ago with respect to physical territory. It may be difficult to distinguish such terrain-dominating structures from gated cognitive communities reminiscent of the monasteries of that era. As with the roving bands of that time, a modern equivalent might best be described as dynamically gated communities (Dynamically Gated Conceptual Communities: emergent patterns of isolation within knowledge society, 2004)

- the competitive personal aspiration to be associated with an ultimate formulation, subsuming all other perspectives, to which others might then be expected to subscribe. The appropriate example is the competitive quest by physicists for a Theory of Everything. Unfortunately, by the very nature of physics, this is likely to exclude those dimensions vital to any sense of identification with the form so elucidated, especially if it is exceptionally complex or challenging to comprehend in its simplicity. A distinct challenge has been highlighted by Russell K. Standish (Theory of Nothing, 2006) purportedly linking the laws of physics to the laws of psychology.
  - The nature of this challenge is more evident in the personal encounter with the variety of all-encompassing theories of consciousness and spirituality competitively proposed by non-physicists, as previously argued (Musing on Information of a Higher Quality, 1996; Self-reflexive Challenges of Integrative Futures, 2008; Import of Nothingness and Emptiness through Happening and Matter, 2008).

- the comprehension capacity required fully to understand the nature and implications of a mathematical object in the light of the highest extant expertise (Dynamics of Symmetry Group Theorizing: comprehension of psycho-social implication, 2008; Comprehensive Formulations and their Cognitive Challenge, 2009):
  - But in seeking sustaining forms, patterns and templates for personal identity, of particular importance for the individual is the kind of intelligence through which engagement with such forms is facilitated. Of relevance then is the kind of intelligence (or cluster of intelligences) with which the individual is most comfortable -- possibly in contrast to the intelligence promoted by a discipline claiming absolute authority in that domain. The various types of intelligence distinguished by Howard Gardner in the theory of multiple intelligences offer a sense of the opportunities (Frames of Mind: the theory of multiple intelligences, 1983; Intelligence Reframed: multiple intelligences for the 21st Century, 1999). Gardner distinguishes the following types: bodily-kinesthetic, interpersonal, verbal-linguistic, logical-mathematical,
intrapersonal, visual-spatial, musical, and naturalistic. But what kinds of intelligence are required?

- the pre-logical and other biases for or against any particular formulation, notably taking the form of personal antipathy (Systems of Categories Distinguishing Cultural Biases, 1993; Epistemological Challenge of Cognitive Body Odour: exploring the underside of dialogue, 2006);
  - Again the question is what "works" for the individual, irrespective of the criteria of others promoting adherence to their own framework of understanding. This process is most evident in interior design and clothing preferences.

In practice these dysfunctional constraints contribute significantly:

- to limiting the capacity of people to take advantage of knowledge which is supposedly for the benefit of humanity. This applies as much to policy makers as to private individuals.
- to constraining people (individually and collectively) to identify with geometry of the simplest kind, effectively reinforcing a form of cognitive imprisonment (Metaphoric entrapment and impoverishment? 2006). Most evident in this respect is the case with which people are defined as "points", required to "align" themselves with the views of authoritative others -- effectively ensconced in a piece of geometry. Any capacity to transcend polarization is then to be hailed as a breakthrough.
- to obscuring recognition that the form through which it is possible and meaningful to sustain a sense of identity may well constitute a type of closure that will not be sustainable in the light of insights that subsequently become apparent (Being What You Want: problematic kataphatic identity vs. potential of apophatic identity? 2008). The resulting closure may be premature, whether for a Theory of Everything, or a Theory of Nothing (Hilary Lawson, Closure: a story of everything. Routledge, 2001).
- to obscuring self-reflective insight into the process of articulating a sense of identity through forms. (Hilary Lawson, Reflexivity: the post-modern predicament, 1985)

Mathematicians have offered a variety of delightful fictional descriptions of aspects of this cognitive condition: Edwin A. Abbott’s Flatland: a romance of many dimensions (1884), Charles Howard Hinton’s An Episode on Flatland: or how a plain folk discovered the third dimension (1907), A. K. Dewdney’s The Planiverse (1984), Ian Stewart’s Flatterland (2001), and Rudy Rucker’s Spaceland (2002). The 1884 novel has recently taken the form of an animated version (Flatland, 2007) to highlight the challenges otherwise.

Re-cognizing freedom of identification

The focus in what follows is to identify how individuals remain free to explore and benefit from geometrical objects in support of the development of their own identity -- despite the above constraints then understood as framing windows of cognitive opportunity. The exploration is consistent with the principles of such as Paul Feyerabend (Against Method: outline of an anarchistic theory of knowledge, 1975; Conquest of Abundance: a tale of abstraction versus the richness of being, 1999) -- as previously discussed (Value Embodiment: participatory engagement with environmental reality, 2008; Declaration of Universal Independence: delinking from detachment through radical questioning, 2009).

The windows of opportunity are conveniently identified with the aid of the following figure.

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<tr>
<th>Tentative map relating &quot;closed&quot; and &quot;open&quot; arenas</th>
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</table>

This cognitive freedom is a feature of:

- the creativity of an individual or group: understood as the freedom to reimagine one's own identity, to "reinvent oneself" as accepted and admired in the case of media celebrities (Being What You Want: problematic kataphatic identity vs. potential of apophatic identity? 2008)

- a focus on what "works": with the emphasis placed on articulating a sense of identity that is most fruitful or integrative rather than accepting restrictive, reductionist understandings of identity promoted through narrow disciplinary frameworks. The fruitful approach is therefore intimately associated with its aesthetic and intuitive appreciation
• **working with the integrity of what one understands**: with the emphasis on what resonates with one's own comprehension and sense of coherence, irrespective of whether this adequately reflects the subtler insights promoted elsewhere with whatever authority. As with the challenge of a habitable shelter, the question is what one can obtain or construct with the resources available rather than "better" forms of shelter to which one does not have access.

The issue is what can be assembled that offers a degree of shelter and identity. Views from elsewhere by those with greater knowledge, and the inability to communicate it effectively, are all but irrelevant. Again this renders secondary any sense of obligation to seek external authentication or authorization for the form that serves such a function. The assumption that a set of texts should be read, that lengthy courses should be attended to achieve relevant qualifications, or that experts should be consulted, is an increasingly naive indulgence.

As noted above, the era of global knowledge society is likely to be a context in which cognitive constructs can only be built with the "scrap" to which one has access with the time available -- from the scrap heaps of knowledge. To the extent that the inappropriateness of any insistence on perfect materials is now only too evident in refugee camps, many in the future will effectively be "knowledge refugees" -- even if they do not already have that status.

• **exploitation of a useful mnemonic**: however curious to others, worthy of consideration is any form that serves as an aid to "re-memorizing" an identity that is easily fragmented (even "shattered") by daily encounters with reality (*In Quest of Mnemonic Catalysts -- for comprehension of complex psychosocial dynamics*, 2007). The attitude recalls the traditional status of memory palaces and memory theatres in the *Ars Memorativa* as highlighted by Frances A. Yates (*The Art of Memory*, 1966) and Jonathan D. Spence. (*The Memory Palace of Matteo Ricci*, 1984). With respect to the geometric argument here, Yates notably focused on the graphical memory devices in the works of Giordano Bruno (mentioned above).

• **detachment from any particular form**: whilst a form may indeed be useful as a support for a sense of identity, there is no need to be dependent on a particular form, either when others emerge as more fruitful, or where there is a case for alternating between a set of (complementary) forms (*Policy Alternation for Development*, 1984). As with any shelter, a form may then be understood as a stepping stone to more adequate forms -- or as a "secondary dwelling" (for use in "summer" or "winter").

• **the tentative status of the form used**: use may be made of a form that is in some way incomplete (or incompletely understood), where what is understood is felt to be sufficient (avoiding premature closure) and where others may even benefit from it in that form -- appreciating their own possibility of developing it further. Mathematics is itself incomplete and unfinished and perhaps most significantly in terms of what may be relevant for any understanding of individual identity (cf Kurt Gödel, *On Formally Undecidable Propositions of Principia Mathematica and Related Systems*, 1931).

• **partial comprehension**: any "tentative status" may be associated with varying degrees of comprehension of the form, including not understanding as highlighted by Q-analysis (*Social organization determined by incommunicability of insight*, 1995).

• "**reinventing the wheel**": given the challenge of access to resources and the constraints on determining how best to use them, it may well be more efficient to recreate something. This is a well-known experience in computer programming when rewriting a program may be more efficient than endeavouring to understand and develop an earlier program (even one's own, when poorly remembered).

• **tolerance of error**: Donald N. Michael (*Learning to Plan and Planning to Learn*, 1997), stresses the "requirement to embrace error":

> More bluntly, future-responsive societal learning makes it necessary for individuals and organizations to embrace error. It is the only way to ensure a shared self-consciousness about limited theory on the nature of social dynamics, about limited data for testing theory, and hence about our limited ability to control our situation well enough to be successful more often than not.

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**Examples of maps with related concerns**

<table>
<thead>
<tr>
<th>AQAL Map: &quot;All Quadrants All Levels&quot; (Open Source Integral)</th>
<th>Interrelating problematique, resolutique, &quot;imaginatique&quot; and &quot;iresolutique&quot;</th>
</tr>
</thead>
</table>
Tentative design of a cognitive array of geometric elements

Presented separately as Annex A
-- Sense of static identity through cognitive elements (in an array)
-- Cognitive dynamics of identity associated with elements of an array
-- Transformational dynamics of identity across an array

Framing the identity of an other (and an other)
Irrespective of the framing of one's own identity as a point, a line, or a circle, etc, a corresponding issue is how the identity of any other person (or group) is then to be framed. Examples possibly include framing the other as:

- a point: typically as contacts in a network, or citizens (whether simply clustered with others, or possibly "aligned" with them with respect to a belief). Such a point may be a "target", whether for marketing impact or as an enemy. In the absence of any other structure, an other may be sensed as a cluster of points.
- a line: typically as a channel or a link to some other person or group (in a network or hierarchical structure), with whom one may be aligned. An other may also be understood as being simply a "budget line". The sense of identity may be associated with several seemingly unrelated lines. The line(s) may be sensed as vibrating in some way, as within the frame of a musical instrument.
- a matrix: as when "lines" of identity are sensed as being interwoven to some extent to constitute a pattern
- a polygon: typically as constituting a triangle or some such configuration, possibly embedded in a (kinship) network
- a circle:
- a cylinder: notably as an experiential development (and combination) of line and circle), as a form of "tunnel" through which (or down which) one may travel to some other place -- the other as a form of "rabbit hole" or "wormhole"
- a polyhedron: when the other is experienced as a configuration (possibly understood as subpersonalities) -- potentially together approximating to the coherence and integrity of a sphere
- a sphere: especially when sensed as potentially encompassing or enfolding, raising the question of how several such others may "pack" together (and are then to be experienced)
- a torus:

Each such framing of identity raises the question of how "agreement" or "disagreement" with the other is experienced and what is invariant in the sensed identity. Clearly there is also the question of how one's own "geometry" connects and engages with that of any other.

Complexification and simplification of identity

Simplification of identity: This may be understood in two senses:

- oversimplification as with using a geometric form that is unable to hold dimensions that would be more appropriately rendered explicit. The extreme case is a sense of identity based on a single point, especially when this is used to frame the identity of another -- as is typically the approach to dealing with many others, for example in administrative situations or for any kind of targeting. This may be understood as geometric reductionism
- integration as with consolidating disparate geometric elements through which identity is sensed, perhaps organizing them on the basis of some pattern of symmetry. The pattern as a whole then provides the simplification with a degree of complexity held by the details of the pattern

Where identity is associated with a variable geometry, simplification may be a temporary reconfiguration for a particular purpose. The geometry with which a richer understanding of identity is associated is then implicit in the simpler form. Expression of identity may then be effectively unfolded and enfolded (as illustrated by some forms of origami).

Complexification of identity: This may also be understood in two senses through:

- engendering new features, as yet unintegrated into any meaningful geometric framework
- standard transformations of existing geometry with which one is identified -- effectively unfolding them -- to engender more
complex structures (which may in turn be enfolded to simpler forms when appropriate)

With respect to complexification, of great interest are the very complex geometric objects discovered by mathematicians. These may be understood to some degree through their symmetry. The key question is how such symmetry may be used as a support for more complexified identity. How vital is greater complexification of individual or group identity as a means of sustaining higher degrees of order, especially in situations which are otherwise completely problematic? ([Engaging with Questions of Higher Order: cognitive vigilance required for higher degrees of twistedness, 2004].)

Transformations of identity: However, with respect to both simplification and complexification, the argument here is for an ability analogous to that now well-recognized with respect to any maps on the web, namely the ability to "zoom" into greater detail, or out of it, as required. How is identity to be understood in such terms?

What might be the cognitive implications of these transformations and the attraction of their ultimate forms, as noted above with respect to the Mandelbrot fractal, the E8 group and the Monster group ([Potential Psychosocial Significance of Monstrous Moonshine: an exceptional form of symmetry as a Rosetta stone for cognitive frameworks, 2007; Psycho-social Significance of the Mandelbrot Set: a sustainable boundary between chaos and order, 2005; Cardioid Attractor Fundamental to Sustainability: 8 transactional games forming the heart of sustainable relationship, 2005; Hyperaction through Hypercomprehension and Hyperdrive, 2006; Comprehension of Requisite Variety for Sustainable Psychosocial Dynamics, 2006].)

Of particular interest is the relevance of more complex geometry to adaptive resilience under turbulent conditions as the possible requirement for:

- new forms of social organization and their strategies ([Polyhedral Empowerment of Networks through Symmetry Psycho-social implications for organization and global governance, 2008; Consciously Self-reflective Global Initiatives: Renaissance zones, complex adaptive systems, and third order organizations, 2007; Spherical Representation of Icosidodecahedral Net of Strategies: configuring strategic dilemmas in intersectoral dialogue, 1995].)
- new conceptual structures and "models" ([Spherical Configuration of Categories -- to reflect systemic patterns of environmental checks and balances, 1994].)
- new value structures, in contrast with "pillars" and "axes" ([Topology of Valuing: psychodynamics of collective engagement with polyhedral value configurations, 2008; In Quest of a Strategic Pattern Language: a new architecture of values, 2008].)

communication with "extraterrestrials": The challenges of communication with hypothetical extraterrestrials of the future have long constituted an opportunity to reflect on the forms appropriate to such contact ([Communicating with Aliens: the psychological dimension of dialogue, 2000]. The matter was given due consideration in the design of the famous plaque affixed to the Pioneer 10 (1972) and Pioneer 11 (1973) spacecraft. The plaques show the nude figures of a human male and female along with several symbols that are designed to provide information about the origin of the spacecraft. The controversial nude figures were removed from the cover of the Voyager Golden Record included in the two Voyager spacecraft launched in 1977.

In terms of the argument here, these plaques are unique in their effort to represent human identity to a potential other -- hence the irony of the deliberate removal of the contrasting human figures.

<table>
<thead>
<tr>
<th>Representations of human identity by NASA for extraterrestrials</th>
</tr>
</thead>
<tbody>
<tr>
<td>Plaque affixed to Pioneer spacecraft</td>
</tr>
<tr>
<td>![Image](Vitruvian Man by Leonardo da Vinci)</td>
</tr>
</tbody>
</table>

In the light of the argument previously presented, the interesting feature of these plaques is whether they say more about human communication preferences (and inhibitions) than about how it may be fruitful to engage with others ([Self-reflective Embedment of Transdisciplinary Integration (SETI) the universal criterion of species maturity? 2008]). The emphasis is placed in the above images on the fundamentals of number theory with only a minimalistic use of geometry. It may however be the case that extraterrestrials attach greater significance to geometric forms, as suggested in the controversy regarding the origins of crop circles ([Jenny Haworth, Is crop circle pi from the sky or just another con? News.Scotsman.com, 18 June 2008; Graham Tucker, What's behind the symbolism found in formations? Medway Crop Circle, 2007].)

Ironically again, rather than abstract geometry, it also the case that humans attach greater significance to the geometries of the human form -- fundamental as (strange) attractors to the process of reproduction, and currently the source of the major problem of humanity and the planet. Also of relevance is the Protagorean dictum that "man is the measure of all things" -- a focus for the Renaissance and famously depicted by Leonardo da Vinci as Vitruvian Man (naked). Curiously this image was used as the basis for the astronaut patch of the Earth-orbiting Skylab Expedition 2 in 1973 (with a variant patch for the wives of astronauts) -- presumably not for the attention of extraterrestrials.

![Image](Vitruvian Man by Leonardo da Vinci)
The cognitive role of aesthetics in relation to an "extraterrestrial" challenge was provocatively framed at that time by Marsilio Ficino (Thomas Moore, *The Planets Within: the astrological psychology of Marsilio Ficino*, 1990). The cognitive implications of reproductive geometry have been separately explored (*Intercourse with Globality through Enacting a Klein bottle: cognitive implication in a polysensorial "lens",* 2009).

In the light of the argument above, how might a degree of communication be ensured through geometric pattern? The question is especially pertinent if it is assumed that communication is driven by sets of values and understandings of order and harmony -- configured beyond the simplistic conventional use of "pillars", "poles" and "axes".

If such cognitive order, and the psychosocial order with which it is associated, was more fully articulated through such unique mathematical objects as the the Mandelbrot fractal, the E8 group and the Monster group, how would humanity seek to engage with such expressions of identity? Is the "key" to ("unlocking") such communication a question of matching geometries rather than one derived from decryption based on number theory?

Some possibilities for communication reflecting a degree of transcendence of duality can be highlighted through the manner in which precious stones -- traditionally emblematic of human values -- are cut into jewels (*Patterning Archetypal Templates of Emergent Order: implications of diamond faceting for enlightening dialogue*, 2002). This may correspond to Celtic and other traditions regarding the elder races, "from the time before", who thereafter "withdrew into the stones".

To the extent that such integrative communication relates to spherical geometry, and "approximations" to a sphere, any notion human representation of extraterrestrials as "angels" might also be fruitfully considered in terms of the "angles" at which such "stellated" entities variously engage with an all-encompassing sphere of global insight. By comparison humans may simply be "geometrically dyslexic" -- despite the role of geometry in courtship and reproduction!

**Communication with the alienated:** Rather than any focus on extraterrestrials, of dramatic current significance are the "terrestrial extras" -- the alienated with whom communication is a major challenge of increasing political relevance. The term might be interpreted as geometrically delinked or "out of line" (with respect to social geometry).

Both "angels" and "angles" are widely used metaphorically. Of relevance to the argument here is the sense in which "angle" is then associated with insight as in an "angle of research" or "angle of negotiation". "Angel" is widely used as an exemplification of value. "Dyslexic" or not, curiously any web search for items containing both "angels" and "angles" reveals an unexpectedly rich assortment of documents in which an association between them has been variously recognized. This implies a degree of recognition of a bridge between two seemingly unrelated cognitive functions -- the logical and the intuitive. The references include:

- early terminological confusion between the two terms (giving rise to a well-known pun by Pope Gregory), as well as current confusion in the spelling of the two terms
- numerous references to the song *Of Angels and Angles*, possibly in allusion to that pun
- sources in relation to ritual and magic, in which mis-spelling may be deliberate (*Angels, names of angels;* Benjamin Rowe, *The God-Names and Angles of the Lesser Angles*)
- references to the role of financial "angels", or angel investors, in enabling innovative business "angles" (*J. Freear, Angels on angels, Venture Capital*, 2002).

**Array of geometric forms as a musical instrument**

Perhaps appropriately, the explicit use of geometry in the *Pioneer* and *Voyager* imagery was replaced in the latter case by music and song as an expression of human identity. As noted above, there is a geometry to music and its cognition that is potentially richer than that which can be visually represented -- and clearly attractive to "terrestrial extras" and potentially to "extraterrestrials".

There is the suggestive possibility that any array of geometric forms, with their cognitive implications, might be fruitfully considered as a kind of musical instrument -- with the strings of the traditional lyre bearing a resemblance to such an array, or the guitar with its *fret*. "Playing" on such an instrument then elicits cognitive associations patterned by the many possible geometric transformations between those forms. Of particular interest is the implication in such stringed instruments that the "columns" of an array are explicit as "strings", but the connections between the "rows" (and across the array as a whole) is supplied by the cognitive engagement of the "player". It is through playing that the Gregory Batesons "pattern that connects" is rendered consciously explicit.

As explored elsewhere, identity is then associated dynamically with what is played, and the ability to play, rather than with any particular form (*Polarities as Pluckable Tense Strings: hypercomprehension through harmonics of value-based choice-making*, 2006). On the
As previously argued, the challenge of identity is that of existential embodiment of externalities: radical cognitive engagement with environmental categories and disciplines (2009).

<table>
<thead>
<tr>
<th>Use of geometry to articulate cognitive insight</th>
</tr>
</thead>
<tbody>
<tr>
<td>(generated with Stella Polyhedron Navigator as described in Polyhedral Pattern Language: software facilitation of emergence, representation and transformation of psycho-social organization, 2008)</td>
</tr>
<tr>
<td>Universal Declaration of Human Rights (UDHR)</td>
</tr>
</tbody>
</table>
Articulation of a pattern of strategic insight at some future time (in a semantic web context) might use such polyhedra, or transformations between them, to interrelate (in an integrative, comprehensible manner) the elements of the pattern. The sections of a document (such as this one) might be accessible through each face - appropriately related by the geometry to other sections.

References


Ron Atkin:
- Combinatorial Connectivities in Social Systems; an application of simplicial complex structures to the study of large organizations. Basel, Birkhauser, 1977


J. G. Bennett:
- The Dramatic Universe. Hodder and Stoughton, 1956-1966


Luciano Boi. Geometrical and Topological Foundations of Theoretical Physics: from gauge theories to string program. 2003 [text]

J. L. Casti:
- Polyhedral dynamics - II: Geometrical structure as a basis for decision making in complex systems. IIASA Report, Laxenburg, Austria, 1976
- Connectivity, complexity and catastrophe in Large-Scale systems. John Wiley and Sons, 1979

Mark C. Chu-Carroll. From Sets to Groups: deep meaning in simple constructs. Good Math, Bad Math, 3 December 2007 [text]


Paul Feyerabend:
- Against Method: outline of an anarchistic theory of knowledge, 1975
- Conquest of Abundance: a tale of abstraction versus the richness of being, 1999
R. Buckminster Fuller with E. J. Applewhite:

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

Howard Gardner:


P. Gould. Q-analysis, or a language of structure: an introduction for social scientists, geographers and planners. 

Thomas Homer-Dixon. The Ingenuity Gap: how can we solve the problems of the future? Knopf, 2000


George Lakoff and Mark Johnson:

- Philosopy in the Flesh: the embodied mind and its challenge to western thought, 1999


Hilary Lawson:

- Reflexivity: the post-modern predicament, Hutchinson, 1985


Donald N. Michael. Learning to Plan and Planning to Learn, 1997


Jean Piaget:


Arielle Saiber. Giordano Bruno and the Geometry of Language. Ashgate, 2005


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