Qualitative Systems Thinking: A fresh look at J.G.Bennett's General Systematics

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Abstract

This paper explains the philosophy and formalism behind General Systematics, illustrates the first eight systems in relation to the design of a sustainable democracy and then develops some diagnostics of our current shortfall from such a sustainable democracy. Aspects of well known systems thinking approaches are summarised as a way of positioning systematics ias a qualitaitve approach. Systematics enables multi-perspective thinking through different orders of system from simple to complex. The scheme of n-term systems referred to as monad, dyad, triad, tetrad etc. to duodecad is outlined. The illustration of applying this to designing a sustainable democracy shows its relevance for eliciting holistic and cross-disciplinary perspectives in the area of socio-technical messes. Systematics as an appreciative system enables a more inclusive, cross-disciplinary and holistic understanding to be discussed

Keywords: general systematics, appreciative systems, inquiry systems, isomorphism, complexity, connectedness, science of qualities, socio-technical messes, cross-disciplinary, n-term systems, monad, dyad, tetrad, pentad, hexad, septad, octad, sustainability, viable systems, sustainable democracy.

Introduction: A Background for General Systematics

> "A common characteristic of these varied techniques is the recognition that structure is a primary element of experience and not something that is added by the mind. In this respect it can be said that the techniques of understanding call for a drastic revision of the usual modes of thought that treat being and understanding as independent or at least as separable from one another." - J.G.Bennett

This conference has as its over-arching theme, complexity, democracy and sustainability. Why is systems thinking relevant to these themes? What forms of systems thinking are most likely to be helpful? The aim of this paper is to make a case for the growing importance of *qualitative systems thinking*. A sustainable democracy in a complex world requires many skills, some of which go beyond the calculus of the quantitative sciences, including the systems sciences.

This paper will illustrate a holistic approach, focusing on the relation between appreciative perception, judgement and a specific systems method based on exploring complexity based on the progression of numbers, called *General Systematics.* [1] [2] It will then illustrate how this method can help develop a holistic understanding of a sustainable democracy. Finally, it will discuss some of the policiy and practical implications of this approach in understanding the challenges of achieving a sustainable democracy.

General Systemarixcs (referred to hereon as Systematics) can be viewed as an appreciative inquiry system.. There are a number of points of contact, conceptually, with other more well known schools of systems thinking.

Sir Geoffrey Vickers developed the idea of the *appreciative system*.[3] This is a view of system, which is inseparable from human perception and understanding, is, essentially, qualitative. Vickers distinguishes three modes of appreciative system, all of which are forms of human judgement; these modes have mental and emotional skills associated with each of them. *Reality judgement* is the ability to represent to oneself in comprehensive and balanced way a total state of affairs around a policy issue. *Instrumental judgement* is the ability in the face of appreciation to design appropriate actions and solutions. *Value judgement* is the ability to sustain and develop integrity in the policy decision process. Integrity implies an integration of fact and value, of function and ethic. The three modes together combine fact and value in an act of decision. Systematics emphasizes reality judegment but leads into support for the other two.

Another helpful angle on qualitative systems thinking was provided by C. West Churchman's approach, usually referred to as *critical systemic thinking*.[4] He advocated the inclusion of human purpose and participation in systems design in a never ending learning cycle. In Churchman's approach there is ethics as well as efficiency and effectiveness. Systems are teleological, designed and must be considered in the wholeness of context. Systems do not exist "out there" but are whole system judgements. However,

the appreciation of whole system is a "sweep in" process in which many points of view, contrasting meanings and explorations of where choices about boundaries are to be made. A relevant feature of his approach was the articulation and use of differnt types of inquiry system based on philosophical suppositions (e.g. Leibnizian, Lockean, Hegelian etc.). Systematics could be reagrded as offering yet another type of inquiry system that evokes its own unique form of understanding.

Another useful concept in approaching Systematics is the *principle of recursion*, that the whole may be found in the parts, enunciated by the cybernetician, Stafford Beer. This principle, which he elaborated in his Viable Systems Model (VSM) asserts that there are recurring qualities that appear as nested hierarchies in both nature and human systems. As these are identifies and recognised, they ease our ability to comprehend complex structures. The viable system organisation gives the parts as much independence as is possible given the constraints that exist when co-ordinating and sustaining a whole.

A final context point in this introduction is the similarity of Bennett's systems philosophy with that of Buckminster Fuller who expressed the *Principle of the Whole System* as

> "There is a synergetic progression in Universe - a hierarchy of total complex behaviours entirely unpredicted by their successive subcomplexes' behaviours. It is manifest that Universe is the maximum synergy-of-synergies, being utterly unpredicted by any of its parts." [5]

What be referred to as the attribute of an n-term system is its unique quality that cannot be inferred form the parts or terms

Systematics originated shortly after the formation of the ISSS in the USA. John Bennett in the UK was exploring a parallel approach to systems and isomorphism. His systematics is based on an unusual mix of sources ranging from Russell and Whitehead's Principia Mathematica [7], through von Bertalanffy's own work to the unusual cosmological scheme attributed to Gurdjieff and Ouspensky. The genesis of this work is forty years ago in 1966 with the first edition of the journal "General Systematics". At that time this author was Senior Research Fellow at Bennett's Institute for the Comparative Study of History, Philosophy and the Sciences. As the formalism of the scheme evolved it was applied by the author and his colleagues to a wide range of cultural and professional disciplines which further refined and verified the general validity of the approach and a tool and technique for accelerated understanding.

Whereas Fuller based his number progression on the unfolding of a geometric progression [6], Bennett based his on the unfolding of number. Of course these two are complementary aspects of the same insight. Fuller explored number through the principles of geometry and Bennett explored the geometry of number systems as an essential means of representation (albeit in two-dimensions only).

Russell and Whitehead were searching for deep underlying principles of mathematics and formulated a principle that certain key mathematical concepts require a certain number of factors in order to be what they are. For example, relationship is essentially a notion that requires threeness and order a notion that requires fourness. However, Bennett also linked this with his considerable knowledge of esoteric subjects including ancient number systems and the field of symbolic geometry.

So Bennett's equivalent of the appreciative system is based on the following three observations:

- that understanding (as distinct from knowing) occurs when there is correlation between an internal mental image in the perceiver and a an external structure in the perceived
- that significant structures have qualitative properties that are a function of the number of interconnected terms in the domain of interest
- that giving form and language to these fundamental constructs provides a discipline that aids intuition as logic aids analysis

Bennett's Systematics is a technique for understanding fundamental structures that shape our practical experience of the world. As such it is perceptive and participative rather than informational and analytic. It is a discipline for the intuition rather than the analytical mind. In approaching the explanation of the method below it will be helpful to bear in mind a key observation made by Buckminster Fuller: "The artist frequently conceives a unique pattern in his imagination before the scientist finds it objectively in nature."

The Structure of Systematics

Qualitative complexity can be understood by viewing the field of interest through a series of conceptual lenses based on the qualitative significance of number. Number is much more deeply ingrained in our everyday understanding and the implicit categories in everyday speech, such as:

- "We need to get the whole (big) picture" - (oneness)
- "This situation is locked in a dilemma" - (twoness)
- "This relationship has broken down" - (threeness)
- "Some order needs introducing here" - (fourness)
- "What potentialities are we looking at here?" - (fiveness)

For qualitative systems thinking we adopt the following working definitions of the nature of systems.

1. an n-term system is a coherent set of n independent mutually relevant terms [8]
2. the order of a system is determined by n which is an integer 1,2,3,4,5,6 and so on
3. each n-term system has a perceptible *attribute* that identifies it as a whole
4. in any given system each term has a unique character that is specific to that system and such that no two characters are alike
5. (independence) and within that system are complementary in role (mutual relevance)
6. connections are taken as primary and the elements as secondary thus emphasizing mutual relevance. First order connectivities are determined by the expression ½ n(n-1)
7. each n-term system is also self standing and thus no n-term system is reducible to another
8. understanding emerges from recognising the instantiation of these attributes and characters in the situation of interest
9. n-term systems can theoretically extend to n = ∞ but cognitive limits make even getting as far as the 12-term system really hard

The assumptions that lie behind this scheme are that

- whole numbers, integers, have qualitative significance and meaning
- these structures of meaning are inherent in both universe and man
- these structures are recurrent and isomorphic at different levels
- understanding is a state of coherence between "in mind" and "in world"
- intuition can be trained to resonate understandings by means of number systems

Thus the schema of systematics provides a discipline for developing the intuitive capacity of the human appreciative system. Any given judgement may be made in the context of one or more n-term systems.

Theoretically there are n perspectives of understanding where n is 1 to infinity.

No one system alone can exemplify the organised complexity of real structures. Different aspects of a real situation yield understanding with different n-term systems. This fit between mind and situation we shall call *attribute resonance*.

Each n-term system attribute is mode of experiencing the world. The application studies of Bennett and his co-workers established a "quantisation" of attributes as we move up the number systems. The following table gives a first indication. The term "coherence attribute" is explained in the section "How systematics is applied".

Table 1 - A Brief Overview of the First Eight Systems

SYSTEM	NAME	Appreciative quality	Coherence Attribute
1-term	MONAD	Totality without distinction of parts	Universality
2-term	DYAD	Difference without degrees	Complementarity
3-term	TRIAD	Relatedness without relativity	Dynamism
4-term	TETRAD	Structured activity with relatedness and order	Field of action
5-term	PENTAD	Internal and external potentiality	Significance
6-term	HEXAD	Multiple event manifestation around an identity	Coalescence
7-term	HEPTAD	Integrity of levels and transformations	Emergent structure
8-term	OCTAD	Fulfillment of potential in realisation	Completedness

The structure of a range of n-term systems will now be described in more detail, using an exploration of sustainable democracy as a topic. First some reflections about the topic itself.

Complexity, Democracy and Sustainability

Twenty years ago, sustainable development, as formulated by the Bruntland Commission, was meant to be a framework for policy and action that would resolve the dilemma of growth of economic prosperity and the need for human society to operate within the restorative boundaries of the one planet earth. At the same time, there emerged a view that the just society was a democratic society and that "rule of the people, by the people, for the people" was the direction that would deliver societal sustainability. Both these have foundered on the shoals of complexity.

For example, David G. Victor [9] pointed out recently that:

> "As these central tenets of sustainable development have spread into practice, something has gone horribly wrong. The watchwords of nimbleness, resilience, and ingenuity have given way to a vast apparatus marked by bureaucracy, specialization, and mandates. Rather than becoming suffused throughout the practice of human policy and economic affairs-as Brundtland and her generation had implored-sustainable development has become its own special interest."

Also, Bernard Crick [10], reminds us that:

> "Many meanings attach to the word democracy. If there is one true meaning then it is, indeed, as Plato might have said, stored up in heaven; but unhappily has not been communicated to us. The word is what some philosophers have called 'an essentially contested concept', one of those terms that we can never all agree to define in the same way because the very definition carries a different social, moral or political agenda. But somehow, nowadays at least, we cannot live without it."

So we are immersed in a grand social "mess" to which we must, of course add the earth system and our interaction with it as a species. We seek justice and sustainability in a world where James Lovelock [11] reminds us:

> "Even if we stopped immediately all further seizing of Gaia's land and water for food and fuel production and stopped poisoning the air, it would take the Earth more than a thousand years to recover form the damage we have already done, and it may be too late even for this drastic step to save us. To recover, even to lessen the consequences of our past errors, will take an extra-ordinary degree of international effort and a carefully planned sequence for replacing fossil carbon with safer energy sources."

Can the systems sciences contribute to error reduction in our policies and decisions? As a pragmatist practitioner having explored the facilitation of management minds towards more holistic comprehension and decision making, I believe it can. But there is a deep-seated cognitive barrier - the centuries of mental conditioning in the power of the analytical "divide and conquer" mind. One of its most distorting properties is the belief that there are "absolute truths" that give "right" answers. However, we subscribe to the view similar to that held by physicist David Bohm, then in a universe of qualitative infinity, there can be no final learning, just a progressive journey to more comprehensive understanding.

Systematics is interesting in this regard in that it implies a continually expanding complexity from n=1 to n=∞. Whatever level of systemic understanding we have mastered, there are always higher systems. Or put the other way round, the infinite reality can be deconstructed from the concrete to the abstract to the point where our limited human minds can begin to engage in a reconstructuive learning journey of reality exploration.

What follows describes the systematics structure and illustrates its application to the conference topic of sustainable democracy in a complex ecology. It offers the prospect that the technique may stimulate more effective policy making and decision taking processes.

How Systematics Is Applied

Systematics is an inquiry system based on a progression of systems from simple to more complex. The complexity is related to the number of terms or components in the system. The principle is that the number of terms in a system determines its structure, its qualities and its behaviour.

Each n-term system is taken in turn and its structure defined and explained. To describe a system we need to build a mental model that incorporates:

1. the order of the system and its name

2. the systemic coherence attribute for that system
3. the term designation - the kind of terms it incorporates
4. the term characters, of which there will be n
5. the quality of first order connectivity between the terms

The higher the order the system the more difficult it is to clarify features 4 and 5 as the complexity is increasing geometrically. For example the 12-term system has ½(12x11)=66 first order connectivities. This means that some simplifications are necessary to "get inside" higher order systems.

To help the mind stay tuned to the system of interest, colour coding is used in this article. Each colour, up to twelve, visually distinguishes the characters within a system and helps the mind to register differentiation of the term characters within a system.. However, the systems are more subtly complex than that. For example, red will appear as a term in the dyad and will reappear in the diagram of the triad. But the triad is a new order of system so that red in the context of threeness is not the same as red in the context of twoness. So the order of the system is printed in the colour sphere of the term character to remind us that red in the 6-term system has a different role from red in, say, the 2-term system.

As the systems become more complex, not all the 1st order connections are shown. This is to restrict the complexity to something manageable for a short paper like this and also to make the symbols more memorable for the reader. In the case of the higher order systems, the full nature of the connectivities have not been worked out and need further research.

Some of the key words or phrases are supplemented by other kinds of similar ideas that enrich the sense of quality that the system is evoking. This also helps to bring out the isomorphism in different situations and topics.

The reader is invited to take each system in turn and build a mental image, like an abstract visualisation and then turn attention to the topic in question and see how the various factors begin to group and articulate. Where cognitive dissonance is experienced (from obscurity to plain disagreement) the reader is asked to apply the process rules of creative thinking and attempt, until the end of the exercise, to

- suspend premature judgement
- entertain the possibilities
- seek analogous or correlating ideas consistent with the system in mind
- park anomalies until the higher systems have been reached - they may "mop them up"
- reflect on the whole sequence as one super-exercise and whether it sheds light on the mess

As an appreciative inquiry system, the basic use of the method is to identify the "mess" or "wicked" problem to be investigated and work through the sequence of systems form monad upwards, at each stage articulating a more detailed understanding. Often, the movement to a higher n-term system also sheds light backwards onto previous systems and that enables further clarification. This is essentially a method of progressive approximation.

The Monad

The monad is undifferentiated diversity and so contains the whole latent spectrum of possibilities. It does not have a sharp boundary but is unified by a shared central character or "heart". It is also unfixed with no beginning and no end (symbolised by the spiral). It is, of course , the only system in the series where the attribute and the term are identical.

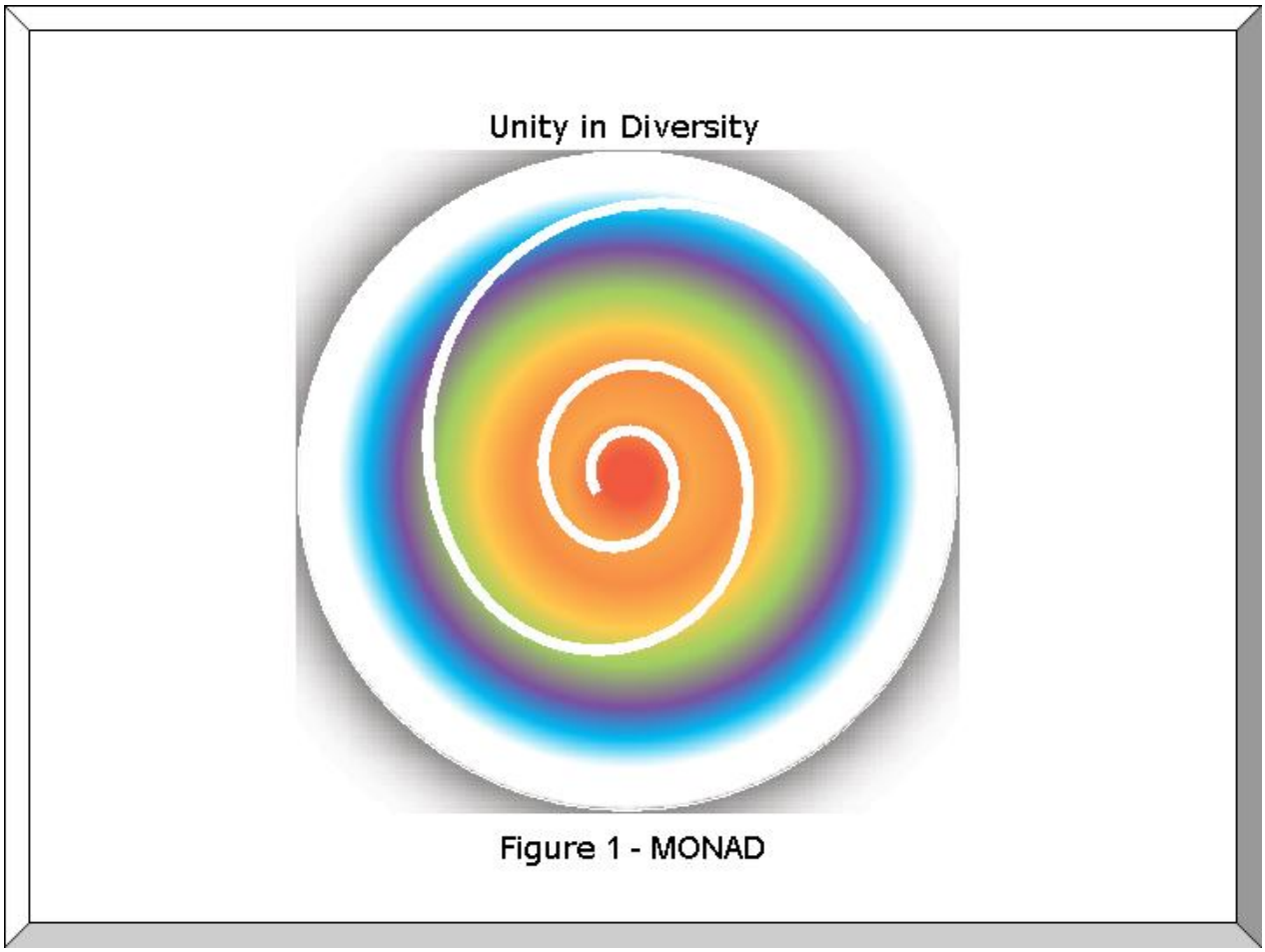

Figure 1 - MONAD

- Coherence Attribute: universality
- Term Designation: totality
- Term Character: diversity in unity

The start of a process of understanding a mess is the experience of a confused immediacy combined with the anticipation that somewhere or other there may be an organised structure. The cognitive act is "identifying the monad". This has similarities in cybernetics of clarifying the "system in question". It is also the universe of discourse.

Illustration: The Monad of Sustainable Democracy

The qualities we are tuning into here are something that endures, has participation, is in harmony with the living environment, and fulfils human aspiration but not in conflict with the cosmic processes of the planet. All the human race is there but not all the acts of men are. Some acts are excluded form this monad because they lack the unity of participative endurance. In this universe of discourse there is an ever expanding literature of all the systems factors that are or may be relevant to achieving sustainable democracy, such that any one sub-field may be necessary but the while monad cannot be assembled as a list of parts.

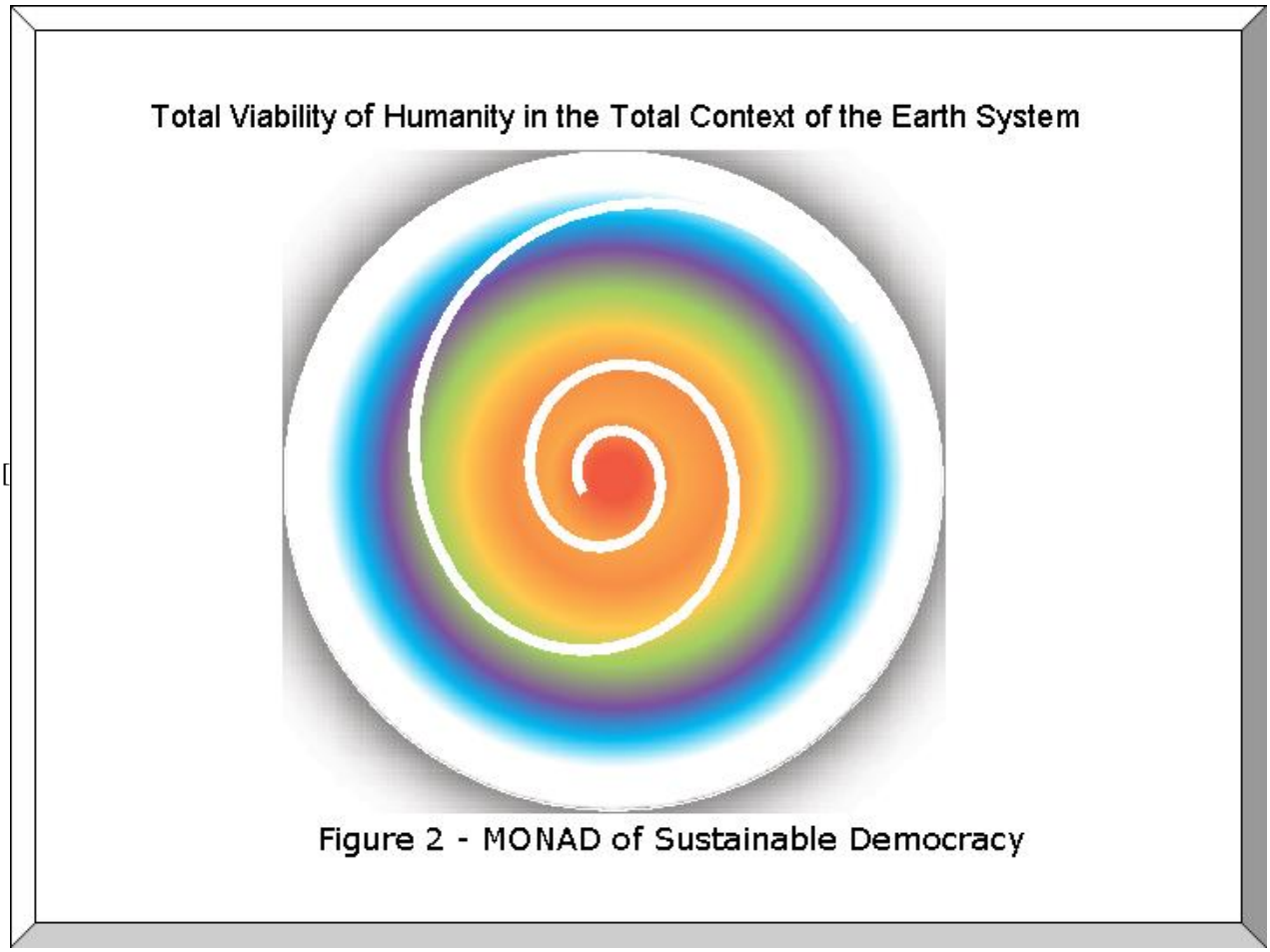

Figure 2 - MONAD of Sustainable Democracy

The Dyad

The dyad represents a fundamental and irreducible ambiguity in the nature of things. There is a tension between internal diversity and external connectedness both of which are quasi-infinite. [12] Each side of duality is necessary for the other, much as the north and south poles of a magnet.

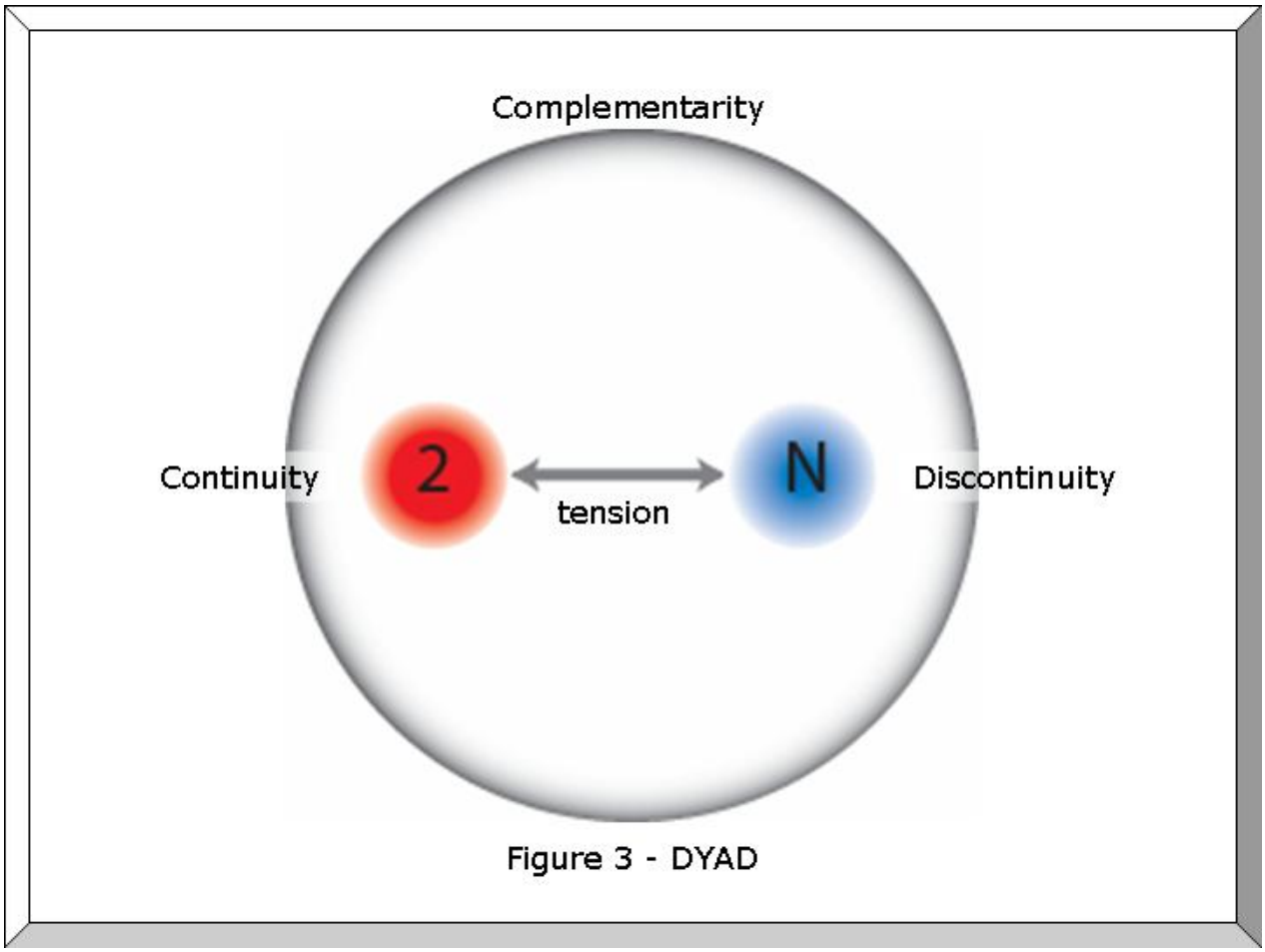

Figure 3 - DYAD

- Coherence Attribute: complementarity
- Term Designation: poles
- Term Characters: continuity / discontinuity
- Connectivity: force

Entering into the process further we find a dominant aspect (pole) that appears dominant only to find that this can flip so ground becomes figure and figure becomes ground. This is symbolised in the Eastern symbol of yin and yang. It is also reflected in the wave/particle duality [13] and in positive and negative charges. Fundamental dilemmas also arise from the dyad. [14]

Illustration: The Dyad of Sustainable Democracy

There are many candidates for dyads in sustainable democracy: freedom and responsibility; participation and representation; human needs and Gaian needs; economic growth and viable human ecology; short term surviving and long term thriving. In the context of complexity perhaps there is a more fundamental dyad in the connection between the two word indicating the monad. In an ecology each species of plant and animal has a character and role that is tightly species determined. In a human society, with creative individuals, discontinuities are frequently occurring that break relationships and break the web of life. Yet these are often valued by people as works of art, of civilising influence and of expression of the human spirit. Some religions assert that nature is there to serve man and man is responsible and intelligent enough to be a steward of nature. Some philosophers [15] assert that such a view as the height of deluded hubris, where the values of non-human life are regarded as independent of their usefulness for or impact on the human world.

So we will provisionally focus the dyad as

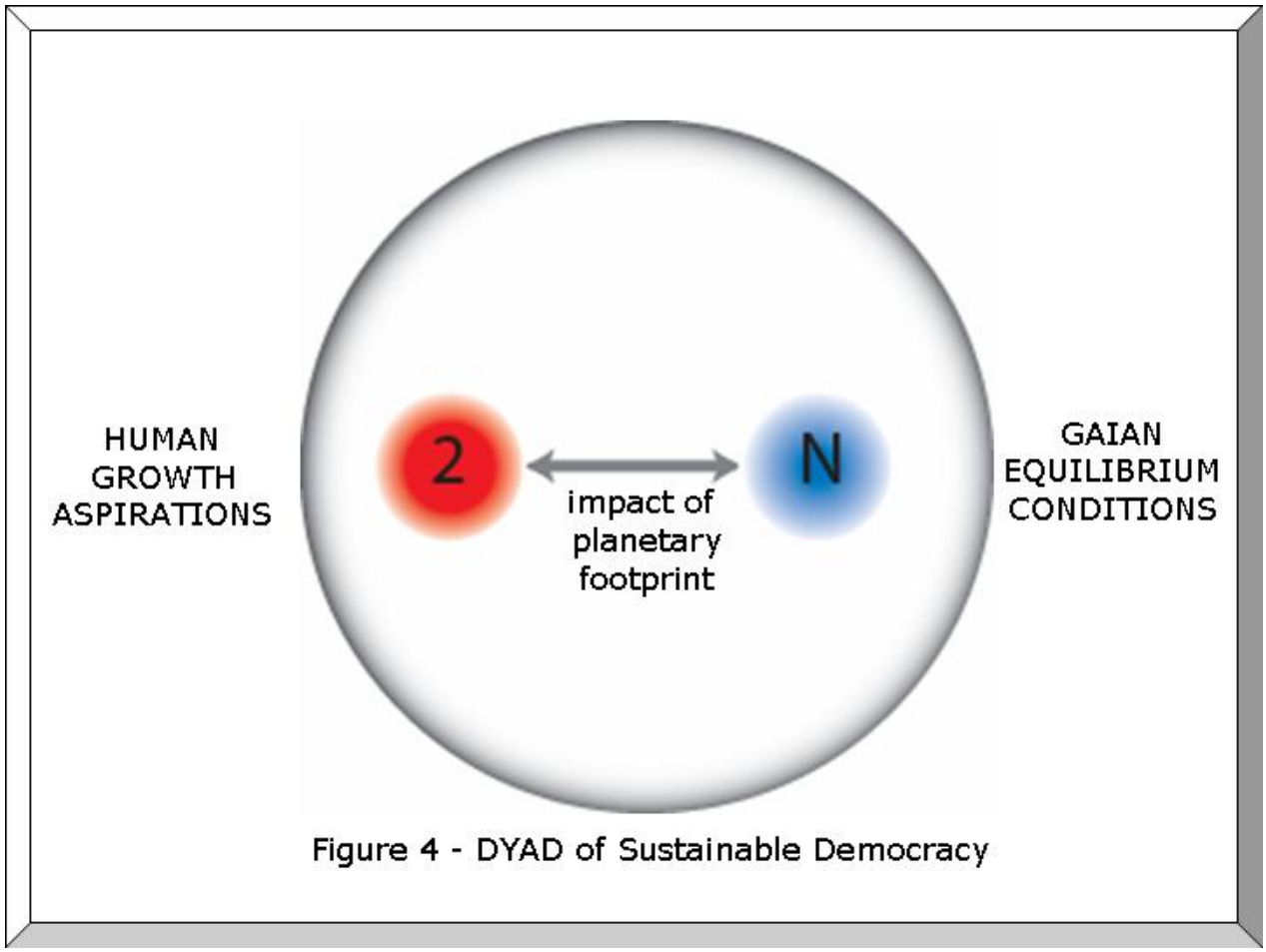

Figure 4 - DYAD of Sustainable Democracy

The Triad of Sustainable Democracy

The dyad is inherent and cannot be "left behind". However, movement up the progression of systems leads us to the introduction of a "third force" and changes the characters of the other two terms. In this system relationship beyond polarity can be explored. We see dynamic possibilities.

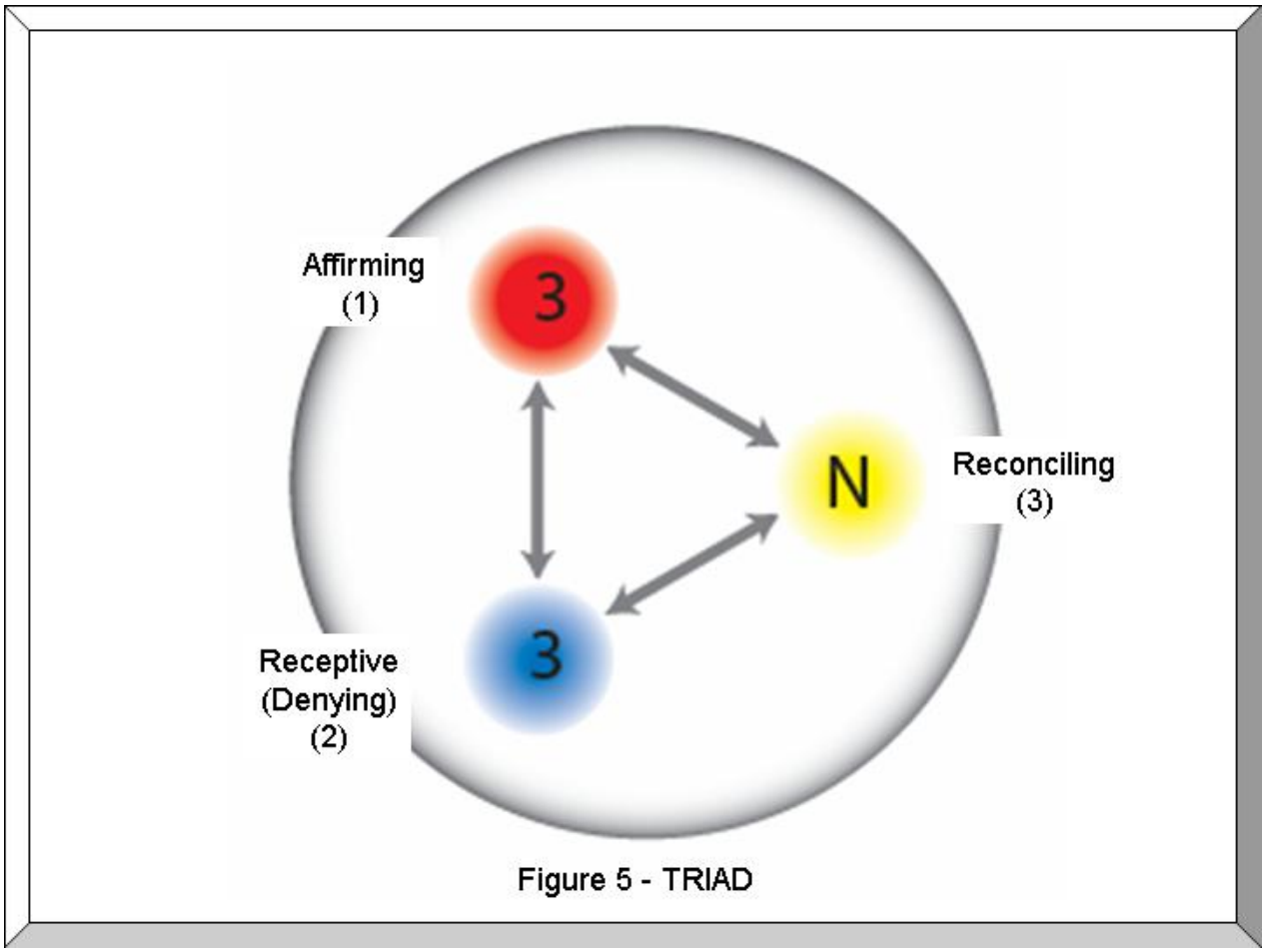

Figure 5 - TRIAD

- Coherence Attribute: dynamism
- Term designation: impulses
- Term Characters: affirmation (1); receptivity (2); reconciliation (3)
- 1st Order Connectivities: acts

In concrete situations the impulses interpenetrate and blend with each other. The dynamism can start at any point of the triangle and so give rise to 2nd order connectivities.

Illustration: the Triad of Sustainable Democracy

The triad enables us to look at events that are taking place in the universe sustainable democracy. Humans are affirming their place in nature. The quality of that affirmation impacts on nature which is receptive. If the affirmative quality is destructive, however, then the feedback becomes a denying force rather than receptive force. The outcome is determined by the reconciling force which has the peculiarity that it must embrace both aspects and therefore, to be viable, requires a collaborative understanding between man and nature. This may sound odd to technological "homoeconomicus" but is well recognised by many indigenous societies which are being rediscovered and listened to as one way of seeking a better dynamism between humanity and the earth. It is also increasingly understood in a different way by scientists who begin to recognise the cybernetic systems that keep the earth in a relatively stable state suitable for the richness of life. If we are in system "overshoot" as some people believe, then aspects of the macro level dynamism is set for many years to come. So can a democratic society develop the power of reconciliation between its own affairs and those of the planet and biosphere it co-exists with?

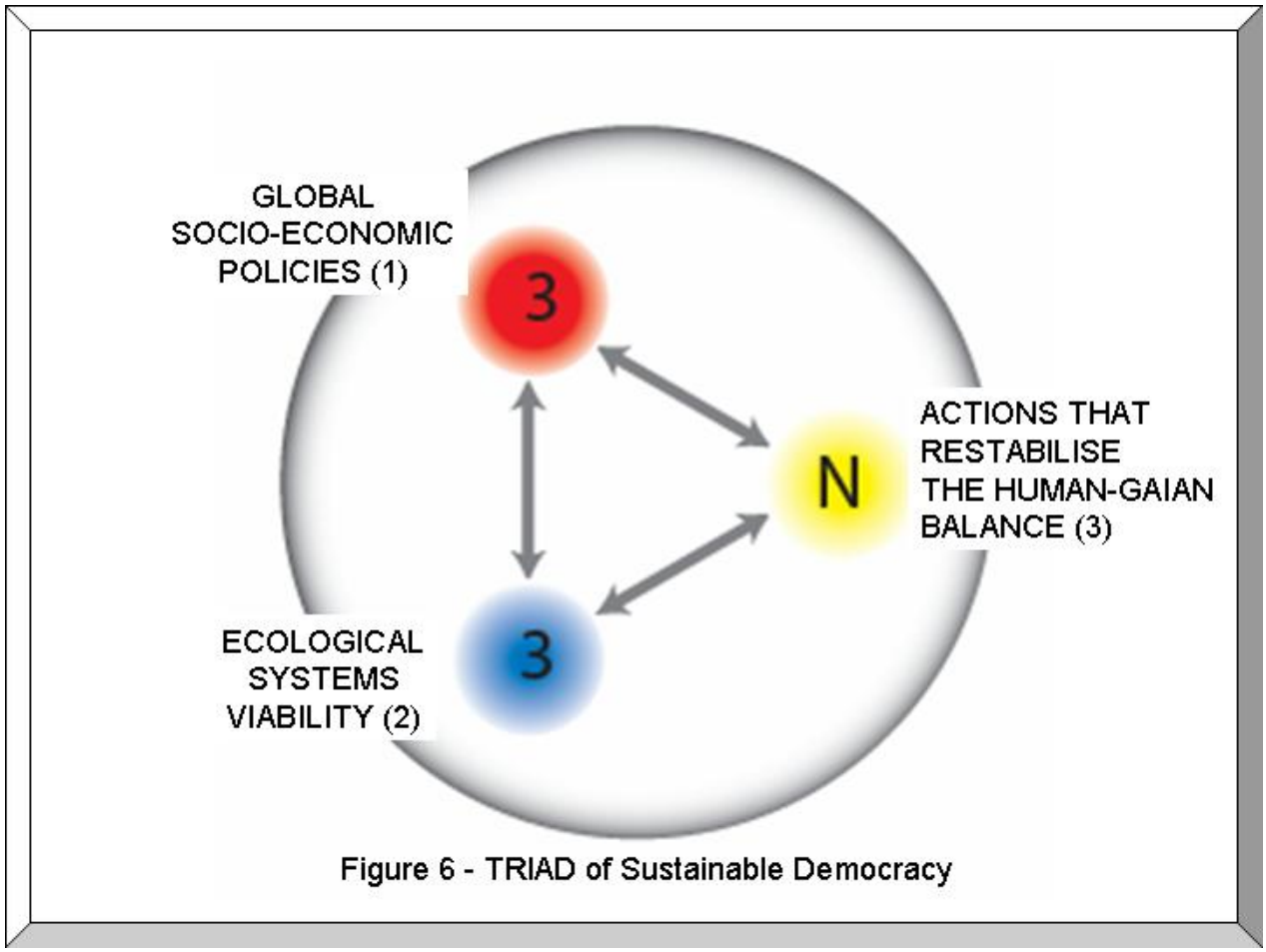

Figure 6 - TRIAD of Sustainable Democracy

The Tetrad

The triad is defined as relatedness without relativity. Relativity requires we move to the next system which enables order beyond relationship. Bringing a new order involves activities that are organised into some sort of field of action.

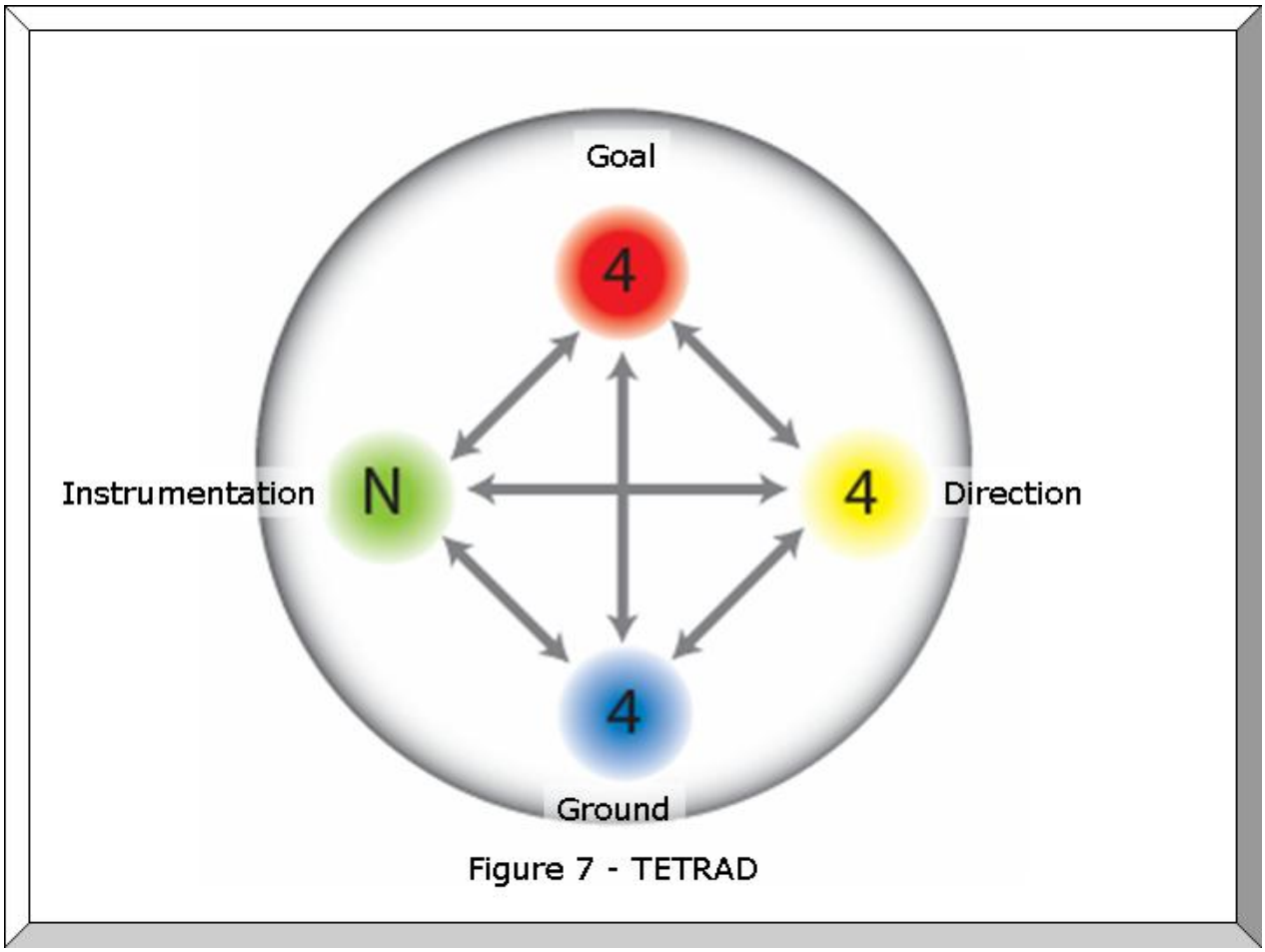

Figure 7 - TETRAD

- Coherence Attribute: activity field
- Term designation: sources
- Term Characters: goal (top); ground (bottom); instrument (left); direction (right)
- 1stOrder Connectivities: interplays (6)

The tetrad is structured activity with relatedness and order. There is a motivational tension between the goal at the top and the ground at the bottom. There is a horizontal tension between the instrumental source on the left and the directional source on the right. A simple way to think of this is the tetrad of sculpting. There is the image in the stone, there is the marble, there is the chisel and hammer and there is directing skill of the sculptor. Without all four the sculpturing could not take place.

Illustration: The Tetrad of Sustainable Democracy

The field of activity of humans in the biosphere is determined by the goal or ideal that is pursued. For sustainability this needs to be that of a thriving human civilisation that is benign towards and with in the Gaian system. We'll call this *harmonious development* in which include human aspirations and culture as well as material and biological life. The ground is the earth/ biosphere but especially its *ecological health* in terms of its non-human components. The instrumental source and means for this are a steady state socio-economic order that is guided by *renewing strategies* rather than a "slash and burn" economic model. The directive source is the application of *balanced policies* which are democratically owned and supported by whatever form democracy takes. This implies a society educated in sustainability replaces the current consumer society.

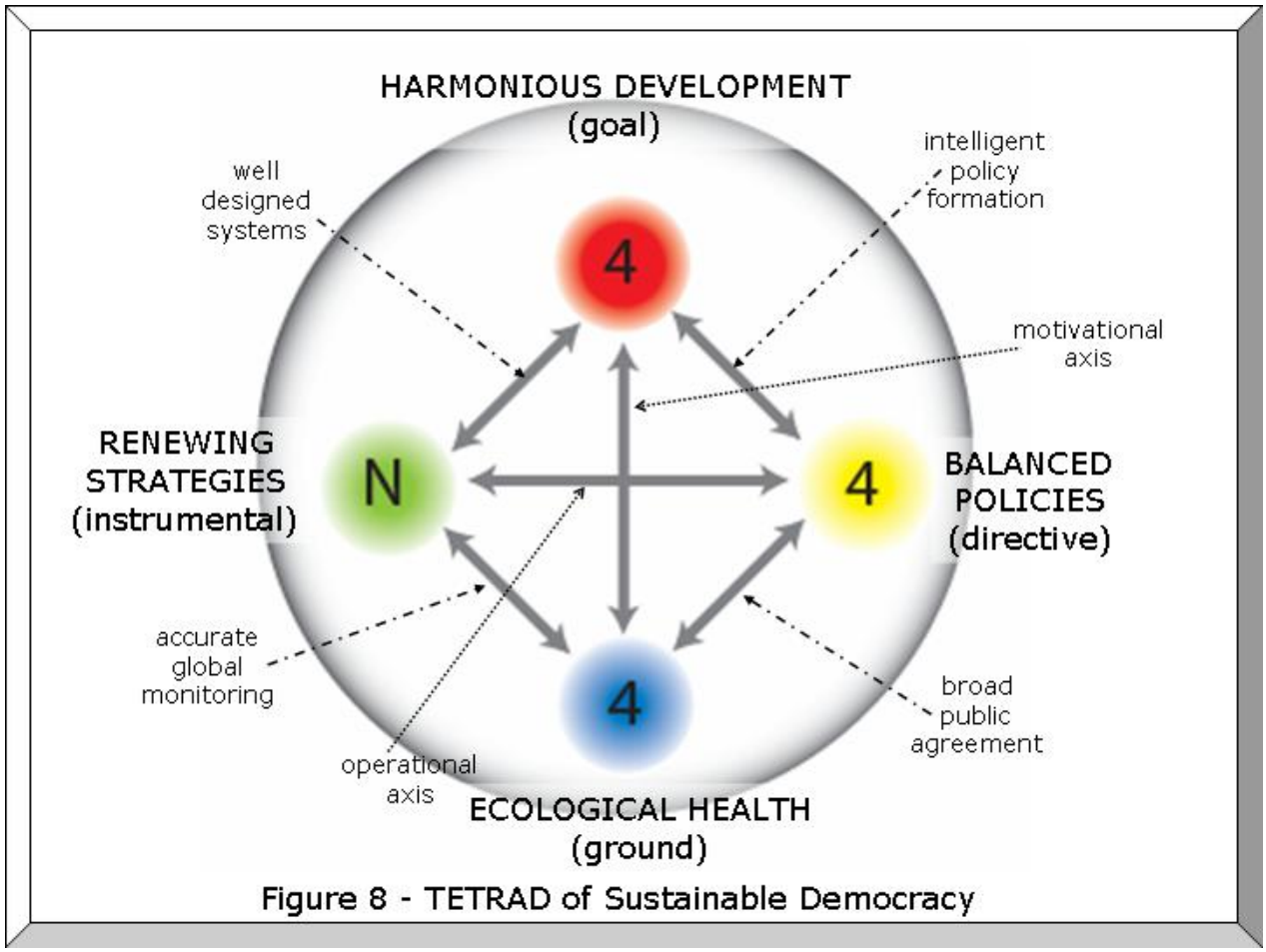

Figure 8 - TETRAD of Sustainable Democracy

The Pentad

The tetrad does not go far enough to discover meaning and significance. This requires that we begin to examine the system in context. Though not quite the same as recursion in Stafford Beer's sense it is a structure that is exploring similar territory.

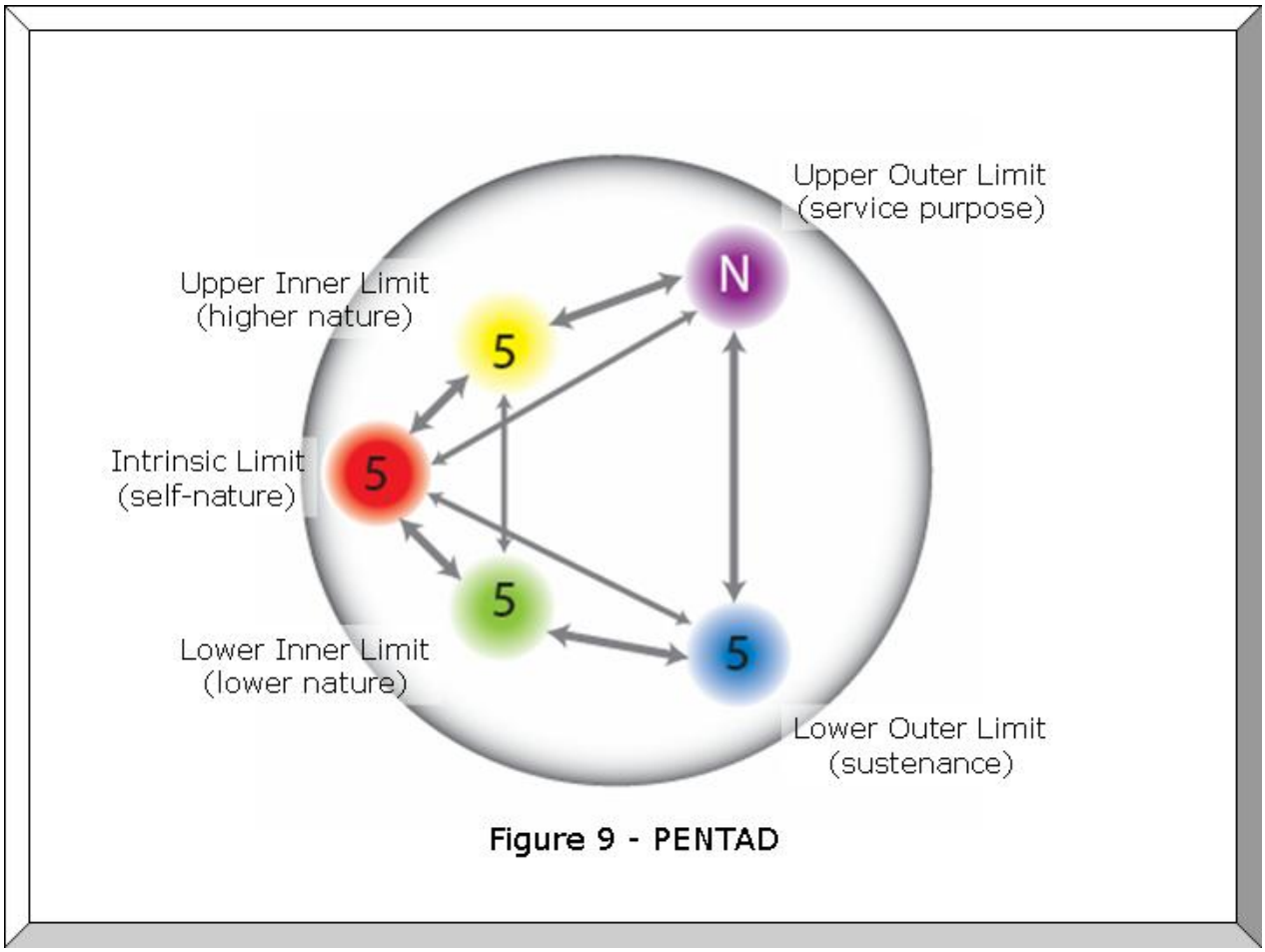

Figure 9 - PENTAD

- Coherence Attribute: significance and potentiality
- Term designation: limits
- Term Characters:
  - Intrinsic limit: self-nature
  - Lower inner limit: base nature
  - Upper inner limit: higher nature
  - Lower outer limit: sustenance
  - Upper outer limit: service
- 1st Order Connectivities: mutualities (10)

The pentad is the first system in which the unique character of the monad in question comes into view. The particular way in which the pentad is drawn is deliberate and brings out also an implicit hierarchy. At the centre (the quintessence) is the self-nature or individuality that reveals its meaning. There are inner limits to that significance which cover a range from basic existence to possible higher meaning and purpose. Equally there are contextual our outer limits within which significance is meaningful. These outer limits may relate both to scale and to value.

Illustration: The Pentad of Sustainable Democracy

A sustainable democracy is not based on globalisation in the form of the current global monetocracy, which cannot conceivably have a system purpose to be both sustainable and a democracy. The root definition of the current economic system is to grow money for the elite, with democracy and sustainability as a gloss of public relations. So the quintessence of a viable society must be to achieve a Gaian Democracy. [16] This requires a higher aspiration on the part of peoples around the world to achieve a diverse globality, something very different from globalisation based on the Washington consensus. [17] Globality is the recognition that there are challenges, like anthropogenic climate change, that no community is isolated from. However, the base nature of a Gaian democracy is that each locality requires its own fairly self-sufficient solution pattern to the sustainable problems of food, air, water and energy. This sets the inner potentiality of the system. However, the outer potentiality is determined by the planet itself which is the home and the sustenance for global democracies. This idea goes beyond "space ship earth" and

recognises the earth as a living system in which humanity participates. The upper outer limit is transrational, in that it is clouded by the diversity of belief systems that occupy the human mind. But whatever the belief system, whether eliminative materialism of the bio-robot school or the transcended belief in cosmic consciousness, the absence of any shared wonder and questioning of what is going on and what it all means with no final answers is probably the best we can hope for as common higher purpose.

The 1st order connections begin to fill in the richness as shown in the diagram of the potentiality of a Gaian democracy.

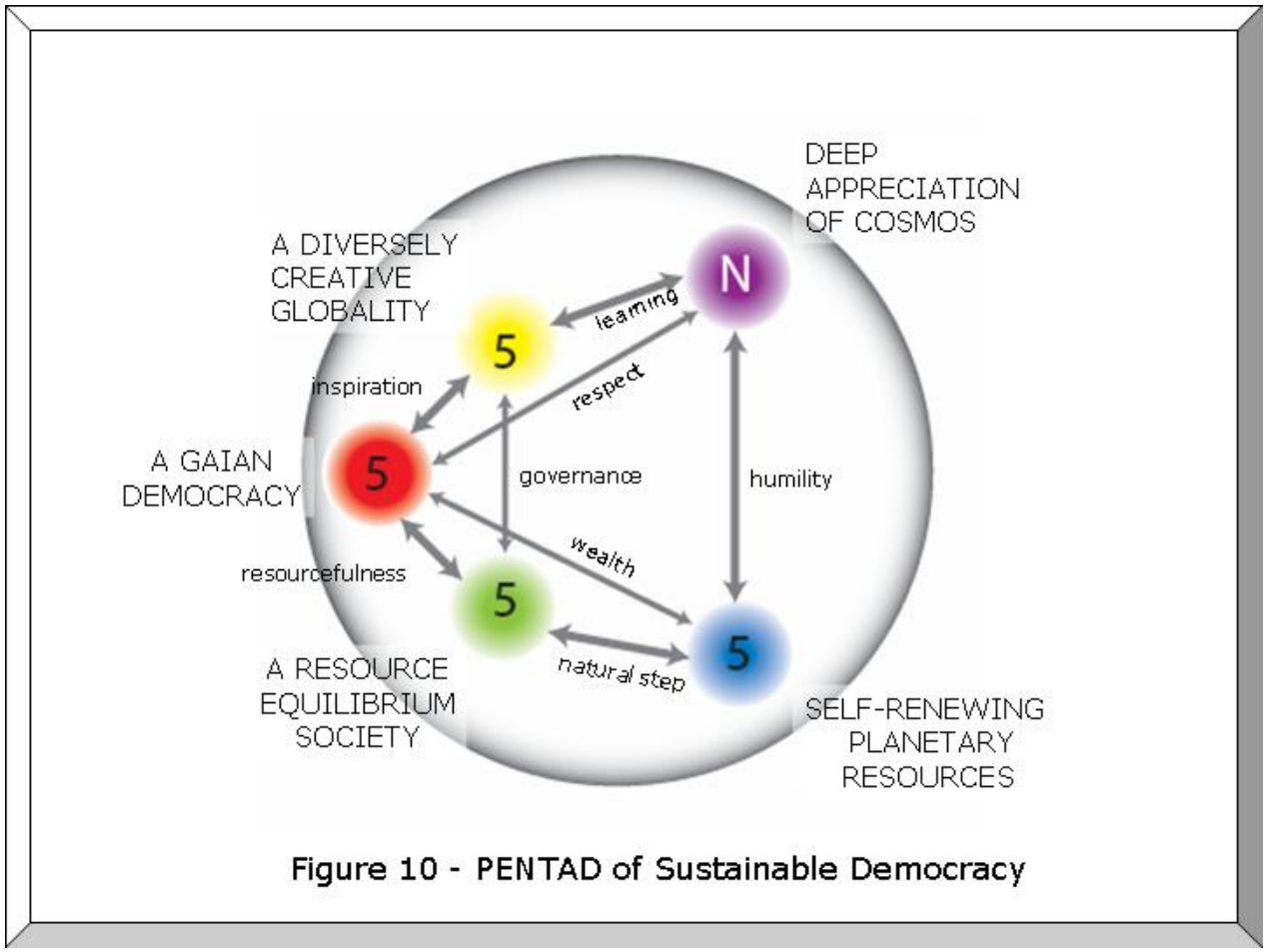

Figure 10 - PENTAD of Sustainable Democracy

The Hexad

We now reach the next stage of the progression which raises the question as to whether such a significance and potentially could be realised. Could a Gaian democracy actually be created? What would have to come about? This moves us on to the hexad or 6-term system.

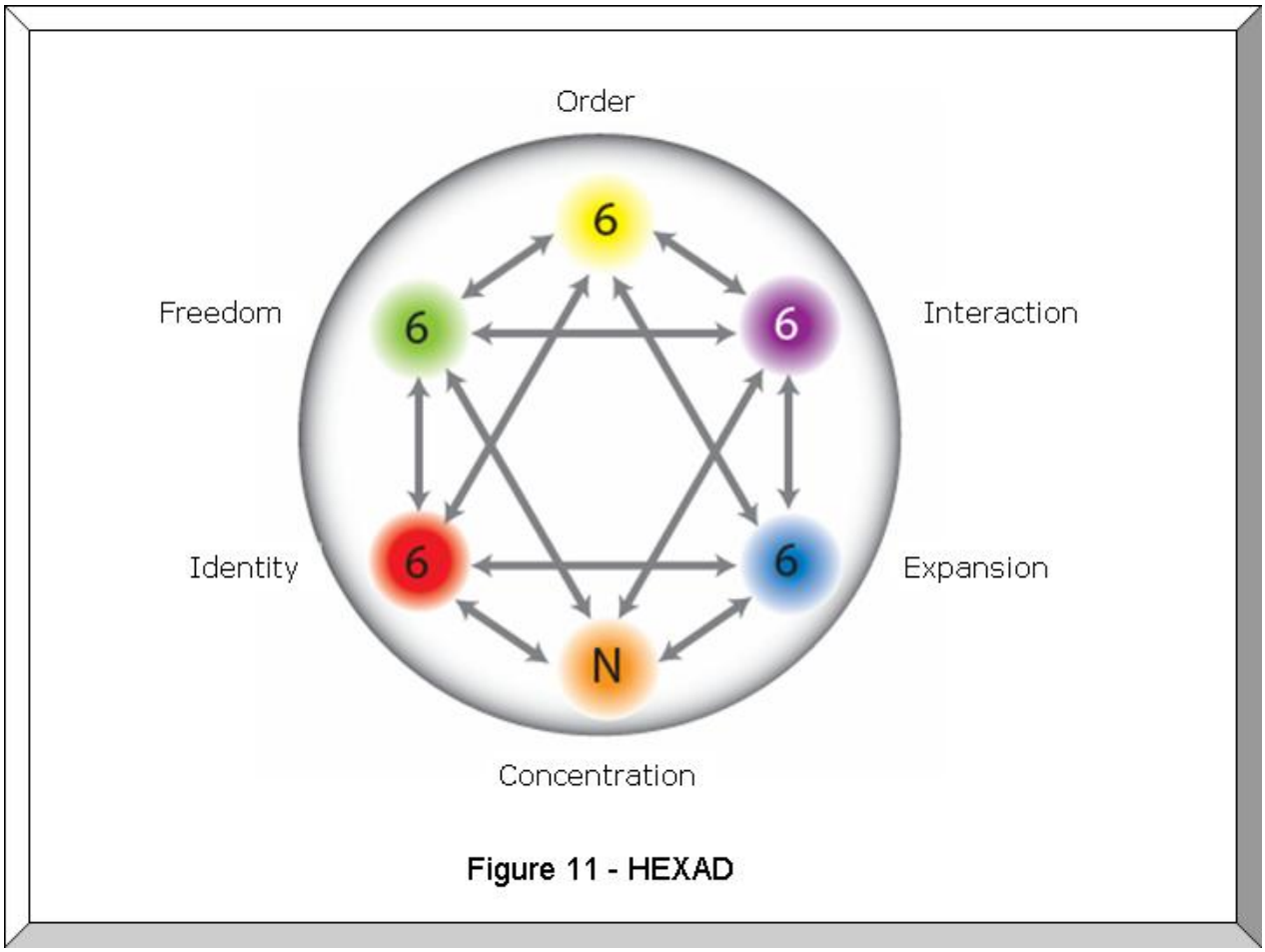

Figure 11 - HEXAD

- Coherence Attribute: coalescence (events, recurrence, self-realization, independent existence)
- Term Designation: law
- Term characters: order, expansion, identity, freedom, concentration, interaction

The passage from potential to actual requires an act of realization. This is more than actualisation as a series of happenings. The event carries into manifestation the significance. The term characters are taken to be laws here, much as the laws of form determine structure, the laws of coalescence determine events. The six characters are also related to and can be derived from the basic triad by going into the sequencing of impulses. Using the conventions that (1) is affirming, (2) is receptive and (3) is reconciling we get

- 1-2-3 expansion
  - an affirmation connects to a receptivity and generates a reconciliation
- 2-1-3 concentration
  - a denial calls forth an affirmation which generates a reconciliation
- 1-3-2 interaction
  - an affirmation acts through a reconciliation to produce receptivity or denial
- 2-3-1 identity
  - a denial acting through reconciliation asserts identity
- 3-1-2 order
  - reconciliation acting through an affirmation asserts order in receptivity
- 3-2-1 freedom
  - - reconciliation acting through receptivity releases new affirmation

Illustration: the Hexad of Sustainable Democracy

The primary learning from the hexad is that for the realization for a sustainable democracy there are six strategies, not one, that need to come into play. They are based on the 2nd order connectivities of the triad as indicated above. Each of these strategies

must conform to one of the six laws. There formal expression is shown in the diagram. But we need to unpick the meaning intuitively.

Two of the terms, interaction and identity, hold the dynamic in its current position, whatever that maybe. When the reconciling term is in the middle position then it means that the restabilisation balance is not changing and simply modulates the global policies and determines the feedback form nature. To change the quality of the dynamic it is necessary to take two further types of initiative. One is from the revision of policies themselves. If implemented, this can expand the scope of restabilisation actions. For example adoption of the policy of contraction and convergence [18] would gradually shift the carbon load on the atmosphere. Alternatively, the initiative might come from a deeper research into what is really going on. The work with ice cores on atmospheric changes is an example that brings more weight to the need for restabilisation.

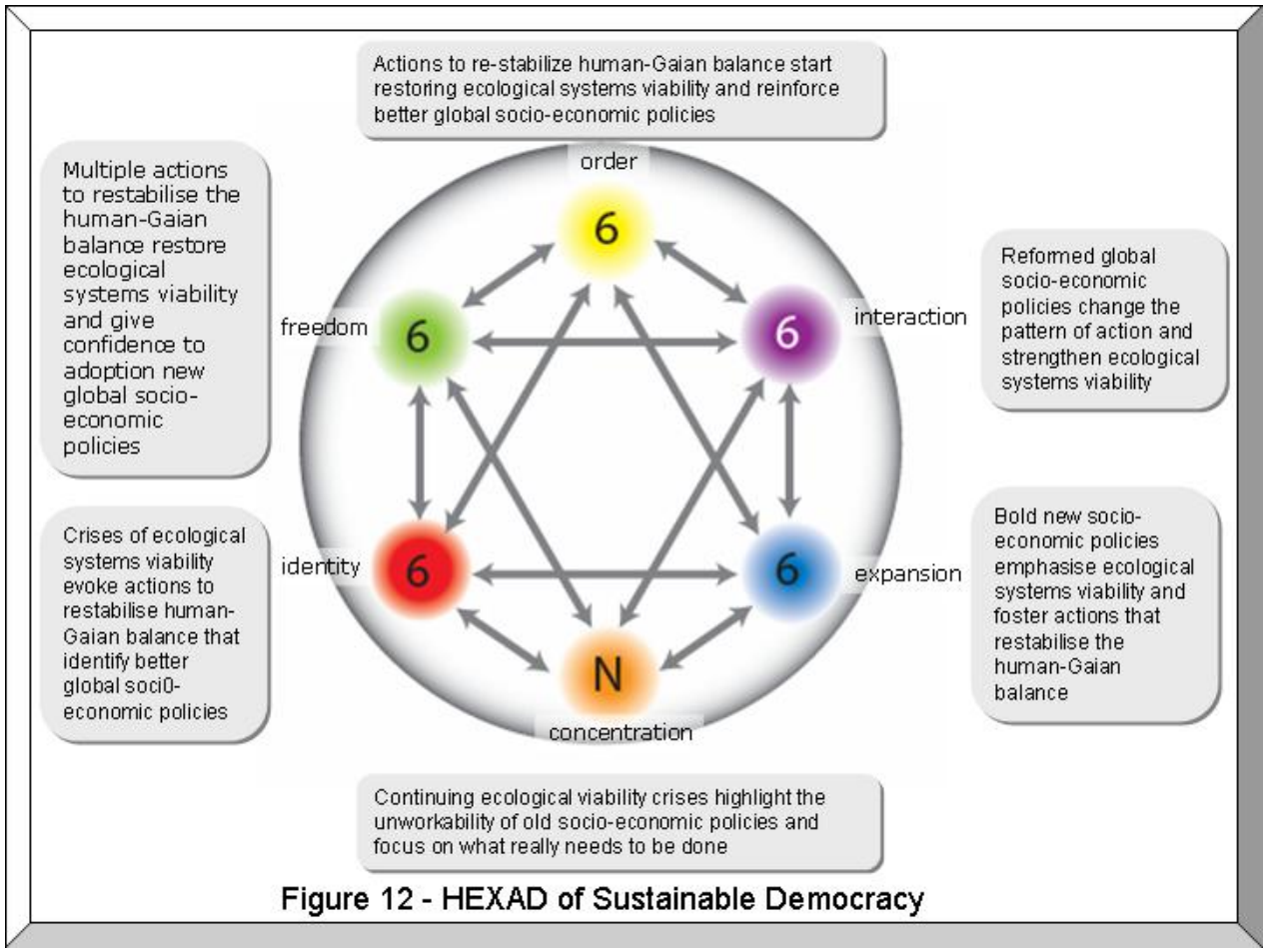

Figure 12 - HEXAD of Sustainable Democracy

However, the strength of democracy is that, with education and deconditioning from misleading propaganda, multiple citizen actions can begin to change the human-Gaian balance. Even the consumer mind set can vote with its feet around, say, additives in processed food. Finally the law of freedom indicates that there could be a tipping point where mass movement effects change sweeping the policies with them.

The Heptad

The seven term system is the first system that combines structure and process. This system reveals the qualitative process of transformation. A symbol for this system is difficult because it is both a structure that can be represented geometrically but also a process of realization that flows the structure. Hence the symbol below has an internal spiral echoing the spiral hint in the monad symbol.

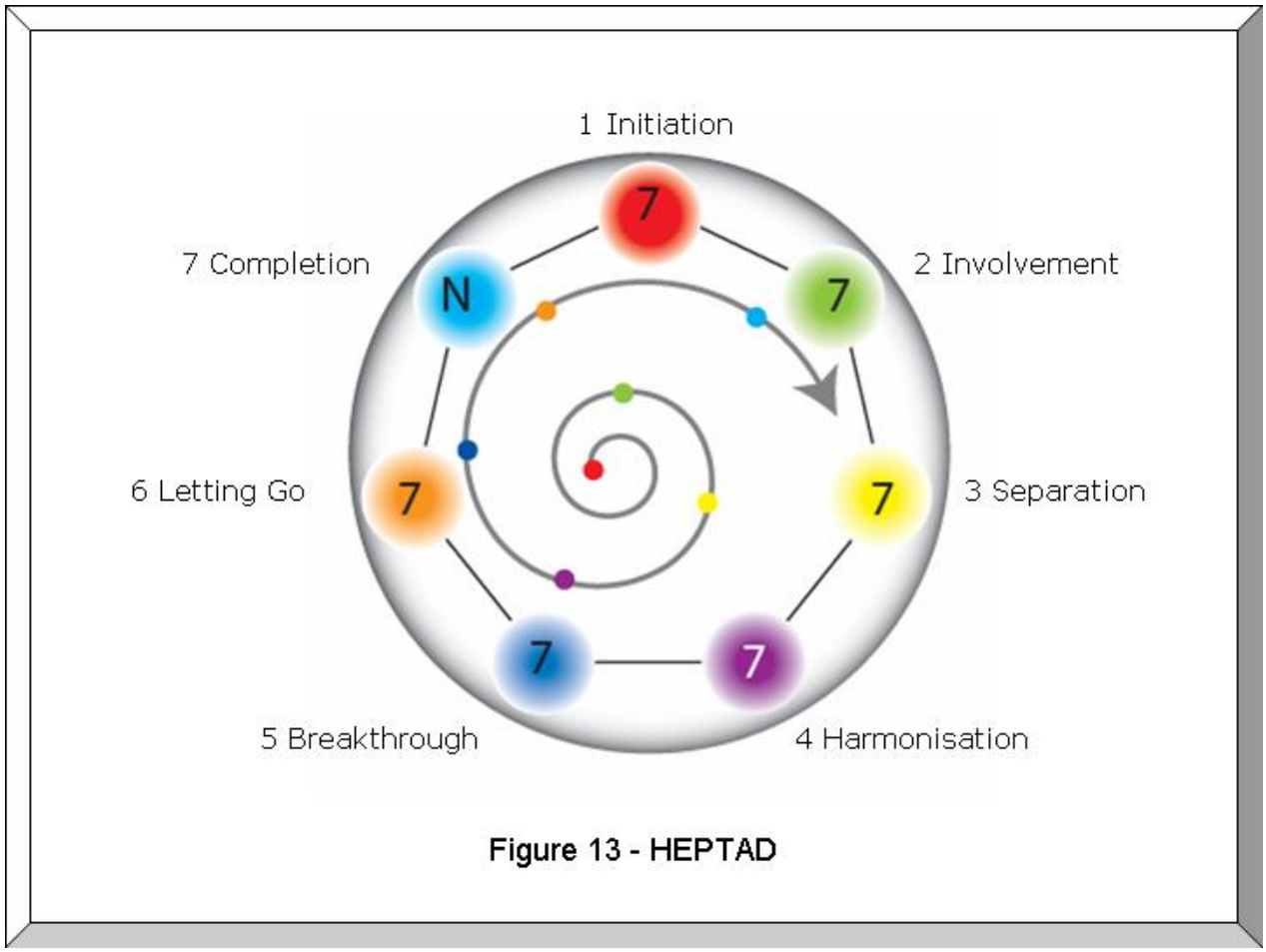

Figure 13 - HEPTAD

- Coherence Attribute: transformation
- Term Designation: state
- Term Characters (as both state and sequence)
  - 1 initiation
  - 2 involvement
  - 3 separation
  - 4 harmonisation
  - 5 breakthrough
  - 6 letting go
  - 7 completion

Viewed as a process spiral, the seven terms represent a development which has been referred to as an octave, analogous to the musical scale. Thus an initiation is sounded as doh and goes through quickening vibrations until it reaches completion as the doh an octave higher. This also implies that transformation is not a smooth curve but a sequence of discontinuities. Transformation is quantised, and each stage may "freeze" or even fall back. This unfolding progression is well exemplified in embryology.

Illustration: The Heptad of Sustainable Democracy
Let's explore the transformation changes need form where we are today to a sustainable democracy.

1 Initiation

Firstly there needs to be a growing and increasingly shared core vision and understanding of what a sustainable democracy needs to be, For example a vision needs to embrace all the systems from the monad to the hexad. It needs to be a core understanding that is real enough to be pretty independent of political colour, racial difference and global location. It requires a deepening of the realisation of the common predicament of the common humanity.

2 Involvement

Secondly, just having a vision is only a start. People from all walks of life and all parts of society need to start involving themselves in earnest. It might be as simple as stated by the mayor of Curitiba, Brazil, to start with. "Use your car less and sort your rubbish". It may also be grass roots movements for sustainable energy and citizen groups fighting back for civil liberties against the propaganda machines that have hijacked democracy.

3 Separation

This might seem an odd stage but it basically means the parting of the ways. Beyond a certain point the vision cannot be realised by compromise. Tough choices have to be made and even laws and sanctions passed and applied to shift the ground of behaviour. A sufficient proportion of the half billion professional middle classes who implement the globalisation programme (mainly as unwitting agents) will need to realise that the problem is not someone else's. This is dangerous ground because the temptation is to enforce regulation undemocratically and substitute eco-fascism for sustainable democracy.

4 Harmonisation

If the chasm of behaviour switch can be crossed then there is the basis for a new harmonisation of living arrangements and the formation of a new socio-economic order that is consistent with principles such as the natural step and contraction and convergence. The harmony must be emergent to sustain democracy and must have the requisite variety to allow freedom of human aspiration within the sustainable limits. An ethics of interconnectedness will emerge where systems thinking is embedded in the mores and memes of society.

5 Breakthrough

Curiously, the harmonisation in the previous stage is fragile and could easily disintegrate under pressure or contest. This next stage revisits the vision with the learning that has been achieved and through this establishes a new reality. From this new perspective, the way we live today will appear immature and primitive. We will be aghast at the scientific and moral ignorance that dominate us through the industrial age of resource exploitation. Yet we will have reframed the technologies to help us meet the criteria of sustainability and create not just sustainable but restorative businesses. [19] Whether our energy comes from nuclear fusion or photosynthesis, we will have drastically reduced fossil energy dependence and have established new intuitions empowered to curb the excesses of those elected to power before the damage is done rather than afterwards.

6 Letting Go

This will be a challenge as the generation that led the transformation confronted by the fact that people in a democracy choose and may not follow the transition orthodoxies. We see today efforts to "introduce democracy" to countries who take the opportunity to choose and upset their sponsors by choosing something different what was hope for. This can be bad or good. In a sustainable democracy it would be a learning society that stood on the shoulders of the older generation and went further, beyond any current imaginings. The vehicle that got us there will need to be abandoned for a new approach when we get there. We cannot anticipate very far the new knowledge and understanding.

7 Completion

This stage is not a deadline but rather an emergent property which, if successful, is barely noticed. Sustainable democracy becomes a global culture of diversity in unity in a viable mutual relationship with Gaia. It becomes the new statusquo. New challenges will now emerge and new octaves of transformation will be needed. The music goes on!

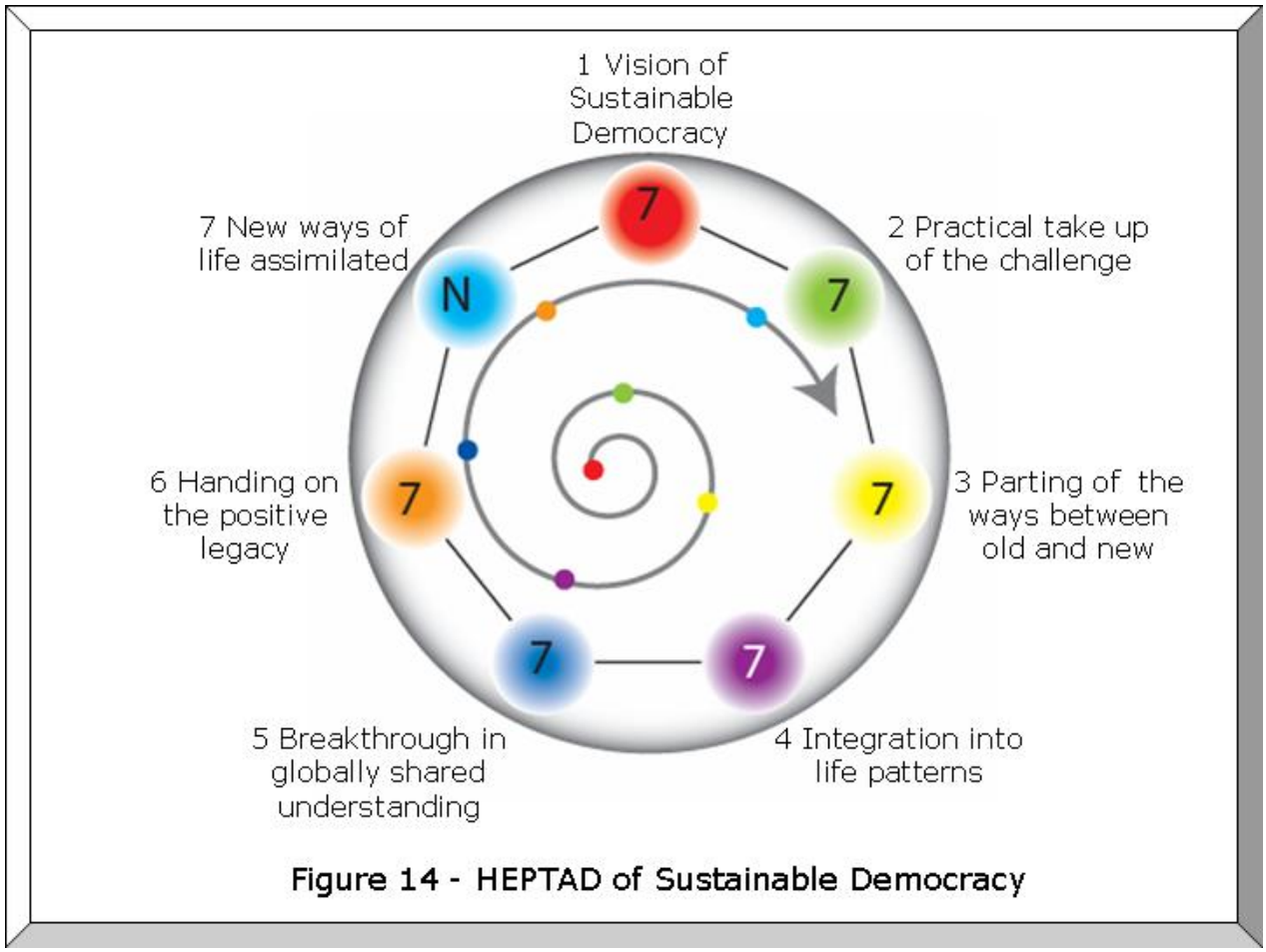

Figure 14 - HEPTAD of Sustainable Democracy

Illustration: The Octad

With the Octad we now can place the preceding systems into a context. This is the conceptual equivalent of the ecosystem. The symbol can be seen as two interlocking squares, blue and brown. The inter octagon sets the field in which the other n-term systems inhabit.

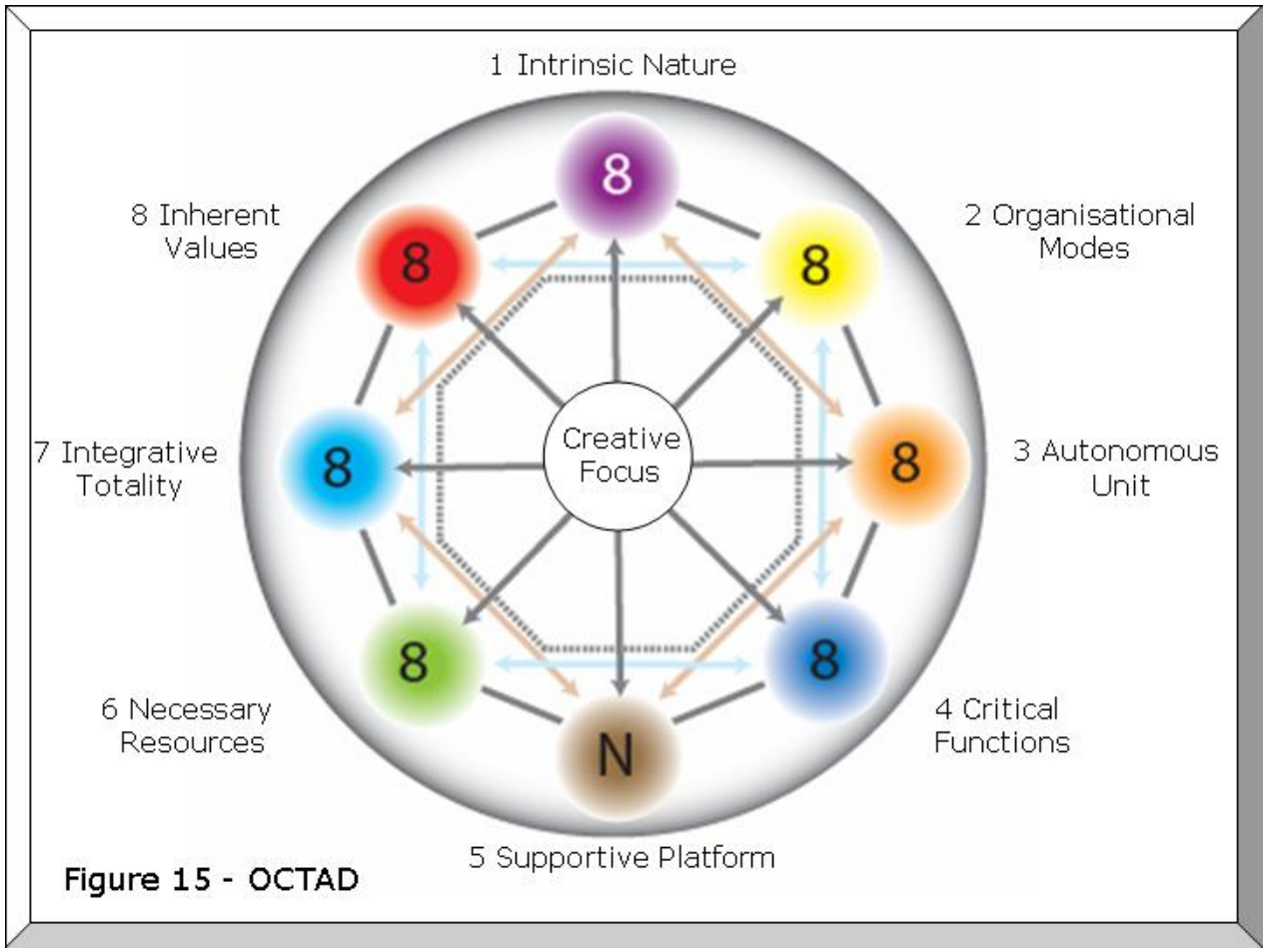

Figure 15 - OCTAD

- Coherence Attribute: self-sufficiency
- Term Designation: Element
  - 1-3-5-7 structural
  - 2-4-6-8 functional
- Term Characters:
  - 1 Purple - intrinsic nature
  - 2 Yellow -organisation modes
  - 3 Orange -autonomous unit
  - 4 Blue - critical functions
  - 5 Brown - supportive platform
  - 6 Green - necessary resources
  - 7 Pale blue - integrative totality
  - 8 Red - inherent values

The octad has 28 connectivities which if all drawn makes a symbol difficult to decipher. The symbol here highlights some of the important connectivities. The diamond square 1-3-5-7 represents the structural elements in the system which provide the framework. The flat square 2-4-6-8 represents the functional elements that generate action. Hence the octad is a symbol of the integration of structure and function. The horizontal dimension (3-7) indicates a scale form the smallest unit that participates in the system to the largest scale of completion. The vertical dimension (1-5) indicates the range form external existence to internal meaning. The internal dotted octagon represents the arena, the region in which the total ecology functions.

Illustration: the Octad of Sustainable Democracy

The smallest unit of a sustainable democracy is the individual human being. Rather than simply "one person, one vote" this is "one person, one conscience". Democracy requires educated and responsible individuals. At the opposite end of the scale is the totality of the Earth System. This understanding is increasingly being referred to as Gaia. [20] The supportive platform for sustainable democracy is the earth biosphere in relation to which humanity needs to reduce its impact or footprint.[21] However, human life

needs essential life support systems of air, water, food, shelter and a tolerable version of standard of living. Also needed are shared values of globality [22], as distinct from globalisation. The challenge is that this is to be achieved not by totalitarian coercion or by eco-fascism but by participative democracy [23]. For this to work there need to be adequate civic participation processes, beyond the voting systems of "elected dictatorships". It also require a holarchic [24] approach to governance systems in which authority and responsibility are discharged at appropriate levels. All of this is a far cry from current organisation of human affairs. Indeed Bennett observed as long ago that "We are passing through a transitional stage in human history, when it is necessary that there should be a return to the active creation of values upon which all effective community of interests depends, and without which there cannot be anything but conflict and disaster."[25] The outcome of realising the octad would be, in effect, a new planetary civilisation, not homogeneous, but in the spirit of the original monad of unity in diversity.

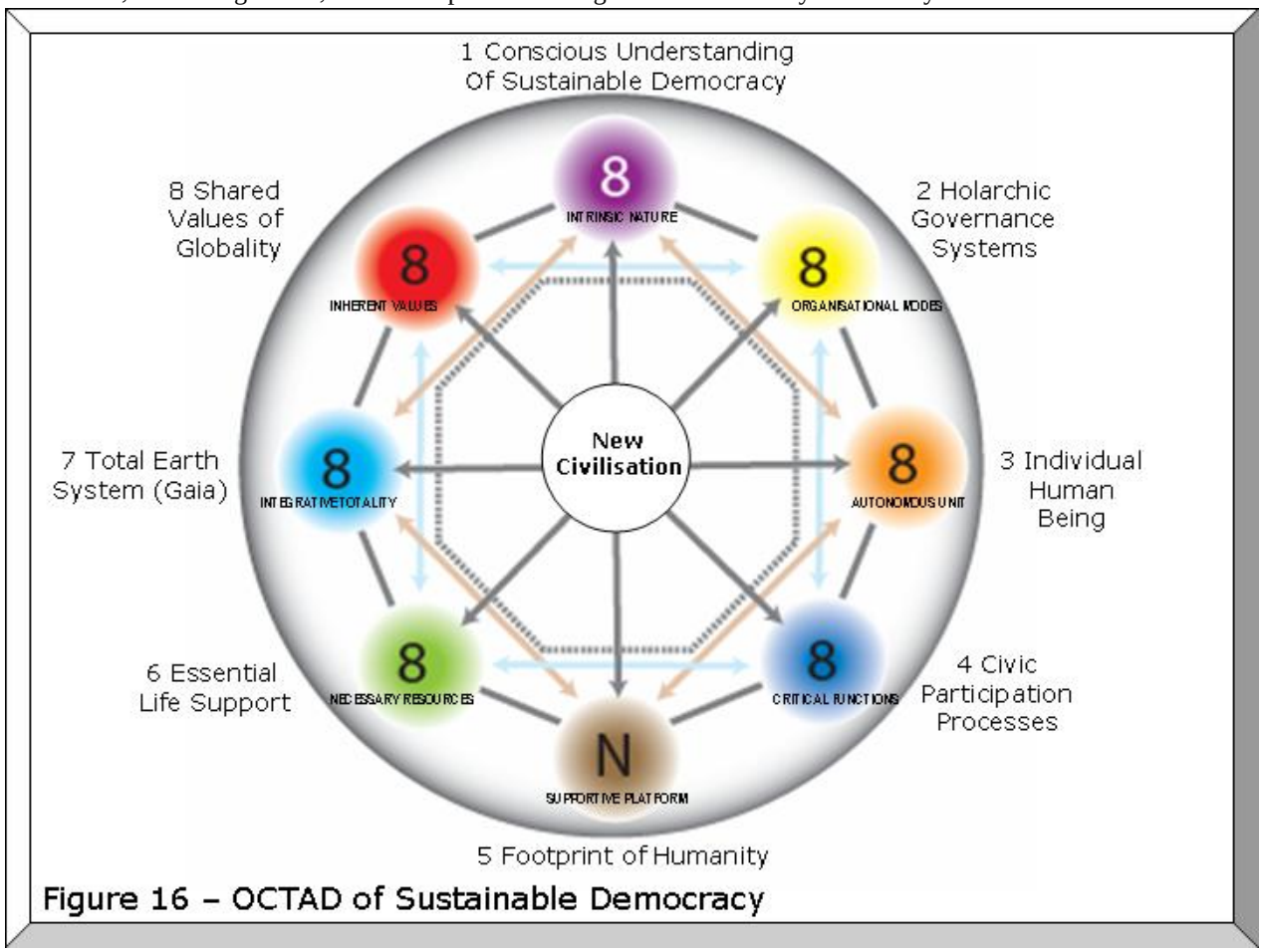

Figure 16 – OCTAD of Sustainable Democracy

Further Systems

It is beyond the scope of this paper to go into geometrically increasing complexity of the higher systems. Indeed this needs to be the subject of considerable further research and thinking. However, for symbols are shown below with some brief indications of where these appreciative might take us. The descriptions are tentative based on Bennett's own brief insights. [26] [27]

The Ennead - Coherence Attribute: harmonisation

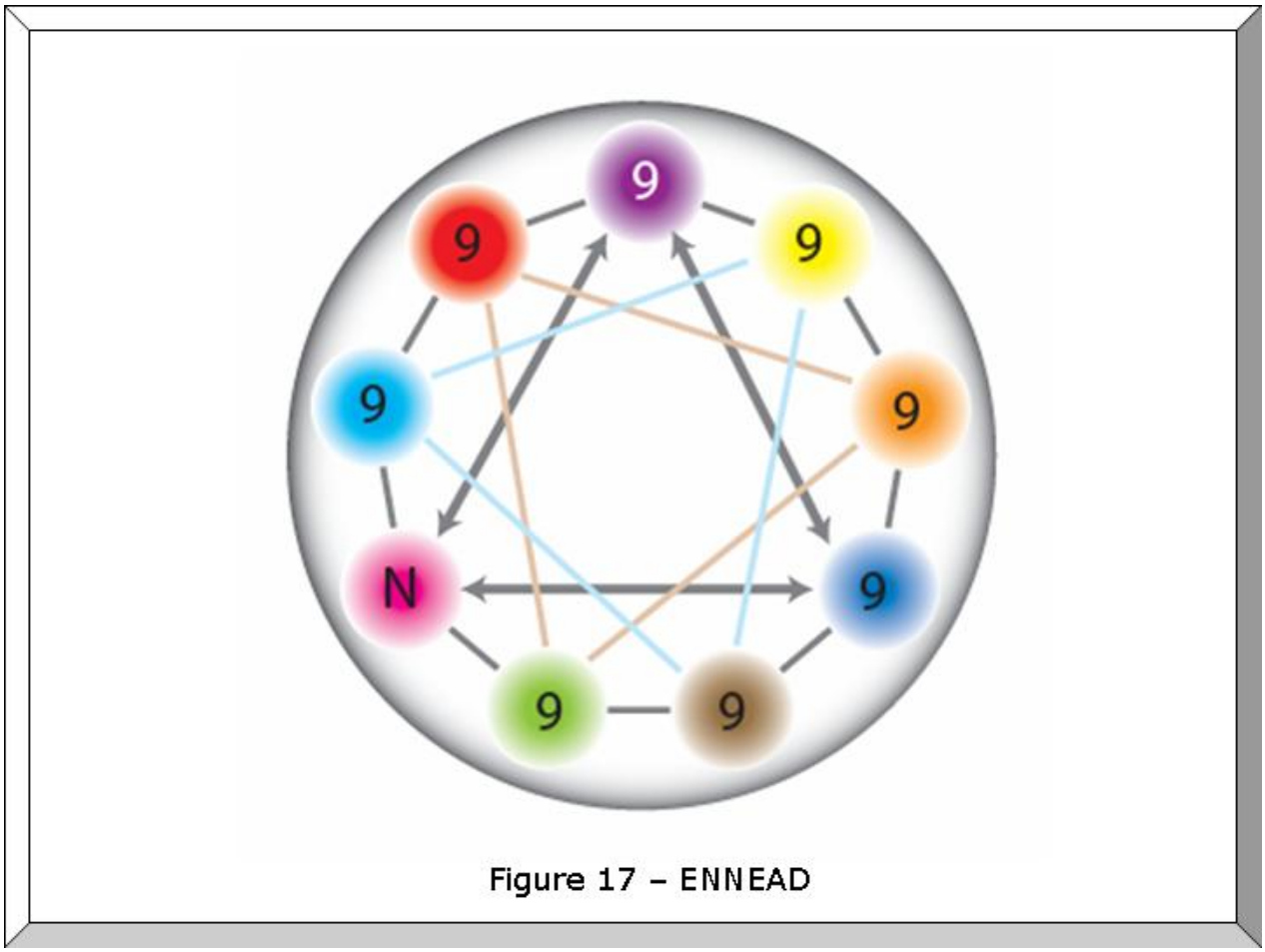

Figure 17 – ENNEAD

This is a system which takes into account the hazard and uncertainty of complexity and exposes ways in which multiple transformations of the Heptad (or octave) can be orchestrated to ensure that risk of deviation is overcome. The processes in time run around the circumference and the insightful management comes form the inner connections.

The Decad - Coherence Attribute: integrative complementarity

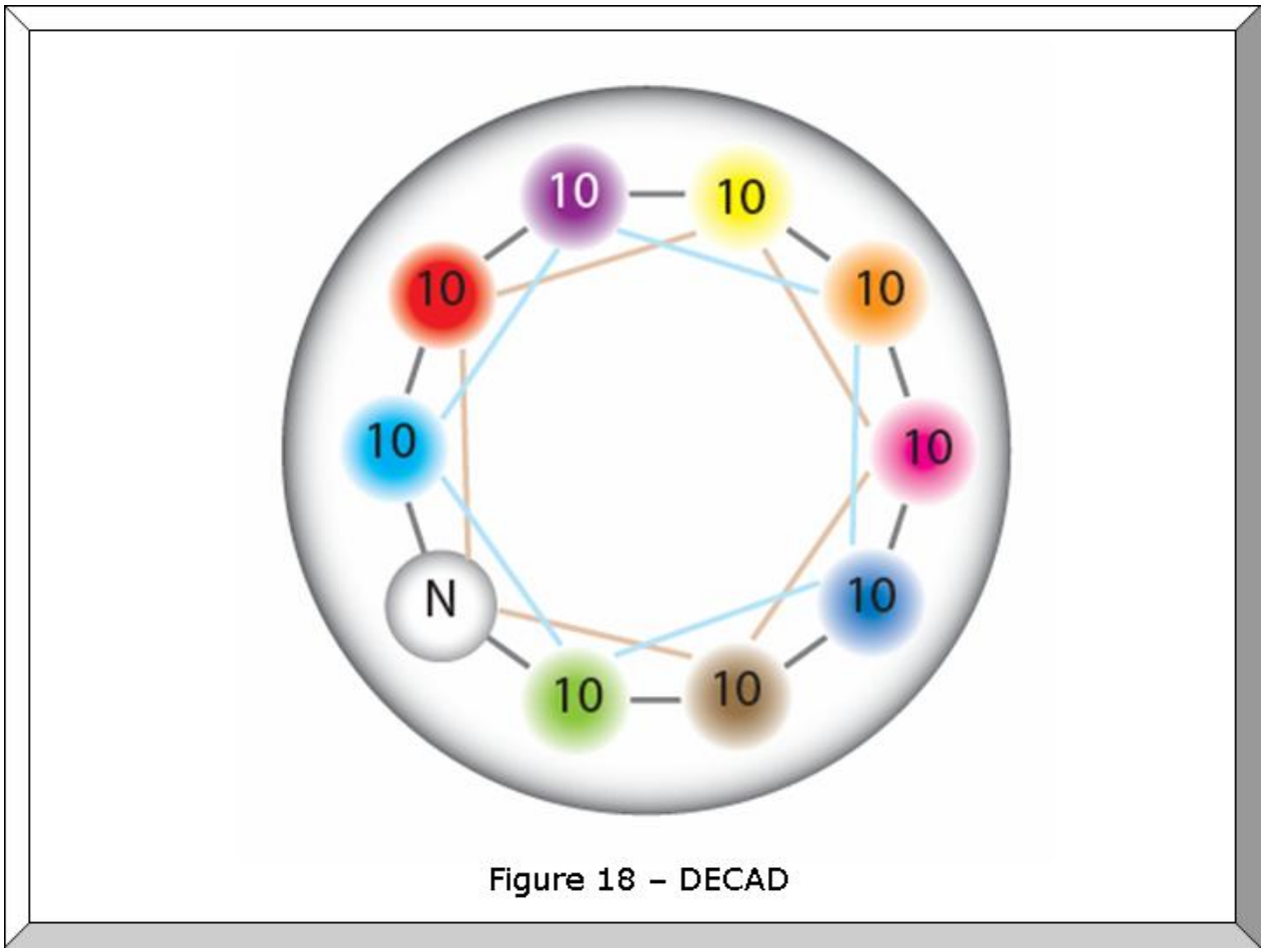

Figure 18 – DECAD

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This system has the ability to represent several sets of processes compensating for one another's defects and sustain overall harmony - integrative complementarity. The system can also be seen as two interlocking pentads and so indicates how deep meanings may be couple in the decad as a more complex corm of complementarity.

The Undecad - Coherence Attribute: synergism

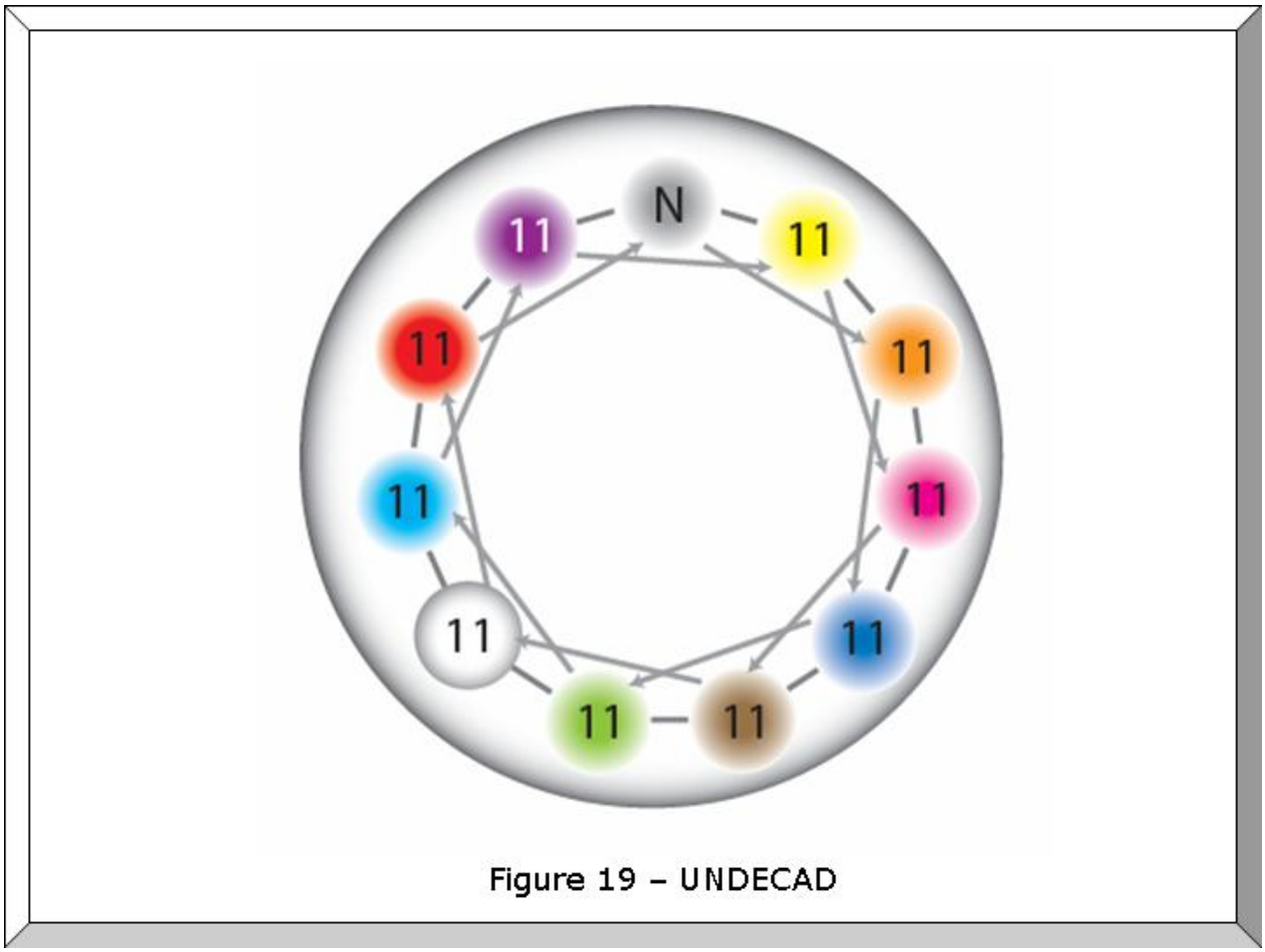

Figure 19 – UNDECAD

The Duodecad - Coherence Attribute: Completion

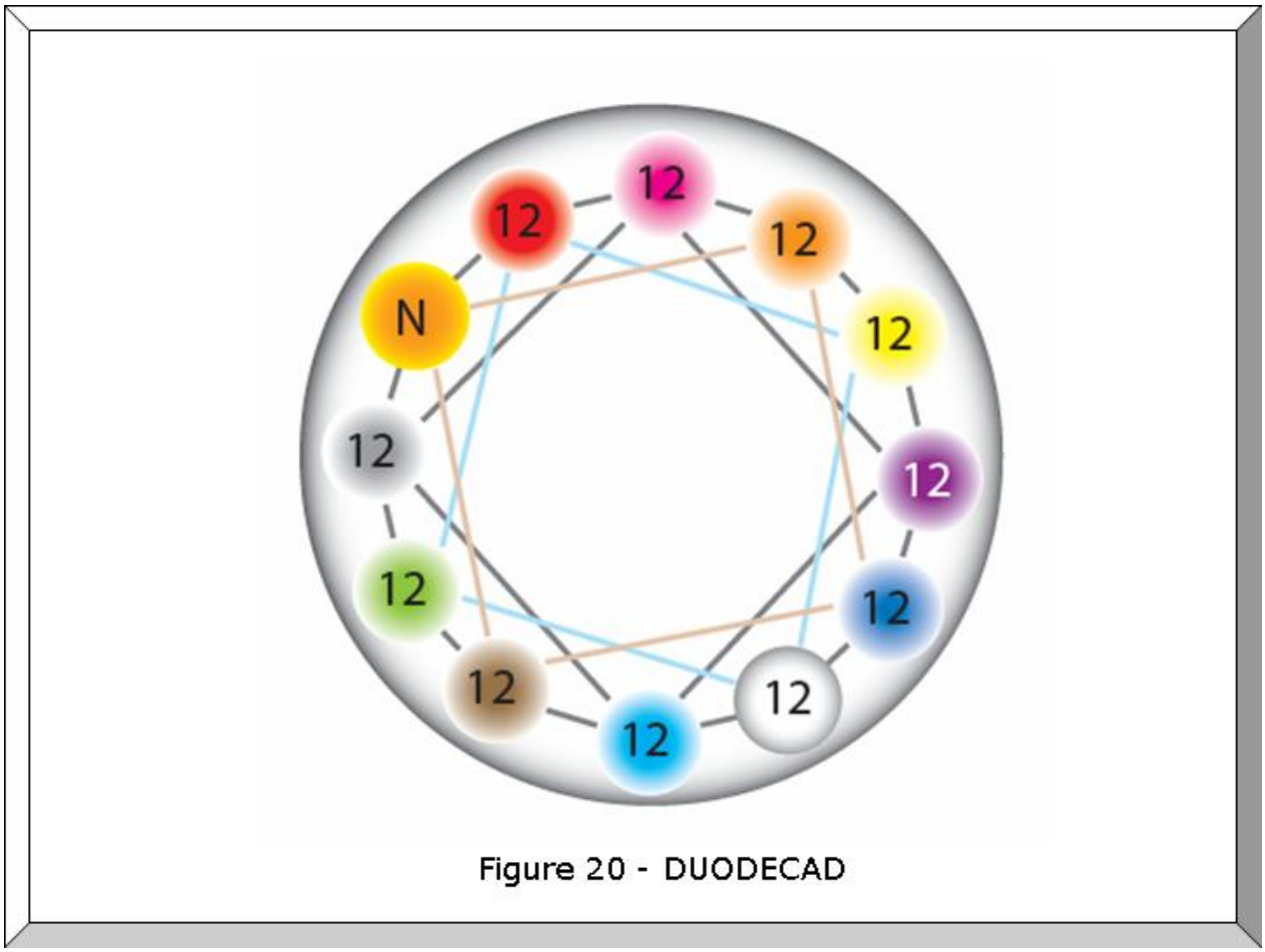

Figure 20 - DUODECAD

The duodecad was deeply investigated by Bennett, especially in a representation as three tetrads that formed a 12 category hierarchy. This was the basic scheme in the Dramatic universe. However, the system was also investigated in a different way in depth by Stafford Beer in the form of the icosahedron and is used to structure the group process called Team Syntegrity. Beer, studies the relationship between the nine term system and the icosahedron.[28]

The Whole Series

An interesting parallel with the whole series of systems is Buckminster Fuller's account of what he called the vector equilibrium with his "jitterbug" geometry. This investigation around which shapes with flexible joints between struts, have inherent structural integrity, It turn out that these are

- the tetrahedron (4 apexes)
- the octahedron (8 apexes)
- the icosahedron (12 apexes)

Bennett recognised an analogous stratification of systems in that he saw systems 1-4 as how structures work; 4-8 as why they work; and 9-12 as their harmonics.

Generating Insights from the Qualitative Systems

The analytical approach can measure well the number of logs floating down the river and the rate at which they proceed. However, the structural approach is needed if we are to see how to free up a log jam. In our complex society more and more difficulties we face are of the log jam variety and no amount of counting how many logs are stuck is going to unstuck them.
From a diagnostic perspective each of the n-term systems is a tool to form appreciative judgements as what is preventing our current society from making much headway on the big issues that block us from achieving a sustainable democracy on planet earth.

Here are some diagnostic observations which mainly take heuristic approach to identifying things we perhaps overlook too easily. But first we need some further concepts and principles of interpretation.

We now distinguish between strong and weak systems. Having visualised the complete systems, the diagnostic and action value comes from studying systemic weakness and failures. These are divided into those which are overall systemic confusion and those which are system specific.

Overall systemic confusions include

- inability to identify and differentiate any of the appreciative systems
- being stuck in one systemic perspective, for example seeing everything as polarities or dyads
- seeking complex understanding before having even got clear what the universe of interest, or monad, is

Specific systemic confusions include

- weak coherence - the attribute is unclear in the situation (e.g. lack of triadic dynamism)
- negative coherence - the system is showing the inverse attribute (e.g. triviality instead of pentadic significance)
- term character weakness - the role is not being played in balance in the system (e.g. poor grounding in a tetradic order)

Challenges in Developing a Sustainable Democracy

1 Monad
The weakness here is that there is extremely limited recognition in people and their leaders that this is both necessary and desirable. Or where it is considered, the definition is too narrow, factional or specialised and therefore cannot embrace the true complexity and diversity of the real situation.

2 Dyad
There is a breakdown of complementarity between human aspirations (mostly without regard to the environment) and the earth system equilibrium conditions which are manifesting backlash. The antagonism between economy and ecology is a false dichotomy since both are derived form the Greek for "home".

3 Triad
There is a negative dynamism prevailing at the moment which is the compulsion to growth. This is driven by the global monetocracy system and exacerbated by the negative component of the elite. So balanced policies are not implemented and are not electable. The receptive force of the ecosystems is being destroyed by overshoot of their resilience. This leading to what James Lovelock calls "The Revenge of Gaia". As a result the reconciling actions of healing the planet are weak and largely ineffectual. However, there is also the positive news of positive community dynamism as reflected in the growing movement of ecovillages across the world.

4 Tetrad
Goals, such as the *Natural Step* and *Contraction and Convergence*, are in the direction of providing harmonious goals. However, they are not yet adopted as directive policies. Renewing strategies are being considered in such fields as industrial ecology but are nowhere near the mainstream of policy implementation. Ecological health is declining rapidly but at least it is being measured more and more comprehensively and feedback is beginning to get back into the human mental and emotional system. Gnerally the state of knowledge on the operational axis is that we already have many strategic components of sustainability. But on the motivational axis we lack the drive and commitment to put what we know into use.

5 Pentad
As Mary Midgley points out, the prevailing philosophies of eliminative material or pseudo-religious man supremacy leave us in a heedless situation as regards the significance of what a Gaian democracy is needed so both we an nature can have a future. More emphasis is being put on renewable resources but often without regard to the wider system of nature. Globalisation aims to create man in the image of the Washington consensus rather than accommodate a wide variety creative expression and social values for well being. The society is far from utilising resources in equilibrium, fossil fuel being the most blatant and ecosystem services the most critical.

6 Hexad
We are clearly a long way from a sustainable democracy coalescing into a significant global event. However, there are specific

communities that exemplify more of the necessary characteristics. Many of these are triggered as a reaction to the failure of the society in general to be democratic or sustainable. False democracy and superficial sustainability prevail. The 6-term system challenges us to create ways of orchestrating a six pronged effort to create a tipping point where the power of mutually reinforcing feedback loops across different fields take over.

7 Heptad

There are seven areas of contribution that the systems sciences can make to the transformation to a sustainable democracy.

1. Portray a powerful vision of how sustainability and democracy form a unified system that need to be in balance and remove the false dichotomy between economy and ecology
2. encourage the systems science community to make even more efforts to infiltrate systems thinking into policy making, citizen education (getting away from the single issue obsessions) and education.
3. Fostering more intensely what Buckminster Fuller called the design revolution that can get beyond politics and business and put them on a new platform
4. Interact increasingly cross-culturally to find the common holistic mind sets between East and West and beyond the divisive fundamentalisms whether they be from religion, science, politics or commerce.
5. harvesting and sharing the excellent work that has already been done but which so easily remains on the margins due to the pushback of those very fundamentalisms that systems thinking undermines.
6. recognise that some people and communities are practising more systemic and sustainable ways of life and social organisation (eg the Mondragon Community in Spain) and yet are not interpreted from the stand point of the systems sconce. Help them establish the science in their practice as living laboratories.
7. Follow the lead of people like Jay Baldwin who lived his experiments in alternative living arrangements and adopt a number of feasible personal practices that are consistent with the vision of sustainable democracy. Help create a "viral" infection using small world [29] understanding.

8 Octad

Research the components and interconnectedness of a possible pattern of a new civilisation based on the full spectrum of systemic understanding of sustainable democracy. Seek the patterned integrity that may well be a design of nature awaiting an evolutionary step, providing we deicide to become conscious of it beyond the historical mindsets that have landed us with the mess we're in.

Conversations in Systems

The above systems are not some set of "right answers". They are a mental tool for probing understanding, discovering new insights and providing hypotheses for testing new actions. They are a constructed appreciative systems for improving our capacity for balanced judgement. As such, they are conversation frameworks very helpful for underpinning interdisciplinary collaboration. [30]

Such conversations help us form new hypotheses which are at the qualitative end of scientific method. Development of the intuitive side of science, including systems science, requires participation. As Brian Goodwin puts it:

> "This implies that we cultivate not just our analytical intellects in understanding the intelligible aspects of nature, but also our intuitions as the vehicles of understanding and participating in the emergent creativity of natural processes, which includes our own creativity. Cultivating the intuition means deliberately practicing methods of investigation that pay attention to the feelings and images that arise in the course of systematic encounters with natural processes, as well as detailed examination of quantifiable characteristics, leading to an experience of wholes and their qualities." [31]

Systematics offers us a philosophically robust procedure for inquiry into complex messy situations. It cultivates our appreciative system as a skill of purpose and participation. It probes the qualitative isomorphism in situations that are traditionally fragmented by disciplines. It works on any level of recursion and is true to the notion of whole system.

Notes

[1] J.G.Bennett "General Systematics" (1996) - a study paper of The Primer Group A Special Integration Group (SIG) of the

International Society for the Systems Sciences (ISSS) viewed April 24th 2006 http://www.newciv.org/ISSS_Primer/asem13jb.html

[2] This must be distinguished from the way this expression is used in biological classification. The word "general" refers to the principle of isomorphism. The word "systematics" refers both to the systemic nature of reality and also to the progression of categories

[3] Vickers, Geoffrey (1965) "The Art of Judgement", Harper and Row, London

- "Appreciation manifests itself in the exercise through time of mutually related judgements of reality and value. …Such judgements disclose what can best be described as a set of readinesses to distinguish some aspects of the situation rather than others and to classify and value these in this way rather than in that. I will describe those readinesses as an appreciative system." p 67

[4] Churchman, C.West (1982) "Thought and Wisdom", Intersystems, Seaside, Calif.

[5] Fuller, Buckminster, (1982) "Synergetics - Explorations in the Geometry of Thinking" Collier Macmillan, London, p13

[6]Fuller, Buckminster, (1982), "Synergetics - Explorations in the Geometry of Thinking" Collier Macmillan, London, "Principle of Prime Number Inherency and Constant Relative abundance of Topology of Symmetrical Structural Systems" p38

[7] Whitehead, Alfred North and Russell, Bertrand, (1910) "Principia Mathematica" visited 24th April 2006 http://www.hti.umich.edu/cgi/t/text/text-idx?c=umhistmath;idno=AAT3201.0001.001

[8] Koestler, Arthur, (1967), "The Ghost in the Machine", Hutchinson, London

- The idea of independent mutual relevant terms has much in common with Koestler's view of the holon and holarchy. "The term holon has been introduced to refer to these intermediary entities which, relative to their subordinates in the hierarchy, function as self-contained wholes; relative to their subordinates as dependent parts. This dichotomy of 'wholeness' and 'partness', of autonomy and dependence, is inherent in the concept of hierarchic order, and is called here the 'Janus principle'. Its dynamic expression is the polarity of the Self-assertiveness and Integrative Tendencies." p58

[9] Victor, David G., (2005) "Ending Sustainable Development" Stanford University viewed 24th April 2006, http://gcep.stanford.edu/pdfs/uQx8GXJG882-3q6NMuyQOw/victor_text_symp05.pdf

[10] Crick, Bernard (2002) "Democracy" Oxford University press, Oxford

[11] Lovelock, James, (2006) "The Revenge of Gaia" Allen Lane, London p6

[12] Fuller, Buckminster, (1982) "Synergetics - Explorations in the Geometry of Thinking" Collier Macmillan, London,

- "A system is the first subdivision of Universe into a conceivable entity separating all that is nonsimultaneously and geometrically outside the system, ergo irrelevant, from all that is nonsimultaneously and geometrically inside and relevant to to the system; it is the remainder of Universe that conceptually constitutes the system's set of conceptually tuneable and geometrical interrelatability of events." p95

[13] Bohm, David J, (1963) "Basic Dyads in Contemporary Physics" Systematics Vol 1 No 3, visited 24 April 2006 http://www.toutley.demon.co.uk/BohmDyad.htm

[14] Hampden-Turner, Charles, (1990) "Charting the Corporate Mind - from Dilemma to Strategy" Blackwell, Oxford

[15] Naess, Arne (1995) "What is Deep Ecology?" in "Deep Ecology for the 21st Century" Ed. Sessions, George, Shambhala, Boston and London.

[16] Madron, Roy and Jopling, John, (2003) "Gaian Democracies - Redefining Globalisation and People Power", Schumacher Briefings, Bristol

[17] Stiglitz, Joseph (2002) "Globalisation and its Discontents" Penguin, London

[18] Meyer, Aubrey, 2000, "Contraction and Convergence - The Global Solution to Climate Change" Schumacher Briefing, Bristol

[19] Anderson, Ray, (1999) "Mid-course Correction - Towards a Sustainable Enterprise - The Interface Model", Chelsea Green Publishing, USA

[20] Midgley, Mary, (2001) "Gaia : The Next Big Idea" Demos, London

- "The idea of Gaia - of life on earth as a self-sustaining natural system- is a powerful tool that could generate solutions of many of our current problems. It does not just lead to new applications of science and technology. It can also counteract the corrosive forms of social atomism and individualism that infuse much scientific thought. Its approach, once fully grasped, makes a profound difference, not just to how we see the earth but how we understand life and ourselves."

[21]Monde Diplomatique (2006) "Planet in Peril - An Atlas of Current threats to People and Environment" Quoting the Millennium Ecosystem Assessment - "Over the last 50 years mankind has used and transformed more than in any equivalent period in history. We have irreversibly damaged more than half of the planet's ecosystems." UNEP/GRID-Arendal, Norway

[22] I am indebted to Professor Martin Albrow of the International Futures Forum for discussions on this distinction.

[23] Walker, Perry (2002), "We, The People - Developing a New Democracy", New Economics Foundation, London

[24] Koestler, Arthur, (1967), "The Ghost in the Machine", Hutchinson, London

- "…we may say that the organism in its structural and functional aspects is a hierarchy of self-regulating holons which function (a) as autonomous wholes in supra-ordination to their parts, (b) as dependent parts in sub-ordination to controls on higher levels, (c) in co-ordination with their local environment. Such a hierarchy of holons should rightly be called a holarchy …."

[25] Bennett, J.G., (1954) "Crisis in Human Affairs" Hodder and Stoughton, London

[26] Bennett, J.G. (1966) "The Dramatic Universe Volume 3", Hodder and Stoughton, London, Chapter 37

[27] Bennett, J.G., Blake, A.G.E. (1966), "Systematics - A New technique of Thinking" , visited 24th April 2006, http://www.toutley.uklinux.net/systematicsbooklet.htm

[28] Beer, Stafford, (1994), "Beyond Dispute -The invention of Team Syntegrity" Wiley, New York, Chapter 12

[29] Buchanan, Mark, (2002) "Small Worlds - Uncovering nature's hidden networks", Weidenfeld and Nicolson, London

[30] See emerging developments at http://www.systematics.org visited 2 May 2006

[31] Goodwin, Brian, (1994) "How the Leopard Changed Its Spots", Weidenfeld and Nicolson, London