

Citation for published version:

Rayner, AD 2011, 'Space cannot be cut: why self-identity naturally includes neighbourhood', *Integrative Psychological and Behavioral Science*, vol. 45, no. 2, pp. 161-184. <https://doi.org/10.1007/s12124-011-9154-y>

DOI:

[10.1007/s12124-011-9154-y](https://doi.org/10.1007/s12124-011-9154-y)

Publication date:

2011

Document Version

Peer reviewed version

[Link to publication](#)

The original publication is available at www.springerlink.com

University of Bath

Alternative formats

If you require this document in an alternative format, please contact:
openaccess@bath.ac.uk

General rights

Copyright and moral rights for the publications made accessible in the public portal are retained by the authors and/or other copyright owners and it is a condition of accessing publications that users recognise and abide by the legal requirements associated with these rights.

Take down policy

If you believe that this document breaches copyright please contact us providing details, and we will remove access to the work immediately and investigate your claim.

Space Cannot Be Cut – Why Self-Identity Naturally Includes Neighbourhood

Alan Rayner¹

Abstract Psychology is not alone in its struggle with conceptualizing the dynamic relationship between space and individual or collective identity. This general epistemological issue haunts biology where it has a specific focus in evolutionary arguments. It arises because of the incompatibility between definitive logical systems of ‘contradiction or unity’, which can only apply to inert material systems, and natural evolutionary processes of cumulative energetic transformation. This incompatibility makes any attempt to apply definitive logic to evolutionary change unrealistic and paradoxical. It is important to recognise, because discrete perceptions of self and group, based on the supposition that any distinguishable identity can be completely cut free, as an ‘independent singleness’, from the space it inescapably includes and is included in, are a profound but unnecessary source of psychological, social and environmental conflict. These perceptions underlie Darwin’s definition of ‘natural selection’ as ‘the preservation of favoured races in the struggle for life’. They result in precedence being given to striving for homogeneous supremacy, through the competitive suppression of others, instead of seeking sustainable, co-creative evolutionary relationship in spatially and temporally heterogeneous communities. Here, I show how ‘natural inclusion’, a new, post-dialectic understanding of evolutionary process, becomes possible through recognising space as a limitless, indivisible, receptive (non-resistive) ‘intangible presence’ vital for movement and communication, not as empty distance between one tangible thing and another. The fluid boundary logic of natural inclusion as *the co-creative, fluid dynamic transformation of all through all in receptive spatial context*, allows all form to be understood as *flow-form*, distinctive but dynamically continuous, not singularly discrete. This *simple move from regarding space and boundaries as sources of discontinuity and discrete definition to sources of continuity and dynamic distinction* correspondingly enables self-identity to be understood as a dynamic inclusion of neighbourhood, through the inclusion of space throughout and beyond all natural figural forms as configurations of energy. Fully to appreciate and communicate the significance of this move, it is necessary to widen the linguistic, mathematical and imaginative remit of conventional scientific argument and explication so as to include more poetic, fluid and artistic forms of expression.

Keywords: abstract logic; boundaries; energy flow; inclusionality; intangibility; natural inclusion; natural logic; neighbourhood; rationality; self-identity

Introduction

During recent decades, there has been a surge in popular enthusiasm for the belief that it is natural to be selfish. Not only has this resulted in the emergence of monetarist economic policy and global advance of consumerism (Gabriel 2002), but it has also been reinforced by the extraordinary coming to prominence of neo-Darwinian notions of individual selection in sociobiology and selfish gene theory (e.g. Wilson 1998; Dawkins 1989).

Department of Biology and Biochemistry, University of Bath, Claverton Down, Bath BA2 7AY, UK.
E mail a.d.m.rayner@bath.ac.uk

Whilst some people, including its proponents, have lamented the unpleasant implications of this belief – as a source of profound intolerance, conflict, distress, exploitation, oppression and waste – its underlying intransigent logic has seemed difficult, if not impossible to refute. Indeed, Richard Dawkins (1989) has urged: “If you wish, as I do, to build a society in which individuals co-operate generously and unselfishly towards a common good, you can expect little help from biological nature. Let us teach generosity and altruism, because we are born selfish.” In effect, human conscience is here called upon to overturn the tyranny of our genetic self-determination so that we can behave more nicely towards one another as members of a group.

But perhaps the real problem resides not – at least not directly – in our actual human nature, but in the paradoxical application to evolving energetic systems of definitive logics that can only apply to inert, material systems. It is such definitive logics, which hold that the only alternative to contradiction (“it is impossible for the same thing to belong and not to belong at the same time to the same thing and in the same respect”) is unity (“all things will be one”) that reinforce the belief that we are born selfish and that if we are not to be selfish, then we must be altruistic. When combined with and contributing to our fear of death as the ‘end’ of life, such dichotomous thought provides extremely powerful motivation for objectifying ‘self’ and ‘other’ – whether individually or collectively – as ‘opponents’ and seeking means to suppress ‘other’ in order to preserve our own self- or group-identity. Such a combination of fear and dichotomous logic may well have been at the root of Darwin’s perception of nature exemplified in the subtitle of his most famous book: *‘natural selection, or the preservation of favoured races in the struggle for life’* (Darwin, 1859).

It was just this dichotomous logic, which underpins modern genetic determinism (Dawkins, 1995), that was called into question by James Baldwin around 100 years ago in his *triadic* ‘genetic logic’ of ‘development’. In many ways, Baldwin’s dynamic dialectical logic of ‘becoming’ was a forerunner (and itself forerun by the works of Fichte and Hegel) of more recent ‘tense’, deontic, multi-value and fuzzy logics (Valsiner, 2009). These logics could also be appreciated as forerunners of the ‘including middle’ evolutionary logic of *natural inclusion* described in this paper, whose main point of departure lies in its treatment of space as a limitless, indivisible, receptive (non-resistive) ‘intangible presence’ vital for movement and communication, not as empty distance between one tangible thing and another. This allows the *simple move from regarding space and boundaries as sources of discontinuity and discrete definition to sources of continuity and dynamic distinction*.

The incompatibility between dichotomous logic and evolutionary process in relation to what Einstein (1954) called ‘the problem of space’, is brought into sharp relief by his following statement:

“When a smaller box *s* is situated, relatively at rest, inside the hollow space of a larger box *S*, then the hollow space of *s* is a part of the hollow space of *S*, and the same “space”, which contains both of them, belongs to each of the boxes. When *s* is in motion with respect to *S*, however, the concept is less simple. One is then inclined to

think that s encloses always the same space, but a variable part of the space S . It then becomes necessary to apportion to each box its particular space, not thought of as bounded, and to assume that these two spaces are in motion with respect to each other.”

Here is clearly portrayed the definitive assumption that space can be subdivided into discrete parts of *a* discrete whole. According to the logic of *natural inclusionality*, (Rayner 2004, 2006, 2010 a,b and c, 2011), this premise is *inapplicable to Nature* where space *cannot be pluralized into discrete particularities*, it can only be distinguished into distinct, dynamically and permeably bounded regions. This is because a presence that has no resistance can neither be cut nor resisted by a tangible frame. It is inescapably present throughout and beyond the boundaries of tangible figures. A tangible frame is an inclusion of and is included in space but *the frame is not the space*. The tangible *frame can move* (or be moved) and be cut, *but not the space*. When the frame moves the space stays where it is: in relative terms by remaining still space *permeates freely* through the frame, the frame does not cut through the space. Moreover, if the frame is to move without being forced to do so by a force situated somewhere outside of it, it must have the capacity for movement within itself, i.e. the frame is itself a manifestation of energy, not inert structure – it is a variably fluid ‘framing’, not a permanent, absolutely rigid ‘framework’. This tangible ‘framing’, or ‘dynamic interfacing’, has to be present for form to be distinguishable in a feature-full cosmos, but it can neither ‘occupy’ nor ‘exclude’ the space that it includes and is included in.

In this paper, I will work through the radical scientific and psychological implications of the natural inclusional understanding of the dynamic relationship between intangible space and tangible energetic form as *distinct* but *mutually inclusive* presences. In seeking to reveal the fundamental *process* of cosmological and biological evolution as a *flow* of tangible form as an inclusion of intangible space, I will make use of forms of language, logic and visualisation that depart from conventional objectivistic scientific discourse. I think this is necessary to avoid the ‘positivistic trap’ set by conventional definitive discourse and representation, which appeals only to analytical thought. To convey a deep appreciation of natural inclusionality depends on evoking the imagination and intuitive feelings *as well as* (not instead of) the analytical focus of the receiver. Indeed the need to engage *both* brain hemispheres through the mediation of the corpus callosum (cf. McGilchrist, 2009) is one of the implications of natural inclusionality. It is for this reason that I both use and explicate my own artistic and poetic imagery, not from a position of authoritative intrusion, but to facilitate my communication. I do not agree entirely with the literary criticism of Wimsatt and Beardsley (1946), to the effect that it is a fallacy to ascribe to the author, or the artist the authority in defining what an artwork is about and so disrupting the emotional response of the receiver. Indeed I regard this critique as a product of the dichotomous logic that hardens the splits between ‘reason’ and ‘emotion’, ‘science’ and ‘art’, ‘practicality’ and ‘imagination’ that has impeded human creativity (cf. Petroski, 2005).

The meaning of natural energy flow

Energy is the currency of nature. The way that energy flows within and through natural boundaries shapes and mobilizes the cosmos, whether in the form of massy local bodies or mass-less radiation. So the story of modern physics implies.

But what is energy, and how might an understanding of natural energy flow contribute to our knowledge of the evolution and sustainability of organic life – including human life – on Earth? How can the occurrence and equivalence of two forms of expression of energy, in material bodies and electromagnetic radiation, be understood and reconciled? These questions have not been answered by standard modern physics, based as this is upon definitive logic and mathematics. But they are vital to a deeper understanding of natural identity and evolutionary diversity.

In classical Newtonian mechanics, ‘energy’ is understood in terms of the relationship between ‘force’, ‘mass’ and ‘motion’. Here, ‘mass’ is a measure of the amount of matter in a body, which is also a measure of its linear inertia or extent to which it resists acceleration when subjected to a ‘force’. ‘Force’ is the physical quantity that ‘does work’ either by changing the motion of a body, by imparting acceleration to it, or by deforming the body. The ability of a force to do ‘work’ is ‘energy’, of which there are two kinds. Massy bodies have ‘kinetic energy’ by virtue of their motion. When work is done against a restraining force, ‘potential energy’ is stored, ready to be converted into kinetic energy when a body resumes motion.

As I will expand upon later, there are deep problems in the partiality of the logical premises underlying these definitions, which have not been solved by the advent either of relativity or of quantum mechanics. The default condition of Nature is regarded as stasis. Space is regarded merely as the distance over which mass, force and energy are stretched (or stretch themselves), such that they have variable density or frequency, and has no other influence beyond their limits. In this default condition, matter is inert and space passive. The very possibility of motion is therefore made ultimately dependent on some inscrutable external forceful agency or ‘unmoved mover’ to get it going. But if such agency can only be contained or applied locally, where is it? There is clearly something, or rather somewhere, missing from this classical description, which leads energy in the guise of mass and force paradoxically to be mentally confined within and excluded from the boundaries of discrete, completely quantifiable units – i.e. as atomic particles in material bodies, photons in electromagnetic radiation and phonons in heat. That missing somewhere, according to natural inclusionality, is everywhere, without limit – the intangible receptive presence of space. With the dynamic inclusion of this non-local omnipresence within, throughout and beyond local form, movement and change become understood in terms of processes of *flow* as a continuous energetic reconfiguration of space, not as the travel of independent particles or waves *through* space. By the same token, massy bodies and electromagnetic radiation are understood as distinctive energetic configurations of space, neither solely ‘particles’ not ‘waves’, but ‘flow-forms’ (e.g. Shakunle and Rayner, 2009; Rayner and Tattersall, 2010).

‘I-Closure’ and the cult of ‘selfishness’

To argue that it is natural to be selfish based on a model of evolution by individual selection presupposes that it is possible to define ‘self’ as an autonomous unit or ‘whole’ that either ‘is’ or ‘is not’. Equally, the altruistic surrender of local individual

identity and agency to collective identity (as in ‘group selection’) simply transfers the definition of autonomy to a larger ‘whole’ or ‘unity’ (e.g. from ‘individual’ to ‘family’, ‘race’ or ‘species’). As I will describe below, both kinds of definition are deeply questionable, for intellectual as well as emotional and spiritual reasons. Ultimately, they can only hold true if it is possible to *cut space* by inserting a *complete boundary limit* or definitive *hard line* between one individual or group identity and another. There is neither any consistent evidence for this possibility, nor, as was recognized by Baldwin (Valsiner, 2009), can it make consistent sense in any evolutionary (irreversibly changeable) system (see also Rayner, 2004). *Evolution itself is contradicted by the supposition of self- or group exclusiveness upon which ‘selection’ theory is founded.* A completely closed system has no capacity for change or relationship with any other – a point recognized by Bertalanffy (1968), but problematic to address satisfactorily within the definitive framing of general systems theory. Self- or group-preservation therefore implies the fixture of life in suspended animation, not life as an evolutionarily creative flow. Keeping going in evolutionary terms is about sustaining life as a flow of energy, not preserving it – and death and reconfiguration are vital inclusions of that process, not necessarily its cessation.

Natural Sustainability - How Organisms Attune Fluidly to Changing Environmental Circumstances

To be entirely self-contained is correspondingly to be an inert, hermetically closed structure with no capacity for take up or loss of energy between inner world and outer world. The nearest any life forms actually get to this condition is when they form survival capsules such as spores, seeds, pupae and cysts that carry them through periods of scarcity. This is what *real* biological ‘survival’ or ‘preservation’ entails. In such a dormant condition they are incapable of any active growth or relationship with others. But no sooner is any activity resumed that can support growth, so too is any life form’s capacity to lose as well as take up energy through its necessarily permeable bodily boundaries and those of others in its vicinity.

It is therefore clear that the availability of sources of energy is the principal influence that governs the growth, organization and function of all forms of organic life as variably open systems. Any activity or pattern of development in which energy loss through permeable boundaries persistently exceeds energy acquisition will result in unsustainable deficit. On the other hand, any pattern of development that permanently prevents energy loss also prevents energy gain. For any living system to sustain itself, its primary need is therefore to be able to attune its activities and development to correspond with energy availability and hence with the local conditions of its habitat. This availability varies, both in amount and rate of supply due to seasonal and climatic fluctuations, and where and in what form it is located. It also changes due to the growth, death and decomposition of the systems themselves, which respectively deplete and replenish supplies as they come under one another’s simultaneous mutual influence. For example, within a forest, Rayner (1998) fluidly described (rather than rigidly defined) a tree as “a solar powered fountain, its sprays supplied through wood-lined conduits and sealed in by bark until their final outburst in leaves... Within and upon its branching, enfolding, water-containing surfaces, and reaching out from there into air and soil are branching, enfolding, water-containing surfaces of finer scale, the mycelial networks of fungi... which provide a communications interface for energy transfer from neighbour to neighbour, from living to dead, and from dead to living”.

Real life does not, therefore, inhabit an even playing field of energy, space and time. Instead it continually both changes and responds to changes in the contextual circumstances of its natural neighbourhood in an improvisational process of autocatalytic flow, which gives rise to evolutionary and ecological complexity and succession (Rayner, 1997; 2004). This process of ‘natural inclusion’ has been described as ‘the co-creative, fluid dynamic transformation of all through all in receptive spatial context’ (Rayner, 2006). Through it, an opening is made dynamically for an extraordinary diversity and complexity of interdependent forms and patterns of life to co-evolve over myriad nested temporal and spatial scales. The breathtaking variety that we can find in a crumb of soil, a patch of chalk grassland, a coral reef and a tropical forest comes into being under the guidance of no more and no less than the responses and contributions of its membership to natural energy flow in a natural ‘sustainability of the fitting’ (Rayner 2008, 2010b; cf. Elstrup, 2009).

Correspondingly, as depicted in Fig. 1, the boundaries of real organisms, populations and communities do not remain constant throughout their life span, but fluidly vary in *permeability*, *deformability* and *contiguity (connectivity)* (Rayner, 1997; cf. Elstrup, 2010). They change in dynamic relationship with the availability of energy predominantly assimilated from sunlight into organic compounds via the process of photosynthesis, and rendered into chemical form (adenosine triphosphate) via the oxidative-reductive reactions of respiration as a form of combustion. Moreover, these changes themselves entail alterations in boundary chemistry induced by and involving shifts in availability and production of oxidizing and reducing power (Rayner, 1997; Rayner et al, 1999).

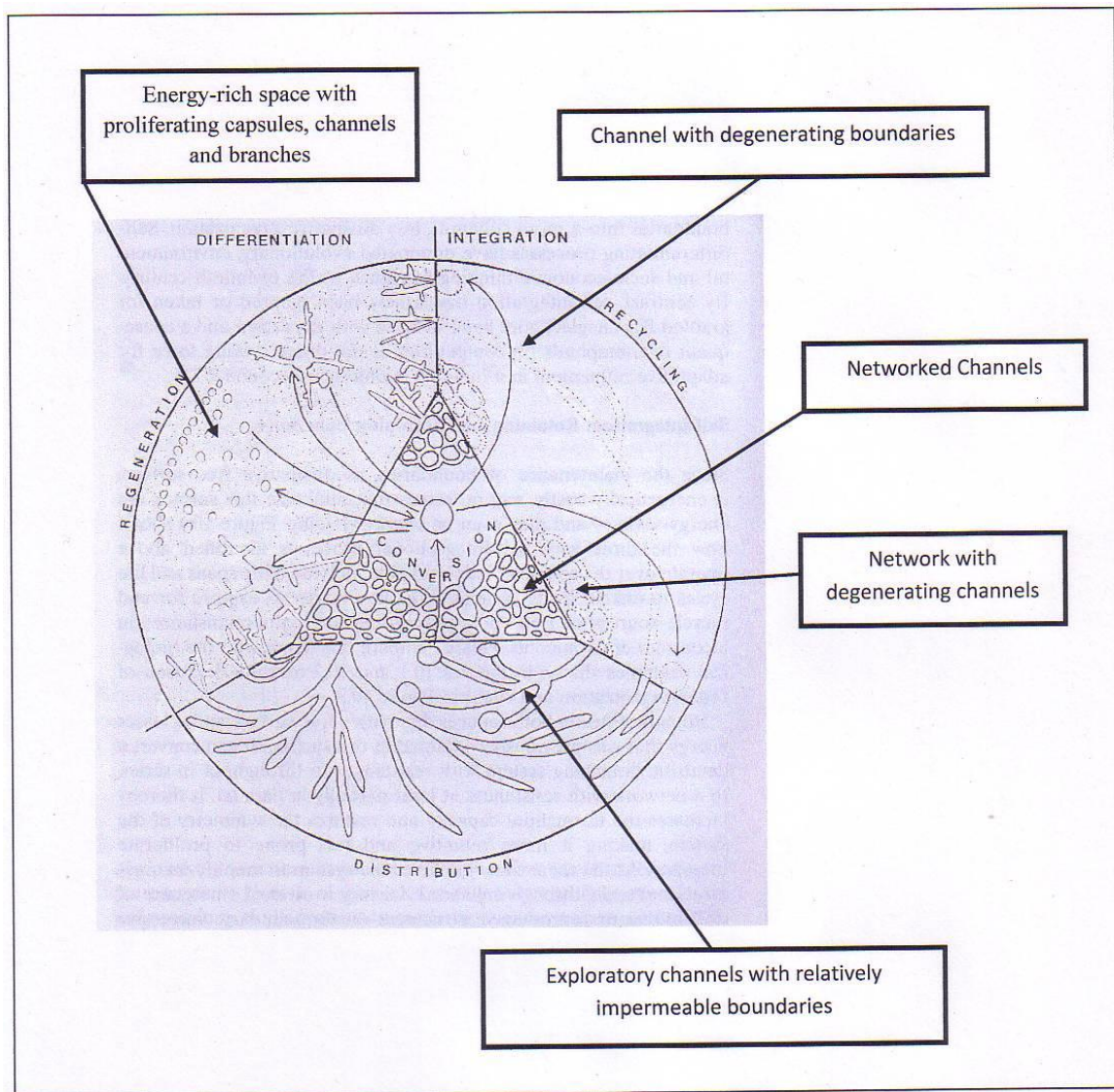


Fig. 1. The interplay between boundary-proliferating ('differentiation') and boundary-condensing ('integration') processes in energy-rich (stippled) and energy-restricted circumstances. This interplay enables energy to be assimilated (allowing regeneration and proliferation of boundaries), conserved (by conversion of boundaries into relatively impermeable form), explored for (through internal distribution of energy) and recycled (via redistribution/reconfiguration of boundaries) in spatial capsules, channels, branches and networks of life forms in dynamic attunement with their natural neighbourhood. Thin lines indicate relatively more permeable boundaries, thick lines relatively impermeable boundaries and dotted lines degenerating boundaries. (From Rayner, 1997).

The ecological and evolutionary sustainability of natural life forms, from the cells and tissues in a human body to the trees in a forest depend upon close *mutual attunement with* (as distinct from unilateral adaptation to) the diversity, complementary nature and changeability of all within their neighbourhood, *to which they themselves contribute*. When energy supplies become scarce, sustainable living systems pool and redistribute internal resources within integrated structures and survival capsules – they *do not* compete to proliferate faster on the dwindling supplies

than their neighbours. When supplies are abundant they proliferate and differentiate. Moreover, as is beautifully illustrated by the exploratory patterns of some kinds of fungi, this ability to attune their capacity to differentiate and integrate activity in dynamic relationship with energy availability allows life forms to locate and sustain supplies in heterogeneous habitats with extraordinary efficiency. As illustrated in Fig. 2, they do this through a combination of all- round exploration and directional focus.

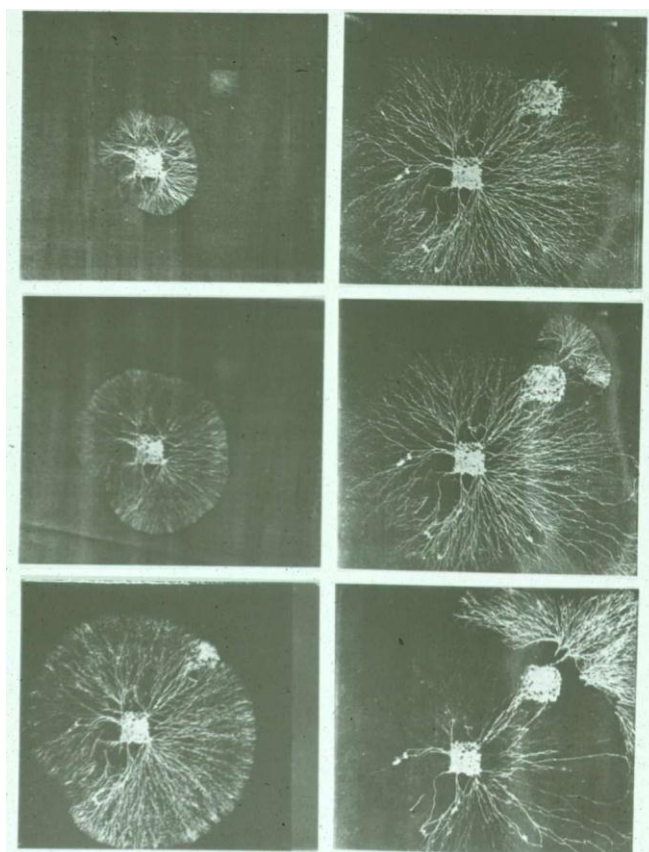


Fig. 2 ‘Fungal Foraging’. (From Dowson et al., 1986; see also Rayner, 1997).

Fig. 2 shows how the mycelium of the wood-decaying fungus, *Hypholoma fasciculare*, finds an ‘oasis in a desert’, by fluid-dynamically spreading and narrowing its energetic focus. The fungus has been inoculated into a tray full of soil on a block of wood (‘starter’ food source), with an uncolonized wood block (‘bait’ food source) placed some distance away from it. Distinct stages are shown in the radial spreading of the fungal colony from the inoculated wood block, followed by the redistribution and directional focusing of its energy following upon contact with the bait. As indicated in Fig. 1, similar fluid dynamic patterns of gathering in, conservation of, exploration for and redistribution of energy supplies within variably connective channels and capsules of receptive space are found throughout the living world, from subcellular to ecosystem scales of organization

Sustainability, not *supremacy*, is therefore the path of evolutionary and ecological continuity. Natural energy flow is variably fluid, circulatory and redistributive along pressure gradients from higher concentration (relative ‘abundance’) to lower concentration (relative ‘scarcity’), as illustrated, for example by atmospheric and ocean currents. The primary need for all life forms is not to seek competitive advantage through the unilateral accumulation of energy ‘wealth’ at the

expense of their neighbourhood, but to sustain themselves and their offspring as variable channels for natural energy flow. They are more like members of a relay team – continually receiving, temporarily retaining and eventually passing along what sustains life – than a set of autonomous individuals striving to be first past the post. To succeed in this they have to be open to the energetic influence of their neighbourhood at the same time as sustaining the distinctiveness – but not discreteness (or separateness) – of their inner worlds from their outer worlds through their dynamic boundaries.

Any ecological or evolutionary model that treats an individual or group as a discrete, autonomous object or subject with the set objective of promulgating and preserving its self at all costs as sole survivor of a war of attrition is therefore partial and unsustainable in a changeable world of natural energy flow. Yet just such partial treatment underpins the Darwinian concept of ‘natural selection’ as ‘the survival of the fittest’ or ‘preservation of favoured races in the struggle for life’ (Darwin, 1859). Why, then, does this concept persist? Why does it continue to be celebrated?

Adverse Abstraction: Self-Dislocation from Natural Neighbourhood

Notions of adversarial ‘competition’ and coercive ‘co-operation’, which respectively underlie individualistic ‘capitalism’ and collectivistic ‘socialism’, are predicated upon definitive logic. It is presupposed that individual or group entities can be defined independently from their spatial context and correspondingly that their ‘future’ can be fully defined by present or ‘initial conditions’. As recognized by Bateson (1972), this narrows the focus of perception and purpose at the outset of enquiry into nature instead of in the process of discovery (cf. Fig. 2) and can give rise to the familiar idea that undesirable present ‘means’ can justify desirable future ‘ends’.

Human beings may be cognitively and culturally predisposed to make this presupposition through a combination of our inter-related capacities for categorization, sociality, abstract thought, tool and language use and awareness of mortality (Rayner and Jarvilehto, 2008; Rayner 2010a,b and c; cf. Elstrup 2009, 2010). On the other hand, the imagination that comes alongside these capacities offers the creative potential to escape the restrictions imposed by purposive abstract objectivity through what is actually the more comprehensive worldview of natural inclusionality (Rayner 2010a, b and c, 2011; see below).

As terrestrial, omnivorous, bipedal primates unable to digest cellulose but equipped with binocular vision and opposable thumbs that enable us to catch and grasp, we are predisposed to view the geometry of our natural neighbourhood in an overly definitive way. We are prone to see the world in terms of what it can do for us and to us as detached observers or *abstracted* ‘exhabitants’, not how we are inextricably involved in it as *natural inhabitants*. We perceive ‘boundaries’ as the limits of definable ‘objects’ and ‘space’ as ‘nothing’ – a gap or absence outside and between these objects (Rayner, 2004).

This perception of space and boundaries as definitively discontinuous inescapably renders the comprehension of continuity and change problematic (Smith, 1997). If two adjacent locations in space and/or time are distinguished by a boundary, which one does the boundary belong to? If it belongs to both of them, how can the mutual exclusivity of definitive logic be satisfied, and where do both cease to be both

and become either one or the other? If it belongs to neither, then where does one location end and the other begin and what *really* comes between them? In the case of a curved boundary, does it belong to whatever lies within it or to whatever lies without it? If two distinct locations are both contained within a larger location, are they mutually exclusive or co-existent? Upon such dilemmas rests the whole gamut of alternative propositional (either/or) and dialectical/transcendental logics (both/and in mutual opposition) that have been in conflict for millennia and continue to be so (e.g. see Valsiner, 2009). So too do the ‘holons’ - as ‘Janus-faced’ entities combining individual and collective aspects, and ‘holarchies’ - as nested arrays of holons, of Koestler (1976) in his ‘Open Hierarchical Systems Theory’ (Rayner et al., 1984; Wilber, 1996).

That it is nonetheless possible to avoid this perception is, however, evident from the indigenous cultures that sustain a much stronger sense of inclusion in Nature, aided by the preservation of oral, aural and nomadic traditions (e.g. Cairns and Harney, 2004; Taylor, 2005). For example, notice the similarity between the following quotes from Bill Yidumduma Harney (BYH), a fully-initiated Elder of the Wardaman people of Northern Territory, Australia (see Cairns and Harney, 2004) and a ‘natural inclusional poem’, ‘The Hole in the Mole’, by myself (AR) (see also Rayner, 2010a).

BYH: 'You might recognise some of the land, changing all the time. Then, like imagination to us, with spiritual link-up from the stars, and all the other stuff from the top to the bottom, they sort of guide you all the way. They start like be still in the valley, you've got it in your mind, links the air to you, up to the stars, guide you direct to it straight across country...all these stars pulling everything together, moving around, all come together'.

AR: ‘The Hole in the Mole’

‘I AM the hole; That lives in a mole; That induces the mole; To dig the hole; That moves the mole; Through the earth; That forms a hill; That becomes a mountain; That reaches to sky; That pools in stars; And brings the rain; That the mountain collects; Into streams and rivers; That moisten the earth; That grows the grass; That freshens the air; That condenses to rain; That carries the water; That brings the mole; To Life’

Moreover, according to Walker (2003), “Cross-cultural views of the self define individuality in terms of boundaries, locus of control and inclusiveness versus exclusiveness, or that which is intrinsic versus that which is extrinsic to the self (Heelas and Lock, 1981, Sampson, 1988). Cultures that emphasize firm boundaries and high personal control tend to view the self as exclusionary or ‘self contained’. Fluid boundary, strong field control cultures, view the self as “ensembled,” meaning that the self is inclusive of other individuals. While ‘self contained’ individualism is indigenous to the United States and to the European countries from which its dominant ethnic groups draw their roots, ‘ensembled’ individualism is far more prevalent as a percentage of all known cultures (Sampson, 2000). Ensembled individualism is also indigenous to Aboriginal, Native American, Senoi and other cultures that are widely known to use dreams for social purposes.”

The perception of completely definable objects separated by intervals of space as ‘gaps of nothingness’ sets the scene for the hard line logic of abstract rationality to become established in the foundations of our mathematical, scientific, theological, linguistic, governmental and economic endeavours. It also profoundly affects our perceptions of ‘self’ and ‘self-interest’. The definitive supposition that ‘one thing is not another thing, and, specifically, that ‘one self cannot be another self’ leads to what C.S. Lewis (1942) called ‘the philosophy of Hell’, in which ‘to be means to be in competition’.

The potentially restrictive influence of hard line logic on innovative as well as conventional thought can be seen in the depiction of the third generation activity theory model proposed by Engeström (1999) in Fig. 3. Definitive methods of visualization have the effect of cutting off the inside of what is perceived as an ‘object’ from its outside, within a fixed frame of space and time. This problem is also evident in the work of Elstrup (2009, 2010). Elstrup recognizes the vital importance of changeable spatial context in shaping the behaviour of organisms (including behaviour of the kind shown in Fig. 2) as a source of ‘intentionality’. However, he still dislocates the discrete boundary of the organism from the transforming boundary of its environment in much the same way that Einstein’s space-excising treatment of gravitation (cf. his description of ‘boxes of space’, above) dislocates – whilst embedding – the movement of discrete material bodies from the curvature of space-time in an oppositional dialectic of each telling the other what to do.

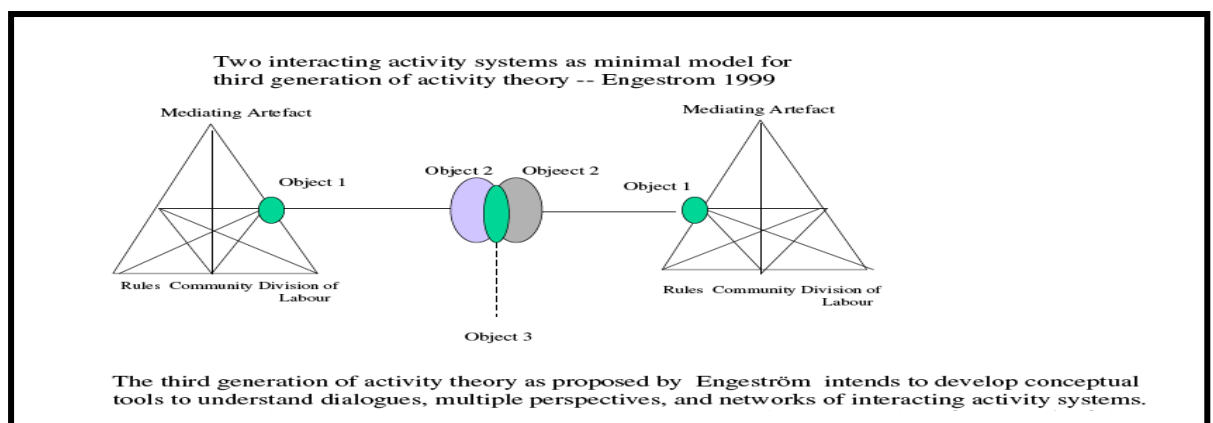


Fig. 3 Engeström’s third generation activity theory model (see page 2 – at <http://www.bath.ac.uk/research/liw/resources/Models%20and%20principles%20of%20Activity%20Theory.pdf>)

Hard-line logic renders every figure *completely* discontinuous from the contextual space that it manifests from and within. The number, 1, becomes a lone figure – *all one* – an independent singleness, a complete ‘whole unit’, ‘object’ or ‘oneness’ without neighbourhood. ‘I’, as an individual self-identity, is set narcissistically apart from its environment, which it must command or obey if it is not to succumb in the struggle for its own existence. The ‘environment’, what Einstein declared to be ‘everything that isn’t me’, becomes viewed *one-sidedly* as a source of threat and promise to be *adapted* to, not the very ground from which the self manifests and into which the self returns. Nothing appears more of a threat in this

abstract environment than ‘nothingness’ – the receptive transparency and darkness of the void that seems ever-ready, in the guise of ‘death’, to dissolve the illusion of independent existence upon which the self stands on its own two feet. Everything possible is done to defer this ultimate fate, by walling the self away from its origins and destiny. Maintaining order *against* the forces of uncertainty – Hamlet’s ‘sea of troubles’ – becomes the order of the day.

I painted the picture, ‘Arid Confrontation’, shown in Fig. 4 in 1973 when I was depressed after a year of postgraduate scientific research. It depicts the limitations and desolation of the self-detaching view of the observer excommunicated from nature by the mental slashing of space in the same way as in the triangles of Fig.3. After a long pilgrimage, access to life is barred from the objective stare by the rigidity of artificial boundaries. A sun composed of semicircle and triangles is caught between straight lines and weeps sundrops into a canalized watercourse. Moonlight, transformed into penetrating shafts of fear encroaches across the night sky above a plain of desolation. Life is withdrawn behind closed doors.



Fig. 4 ‘Arid confrontation’ (oil painting on board by Alan Rayner, 1973; featured in Petroski, 2005).

It is easy to see that this detached perception of nature and human nature in unnatural opposition could lead to profound human conflict and jealous possessiveness. With the continuous presence of space throughout and beyond all form erased from consideration, ‘subjective self’ and ‘objective other’ are brought into fear-full confrontation. Priorities are inverted from seeking sustainable relationship with others in a natural ‘Garden of Eden’ or ‘communion of diversity’, to

seeking cancerous dominion over other as the only certain route to ‘self-preservation’ (cf. Taylor, 2005). Sustaining ‘Ego’ becomes the focus of attention at the expense of the natural neighbourhood upon which individual self-identity actually depends to sustain itself. Love and trust of others break down into xenophobia and avarice.

A question therefore arises. Is this abstraction humanly inevitable, or is there a way we can develop a more natural and comprehensive perception of our place in Nature? Can this abstraction actually be intellectually justified as a means of representation consistent with sensory experience (i.e. evidence) and that makes consistent sense? In a word, no, it cannot, because energy/matter cannot physically be cut away from space (Tesson, 2006; Rayner and Jarvilehto, 2008; Shakunle and Rayner, 2009). If natural form was purely material, it could consist of no more than a dimensionless point with no shape or size. If natural form was purely spatial, it would be featureless. If nature consisted purely of solid, massy particles and space wasn’t a natural presence, nothing could move. If space was just an infinite emptiness surrounding discrete objects, there would be no place to situate an external agency to move these objects around. If space wasn’t within and throughout as well as around natural form, it wouldn’t be possible for form to be distinguishable or to flow as liquid or gas or to have variable qualities of density, bounciness, flexibility and conductivity (Whitehead and Rayner, 2010).

As depicted in Fig. 5, researchers often present their ideas using Venn diagrams. Such imagery begins to suggest how distinctive forms or activities could be mutually inclusive through a zone of overlap that includes both. It is, however, constrained by the same definitive framing that Einstein’s depiction of boxes of space, described earlier, suffers from. The zone of overlap, often referred to as a ‘mandorla’ or ‘vesica piscis’, appears to bite a piece out of each its ‘parents’, which otherwise remain set statically apart from one another at the edges of the overlap zone. The continuity of space and fluidity of boundaries necessary to allow each to flow into and out from the other as dynamically distinct but not definitively discrete identities is lost. The circles appear to cut into space and one another, so that we have three mutually exclusive locations instead of two. Without imaginative interpretation, the dichotomy is not resolved, but simply converted into a ‘trichotomy’.

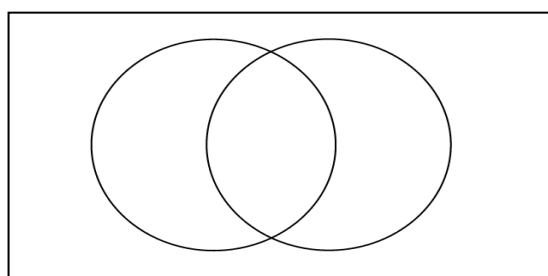


Fig. 5 A conventional Venn diagram.

In the painting ‘Holding Openness’, shown in Fig. 6, I am seeking to engage the receiver’s imagination by providing a figural representation of a ‘sphere of influence’ that fluidly includes space in local energetic form and energetic form in

non-local space that cannot be cut. There is distinction but no discontinuity between inner and outer spatial locations and everywhere, without limit.



Fig. 6 'Holding Openness' (Oil painting on canvas by Alan Rayner, 2005). Energy as a dynamic inclusion of space (darkness/transparency) continually brings an endless diversity of flow-form to Life.

I further developed this visualization of a 'local energetic sphere of non local spatial influence' into a series of overlapping spheres in the 'superchannel' of 'transfigural geometry' (see Shakunle and Rayner, 2008, 2009). This is depicted in Fig. 7 as an extended and fluidly bounded version of the conventional Venn diagram. The thought process that gave rise to this depiction is shown in Fig. 8.



Fig. 7 'Flow and Counterflow' (By Alan Rayner, Oil on canvas, 2008). The central horizontal panel is a superchannel of reciprocal inflows and outflows amongst overlapping local energetic spheres of non-local spatial influence. The ferns and seahorses represent underwater and terrestrial forms of spiral flow-geometry.

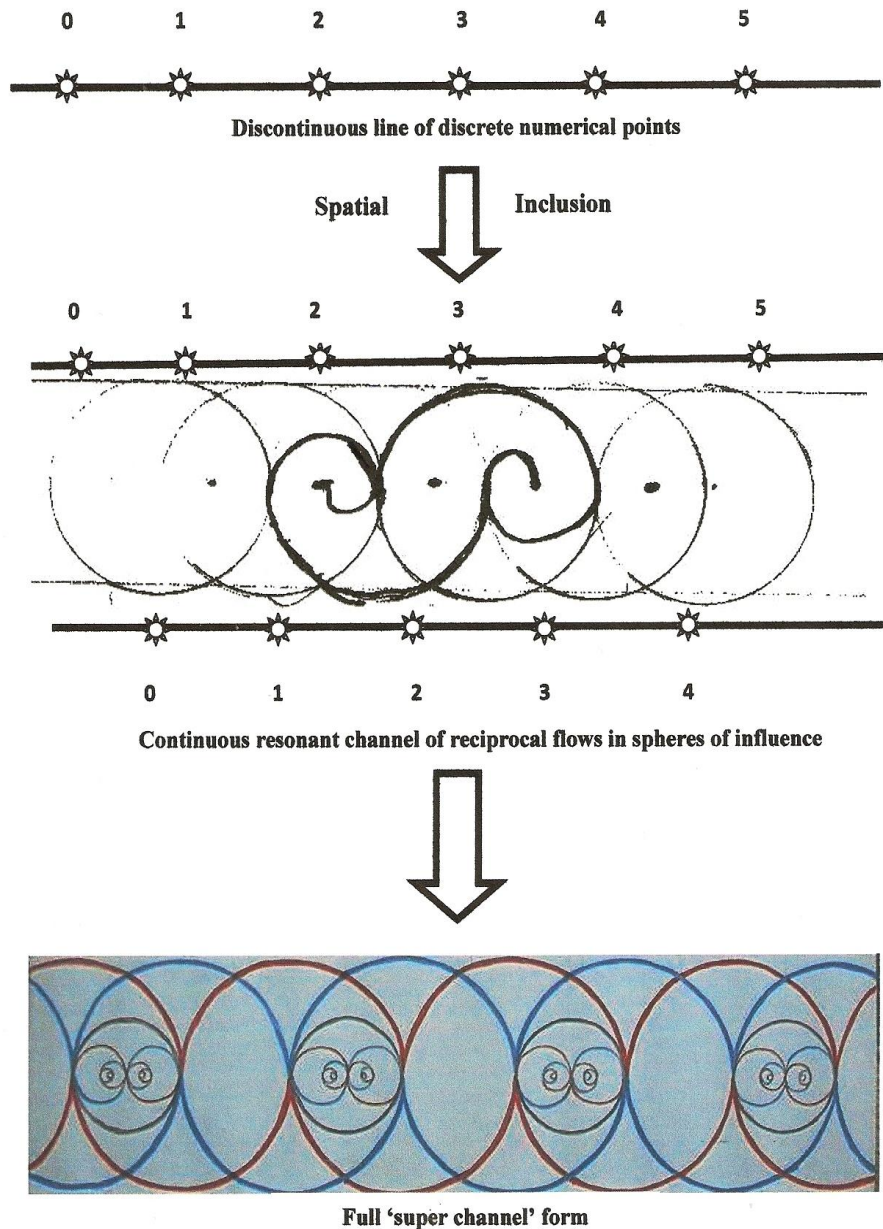


Fig. 8. Drawing by Philip Tattersall, based on an initial sketch made by Alan Rayner, showing geometric origin of the ‘superchannel’ (see also Shakunle and Rayner, 2007)

Fig. 8 (which, coincidentally, is also a figure of ∞ !) depicts how the continuous ‘superchannel’ spatially expands the discrete, one-dimensional, purely material line comprising contiguous but spatially discontinuous and dimensionless numerical point-masses upon which classical and modern mathematics are founded. Each discrete point is transfigured from a static, lifeless entity into a dynamic, breathing identity as a local informational (electromagnetic) sphere of non-local spatial influence, a ‘breathing point’. The breathing points reciprocally inspire from and expire to their immediate neighbours, creating a double helical energy flow and counter-flow through coupled numerical neighbourhoods of three, reminiscent of the chemical configuration of DNA.

Here it may be recalled that Euclidean geometry is the abstract geometry of zero-dimensional (size-less) points, one-dimensional (breadth-less) lines, two-dimensional (depthless) planes and three-dimensional solids (self-contained volumes). Its figures are used to represent definitive tangible structure and yet can only *actually* represent the intangible presence in the core of tangible form because *it is impossible to reach zero without removing the tangible presence*. The same applies to the so-called ‘non-Euclidean’, Riemannian and Lobachevskian geometries of curved surfaces.

The scientifically inconvenient truth is hence that abstract Euclidian and non-Euclidean points, lines and planes/curved surfaces can consist *only* of intangible presence, *not* tangible presence! By the same token, it is impossible to drive or rotate a solid body from or around a solid fixed centre. The central ‘still’ point, axis or plane of symmetry of any bodily form can only consist of intangible presence, with correspondingly zero pressure.

In effect, conventional mathematics and its discontinuous underpinning logic thereby treat ‘1’, as a ‘unit of tangible presence’, as if it is ‘0’, a vanishing point of intangible presence. They literally attempt to construct ‘one thing from nothing’ and then to sum an infinite number of these one things up into an infinite ‘whole’ as a ‘one’ that is also ‘many’, whilst discounting the very presence that truly is infinite, at all scales.

This difficulty can only be resolved realistically by accepting that in Nature, tangible and intangible presences are *distinct but mutually inclusive*. This is the point recognized by the fluid geometry of natural inclusionality. Here, space and boundaries are regarded as *mutually inclusive* sources of continuity and dynamic distinction with variable connectivity, not *mutually exclusive* sources of discontinuity and discrete definition, as in Euclidean and non-Euclidean geometries. So far, the only mathematical formulation explicitly to accept and incorporate this natural inclusion of nonlocal space in and throughout local figural form is the ‘transfigural mathematics’ introduced in 1985 by Lere Shakunle (see, e.g. Shakunle, 1994; Shakunle & Rayner, 2008, 2009).

Natural inclusionality effectively transforms the *fixed frameworks* of Euclidean and non-Euclidean geometries into *fluid framings* of *omnipresent, non-local* intangible space *everywhere, within* (intra-), *throughout* (trans-), *between* (inter-) and *beyond* (extra-) local tangible energetic form (cf. Shakunle & Rayner, 2009). This opens the possibility of a dynamic, co-creative, mutually inclusive relationship between internally and externally situated non-resistive (and hence *receptive*) intangible spatial presence and locally situated, tangible energetic presence.

Natural Inclusionality – The ‘I-opening’ of Self-Identity as a Fluid Inclusion of Neighbourhood

All that may therefore be needed to unlock our self-identity from the unnatural confinement imposed by abstract rationality is the simple understanding that space cannot be cut, occupied, confined or excluded. Space is a continuous presence throughout and beyond the boundaries of natural figures. By the same token, these boundaries are energetic interfacing between inner and outer realms, not fixed limits. This *simple move from regarding space and boundaries as sources of discontinuity and discrete definition to sources of continuity and dynamic distinction* is the

ecological and evolutionary point of departure of ‘natural inclusionality’ from objective rationality.

The underlying logic of natural inclusionality can be described as ‘the understanding of all form as flow-form, an energetic configuration of space throughout figure and figure in space’, such that space, as a receptive (non-resistive) presence, is not assumed to be discontinuous (i.e. to stop at discrete boundary limits) (e.g. Rayner 2010a, b and c; Shakunle and Rayner, 2009). Correspondingly, we can recognize the impossibility of defining or measuring anything in absolute numerical terms anywhere, because all form has both a ‘*figural*’, energetic inner-outer interfacing or dynamic boundary, which makes it distinct, and a ‘*transfigural*’ (this term was first conceived by Lere Shakunle in 1985) – ‘through the figure’ – spatial reach that cannot be sliced or limited.

The continuous space throughout and beyond the figure pools it within the co-creative, influential neighbourhood of all others: local ‘self’ as an ‘including middle’ finds identity in its non-local neighbourhood as neighbourhood finds identity through its local ‘self’. Without spatial continuity, figures are rendered into lifeless bodies, integral or fractional numbers and idealized geometric points, lines and solids. With space included, we can escape the confinement and inconsistencies of the ‘excluded middle’, discrete boundary logic of ‘one opposed to other’ that has held human imagination to ransom for millennia. This enables us to move on to a more natural and comprehensive form of reasoning in the *fluid boundary logic* or *fluid transfigural logic* of each in the other’s mutual influence. The real meanings of ‘zero’ and ‘infinity’ as *qualities of space* and sources of creativity, not abstract quantities of material, are brought into our natural accounting systems, not excluded by abstract definition.

The following simple exercise might help illustrate the difference between the hard-line, space-cutting view of discontinuous models and fluid-line understanding of natural inclusionality. Draw an outline of two figures using a dotted line on a plain sheet of paper. The ‘paper’ infinitely stretched would represent what in the transfigural geometry developed by Lere Shakunle is called ‘Omni-space’ (Shakunle and Rayner, 2008b, 2009). The space within each figure represents ‘Intra-Space’, the space between figures ‘Inter-space’, the space beyond the figures ‘Extra-space’ and the space transcending the figures’ permeable and dynamic boundaries ‘Trans-Space’. You can see how the continuous non-local space everywhere (omni-space’) is locally configured into distinctive, but *not discrete* regions. In the way that you have drawn them, the figures are not contiguous (connected), and so their ‘intra-spaces’ can only communicate through the ‘inter-space’ and ‘trans-space’ between and permeating their boundaries as *energetic interfacing*s and *restraining influences* (not *restrictive material definitions* or *external forces* – see later). Nonetheless, they inhabit the same limitless pool of omni-space everywhere. If you were now to draw the figures closer together, so that their boundaries first connect and then coalesce at one or more points, their intra-space now becomes continuous (cf. Fig. 9). On the other hand, if you were to take a pair of scissors and cut around the dotted lines, the figures will drop out of their spatial context as discontinuous individual entities. This ‘dropping out’ of context is what discontinuous models of reality effectively do – they treat boundaries as cut-out zones between discrete inner realms and outer realms, instead of

dynamic relational interfacing through which these realms remain continuous through trans-space.

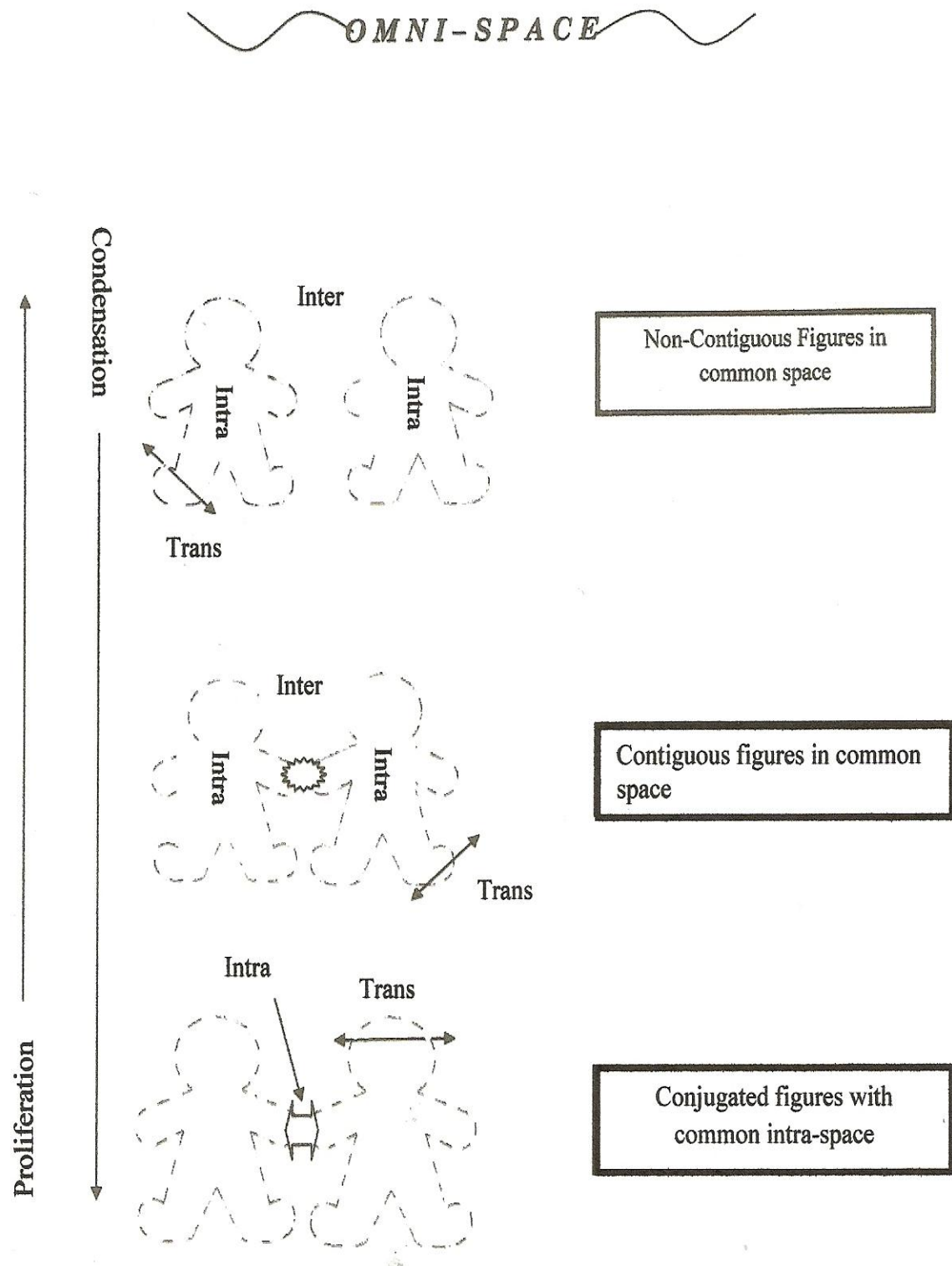


Fig 9. Distinct but not discrete figures of space in space (redrawn by Philip Tattersall from original pencil sketch by Alan Rayner, 2010).

Fig. 9 illustrates the dynamic relationships between figural flow-forms as energetic configurations of space throughout figure and figure in space. It also serves to distinguish the natural inclusional dynamic relationship between distinct but not discrete flow-forms both from reductive schemas that cut off inner from outer spatial realms and from connective and holistic schemas where individual dynamic locality is eschewed from a seamless, purely figural whole or ‘unity’. Since the cartoons can only represent an instantaneous ‘slice’ through the figures, the dotted lines shouldn't be taken to represent ‘sieves’ but more the seething ‘fluid mosaic’ that constitutes real biological membranes. A very simple example of what is represented in the cartoon can also be seen between surface-tense droplets of water condensing on a surface. As they expand and come into proximity their tensely curved inner-outer interfacings first touch and then coalesce in a visible rush as each flows reciprocally into the other and the tension of their boundaries is released.

A living illustration of the process of figural boundaries coming into proximity, contiguity and conjugation occurs during the process of hyphal fusion that is found in many fungi (e.g. Ainsworth and Rayner, 1986) and is shown in Fig. 10.



Fig. 10 Stages (from top left clockwise) in fusion between the protoplasm-filled cellular tubes (hyphae) within the mycelium of the basidiomycete fungus, *Phanerochaete velutina*. The

tubes are internally partitioned into distinct compartments by septa, which have a door-like pore in their middle. As fusion occurs (third picture in the sequence) the cell walls and membranes around initially distinct tubes coalesce, so that their intracellular cytoplasm, which in its turn contains membrane bound organelles (nuclei and mitochondria) becomes continuous. A visible recoil can occur in the receptive hypha when the tubes coalesce. (Photographed by Dr A.M. Ainsworth).

Here some fundamental differences between rationalistic and natural inclusional perceptions of connectivity and continuity emerge:

1. In rationalistic thought, continuity is *equated with* ‘connectedness’ because space is regarded as void, a source of discontinuity or disruptive gap between and around ‘things’ as discrete objects. Hence the only way of deriving continuity in this ‘whole way of thinking’, is either by totally excluding space and boundaries from form as a continuous line or network of width-less threads, or by totally conflating space with form in a seamless [distinction-less] whole. Such exclusion or conflation is neither consistent with evidence/experience nor does it make consistent sense.

2. In natural inclusional thought, space is a continuous omnipresence that cannot be cut, occupied, confined or excluded, and form is *dynamically continuous* through its energetic inclusion of space throughout figure and figure in space. Distinction and difference are hence accommodated in a natural fluid continuum, *without contradiction*. Local identity is recognised as a dynamic inclusion of non-local space in which all forms are pooled together (but not merged into complete unity) in natural communion as flow-forms.

3. Correspondingly, the treatment of continuity by objective rationality as the same as connectedness – as exemplified in conventional calculus, where continuity is approximated by connecting infinitesimal discontinuous units – is an idealized abstraction that is physically impossible. The very idea of complete ‘whole units’ existing anywhere, at any scale in Nature as an energetically open, fluid system does not make sense. The *fluidly variable connectivity* of natural inclusionality arises from the coming together (contiguity/inter-connectivity), fusion (confluence/intra-connectivity) and dissociation (individuation/differentiation) of energetic paths, corridors or channels of included space in labyrinthine branching systems and networks (i.e. as shown in Fig. 10), *not* the ‘ties that bind all into a web of one’ (Rayner, 2004; Tesson, 2006; cf. Barabasi, 2002).

A ‘New Physicality’: The Living Self As A Natural Inclusion of Neighbourhood

How might natural inclusional logic contribute to the development of ways of thinking that encourage rather than impede sustainable, co-creative human-ways of life? Primarily it offers scope for a change in mental attitude concerning the true nature of self-identity, life, love, pleasure and suffering, along with a shift in values towards love, respect, care, generosity and honesty and away from avarice and xenophobia (Rayner 2010b).

Here, a cognitive or ‘mental imaging’ difficulty that many people have with deeply understanding natural inclusionality may arise through confusing ‘presence’ with ‘tangibility’. If ‘space’ is to be recognized as a ‘presence’, this makes people try to make it ‘substantial’ in some way, for example as ‘aether’, ‘space-time fabric’,

‘dark matter’, ‘dark energy’, ‘subtle energy’, ‘dark flow’ etc. No sooner do they do this, however, than it becomes definable and/or divisible in some way as a singular ‘whole’ (independent singleness). Since this doesn’t make sense - because you can’t cut or resist what has no tangible resistance - the mind may then revert to regarding ‘space’ as ‘absence’ or ‘nothingness’, which can’t ‘interact’ with ‘tangible form’ and so is regarded as a source of discontinuity and distance between one form and another.

This difficulty is the foundation of ‘mind-matter’ and ‘one-many’ dualism/dichotomy (Rayner and Jarvilehto, 2008), from which there is no escape *unless* the key insight of natural inclusionality is appreciated - that ‘space’ is neither ‘nothingness’ nor ‘somethingness’, but ‘no-thingness’ – intangible, non-resistive, continuous presence, which figural (energetic) presence can dynamically configure/relate through but not inter-act with as a discrete subject or object (Shakunle and Rayner, 2008). No energetic boundary can resist the omnipresence of space - it is itself a dynamic configuration of space - it can only offer variable degrees of resistance (relative impermeability and rigidity) to figural presence.

Correspondingly, a ‘living I’ cannot be a hermetically sealed, autonomous unit isolated from its neighbourhood, because the space within its distinctive but not absolutely definitive bodily boundaries is continuous with the space beyond these boundaries. It finds identity not in its inner self, alone, but in its variably receptive, reflective and responsive energetic relationship with its limitless and changeable surroundings. It lives as an energetic inclusion of space throughout figure and figure in space, a natural dynamic inclusion of its context. It is a ‘natural inclusional I’, not a mentally constructed ‘abstract I’.

This distinction between the ‘natural inclusional I’ and the ‘abstract I’, may correspond with the distinction made by Winnicott (1965) – albeit one made using a definitive frame of reference – between the ‘true self’, which alone can feel real and be creative, and ‘false self’, which plays a protective but potentially pathological role. The ability to distinguish, *but not necessarily define* unique identities is a vital condition for intervention and participation in the world (Rayner and Jarvilehto, 2008). A newborn baby may have no such sense of distinction between self and world, so that all that happens seems to happen to itself. The experience of meditative trance and what some have called ‘no-self’, ‘core consciousness’ and ‘inspiration phase’ mental activity (Harding, 2000; Damasio, 2000; Claxton, 2006) may correspond with this lack of distinction and openness to all possibility (as in the spreading phase of the fungus shown in Fig. 2). With the development of co-creative relationships with other people and outside world, however, the child needs to make distinctions between her/his body and others in order to receive, respond to and provide directional guidance (as in the directional phase shown in Fig. 2). An objective/subjective ‘self-consciousness’, ‘extended consciousness’ and ‘elaboration phase’ mental activity develops (Harding, 2000; Damasio, 2000; Claxton, 2006), along with an awareness of personal joy and pain through learning experience of self-inclusion in natural neighbourhood. As this takes hold – and may even be regarded as a ‘superior’ form of ‘intelligence’ (Damasio, 2000; Claxton, 2006; cf. Harding, 2000) it may, however, harden into objective definition and the rationalistic idea that something that happens to other people does not happen to ‘me’. With this hardening comes the potential for abusive mentalities.

By acknowledging ourselves as distinct but not isolated local inclusions of natural energy flow, it is always possible gracefully to accept what we receive, to nurture and make the best of it, eventually to pass it on. Such is the way of cultures that operate the co-creative relay of a gift economy (Hyde, 2006). But trouble starts as soon as it seems possible to define and own what's morally or functionally best and remove or exclude what doesn't pass muster. To make such judgements it would be necessary to step *completely* outside the flow of what we are inescapably immersed in order to take a 'God's eye view' – or, in Darwinian terms, the view of a 'natural selector'. This isn't possible, but when we nonetheless attempt to do it, as observers distanced from what we observe, we risk converting the true empathy and co-creativity that comes from sensing the *needfulness* that comes with being a receptive centre of energy flow (Rayner 2010b, d), into psychological projections of narcissistic self-reference (selfishness) and dependency (neediness) (cf. Neuman, 2010). What may appear superficially to be good for the persistence of the individual or group from a definitive perspective may not be good for the sustainable flourishing (well-being and well-becoming) of all in natural, co-creative communion (Rayner, 2008).

Natural inclusionality may hence provide a new understanding of physical reality – a '*new physicality*' that doesn't split or deem it necessary to posit the independent existence of a material world free from the influence of a non-material world, or *vice versa*. From a natural inclusional viewpoint, such splitting and independence is profoundly *unrealistic*, neither consistent with evidence nor capable of making consistent sense.

Natural inclusionality correspondingly explains how it is possible, *without contradiction*, for natural forms *not only* to be distinct and diverse but also *dynamically continuous*, through having variably fluid figural boundaries permeated by space that cannot be cut. Hence the physicality of all form arises as variably viscous flow-form, an energetic configuration of space throughout figure and figure in space, combining both local and non-local qualities. With this new physicality come possibilities of new scientific, mathematical, spiritual and socio-political understandings, along with the removal of the unrealistic grounds for opposition between 'each' and 'other(s)', that contribute to profound human conflict and environmental damage. For these possibilities to be realized, new forms of communication and educational practice may be needed. For example, within the field of living educational theories (Whitehead and McNiff, 2006), the language and logic of natural inclusionality may greatly assist the work of individuals in showing that their 'living I' is not an hermetically sealed, autonomous unit isolated from its neighbourhood. Indeed, this is already happening (e.g. see Naidoo, 2005; Adler Collins, 2007; Tuyl, 2009). Each individual finds identity not in the inner self, alone, but in the variably receptive, reflective and responsive energetic relationship with its limitless and changeable surroundings. This fundamentally psychological understanding holds the hope, perhaps the only hope, for sustaining the flourishing of humanity in a world that has been drawn to the brink of environmental and social breakdown through the assumption that space can be cut. As Michael Polyani (1958) put it:

"For once men have been made to realize the crippling mutilations imposed by an objectivist framework – once the veil of ambiguities covering up these mutilations has

been definitely dissolved – many fresh minds will turn to the task of reinterpreting the world as it is, and as it then once more will be seen to be.”

Acknowledgments

I would like to thank Professor Jack Whitehead, Phil Tattersall, Yaqub Murray and Rev. Roy Reynolds for their assistance with preparing this paper.

References

- Adler Collins, J. (2007). Developing an inclusional pedagogy of the unique: How do I clarify, live and explain my educational influences in my learning as I pedagogise my healing nurse curriculum in a Japanese University? PhD Thesis, University of Bath. Retrieved 30 July 2010 from <http://www.actionresearch.net/jekan.shtml> .
- Ainsworth, A.M. & Rayner, A.D.M. (1986). Responses of living hyphae associated with self and non-self fusions in the Basidiomycete *Phanerochaete velutina*. *Journal of General Microbiology*, 132, 191-201.
- Barabási, A-L (2002). *Linked: the New Science of Networks*. Perseus Publishing.
- Bateson, G. (1972). *Steps to an Ecology of Mind: Collected Essays in Anthropology, Psychiatry, Evolution, and Epistemology*. University Of Chicago Press.
- Bertalanffy, L. (1968). *General System Theory: Foundations, Development, Applications* New York: George Braziller
- Cairns, H.C. & Harney, B.Y. (2004). *Dark Sparklers*. H.C.Cairns
- Claxton, G. (2006). *The wayward mind*. London: Abacus
- Damasio, A. (2000). *The feeling of what happens: Body, emotion and the making of consciousness*. London: Vintage.
- Darwin, C. (1859). *On the Origin of Species by Means of Natural Selection, or the preservation of favoured races in the struggle for life*. Down, Bromley, Kent.
- Dawkins, R. (1989). *The selfish gene*. New edition. Oxford: Oxford University Press.
- Dawkins, R. (1995). *River Out of Eden: A Darwinian View of Life*. Basic Books.
- Dowson, C.G., Rayner, A.D.M. & Boddy, L. (1986). Outgrowth patterns of mycelial cord-forming basidiomycetes from and between woody resource units in soil. *Journal of General Microbiology*, 132, 203-211.
- Elstrup, O. (2009). The ways of humans: modelling the fundamentals of psychology and social relations. *Integrative Psychological and Behavioural Science*, 43, 267-300.
- Elstrup, O. (2010). The ways of humans: the emergence of sense and common sense through language production. *Integrative Psychological and Behavioural Science*, 44, 82-95.

- Gabriel, Y. (2002). Essai: on paragrammatic uses of organizational theory – a provocation. *Organization Studies*, 23, 133-151.
- Harding, D.E. (2000). *On having no head – Zen and the rediscovery of the obvious*. London: The Shollond Trust.
- Heelas, P. & Lock, A. (1981). *Indigenous Psychologies: The Anthropology of the Self*. London: Academic Press.
- Hyde, L (2006). *The gift – how the creative spirit transforms the world*. Edinburgh: Canongate Books
- Koestler, A. (1976). *The Ghost in the Machine*. London: Hutchinson
- Lewis, C.S. (1942). *The Screwtape Letters*. Geoffrey Bles.
- McGilchrist, I. (2009). *The Master and His Emissary: The Divided Brain and the Making of the Western World*. Yale University Press.
- Naidoo, M. (2005). I am because we are (A never ending story). The emergence of a living theory of inclusional and responsive practice. Ph.D. Thesis, University of Bath. Retrieved 30 July 2010 from <http://www.actionresearch.net/naidoo.shtml>
- Neuman, Y. (2010). Empathy: from mind-reading to reading of a distant text. *Integrative Psychological and Behavioural Science*, DOI 10.1007/s12124-010-9118-7
- Petroski, H. (2005). Technology and the humanities. *American Scientist*, 93, 305.
- Polanyi, M (1958). *Personal Knowledge: Towards a Post-Critical Philosophy*. London; Routledge and Kegan Paul. (p. 381)
- Rayner, A.D.M. (1997). *Degrees of Freedom - Living in Dynamic Boundaries*. London: Imperial College Press.
- Rayner, A.D.M. (1998). Fountains of the forest – the interconnectedness between trees and fungi. *Mycological Research*, 102, 1441-1449.
- Rayner, A.D.M. (2004). Inclusionality and the role of place, space and dynamic boundaries in evolutionary processes. *Philosophica*, 73, 51-70.
- Rayner, A.D.M. (2006). *Natural Inclusion: How to Evolve Good Neighbourhood*. Available from <http://www.inclusional-research.org/naturalinclusion.php>
- Rayner A.D.M. (2008). *Natural Communion: Poems and Paintings About Our Human Inclusion in the Evolutionary Flow of Place-time*. Available from <http://www.inclusional-research.org/furtherreading/naturalcommunion.pdf>

Rayner, A.D.M. (2008). *From Emptiness to Openness: How Inclusional Awareness Transforms Abstract Pride and Prejudice Into Natural Sense and Sensibility*. Available from <http://www.inclusional-research.org/furtherreading/inclusionalesays.pdf>

Rayner, A.D.M. (2010a). Sustainability of the fitting– bringing the philosophical principles of natural inclusion into the educational enrichment of our human neighbourhood. <http://www.bestthinking.com>

Rayner, A.D.M. (2010b). Essay: life, love and suffering – from demanding human rights to appreciating human needs. *Action Learning and Action Research Journal*, 16, 97-104.

Rayner, A.D.M. (2010c). Inclusionality and sustainability – attuning with the currency of natural energy flow and how this contrasts with abstract economic rationality. *Environmental Economics* 1, 98 – 108

Rayner, A.D.M. (2010d). Needfulness, neediness and needlessness. www.bestthinking.com

Rayner, A.D.M. (2011). *NaturesScope: unlocking our natural empathy and creativity – an inspiring new way of relating to our natural origins and one another through natural inclusion*. O Books (in press).

Rayner, A.D.M., Coates, D., Ainsworth, A.M., Adams, T.J.H., Williams, E.N.D. & Todd, N.K. (1984). The biological consequences of the individualistic mycelium. In D.H. Jennings & A.D.M. Rayner, (Eds), *The Ecology and Physiology of the Fungal Mycelium* (pp. 509-540). Cambridge University Press

Rayner, A.D.M. & Jarvilehto, T. (2008). From dichotomy to inclusionality: a transformational understanding of organism-environment relationships and the evolution of human consciousness. *Transfigural Mathematics*, 1 (2), 67-82.

Rayner, A.D.M. & Tattersall, P. (2010). From Field Theories to Pool Theory: the inclusional basis of natural physicality. Available from www.bestthinking.com.

Sampson, E. (1988). Indigenous Psychologies of the Individual and their Role in Personal and Societal Functioning. *American Psychologist*, 43 15-22.

Sampson, E. (2000). Reinterpreting Individualism and Collectivism: Their religious roots and monologic versus dialogic person-other relationship. *American Psychologist*, 55, 1425-1432.

Shakunle, L.O. (1994). *Spiral Geometry. The Principles (with Discourse)*. Hitit Verlag, Berlin, Germany.

Shakunle, L.O. & Rayner, A.D.M. (2007). Superchannel of zero spirals. *Journal of Transfigural Mathematics*, 1, 63-64, 104-105.

- Shakunle, L.O. & Rayner, A.D.M. (2008). Superchannel – Inside and beyond superstring: the natural inclusion of one in all - III. *Transfigural Mathematics*, 1 (3), 9-55, 59-69
- Shakunle, L.O. & Rayner, A.D.M. (2009). Transfigural foundations for a new physics of natural diversity – the variable inclusion of gravitational space in electromagnetic flow-form. *Journal of Transfigural Mathematics*, 1 (2), 109-122.
- Smith, B. (1997). Boundaries: an essay in Mereotopology. In L. Hahn (Ed.), *The Philosophy of Roderick Chisholm* (pp. 534-561). La Salle: Open Court.
- Taylor, S. (2005) *The Fall*. Winchester, New York: O Books.
- Tesson, K.J.A. (2006). Dynamic networks: an interdisciplinary study of network organization in biological and human organizations. PhD Thesis, University of Bath.
- Tuyl, G. V. (2009). From Engineer To Co-Creative Catalyst: An Inclusional And Transformational Journey. Ph.D. Thesis, University of Bath. Retrieved 27 July 2010 from <http://www.actionresearch.net/living/gvt.shtml>
- Valsiner, J. (2009). Baldwin's quest: a universal logic of development. In J.W. Clegg (Ed), *The Observation of Human Systems – Lessons From the History of Anti-Reductionist Empirical Psychology* (pp. 45-82). New Brunswick, London: Transaction Publishers.
- Walker, E.M. (2003). The confusion of dreams between selves and the other: non-linear continuities in the social dreaming experience. In W.G. Lawrence (Ed.), *Experiences in Social Dreaming* (pp. 215-227). London: Karnac Books.
- Whitehead, J. & McNiff, J. (2006). *Action Research Living Theory*. London; Sage.
- Whitehead, J. & Rayner, A. (2009). From dialectics to inclusionality – a naturally inclusive approach to educational accountability. <http://www.bestthinking.com>.
- Wilber, K. (1996). *A Brief History of Everything*. Boston: Shambhala Publications.
- Wilson, E.O. (1998). *Consilience - The Unity of Knowledge*. London: Little, Brown and Company.
- Wimsatt, W.K. & M.C. Beardsley (1946). The intentional fallacy. *Sewanee Review* 54, 468-488.
- D. W. Winnicott (1965). *Maturation Processes and the Facilitating Environment* London: Hogarth Press.