GETTING *(EMPIRICALLY)* BACK TO*(WARDS) (PRE-)(EXISTENTIAL)* BASICS

Ron Cottam, Willy Ranson and Roger Vounckx
The Evolutionary Processing Group. ETRO, Vrije Universiteit Brussel,
Pleinlaan 2, 1050 Brussels, Belgium

ABSTRACT

Hierarchical systems are understandably of great interest because of the apparent difficulty in understanding them. They are, by their very nature, the result of some kind of evolution, whether of themselves or of some precursor or template. In many ways their developments parallel the evolution of organisms, in their environmental sensitivity and their existential dependence on some kind of relative cost function. Natural evolution is notorious for scavenging earlier evolved characteristics in its search for survivalist advantage, and consequently a current hierarchical instantiation may be far from its evolutionary template, and may consequently be inadvertently driven to extinction. A major source of this estrangement derives from a primary support for the establishment of *hierarchy*: the belief that formal fractionation of a large group of elements can lead to stronger cohesion and a more unified purpose. But where does this apparent contradiction come from? How is it that we can believe that the best way to unify a system is by splitting it up? In this paper we address the appearance of this phenomenon in the natural world, and relate its implementation to examples from many domains of systemic study.

Keywords: reunification, analog, digital, evolution, reality, existence.

INTRODUCTION

In the *Hierarchy Theory* SIG of the 2006 ISSS meeting in Sonoma we presented a paper entitled "Living in Hyperscale: Internalization as a Search for Reunification", which concluded as follows:

> "*We view our universe's evolution, and its entire post-'big bang' history, as an assembly of interacting individual attempts to 'turn back the clock' to the intimate unification of a pre-'big bang' state*."

The core underlying hypothesis of our argument was that the essential process of Nature is its evolution from the 'big bang singularity' of global unification towards the 'ecosystemic multiplicity' of local differentiation. But why has this evolution taken place? And why is Nature still evolving all around us?

The following sentence of the paper stated that:

> "*Relativity – the cause of localization and differentiation, and of the inevitability of inter-locational delay and informational incompleteness – precludes any 'factual' achievement of this aim, leaving only the surrogate possibility of virtual reunification through environmental internalization*."

Relativity certainly precludes any *complete* 'factual' achievement of reunification[1], but not a *partial* shift from 'factual' *analog* quasi-unification towards 'factual' *digital* quasi-unification. We now believe that the 'attractor' of unification is not only responsible for environmental internalization, but that it is the driving force behind evolution. Attempted reunification is not only 'virtual'; it lies at the root of natural survivalist pragmatism: *it is the very nature of reality itself*!

Everything around us, and in us, is a process of, or the result of an attempted (systemic) reunification. We present the image of an initially analog universe, perturbed by the 'injection' of asymmetry at the 'big bang', which progressively builds more complex structures in a mistaken bid to regain its undifferentiated wholeness. At every stage of its evolutionary localization, in the creation of strings, of fermions and bosons, of atoms and molecules, of bio-chemicals and organisms, of scale, hierarchy and hyperscale, its target is to re-establish homogeneity of communication, through the development of energy-based digitality in place of peaceful analog communion.

We do not presume that the universe is a 'living entity', but point out that life is a natural emergence from the low-level identity-retaining awareness of elementary Newtonian interactions.

Rather than exposing the historical endeavours which led up to the acceptance of this expanded point of view we present in this paper an empirical justification for its adoption, through many examples from a multiplicity of natural science, systems science, ecological, sociological, technological, psychological and neurological domains.

SETTING THE STAGE

We will need a few basic concepts on our journey, which we will pragmatically define for the purposes of their use here.

Local, nonlocal and global:
Any complete description of these three would take up a complete encyclopedia, but we will make a limited attempt. By *local* in the paper we will refer to entities, processes or events which are or take place within a restricted range of spatial dimension. *Nonlocal* is the logical opposite of local, in that it implies no restriction of spatial occurrence. *Light* provides a good example of the difference and of other implied aspects: a single frequency light wave is *nonlocal* in character, and any change in its phase would 'theoretically' touch the entire universe at the same time, thus bypassing any communicational restriction implied by *relativity*. In its particulate appearance, light presents itself as a *local* spatially confined photon, which is subject to relativistic restriction to the commonly understood 'the speed of light'. We will use global in a contextually-dependent approximative manner, to which it is restricted at any exact point in time by relativity.

[1] Always assuming, of course, that the average density of the universe (currently estimated at ~0.2 atoms/m^2) does not, in fact, turn out to be more than its critical density (currently estimated at ~5 atoms/m^2), in which case the universe will ultimately, in principle, stop expanding and re-collapse into a 'Big Crunch'!

Digital and analog:
Although *digital* is commonly used in referring to the binary formulation of computer operations, we will use it here in a manner closer to its origin, to refer to any situation where there is discretization of entities. *Analog* will then refer to the 'opposite' of digital, where there is at least a degree of continuity between nominally localized entities, processes or events.

Reality and abstraction:
This distinction will be very pragmatic for the purposes of the paper, and we will take no account here of any degree of hypothetical monoscalar conflation. We will attribute at least some degree of *reality* to occupants of any scale of a unified hierarchical system, although they may be only incompletely accessible from an observer at another, different scale. *Abstraction* will refer to an informationally-reduced local related representation of entities, processes or events at, or taking place at another, different scale. A more complex differentiation/integration of these two terms in a hierarchical context will appear later in the paper.

Factual and virtual:
The word *factual* will be used to refer to individually perceived entities, processes or events which would, or could be corroborated and therefore considered *factual* by other occupants of the same unified environment. *Virtual* will refer to individual perceptions which would not be considered factual by other observers, or which they themselves would agree, or maintain are *non-factual*.

NATURAL EVOLUTION

We consider natural evolution to be a single unified process, whose target is the re-unification in nonlocality of all localized differentiations. We make no distinction between *observer* and *observed*, nor between *observed* and *manner of observing* – whose contradiction is the greatest obstacle to any hypothetically accurate observation. The former relationship – between observer and observed – first came to light within physics under the scrutiny of quantum physicists at the beginning of the 19th century. The latter necessary relationship – between observed and manner of observing – is currently still 'waiting in the wings' for any *global* implementation through a reduction in human ego. Correlation between observed and manner of observing does indeed make fragmentary surrogate appearances in the construction of measuring instruments, but in most cases it becomes absorbed into a supposition that 'what is measured is real', rather than 'if you look for particles, you find particles'! The importance of this correlation in the context of evolution is that we must permit evolution itself to evolve in our representations of it, rather than presupposing that 'what is now' or 'what is observed now' is as it always was. An excellent example of this problem is the presupposition within particle physics that, for example, 'an electron was always an electron', or, more to the point, that 'all electrons were always the same', when hierarchy theory would suggest that long ago the slaving imposed on that material level of the universe was far weaker than we now observe.

We picture the 'big bang' as an injection of asymmetry, and therefore of a propensity for differentiation, into a pre-existing (if we may use the word!) symmetry. Symmetry-breaking results in, or is caused by, differentiation, and consequently we can surmise that a primitive 'scale' was the result. However, this corresponds to the appearance of a reduced (abstracted) model of any pre-symmetry-breaking state, and as such it lacks sufficient information content to define a route back to a unified differentiation- and scale-free analog condition. Further localizing differentiation, however, can be achieved by the creation of a new more abstracted scale, bringing the system closer to being able to generate the energy-based communicational unification of digitality. We suggest that multiple sequential occurrences of this process of 'searching for unification' through the creation of digitally-based communication has created the natural world we see around us, and has driven us as humans towards the development of language and ultimately towards our 'modern' world of a digital-processor communicational society.

'EXISTENCE' AND THE NATURE OF REALITY

A central concern of traditional philosophy has been, and is the nature of 'existence'. Sometimes this takes the form of a simple presupposition, considering 'existence' to be defined as the opposite of 'non-existence', and sometimes it takes the form of its presupposition as illusion. The authors are unaware, however, of any consideration within conventional Science of 'existence' as being the *derivative* of some other state(s) or condition(s), other than in a number of mathematical theories. In a natural hierarchy, however, 'existence' appears as the result of the iterative correlation of the hierarchy's different scales, as an intermediate 'phenomenon' between the poles of perfect non-locality and perfect localization (Cottam *et al*., 1998; Cottam *et al*., 2003). If, as the authors believe, the concept of a natural hierarchy is capable of representing both the universe's overall form and its elemental parts, then 'existence' is always derivative of the apparently existing couple of nonlocality and localization. In this, a natural hierarchy has the characteristics of some combination of Platonic and Aristotelian ideas.

Plato proposed that all of our experiences were imperfect derivations from a perfect underlying reality. Aristotle, on the other hand, proposed that the only reality was the result of our senses. Aristotle's ideas gave rise to the growth of Science, as a world view based uniquely on empirical evidence, without the presupposition of an *underlying* 'reality'. However, this view now seems flawed, given the extensive inter-correlated nature of Scientific modeling, within which the generalizations of models have become 'real' in their own right, and any empirical deviation from them is referred to as 'experimental error'. In this way, Plato's underlying perfection has crept back into the picture. Realistically, it could be no other way, as the generalizing models we use in everyday life correspond to the survival-promoting simplifications of the massively intractable data we receive from our surroundings through our senses. The 'physical laws' which Science describes are constructed from multitudes of individual measurements through the agency of our efforts, imagination and mathematics. Are these 'laws' themselves ever 'observable' as such? No: they are nothing other than Plato's underlying 'realities'; as in a slightly different sense are the biological genotypes from

which individual phenotypic organisms develop. Our own brains' information-processing itself corresponds to this Platonic-Aristotelian duality. If we listen to the bass notes of an orchestra via a conventional loudspeaker system we are not hearing the lowest notes themselves *directly*. Most loudspeakers are incapable of reproducing notes below 40-50Hz, and what we 'hear' is a neural reconstruction of the note's fundamental from the received set of its speaker-reproduced higher harmonics. In this way, we perceive as 'real' a bass note which is in fact entirely absent from the acoustically transmitted information. It is now even customary in the production of commercial music recordings to digitally add a suitable harmonic set, to lower the apparent notes of bass instruments when the music is listened to via small loudspeakers.

A pragmatic approach to scientific investigation, therefore, relinquishes any necessity for a dogma of 'is reality *real* or not', and approaches questions of existence and perfection 'as if' empirical demonstration corresponds to truth. Given impossibility of defining any absolutist position from within our environment, therefore, and the extensive underlying networked inter-correlation between the different domains of Science, we proceed 'as if' the generalizing models were 'true', until contradicting proof appears. What else could we do?

We are constrained to recognize two senses of the word *abstraction* which are somewhat at variance with each other. Information is lost through the progressive emergence of scalar levels in a hierarchy, and this makes any previously emerged level difficult to precisely localize. The description of a previously emerged level, therefore, makes use of an incomplete set of information, and this corresponds to that description being an *abstraction* of its complete representation. However, rather problematically, we would habitually treat an underlying scale as being *real*, and consequently its nature could best be referred to as 'really-abstract'. The pre-emergent imagination of an as-yet un-emerged level, however, depends on reduction of the available complete description of the current level, giving it both the character of abstraction and the correspondence to its usually understood meaning – that of 'not really existing'. Consequently, we could best refer to it as being 'abstractly-abstract'. These two characters of 'really-abstract' and 'abstractly-abstract' are pragmatically very different, but not in the sense we might immediately suppose. The more difficult of the two to 'really' access is, surprisingly, the 'really-abstract' one, as we do not possess locally sufficient information to define its location, and it is much easier to 'really' access the 'abstractly-abstract' representation, as this only requires throwing away more information, rather than somehow arbitrarily generating new information.

In the *Hierarchy Theory* SIG of the 2006 ISSS meeting in Sonoma we presented the concept of

> *"… our universe's evolution, and its entire post-'big bang' history, as an assembly of interacting individual attempts to 'turn back the clock' to the intimate unification of a pre-'big bang' state*."

In this context, we propose that every stage of the universe's evolutionary scalar emergence, from strings, to fermions and bosons, to atoms and molecules, to

bio-chemicals and organisms, is each time the result of an 'erroneous' evaluation of 'where to go next to achieve reunification', resulting in the quasi-unification of 'digital' differentiation rather than the true unification of 'analog' continuity. Attempted reunification is not only abstractly 'virtual' rather than 'factual'; it lies at the root of natural survivalist pragmatism: *it is the very nature of reality itself!*

GENERAL PRECURSORS

In general, Science has led us to expect that very different natural scales may exhibit very different properties and phenomena. However, our above argument would at first sight suggest that this should not be the case. We do indeed notice sometimes very different properties, so how is it possible to resolve this apparent contradiction?

Darwinism maintains that the emergence of progressively more and more complex organisms depends on randomly controlled mutation and environmental survival and selection. It is important to note, however, that in this scenario the immediately previous organism's incarnation sets boundary conditions for any possible modification. Evolution is notably a scavenger of pre-existing characteristics. The flaps of skin which a flying squirrel uses to glide through the forest, for example, almost certainly previously performed as cooling surfaces. Consequently, we would not necessarily find exact equivalence of properties across the wide range of natural organisms, or across the even wider range of natural phenomena.

Zeno has pointed out that a static model of motion imposes stasis on the motion itself. Similarly, if my own position is taken as the frame of reference from which I am 'observed', then I am always stationary. A systematic difficulty in our presupposed 'observation' of systems is that we habitually do so *from our own frame of reference*. It is likely that the differences we 'observe' between phenomena at different scales are a consequence of this apparently distorted relativism. A crucial aspect of the development of *scale relativity* (Nottale, 1993) is the belief that establishment of a suitable frame of reference for any scale under consideration would remove many or all of the characteristics and artifacts which we normally expect to 'observe' at that scale. For example, the theory's founders expect that the establishment of a suitable frame of reference for the quantum domain would result in the 'disappearance' of quanta.

It is easy to see that the argument we presented above – namely that information loss makes it easier to move to a new higher emergent scale than to return to a previous one – can be reformulated in terms of frames of reference. A new higher emergent level will provisionally maintain its relationship with the current frame of reference; any previously emerged level will already have lost the precision of its relationship.

We can note a number of non-domain specific 'logical' precursors of the examples of 'erroneous' pro-unification directivity which appear below. The first and most obvious one is Science's maintenance of the superiority of reductionism. This is based, if often less than locally consciously, on the presupposition that systemic analysis and systemic synthesis make up a symmetrical pair. As Rosen has pointed out (1991), this is rarely if

ever the case, and it is *never* true for living systems. A similar, if more widespread differentiation, is between *subject* and *object*, where the entirety of content is supposed to reside in the object. The majority of logical grounds for argumentation are derived from this kind of differentiation. Notable among them are the usual categorical separation of *cause* and *effect*, and Descartes' separation of *mind* from *matter*, neither of which would support close scrutiny as generalities. In many cases, differentiation appears as a by-product of lack of attention to 'how' we do things, as in the usual distinction, for example, between 'top-down' and 'bottom-up' design or constructional modes. Neither of these two modes is pragmatically independent, and in practice both come into play in any successful or efficient operation.

An important example in the context of this paper's primary audience is that of hierarchy. The different levels of a hierarchy are often attributed an unsustainably great autonomy with respect to the entire structure, whether this be bi-directional (i.e. 'upwards' and 'downwards', often resulting in excessive fluidity and loss of control) or uni-directional (i.e. often just 'downwards', resulting in stagnation through stasis). Presumably, establishment of the hierarchy would be justified by the achievement of greater effectiveness through 'unification', but the result is often the opposite, particularly if autonomy is exercised by the strict imposition of individual performance targets (or 'Key Performance Indicators').

It is important to try to distinguish between the 'abstract' attribution of a particular structure to a system and the 'real' auto-establishment of that structure. Stan Salthe (private communication) would maintain that hierarchy is 'only a model' – that it is our imposed representation. However, the authors do not believe that this is the only possibility, and that, given the opportunity or freedom, many (if not most) systems establish their own characteristic scales which partially isolate themselves from their scalar neighbours as part of a natural hierarchy. This is, of course, a matter of belief, as is the recourse to 'natural laws' in an attempt to unify related empirical data. Pragmatism of this kind plays an important role in any 'definition' of reality in the context of a supposition of natural hierarchy. Our own view of reality is that it is a convenience we apply to 'the farthest level of modeling which we can be bothered to go to'. 'Older', now superseded models are not *per se* wrong – they often relate to a more abstracted representation than do those which replace them. A perfect example is provided by 'the flat earth' concept (still supported by the Flat Earth Society, amongst others). Although the Earth would now be commonly considered to be a globe floating in space, this does not preclude the convenient use of 'flat maps' of its surface in planning and executing voyages, or in our direction at road junctions by a GPS-based navigational device.

Many, but not all of the examples which follow are our own human social impositions on our environment.

EXAMPLES FROM...

Natural Science

Newtonian physics presumes that it is possible to observe a system without influencing it. As such it has something of the character of that most unjustifiably named exercise of a 'thought experiment' (which is, of course, not an experiment but a model). This may be the main reason for its relegation to the archive of obsolete descriptions when compared to quantum physics, while it should more reasonably be instated as the complementary companion of quantum physics. We may notice here the usual habit of Science to create crisp categories, around which their supporters erect clearly labeled boundaries. Physics is not to be confused with chemistry, which is different from biology. It is arguable that the differentiated defining operators of Darwinian Evolution – mutation, reproduction and selection – are themselves a result of the evolution of Evolution itself, from primitive purely random quasi-unified development to anticipative differentiating directivity.

An obvious Natural Science candidate for 'segregation as a means to unification' is the prevalence of attention given to a presumed possible 'Grand Unification Theory' or 'Theory of Everything' over the past few decades. This is based on a presumption that complete knowledge, or rather a complete mathematical model, of the properties of the most elementary components of our environment (if such exist…) would be sufficient to describe our environment itself (within, of course, the bounds of elemental and systematic probabilities). Unfortunately, this neglects to take account of the synthetic irreversibility of analysis noted above. Consequently, any 'Theory of Everything' based uniquely on elemental properties would collapse to a logically un-expandable 'Theory of Elemental Properties'. Even if such an expansion could approximately address inanimate aspects of our universe, it would completely fail to predict the properties of those of its inhabitants which operate as open systems, namely living organisms.

Systems Science

Examination of the programme for this instantiation of the ISSS annual meeting reveals fragmentation in the form of multiple SIGs which address individual parts of a presumably unified subject. There are 'Human Systems Inquiry', 'Living Systems Analysis', 'What is Life/Living', 'Medical and Health Systems', 'Systems and Mental Health', 'Aging Systems', … Is it possible to address the apparently essential issue of living entities through such a segregation. Of course, it is also possible to ask the opposite: is it possible to address living entities *without* such a segregation? And here lies the central quandary: can we best 'understand' through the whole or through its parts? Rosen (1991) has distinguished between machine and organism in a related manner, through his examination of the relationship between *analysis* and *synthesis*. For Rosen's *machine*, nothing could be simpler: synthesis is the inverse of analysis, so it makes no difference whether we take the whole or its parts, the result will be the same. A digital computer falls into this class of machines. For an organism, however, nothing could be further from the truth. Neither the parts nor the whole can give us a complete picture, as with our limited intellect we will always be considering the 'picture' of a multi-scalar entity from an approximately mono-scalar position.

Both modern Category Theory and Charles Peirce's categorization of sign types provide excellent examples of 'differentiation as a route towards unification'. Unfortunately, it is difficult to find any kind of natural system which exhibits crisp division into different categories (notwithstanding the efforts of quantum physicists). Does this kind of fragmentation help in understanding a 'general picture', or does it primarily provide an environment within which 'everyone can defend his own territory'?

Ecology

Until Darwin's appearance, pre-20th century biological taxonomy ignored in general the relationships between different products of evolution. Consequently, observations of relationships between humans and other animals were habitually 'pushed under the carpet', and in its fragmentation biology became 'the study of the dead'. It could be argued that the current movement towards ecological unification of our species with Nature is evidence of success of the 'differentiation route', but that leaves us with the difficult question as to whether anticipation of post-differential unification could be present at the processes' initiation: is differential unification a 'successful anticipatory strategy'?

The logical fragmentation which is created by imposing crisp formality has made it impossible for Science to address life itself. Even now, Rashevsky and Rosens' attempts to reformulate the study of Nature and life in terms of *relationships* is far from being accepted as a general necessity, most particularly in that it transcends the 'natural' boundaries of conventionally segregated domains of interest (and influence).

Sociology

It is possibly within sociology and in social and business relationships that the best examples of differentiation for unification can be found. Successful groupings habitually resort to a formal differentiation between Leaders and Team-members, while formal operational reliance on these predetermined functions rarely leads to success. Leaders need to listen to their team-members; team-members need to support their leaders' decisions. While role definition is a primary aspect of social system constitution, its categorical adoption and maintenance has resulted in the historical collapse of many empires, civilizations and organizations.

2009 in England has seen the conclusion of the 'baby P' affair – the death of a small child through the violent actions of his mother and her associates. Although the risk to his health and life was well documented over a long period of time by the various official agencies involved (from social services to the police), and although as a result of this concern he was seen by those agencies some 50 times over the last period of his life, formal fragmentation of those services resulted in non-cooperation to the end of saving his life. And this in a political climate where 'joined-up thinking' in social services was the universal cry.

Technology

Our entire 'digital age' evidences the hypothesis that fragmentation can seem to be a route towards unification. Very soon, our entire global communication network will consist of digital information channels, and there is already a growing public presumption that in any context 'digital is best'. It is tempting to characterize this movement as a conflict between *accuracy* and *precision*, where accuracy is the natural aspect of analog systems, and precision the purview of digitality. Unfortunately, much though these two are usually conflated in common understanding, they are entirely unrelated concepts. Interestingly, the duality of precision and accuracy mirrors the difference between Plato's and Aristotle's views of reality.

Psychology

Unsurprisingly, psychology is an internally fragmented discipline, from its systemic instantiation to its analytic form, to Rogers, to Jung, to Freud, to … Logic and emotion are systematically treated as independent characteristics of our being, when neither is possible without the other. We conceptually separate the characters of 'parent' and 'child' – except within some psychological points of view – when any individual is even physically both! The 'conscious' and 'unconscious' either clash or cooperate, but still remain conceptually differentiated. Unusually, systemic psychology places the individual in his or her many systemic contexts – rather than most other approaches which attach an individual's difficulties to his or her own character, thoughts or actions.

Neurology

The human brain itself provides an excellent example of differentiation as a (successful?) route to integration. Its hemispheric separation supports the operation of different if complementary functions. While there are exceptions, in general the left neural hemisphere processes information in a linear, sequential, logical, symbolic manner: it is specialized in

> *"… verbal skills, writing, complex mathematical calculations and abstract thought*" (Rock, 2004, p. 124).

The right neural hemisphere, in general, processes information more holistically, randomly, intuitively, concretely and nonverbally: it specializes in

> *"… geometric-form and spatial-relationship processing, perceiving and enjoying music in all its complexity, recognizing human faces, and detecting emotions*" (Rock, 2004, p. 124).

Much of modern neuro-psychology is focused on identification of the neural substrate of consciousness: this appears as much as anything else to be a rejuvenation of Descartes' split between 'mind and matter'. Will this differentiation lead to an understanding of consciousness? Neural studies in general address primarily the location in brain images of regions which are associated with different specific neural functions. Here again, we find a concentration of the fragmentation of study for purposes of global understanding.

CONCLUSION

We conclude from these and many other examples that the hypothesis we have presented is viable, namely that attempted reunification is not only 'virtual'; it lies at the root of natural survivalist pragmatism: *it is the very nature of reality itself!*

REFERENCES

Cottam, R., Ranson, W. and Vounckx, R. (1998). Localization and nonlocality in computation, in *Information Processing in Cells and Tissues*, (M. Holcombe and R. Paton, eds.), Plenum Press, London, pp. 197-202.

Cottam, R., Ranson, W. and Vounckx, R. (2003). Autocreative hierarchy II: dynamics - self-organization, emergence and level-changing, in *International Conference on Integration of Knowledge Intensive Multi-Agent Systems*, (H. Hexmoor, ed.), IEEE, Piscataway, NJ, pp. 766-773.

Nottale, L. (1993). *Fractal Space-Time and Microphysics: Towards a Theory of Scale Relativity*, World Scientific, Singapore.

Rock, A. (2004). *The Mind at Night: the New Science of How and Why we Dream*, Basic Books, New York.

Rosen, R. (1991). *Life Itself: a comprehensive enquiry into the nature, origin and fabrication of life*, Columbia UP, New York.