

Propagating Organization, Neo-Duality and Material and Non-Material Emergence

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Stuart Kauffman (2000) in his book *Investigations* introduced the notion of propagating organization as a new union of matter, energy, work, constraint and information exemplified by the vast organization of the coevolving biosphere. In an article entitled Propagating Organization: An Enquiry (hereafter referred to as POE) (Kauffman, Logan, Este, Goebel, Hobill and Shmulevich In press) studied propagating organization in the material abiotic and biotic worlds. More recently Logan (in preparation) in an article entitled Propagating Extra-Somatic Organization in the Symbolosphere: An Enquiry (hereafter referred to as PESOS) has extended Kauffman's notion of propagating organization to the non-material symbolic domain as exemplified by human language, culture, science, technology, governance and economics. Science, technology, governance, and economics are part of culture but we treat them separately because they provide vivid examples of non-material emergence and propagating organization.

In both POE and PESOS it was posited that the transition to higher orders of organization can only be explained in terms of strong emergence as described by Clayton (2004) in *Mind and Emergence*. Clayton (ibid.) describes three basic schools of thought with respect to the question of the relationship between higher orders of organization and the components out of which they are constructed and from which they emerge. The three schools according to Clayton consist of physicalists, dualists and emergentists. The emergentists represent a third option between the physicalists and the dualists. The physicalists believe that all phenomena and all things that exist are basically physical or material and that ultimately everything can be and will be explained in terms of basic physics. The dualists on the other hand believe that in addition to the physical world there is also another element, which is "a soul, self, or spirit that is essentially non-physical (ibid., p. v)." Clayton citing el-Hani and Pereira (2000, p. 133) describes the emergentist position as consisting of following four elements:

1. All things are made of the basic particles described by physics and their aggregates;
2. As aggregates gain a level of complexity novel properties emerge;

3. These properties cannot be reduced to or predicted from the lower level from which they emerge; and
4. Higher level entities causally affect the lower level entities from which they emerged in what is called downward causation.

Clayton also identifies two major divisions within the emergence school of thought namely the strong and weak emergentists. Clayton, a strong emergentist himself, describes strong emergence as the belief that the new higher levels of complexity that emerges are ontologically distinct from the lower levels from which they come and that physics will never be able explain these higher level phenomena. The weak emergence position is that, yes, the levels are distinct but that ultimately they can be reduced to physics once a deeper understanding of the world is achieved.

A Comparison of Material and Non-material Emergence

Human symbolic interactions are naturally part of the biosphere and are part of the human biotic system but we choose to make a distinction between the purely biological interactions of biosemiosis, on the one hand, and human language and culture, on the other hand. Biosemiosis is instantiated in the biomolecules of which living organisms are composed and the information that is communicated is not symbolic, i.e. standing for something else. It is therefore the case that the information cannot be separated from those biomolecules. DNA does not symbolize RNA but creates it chemically through catalysis. The same is true of RNA, it is not a symbol of the proteins it creates – it merely catalyzes their chemical composition. The medium and the information content of biosemiosis are the same. Human language and culture, on the other hand are symbolic in which the information is not instantiated materially but is only physically mediated so that it can jump from one medium another.

In this article we will introduce a distinction between material and non-material emergence. Examples of material emergent phenomena include regular hexagonal convection cells and weather patterns in the abiotic world and living organisms in the biosphere. Non-material emergent phenomena include human language, conceptual thought and culture all of which belong to the symbolosphere. The symbolosphere, originally introduced by Schumann (2003a & b), consists of the human mind and all the products of the mind, namely, its abstract thoughts and symbolic communication

processes such as spoken and written language and the other products of the human mind such as music, art, mathematics, science, and technology.

Non-material emergence differs from material emergence in that the first of the four elements el-Hani and Pereira (2000, p. 133) used to describe emergence does not hold. Human language, conceptual thought and culture are not made up of basic particles described by physics and they exist in the symbolsphere and not the $6N$ dimensional configuration space of physical particles (where N is the number of particles in the system).

Kauffman (2000) in *Investigations* and Clayton (2006) in *Mind and Emergence* argue that biology cannot be predicted from or reduced to physics. In the same way that biology cannot be reduced to physics it is also the case that the symbolic conceptual non-material aspects of human behaviour, namely, language and culture cannot be reduced to, derived from or predicted from the biology of the human brain and the nervous system from which they arise. The symbolic domain of human language and culture are a product of human conceptual thought (Logan 2000, 2006a & 2007) and represent emergent phenomena and propagating organization (PESOS or Logan in prep.). They differ from living organisms that populate the biosphere in that they are abstract, conceptual and symbolic and not materially instantiated as such with the exception of technology. In the case of technology it is the concepts and organization that goes into the creation of the physical tools that are emergent and propagate not the actual physical tools.

Neo-dualism

It is because of the existence of non-material emergence and the symbolsphere that the notion of neo-dualism was introduced in Logan and Schumann (2005) and Logan (2006b). While carefully distinguishing the different forms of emergence Clayton (2002) did not entertain the possibility of different kinds of duality. Neo-dualism is quite different than the dualism that Clayton (2002, p. v) defines, a dualism that incorporates the notion of soul or spirit. “Dualists believe that... humans consist of both [a] physical component and a soul, self, or spirit that is essentially non-physical (ibid.).”

We agree with dualists that there is a non-physical component to humans namely their language, culture and mind. This non-physical component, however, is symbolic and not necessarily spirit-like or transcendent. Neo-

dualism as developed by Logan and Schumann (2005) dispenses with or is agnostic with respect to the notion of soul, spirit or God but assumes that human behaviour consists of both a physical and a non-physical component. The non-physical component is not spiritual but rather is conceptual or symbolic. The concepts of zero, energy, numbers, force, life, morality, democracy, liberty, and marriage, for example, do not have a physical or material instantiation. They are non-material products of the human mind without extension.

Neo-duality makes an explicit distinction between purely material phenomena whether they are abiotic or biotic and non-material phenomena associated with human thought namely, ideas, symbols, language, culture, and the concepts that go into creating science, technology, governance and economics. In the neo-dualistic approach of Logan and Schumann (2005) all phenomena belong to one or the other of two different domains: the physiosphere and the symbolosphere. The physiosphere is simply the material world consisting of both living and non-living matter and corresponds exactly to Descarte's *res extensa*. The symbolosphere consists of the human mind and all the symbolic products of the mind and corresponds to Descarte's *res cogitans* minus God, the soul and spirit. The symbolosphere like Descarte's *res cogitans* has no extension or physicality.

In our neo-dualistic model the human brain and the mind are seen as distinct entities with the brain belonging to the physiosphere and the mind to the symbolosphere. This model of neo-dualism grew out of Schumann's (2003a & b) notion of the symbolosphere and Logan's notion of the Extended Mind (1997, 2000 & 2007), which posits that the mind is the product of the human brain plus verbal language. Neo-dualism represents a weak form of dualism as contrasted with the strong dualism of Descarte.

Clayton (2002, p. v) has suggested that dualism and emergence are in conflict, "Emergence... represents a third option in the debate and one that is preferable to both of its two main competitors," dualism and physicalism. If Clayton restricts his notion of dualism to the Cartesian one that posits the existence of a spiritual substance to explain the existence of God and the human soul then emergence and dualism are in direct conflict. If however one considers the neo-dualist position as developed by Logan and Schumann (2005) then the conflict disappears and the position of emergence and neo-dualism, as we will demonstrate, are perfectly compatible.

The focus of this article is to articulate this notion of weak dualism or neo-dualism in light of propagating organization as described in *Investigations* (Kauffman 2000) and POE (Kauffman et al. in press) and non-material emergence as described in PESOS (Logan in prep.) In carrying out this analysis we will carefully make the distinction between material-based propagating organization in the biosphere as described in POE and non-material, extra-somatic, symbol-based propagating organization in the symbolosphere of human language and culture as described in PESOS.

Dawkins' (1989, p. 192) notion of memes represents the propagation of non-material symbol-based organization:

Just as genes propagate themselves in the gene pool by leaping from body to body via sperm or eggs, so memes propagate themselves in the meme pool by leaping from brain to brain via a process, which, in the broad sense, can be called imitation.

To conclude this introductory section we emphasize that neo-duality embraces strong emergence but makes a clear distinction between the materiality of the biosphere and the symbolic nature of human language, conceptual thought and culture.

Cartesian Dualism and Neo-dualism: A Comparison

Descartes' dualism has fallen into disfavor within the scientific community and large parts of the philosophical community that embrace the scientific method. The reason is that Descartes introduces into his system of thought entities that cannot be empirically probed such as soul, spirit and the Deity and which properly belong to the realm of belief and theology. "Strongly dualist theories of human nature, and in particular substantial theories of the soul, have become problematic in an age of science (Clayton 2004, p. 124)." The position of most scientists and philosophers of science with respect to these categories introduced by Descartes into his philosophy is one of agnosticism in their pursuit of science or their understanding of how science operates. On the personal level scientists and philosophers of science range from true believers through agnosticism all the way to atheism and even to belligerent forms of atheism.

In formulating *res extensa*, the domain of the material, and *res cogitans*, the domain of the non-material or conceptual, however, Descartes made an

important distinction between the material and non-material domains of this world that have extremely important implications for biology, anthropology, sociology, economics, political science, and media ecology. With the exception of biology all of the disciplines listed deal almost exclusively with *res cogitans*; whereas human biology deals with a mixture of the two as is the case with both evolutionary biology and biosemiosis where information in both material and non-material formats influence the evolution, development and the survivability of humans.

The Extended Mind

Our definition of *res cogitans* that we have just given is incomplete, however, unless we describe exactly what we mean by the human mind, which as has been shown in the Extended Mind model (Logan 2000, 2006a and 2007) is different than the human brain. The Extended Mind model for the emergence of language builds from the notion that language is both a communications medium and an informatics tool and that speech, writing, math, science, computing and the Internet form an evolutionary chain of languages (2004).

It is claimed that the origin of speech and the human mind emerged simultaneously as the bifurcation from percepts to concepts and a response to the chaos associated with the information overload that resulted from the increased complexity in hominid life. As our ancestors developed toolmaking, controlled fire, lived in larger social groups and engaged in large-scale co-ordinated hunting their brains could no longer cope with the richness of life solely on the basis of its perceptual sensorium and as a result a new level of order emerged in the form of conceptualization and language or speech. Language arose primarily as a way to control information and then was used as a tool for communication. Rather than regarding thought as silent speech one may just as well regard speech as vocalized thought.

The mechanism that allowed the transition from percept to concept was the emergence of speech. The words of spoken language are the actual medium or mechanism by which concepts are expressed or represented. Words are both metaphors and strange attractors uniting many closely related perceptual experiences in terms of a single concept. All of one's experiences and perceptions of water, the water we drink, bathe with, cook with, swim in, that falls as rain, that melts from snow, were all captured with a single

word, water, which also represents the simple concept of water. Verbal language and abstract conceptual thinking emerged together at exactly the same point of time as a bifurcation from alingual communication skills and the concrete percept-based thinking of pre-lingual hominids (Logan 2000, 2006a and 2007).

Within the context of the Extended Mind model it is assumed that the mind came into being with the advent of verbal language and, hence, conceptual thought. Before language the brain functioned basically as a percept processing engine operating without the benefit of the abstract concepts, which only words can create and language can process. Language is a tool which extended the brain and made it more effective thus creating the mind, hence the formula: Mind = brain + language. It follows that non-human animals have brains but no minds and that the gap between humans and non-human animals is that only humans possess verbal language and a mind.

The emergence of verbal language therefore represents three simultaneous bifurcations: i. from percepts to concepts, ii. from brain to mind, and iii. from pre-human hominids to human beings. Verbal language and the concepts it gave rise to also permitted the development of abstract forms of culture, science, technology, governance and economics as well as the unique human capacity for planning.

Res Cogitans or the Symbolosphere

Res extensa or the physiosphere consists of the material world and hence everything that has extension and is made of stuff, ultimately atoms or elementary particles or if one wants to go to an even deeper level, leptons and quarks. Res cogitans or the symbolosphere is everything else. It is the non-material world or the symbolosphere and consists of the human mind and all of the minds concepts and analytic tools such as language, culture, science, technology, laws and economics. None of these elements of res cogitans or the symbolosphere have extension or are composed of material components. They emerged from the behavior and interactions of the human animal and they have a downward causation on the humans from which they emerged. The difference in the emergence of res cogitans or the symbolosphere from other forms of emergence like the emergence of the biosphere from organic chemistry and hence atoms is that living organisms are composed of atoms but the elements of res cogitans are not composed of anything material but rather are the products of human thought and behavior.

The one characteristic that unites all of the elements of *res cogitans* or the symbolosphere is that they are all symbolic. Terence Deacon described humankind as the symbolic species and *res cogitans* or the symbolosphere is the set of symbolic elements that comprise the behaviors of the symbolic species. John Schumann and his collaborator N. Lee had a very succinct way of describing the relationship between the abstract, non-material, non-extensive element of language and the material extensive human brain from which language emerged and in which language operates in a downward causal manner. Schumann (2003) suggests that the words and grammar of language emerge as a complex adaptive system as a result of the communicative interactions of hominids. Language as a consequence is a cultural artifact; it “is neither of the brain nor in the brain (Lee and Schumann 2003).” Its organization does not propagate biologically but rather culturally and “exists as a cultural artifact or technology between and among brains (*ibid.*)” Language is an artifact that is non-extensive and non-material and hence is not part of the material biosphere but rather forms the symbolosphere. The symbolosphere includes all forms of symbolic communication including spoken and written language, mathematics, science, technology, computing, the Internet, laws, economic systems, music and the arts. Each of the elements of the symbolosphere propagates its organization just as living organisms do. The difference is that the mechanism for replication for living organisms is chemically-based through DNA whereas the replication of the linguistic and cultural elements of the symbolosphere is through memes. It is also the case that just as living organisms evolve through the mechanism of descent, modification and selection the same is true of the elements of the symbolosphere. The descent occurs each time a meme is transmitted from one mind to another. A modification can take place in the mind of the recipient of the meme if he or she so chooses. And the selection process occurs when other human minds decide whether or not to adopt the new or modified meme.

Culture

Culture is an important adaptive mental tool that is more or less unique to humans whereby the learning of previous generations are passed on to the next generation through communication and social interactions. Culture like language is another symbolic activity which is abstract, non-material and non-extensive. Geertz (1973, p. 8) defines culture as

an historically transmitted pattern of meanings embodied in symbols, a system of inherited conceptions expressed in symbolic forms by means of which men communicate, perpetuate and develop their knowledge about and attitudes towards life.” He goes on to add that “culture is patterns for behavior not patterns of behavior.

Durham (1991, pp. 8-9) also defines culture in symbolic terms,

the new consensus in anthropology regards culture as a system of symbolically encoded conceptual phenomena that are socially and historically transmitted within and between populations. As Keesing has pointed out, this view contrasts markedly with earlier conceptualizations of culture as adaptive behavioral systems, for which human populations maintain themselves in local environment.

Culture includes technology, economics, governance and science each of which is symbol based. Culture is a form of propagating organization that evolves like living organisms by descent, modification and selection as described above. Culture represents the way in which a society organizes its material life of food, shelter, clothing, protection, etc. This organization is symbol-based but has a downward causative effect on the material artifacts of society and the behaviour of its members.

Economics and Governance

Economics and governance are another element of culture that organizes human interactions and creates social cohesion. This form of propagating organization is symbolic as is pointed out by Johnson and Earle (1987, p. 322:

To sustain economic integration beyond the capacity of the biological bonds that underpin the familistic group, it is necessary to extend the individual's sense of 'self-interest' to broader social units. This extension of self is based on symbols.

Economics and governance although they are symbolic and non-material they still have a downward causative effect on the human agents in which these forms of organization reside.

Technology

Technology is another element of culture, which at first blush seems to be material. Actually technology is conceptual and symbolic and represents the way in which materials are organized through downward causality to achieve functionality. Technology is therefore a form of propagating organization that also evolves like living organisms by descent, modification and selection. All technologies are derived from or descend from some earlier tool with the first tools being derived from found object. The inventor or designer of a new technology is the source of modification and the users who select to use the technology complete the evolutionary cycle of evolution. Those tools that are functional and easily and comfortably deployed are selected.

Science

Science is the final element of culture that we will analyze. Science is basically a non-material symbolic methodology for describing nature. Thomas Kuhn in *The Structure of Scientific Revolutions* described the descent and propagation of the organization of science through the articulation of normal science. The period of revolutionary science is the period of modification of existing theories by which new scientific laws and descriptions of nature emerge. The empirical verification of scientific hypotheses completes the selection component of the evolutionary cycle. The downward causation of science operates on the other elements of culture such as economics, governance and technology.

Conclusion

We have shown that all the elements of language and culture including explicitly economics, governance, technology and science are all non-material, emergent and represent propagating organization justifying the neo-duality approach to understanding reality and the compatibility of strong emergence and neo-duality or weak duality.

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