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Three Projects
• Propagation of Organization
•Extended Mind – Origin of Language
• McLuhan as Emergentist

Propagating Organization: An Enquiry

by Stuart Kauffman, Robert K. Logan, Robert Este, Randy Goebel, David Hobill and Ilya Shmulevich to appear in Biology & Philosophy

We argue that Shannon information does not apply to the evolution of the biosphere because one cannot prestate all possible Darwinian preadaptations or the ensemble of possibilities and hence their entropy cannot be calculated.

According to the Shannon definition of information a structured set of numbers like the set of even numbers has less information than a set of random numbers because one can predict the sequence of even numbers. By this argument a random soup of organic chemicals would have more information that a structured biotic agent.

The biotic agent has more meaning than the soup, however. The living organism with more structure and more organization has less Shannon information. This is counterintuitive to a biologist's understanding of a living organism. We therefore conclude that the use of Shannon information to describe a biotic system would not be valid. Shannon information for a biotic system is simply a category error.

A living organism has meaning because it is an autonomous agent acting on its own behalf. A random soup of organic chemicals has no meaning and no organization. We may therefore conclude **the meaning of life is organization—organization that propagates.**

The Relativity of Information

You may legitimately ask the question "isn't information just information?", i.e., an invariant like the speed of light. Our response to this question is no, it is relative. Instructional or biotic information is a useful definition for biotic systems just as Shannon information was useful for telecommunication channel engineering.

The Extended Mind:The Origin of Language, the Human Mind and Culture (U of Toronto Press 2007)

Speech emerged as a self-organizing system and 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, which included:

- Tool making and use;
- Control of fire;
- Social cooperation to maintain the hearth;
- Food sharing,
- Group foraging & hunting;
- Mimetic communication (gesture, hand signals, body language and vocalization)

As complexity increased the percept-based brain couldn't cope—it needed concepts for abstract thought.
Speech represented a bifurcation from percepts to concepts.

Our first words were our first concepts.

They acted as strange attractors for the percepts associated with those words.

The word water unites our percepts of the water we drink, cook with, wash with, rain, melted snow, lakes, rivers.

Thought is as much silent speech as speech is vocalized thought.

Why was there a need for verbal language?

It was useful for:
1. conceptualiztion,
2. symbolic, abstract thought,
& 3. planning.

By allowing for thought about objects and actions not in the immediate perceptual field language permits planning.

Mind = Brain + Language

Before language the brain was basically a percept processor.

With language the brain becomes capable of conceptualization and hence bifurcates into the human mind.

The emergence of verbal language represents three simultaneous bifurcations:

1. the bifurcation from percepts to concepts,

2. the bifurcation from brain to mind,

3. the bifurcation from archaic Homo sapiens to full fledged human beings.

(Logan 2003b, pp. 75-76)

McLuhan, Complexity Theory and Emergence

McLuhan was not a Technological Determinist – He was an emergentist

What is Determinism and Is It Such a Bad Thing Anyway

McLuhan's Field Approach

"We live today in the Age of Information and Communication because electric media instantly and constantly create a total field of interacting events in which all men participate (McLuhan 1964, 248)."

> All types of linear approaches to situations past, present, or future are useless. Already in the sciences there is recognition of the need for a unified field theory which enable scientists to use one continuous set of terms by way of relating the various scientific universes (McLuhan 1953, 126).

McLuhan, Emergence and Complexity Theory

Rather than regarding McLuhan as a technological determinist I believe it is more accurate to consider him an early emergentist.

“A new medium is never an addition to an old one, nor does it leave the old one in peace. It never ceases to oppress the older media until it finds new shapes and positions for them (McLuhan, E and Zingrone 1995, 278).”

“It is therefore, a simple maxim of communication study that any change in the means of communication will produce a chain of revolutionary consequences at every level of culture and politics. And because of the complexity of the components in this process, predictions and controls are not possible.”

McLuhan refers explicitly to the general systems theory work of von Bertalanffy.
He embraced the notion that the dynamics of media in the age of electric communication is non-linear.

“Nils Bohr’s complementarity that represents ‘atomic’ interactions as both ‘acoustic’ waves and ‘visual’ particles is exemplified by every process involving the continuous interplay of simultaneous actions….Such complementarity of figure-ground appears as a causal relation in all ‘pre-packaged’ processes. Complementarity is the process whereby effects become causes. Today, as causes and effects merge instantaneously, the new common ground is neither container nor category, but the vastness of space via media (McLuhan and Nevitt 1972).”

“A new medium is never an addition to an old one, nor does it leave the old one in peace. It never ceases to oppress the older media until it finds new shapes and positions for them (McLuhan 1964, 158).” McLuhan’s media ecology approach incorporates the notion of that the interactions of the media among themselves is non-linear, i.e. “causes and effects merge instantaneously.”

Ecosystems or ecologies by the very nature of their non-linear dynamics are emergent systems. Basically, media ecology is a form of complexity.

In complexity theory new levels of order emerge as phase transitions from one form of organization to another. Another element of McLuhan's thought that parallels complexity theory is his idea that a new medium gives rise to new patterns of communication, work, social organization and cognition. I would suggest that these new patterns are emergent and represent phase transitions. According to emergence theory "as aggregates gain a level of complexity novel properties emerge; these properties cannot be reduced to or predicted from the lower level from which they emerged (el-Hani and Pereira 2000, 133)."

With the introduction of a new medium into an existing media environment new properties of the media environment emerge.

McLuhan showed that with the arrival of a new medium society, work, learning goes through a major change in which “novel properties emerge; these properties cannot be reduced to or predicted from the lower level from which they emerged (ibid.).” These novel properties that emerge represent in terms of complexity theory a phase transition that parallels the phase transition from ice to water or water to steam in thermodynamics.

One cannot predict the properties of water from ice. In the same way one cannot predict the properties and impacts of written expression from spoken language or the properties and impacts of the printing press from hand written manuscripts.

Every new medium gives rise to a phase transition in which new forms of expression emerge with properties and impacts that cannot be predicted from the media environment that preceded the arrival of the new medium as McLuhan documented.

An example of a phase transition is the one that took place with the emergence of speech and Homo sapiens from pre-verbal hominids resulting in a richer culture and the uniquely human ability to plan. McLuhan described this development in the following terms: “All media are active metaphors in their power to translate experience into new forms. The spoken word was the first technology by which man was able to let go of his environment in order to grasp it in a new way.”

The next phase transition that McLuhan described was the one that occurred with the introduction of writing and the transition from audile-tactile space of oral culture characterized by the way in which information is processed simultaneously in real time to the visual space of literate culture in which “the forms of space and time that are uniform, continuous and connected” and information is processed one thing at a time.

Other phase transitions that McLuhan identified

a. the alphabet, which led to the emergence of abstract science, deductive logic, monotheism, history & philosophy (McLuhan & Logan);

b. the printing press, which led to the emergence of vernacular literature, individualism, nationalism, the Renaissance, the Reformation, mass production and industrialization (Gut Galaxy);

c. electric media such as the telegraph, telephone, radio, and television, which led to the return to the audile-tactile patterns of oral culture (McLuhan Understand Media).

In each case one could not have predicted the outcome and effects of these media or the developments that followed in their wake.

I would suggest that we can add to this list one more phase transition that McLuhan did not live to see, namely the arrival of digital media which possess many of the properties of electric media that McLuhan identified but also new properties that one nor he could not have foreseen.

One of the interesting points that McLuhan made is that not only is it not possible to predict the new properties and new patterns that emerge with the introduction of a new medium it is also the case that most people cannot even detect the changes that the new medium has introduced. Most people with the exception of artists are completely oblivious to the changes and continue to operate as they did before the introduction of that new medium or use the new medium in more or less the same way they used the older media.

The human communication ecosystem or mediasphere that was the object of McLuhan's studies is a self-organizing system. The mediaspehere is unplanned – it self-organizes itself and evolves like the biosphere. Like the biosphere the mediasphere has no endpoint it constantly probes the adjacent possible and like the biosphere its complexity continues to increase.