



OCAD University Open Research Repository

sLAB (Strategic Innovation Lab)

2007

The biological foundation of media ecology

Logan, Robert K.

Suggested citation:

Logan, Robert K. (2007) The biological foundation of media ecology. Explorations in Media Ecology, 6 (1). pp. 19-34. ISSN 1539-7785 Available at <http://openresearch.ocadu.ca/id/eprint/884/>

Open Research is a publicly accessible, curated repository for the preservation and dissemination of scholarly and creative output of the OCAD University community. Material in Open Research is open access and made available via the consent of the author and/or rights holder on a non-exclusive basis.



2007

The Biological Foundation of Media Ecology

Robert K. Logan

Department of Physics, University of Toronto

Strategic Innovation Lab (sLab), OCAD University

logan@physics.utoronto.ca

The following article originally appeared in [Explorations in Media Ecology](#). It is a pre-publication draft.

Suggested citation:

Logan, Robert K. "The Biological Foundation of Media Ecology." *Explorations in Media Ecology* 6.1 (2007): 19–34. Web.

The Biological Foundation of Media Ecology

Robert K. Logan

Professor Emeritus, Department of Physics, University of Toronto
Senior Fellow, Beal Institute for Strategic Creativity, Ontario
College of Art
logan@physics.utoronto.ca

Abstract: Media ecology is shown to embrace not only the study of media but also the study of language, culture and technology and the interaction of these four domains. It is demonstrated that language, culture, technology and media behave like living organisms in that they are emergent phenomena and that they evolve, propagate their organization and interact with each other in a media ecosystem. This model allows us to explore the biological dimension of media ecology, which it is claimed has been hitherto ignored. It is shown that both biological and media ecosystems may be considered as media in themselves and that an ecosystem is both the medium and the message.

Introduction: Our Purpose

The purpose of this paper is to explore the biological dimension of media ecology. To date media ecology has focused on the environment in which media operate without exploring at a deep level the implications of the biological nature of ecology. We will try to make a start in this direction with the hope that it will stimulate more work of this nature.

The Emergence of the Media Ecology Tradition

The notion of media ecology originated with the work of Marshall McLuhan as indicated by the following quote:

Each new medium is a cliché that burrows and borrows and barrows, or dumps, earlier clichés. Media as environments are quotation devices, as it were — they hook and scrap and hoick all at once. (Letter from McLuhan to John Wain, 8 December 1970 retrieved from the McLuhan Archive in the National Library in Ottawa Canada.)

When McLuhan (1995, p. 275) talks of “media as environments” we should remember that for him environments have an ecological connotation as the following 1967 quote indicates: “Environments are not just containers; but are processes that change the content totally.” This attitude is also reflected in his 1964 quote from *Understanding Media*: “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 (ibid., p. 278).”

In 1977, Marshall McLuhan said that media ecology

means arranging various media to help each other so they won't cancel each other out, to buttress one medium with another. You might say, for example, that radio is a bigger help to literacy than television, but television might be a very wonderful aid to teaching languages. And so you can do some things on some media that you cannot do on others. And, therefore, if you watch the whole field, you can prevent this waste that comes by one canceling the other out (McLuhan 2004).

McLuhan and I used the term “media ecology” in Chapter 1 of our unpublished manuscript *The Future of the Library, An Old Figure on a New Ground* (The McLuhan Archive in the National Library in Ottawa Canada), which we composed around 1978.

Although McLuhan might have originated the term “media ecology” it is certainly the case that it was the writings and pedagogy of Neil Postman that gave currency to the concept of media ecology. The formation of the Media Ecology Association (www.media-ecology.org) has been instrumental in the preservation and propagation of this tradition and the development of media ecology as a discipline.

The introduction of the term ecology into what had been called media studies or communication studies signaled the fact that the study of media by media ecologists was not merely a study of the content of media. Rather, media ecology entails a study of the social, cultural and psychic impacts of media independent of their content embracing McLuhan’s defining one-liner: the medium is the message.

The following definitions by three pioneers of media ecology sum up the approach to the study of media represented by this school of thought (www.media-ecology.org):

Media ecology looks into the matter of how media of communication affect human perception, understanding, feeling, and value; and how our interaction with media facilitates or impedes our chances of survival. The word ecology implies the study of environments: their structure, content, and impact on people. An environment is, after all, a complex message system, which imposes on human beings certain ways of thinking, feeling, and behaving. - Neil Postman

Media ecology (is) broadly defined as the study of complex communication systems as environments. As a perspective, metadiscipline, or even a field of inquiry, media ecology is very much in its infancy....Media ecology is, in short, a preparadigmatic science. - Christine Nystrom

It (media ecology) is the study of media environments, the idea that technology and techniques, modes of information and codes of communication play a leading role in human affairs. – Lance Strate

In all three definitions of media ecology the key word is the study of the environment of media in terms of their structure, content and impact. This approach, which has led to an important body of scholarship, has nevertheless not addressed the possible biological nature of media ecology. Today's media ecologists do not always use the term environment in the way McLuhan did but rather in the sense of surrounding as the etymology of the word suggests. The word arises from the French *virer*, to turn so that *en-viron* connotes to encircle or surround.

Why is it that we who are proud to call ourselves media ecologist hardly ever discuss biology or ecology for that matter much less include it in our analyses of media. It is true that we are not content to do content analysis and we study the way in which media interact with each other. But does this alone justify our use of the term ecology in our self-proclaimed field of media ecology if we do no biology. I think not and therefore propose to explore the connection between media ecology and biology cum ecology. I will even suggest that perhaps media ecology entails more than the interaction of media with each other but it also entails the interaction of media with our biological nature as represented for example by our biological capacity for language and culture, the very first media of human society.

An ecological system is a medium in which its constituents interact or "communicate" with each other. Traditionally an ecological system or ecosystem referred to a biological system consisting of a natural physical environment and the living organisms inhabiting that physical environment. A media ecosystem is a more narrowly defined system consisting of human beings and the communications

media and technology through which they interact and communicate with each other. It also includes the languages and cultures with which they express and code their communication.

The motivation to include biology in the field of media ecology, therefore, goes beyond the association with the term ecology. It is deeper than that. It is my hypothesis that biology and culture can no longer be studied separately because human evolution is a combination of biological and cultural evolution and as is recognized by biologists and also by Marshall McLuhan (1995, p. 276):

We now live in a technologically prepared environment that blankets the earth itself. The humanly contrived environment of electric information and power has begun to take precedence over the old environment of "nature". Nature, as it were, begins to be the content of our technology – 1965

The term ecology in the phrase “media ecology” up to now has been used more in its metaphoric sense than in the strict biological sense. This observation, which also pertains to my own media ecology work, is not meant to critique or disparage the efforts of media ecologists but rather to suggest that perhaps interesting insights might emerge if we take the term ecology at its face value and consider communications and media from a biological perspective. The hypothesis to be explored in this article is that media are emergent phenomena and may be regarded in a certain sense like organisms that propagate their organization and interact with each other like living biotic agents in an ecological system.

Is Media Ecology a True Ecology or Merely a Study of Media Environments and Can Language and Other Media be Treated as Living Organisms?

If we are to seriously consider whether media ecology is a true ecology or just a metaphoric way of saying that media studies goes beyond content analysis we need to address the two questions we have formulated as the title of this section, namely: Is media ecology a true ecology or merely a study of media environments and can language and media be treated as living organisms? The Wikipedia definition of ecology is “the scientific study of the distribution and abundance of living organisms and how these properties are affected by interactions between the organisms and their environment.”

The first question that immediately emerges from this definition is how can there be an ecology of media since media are not living organisms. A living organism is a carbon-based autonomous agent, which Kauffman (2000) defines as an agent that replicates itself and does at least one thermodynamic work cycle. Media are not carbon-based and do not do a thermodynamic work cycle and are therefore not living autonomous agents as defined by Kauffman, but they do replicate themselves. We therefore propose and will argue that language and media can be treated as though they are living organisms because of the fact that they replicate themselves and because of the way in which they evolve and compete with each other for survival.

Our plan of action is to first show using the ideas of Christiansen (1994) and others that language can be treated as an organism at least in the metaphoric sense. We will then show that the same arguments that can be made to show that language can be treated as an organism can be made for culture and the products of culture namely media. McLuhan (1964) in *Understanding Media* regarded language in the form of the spoken, written and printed word as a medium. Furthermore other media that are not direct forms of language are nevertheless part of culture and hence like language can be treated as organisms as we will shortly demonstrate.

Can the Medium of Natural Language Be Treated as an Organism?

The natural acquisition of language by human infants without instruction and despite the poverty of stimulus is one of the great mysteries of natural science. Noam Chomsky's solution to this mystery was to posit the existence of a language acquisition device (LAD) that had been hard wired with a universal grammar (UG) into our genetic make-up by some fortuitous mutation and saltation. Pinker and Bloom (1990) supported Chomsky's hypothesis with the added twist that they believe that the UG and the LAD had evolved by Darwinian selection over a long period of time:

Human language, like other specialized biological systems, evolved by natural selection. Our conclusion is based on two facts that we would think would be entirely uncontroversial: language shows signs of complex design for the communication of propositional structures, and the only explanation for the organs with complex design is the process of natural selection (*ibid.*).

There are a number of alternatives to the Chomsky and Pinker-Bloom hypotheses that the LAD and UG are hard wired into our genes. One such approach is the notion that human language may be regarded as an organism with its own evolutionary dynamic. This is an idea that dates all the way back to Darwin (1871) and has more recently been explicitly advocated by Christiansen (1994), Dawkins (1996, p.81), Deacon (1997, p. 110) and Logan (*in press*).

Following Darwin, I propose to view natural language as a kind of beneficial parasite --- i.e. a nonobligate symbiant --- that confers some selective advantage onto its human hosts without whom it cannot survive (Christiansen (1994)).

Language exists only because humans can learn, produce, and process them. Without humans there would be no language. It therefore makes sense to construe languages as organisms that have had to adapt themselves through natural selection to fit a particular ecological niche: the human brain. (Christiansen, Dale, Ellefson and Conway in press, pp. 144-45)

Deacon (1997, p. 110) develops a position very similar to that of Christiansen,

Languages are far more like living organisms than like mathematical proofs. The most basic principle guiding their design is not communicative utility but reproduction—theirs and ours. So, the proper tool for analyzing language structures may not be to discover how best to model them as axiomatic rule systems but rather to study them the way we study organism structure: in evolutionary terms. Languages are social and cultural entities that have evolved with respect to the forces of selection imposed by human users.

Dawkins (1996, p. 81) also suggests that language evolves like an organism: “Language seems to 'evolve' by non-genetic means, and at a rate which is orders of magnitude faster than genetic evolution.” The same is also true of the evolution of culture and technology. Not only do they evolve faster than genetic evolution but the rate of evolution is also increasing. The evolution from spoken language to written language was of an order of 50 to 100 thousand years. The evolution from the hand written to the printed word was 4,500 years. The evolution from print to word processing was only 500 years and the evolution from computer-based language to Internet-based language was only 50 years. The evolution from the Internet to the Web only 10 years and now new Web based forms like blogs, iTunes, iPods, podcasting seem to emerge in a time frame of months.

Can Human Culture Also Be Treated as an Organism?

The emergence of language can therefore be thought of as the co-evolution of two organisms, the human host and natural language. We will make use of this perspective on the origin, evolution and impact of language so as to provide a biological perspective to media ecology. Naturally language as an organism cannot be taken literally as it is not a carbon based material object that thermodynamically converts free energy to maintain and replicate itself. The source of energy for its metabolism and replication comes from its human hosts. It is a symbiotic parasite.

Culture like language is another symbolic phenomenon. 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.”

Given that culture also represents another abstract symbolic phenomenon like language I have posited that we can extend Christiansen’s idea that language can be treated as an organism, a nonobligate symbiotic parasite, to culture. Culture, like language, evolved so as to be easily learned and acquired. Culture provides an extrasomatic form of instruction that provides individual human organisms with an added margin of survival benefit. The information is extra-genetic and plays a role like genetically transmitted instincts.

Just as instinctual behavior is subject to change and evolution so too is culturally constrained behavior. Just as instinct supports survival so does culture. Without a culture an individual human being or a society of humans would find it difficult to survive. In

Stone Age societies banishment was literally a death sentence. If the environment undergoes a dramatic change the instincts that were inherited from a previous time could be detrimental to survival and they will certainly undergo a change and evolution if the species is to survive. The same is true of culture. As the environment changes so will the culture so as to be a benefit to those who possess it. If not the society will not survive. There are in fact historical examples of cultures that were unable to adapt to changing conditions, which perished or were transformed into very different cultures.

I have taken the liberty of transforming a paragraph of Christiansen, Dale, Ellefson and Conway (2002) by replacing the word “language” with the word “culture” to arrive at some interesting thoughts about the nature of culture and its evolution. By making this substitution I have generalized and expanded Christiansen's (1994) notion of “language as an organism” to the idea that culture can also be considered as an organism in the same metaphorical sense.

Culture exists only because humans can learn, produce, and process them. Without humans there would be no *culture*. It therefore makes sense to construe *cultures* as organisms that have had to adapt themselves through natural selection to fit a particular ecological niche: the human brain. In order for *cultures* to “survive”, they must adapt to the properties of the human learning and processing mechanisms. This is not to say that having a *culture* does not confer selective advantages onto humans. It seems clear that humans with superior *cultural* abilities are likely to have a selective advantage over other humans... What is often not appreciated is that the selection forces working on *culture* to fit humans are significantly stronger than the selection pressures on humans to be able to use *culture*. In the case of the former, a *culture* can only survive if it is learnable and processable by humans.

On the other hand, adaptation toward *culture* use is merely one out of many selective pressures working on humans (such as, for example, being able to avoid predators and find food). Whereas humans can survive without *culture*, the opposite is not the case. Thus, *culture* is more likely to have adapted itself to its human hosts than the other way around. *Cultures* that are hard for humans to learn simply die out, or more likely, do not come into existence at all.

The above quote is from Christiansen, Dale, Ellefson and Conway (in press, pp. 144-45) and has been altered by substituting the word *culture(s)* for *language(s)*. It suggests that culture like language can also be regarded as an organism that evolved to be easily acquired and preserved.

If culture is an organism, as we have posited, then its replication requires something analogous to genes, the replicators of biological systems. Richard Dawkins (1989) in his book *The Selfish Gene* has identified an analog to genes with his introduction of the meme as a cultural replicator. Dawkins considered the cultural meme as a way of extending Darwin's theory of evolution from biological systems to cultural or social systems.

I developed the idea of the 'cultural meme' as a way of dramatizing that fact that genes aren't everything in the world of Darwinism....The meme, the unit of cultural inheritance, ties into the idea of the replicator as the fundamental unit of Darwinism. The replicator can be anything that replicates itself and exerts some power over the world to increase or decrease its probability of being replicated (Dawkins 1996. pp. 80-81).

There is still another interesting (and I might add highly speculative) consequence of extending Christiansen's (1994) metaphor of language as an organism to culture and as a result to

regard culture as an organism as well. Christiansen argued that language in order to survive had to evolve in such a way as to adapt itself “to fit the human learning and processing mechanism.” He then argued that this was the mechanism that led to the universality of the characteristics of human language or to Universal Grammar (UG) as first identified by Chomsky. If natural selection acting on language as an organism led to the UG then we should expect natural selection acting on culture as an organism should lead to a universal set of rules that govern the social interactions within a culture which we might wish to call Universal Culture (UC), i.e. the set of universal elements which characterize all human cultures. The universals would include such elements as: language, marriage, kinship relations, gossip and taboos. Brown (1991, pp. 130-41) has catalogued all those aspects of human culture, which are universal or “near-universal”. He has compiled a list of over 100 items that characterize all cultures right across the world that support the hypothesis of Universal Culture.

Can Technology and Media Be Treated as Natural Systems Subject to the Principles of Ecology

If language and culture can be regarded as organisms we can now think of technology and media as organisms as well that evolved to fit human biological needs. Because media and technologies are each a component of culture, which we have argued can be treated as an organism it follows that they too can be treated as organisms. It is well known that media and technologies like languages and cultures evolve in a manner very similar to that of biotic organisms. Now we are in a position to talk about media ecology as the study of the interactions of agents acting as organisms.

When we speak of language and culture as organisms that reproduce themselves we are talking about the language and culture of an individual speaker or member of society. Language and culture are replicated through the social interactions of a new

member of a society with their parents, caregivers and other conspecifics they interact with. The language or culture of a society may be regarded as a species made up of the individual language and culture organisms of each member of the society. It is only the conspecifics of these societal species of language and culture that can interact and communicate with each other.

The following McLuhan (1995) quotes supports the notion that media and technology are on an equal par with nature.

The new media are not bridges between man and nature; they are nature – 1969, p. 272.

Extending McLuhan's thought Arthur Kroker (2000), a McLuhan scholar, argues that "technology has genuinely come alive as a living species... It has acquired organicity... It has its own forms of intelligence... its own principles of dynamic growth..."

Kroker's line at first glance seems like hyperbole a form of technohype but actually I believe he makes a good point if one considers language as a technology as has been suggested by McLuhan and combine that with the notion of Christiansen (1994) that language can be thought of as a living organism.

A Medium is a Technology is a Tool is a Language is a Medium is a...

My line of research (Logan 2000, 2006a, in press) on the origin and evolution of language led me to the conclusion that a media ecology approach connects all aspects of communication and informatics and embraces not only the study of media but also the study of technology and language and the interaction of these three domains all of which form an ecosystem. A media ecologist must therefore incorporate the history of technology and linguistics into their study of media.

In our discussion up to this point and throughout this paper the use of the terms media, technology and tools is somewhat synonymous as was the case with McLuhan:

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. Words are a kind of information retrieval that can range over the total environment and experience at high speed. Words are complex systems of metaphors and symbols that translate experience into our uttered or outered senses. They are a technology of explicitness. By means of translation of immediate sense experience into vocal symbols the entire world can be evoked and retrieved at any instant. (McLuhan 1964, p. 56)

Today we are beginning to realize that new media are... new languages with new and unique powers of expression. 1957
McLuhan (1995, pp. 272)

If a language contrived and used by many people is a mass medium, any one of our new media is in a sense a new language, a new codification of experience collectively achieved by new work habits and inclusive collective awareness. — 1960

Ads, comics, and movies are not codes... but basic languages. — 1960 (ibid., p. 273)

A medium of communication, for example, is in a certain sense a tool or a technology. The movable type printing press is both a tool or technology and a medium of communication. The mechanism that made the movable type printing press was a tool or technology

whereas the function of the printing press was that of a medium of communication.

As a consequence of this argument, the distinction between technological inventions and media of communication is somewhat arbitrary. I use the term "technology" in its broadest sense, as did McLuhan, to include not only hardware (machinery) but also all forms of communication and information processing, including the languages of speech, writing, mathematics, science, computing and the Internet (Logan 2004). The fact that computers are referred to as information technology supports my notion that the distinction between media, language and technology is an artificial one. The term technology stems from the ancient Greek word *technologia*, which means a systematic treatment, which itself is derived from *techne* the ancient Greek word meaning art and *logos* meaning guiding principle.

Media such as the book, the telephone, radio, and television differ from tools such as the hammer, the bulldozer, the airplane, and the light bulb, but there are also some very important overlaps. The most obvious one is that all media function as tools serving our needs and all consist of some form of technology. One can also argue, however, that technologies become media, for example in the case of the light bulb when it is used to spell out advertising slogans. The road, the canal, and the railroad are also technologies that serve as media for the automobile, the ship, and the train, respectively. The automobile, the ship, and the train have as their content passengers and freight.

There is a certain interchangeability between language, technology and media. A language is both a technology and a medium. A technology is a medium and it may also be considered a language since it possesses both a lexicon (i.e. its parts) and a syntax (i.e., the procedures for its composition and its use). Finally, a medium is some form of technology and also in a certain sense a language. If

this is the case then why have we created three categories to distinguish between media, technology and language. What we have are three separate phenomena, which were narrowly defined but became related to each other through the construction of metaphors. Language once referred to exclusively to speech as the etymology of the word indicates. Langue in French is both a language and the tongue and in English tongue refers to either a language or the organ in the mouth required for speech. A technology originally referred to a hardware-configured tool but came to denote any technique for organizing information or work. A medium in media studies originally referred to an environment through which communications was mediated but McLuhan expanded the scope of the term by showing how technologies such as the clock or the assembly line had effects very similar to traditional communication media such as the printing press or the telegraph.

The study of media, language and technology and their effects revealed the overlap of these three categories. Languages and technologies mediate and create environments like media. Media and languages are both techniques and tools just like any other form of technology. Media and technologies are languages of expression, which like a language communicate information with their own unique semantics and syntax. Given these overlaps we claim that the ecological study of media cannot be restricted to narrowly defined media of communication, but must also include technology and language and the interactions of these three domains, which together form a media ecosystem.

Ecosystems whether they are biological or media-based evolve as the constituents of which they are composed co-evolve through their interactions with each other. The five communications eras of humankind: the pre-verbal mimetic era, the oral tradition, the literary age, the electric mass media era and the current new media or digital age represent the various stages in the evolution of the

media ecosystem from the origins of human life to today's communication environment (Logan 2002).

The Emergence of the Symbolosphere and the Technosphere

With the emergence of human tools and language three new forms of interrelated organization began to propagate, namely natural language, culture and technology (Kauffman et al. 2006). Humans became the first creatures whose cultural evolution as embodied in their language and their technology outstripped their biological or genetic evolution. Non-human biotic systems maximized the propagation of their organization by probing the Adjacent Possible (Kauffman 2000) of DNA mutations and allowing natural selection to optimize their chances for survival.

With language and technology humans probed the Adjacent Possible of the symbolosphere (Schumann 2003a&b, Logan and Schumann 2005) of symbolic language and the technosphere of technology or tools. As was the case with biotic or genetic evolution natural selection chose those possibilities, which optimize the propagation of human organization. In the case of languages this resulted in languages that could be automatically learned by infants and as a result possessed the Universal Grammar that Noam Chomsky identified. In the case of technology it resulted in the language of Strategic Creativity (Manu and Logan in preparation) in which those technologies in the Adjacent Possible that optimized the propagation of organization are chosen by natural selection. As creatures in the ecosphere we propagated our organization genetically. As creators operating in the spaces of the symbolosphere and the technosphere we humans found another channel for the propagation of our organization, namely, language, culture and technology.

**Emergence – the Hidden Message in McLuhan’s One-Liner:
The Medium is the Message**

In this section we will demonstrate the power of a biological approach to media ecology by showing that the hidden message in McLuhan's monumental observation and aphorism, **the medium is the message**, was emergence. We will show that language, media and technologies are emergent phenomena and that emergence explains why content analysis is doomed to failure and why the medium is the message.

We begin with the observation that natural language is an emergent phenomenon in that: 1) its properties cannot be derived from, predicted from or reduced to the properties of the components or subsystems of which it is composed; and 2) it represents a more complex level of organization than its components. These two conditions form the classic definition of emergence. The components of which natural language is composed includes phonemic articulation, vocal imitation, phonemic generativity, lexical creation, conceptual representation, comprehension, a theory of mind, joint attention, altruistic behaviour, syntax, grammaticalization, and generativity of propositions. Speech also serves two functions, that of social communication and conceptualization or a medium for abstract thought.

Natural language represents an emergent phenomenon because its properties cannot be reduced to the properties of the components of which it is composed listed above. Living organisms or autonomous agents are also examples of emergent phenomena. A living organism acts on its own behalf to propagate its organization (Kauffman et al 2006). It evolves so as to maximize its ability to propagate its organization. The same may be said of language, which can be treated as an organism that evolves so that it is easily learned insuring the propagation of its organization.

The same argument can be extended to culture and the products of culture, namely media and technologies. We have already

demonstrated that culture, media and technologies can be treated like organisms that propagate their organization and evolve in a manner similar to language and biotic agents or organisms. Culture, media and technologies are also emergent phenomena is that they satisfy the two criteria for classical emergence, namely,

1. they represent a more complex level of organization than their components, and
2. their properties cannot be derived from or predicted from the properties of the components of which they are composed.

The fact that media are emergent phenomena provides an insight into McLuhan's famous aphorism, "the medium is the message." One of the components of a medium is its content. The other components are the technological mechanisms by which the content is communicated. Content analysis attempts to understand the properties or effects of a medium by studying only one of its components, namely its contents. Because media are emergent phenomena this course of action is doomed to fail. The properties of an emergent system cannot be determined by the properties of its components let alone the property of a single component. McLuhan arrived at his formulation "the medium is the message" by carefully studying the effects of all the components that make up a medium.

The analysis that we have made making use of the basic biology of emergence demonstrates the importance of the application of biology in general and emergence theory in particular in the study of media ecology. The emergence argument is not needed to justify the notion that the medium is the message. Every media ecologist understands the importance of this basic concept of the media ecology canon. For those who are skeptical or for those who still pursue content analysis to the exclusion of understanding the emergent properties of media, however, this argument might help them to understand the basic idea behind the medium is the message from which so much of media ecology emanates.

The Application of Ecological Concepts to Understanding Media

Let us think of a medium as an organism that receives and processes information and then provides new information output to its environment. The environment then processes the output of this medium making new information available to that medium. This sort of feedback dynamics is the basis of media ecology theory. The particular properties or behaviours of media bring about changes in their environment, which effect the other media with which they interact. These affected media's complex responses, products of their own internal changes in turn further alter the shared environment and hence impact on each individual medium in the media ecosystem.

The behaviour of an individual organism brings about changes in the other organisms with which they interact and hence changes the ecosystem, which in turn effects the behaviour of that particular organism. Therefore to understand one organism one must understand the behaviour of all the other organisms in the ecosystem. McLuhan believed that this principle held for media as well as the following quotes suggest (McLuhan 1995, p. 277):

You must be literate in umpteen media to be really "literate" nowadays. — 1966

Understanding several media simultaneously is the best way of approaching any one of them. Any study of one medium helps us to understand all others.— 1964

An additional complication when considering the ecosystem of media is the human users of media that communicate and interact with each other through these media. Each medium changes the interactions of those humans and the interactions change the way in

which the media are used and what their content becomes. This is an extra-dimension of media ecology that we will only identify at this time leaving its incorporation in our understanding of media ecology to future study and research.

The Ecosystem is the Medium and the Message

Media ecology can be expanded in still another direction by considering a biological ecosystem or a living organism as a medium and apply the lessons of media ecology to it.

The lessons of media ecology would include such notions as McLuhan's laws of the media, 'the medium is the message', 'user is the content', figure/ground analysis, 'the content of a new medium is an older medium', service and disservice of new media' and Innis' space/time analysis and 'monopoly of knowledge'. Let's illustrate with a few examples for certain biological organisms or ecosystems.

Laws of the Media:

What does a new species enhance?

The propagation of the organization of the new species.

What does it obsolesce?

The species from which it evolved.

What does it retrieve from the past?

Most of the genes of the species from which it evolved.

Pushed hard enough what does it flip into?

The probing of the Adjacent Possible and the next step in the evolution of the species.

User is the content: viral infections in which the virus invades a cell and takes over its metabolism to replicate itself.

Service and disservice of media: Every new evolutionary adaptation is both service and disservice. Bipedalism allowed genus Homo the use of their hands to make tools but at the sacrifice of losing the safety of the treetops.

The content of a new medium is an older medium: Vestigial structures. The content of the cells of eukaryotes or multi-celled creatures are prokaryote bacteria and a simpler prokaryote, the mitochondria.

Figure/ground analysis: McLuhan could have borrowed the idea from ecology or cybernetics or maybe he developed it independently. The idea of a systems approach arose in many places throughout the twentieth century and late nineteenth century. Emergence theory, complexity theory or non-linear dynamic systems are becoming standard tools in the study of ecosystems and parallel figure/ground analyses. The figure is a particular organism and the ground is the ecosystem.

Media ecology can inform biological ecology, evolution and emergence (or complexity theory) and, vice-versa, these fields can inform media ecology. The ecosystem is both the medium and the message. It is the medium in which all of its constituent parts emerge, co-evolve and interact. The ecosystem is itself an emergent phenomenon in the sense that its behaviour or properties can not be derived from, predicted from or reduced to those of the components that make up the ecosystem. For example this analysis applies with equal validity to a biological ecosystem or a media ecosystem. In both cases we are dealing with a highly interactive non-linear dynamic system. Gaea is an emergent phenomenon whose properties cannot be reduced to those of all the components of the biosphere and the abiotic physical environment. And similarly the mediasphere (Logan 2006b) is also an emergent phenomenon whose properties cannot be reduced to the properties of all the

media that make up the mediasphere and the humans that use these media to communicate and to represent reality.

While the logic of these arguments may have merit their practical application will not be easy. Traditionally media ecologists have not studied biology, evolution and emergence in depth nor have biologists paid much attention to media ecology. I believe, however, the marriage of these two interdisciplinary fields will yield many interesting results to both fields of study.

I have attempted to apply some of the biological concepts of evolution and emergence to media studies to understand the evolution and emergence of language, culture and technology and to suggest a new direction for media ecology. This paper has been highly speculative and preliminary but suggest that an expanded view of media ecology that embraces biology has merit. I offer this study with the hope that students of media ecology just entering the field will be motivated to develop a deeper understanding of biology and non-linear dynamics than my own.

References

Brown, Donald E. 1991. *Human Universals*. New York: MacGraw-Hill.

Christiansen, Morten. 1994. *Infinite languages finite minds: Connectionism, learning and linguistic structure*. Unpublished doctoral dissertation, Centre for Cognitive Studies, University of Edinburgh UK.

Christiansen and Ellefson. 2002. Linguistic adaptation without linguistic constraints: The role of sequential learning in language evolution. In A. Wray (ed), *The Transition to Language*. Oxford: Oxford University Press, pp 335-58.

Christiansen, M. H., R. Dale, M. Ellefson, and C. Conway. 2002. "The role of sequential learning in language evolution: Computational and experimental studies." In A. Cangelosi and D. Parisi (eds), *Simulating the Evolution of Language*. London: Springer-Verlag, pp. 165-187.

Dawkins, Richard. 1989 edition (originally published in 1976). *The Selfish Gene*. Oxford: Oxford University Press.

Deacon, Terrence. 1997. *Symbolic Species: The Co-evolution of the Brain and Language*. New York: W. W. Norton & Co.

Hayle, Katherine. 1999. "The Condition of Virtuality" In Peter Lunenfeld (ed), *The Digital Dialectic*. Cambridge MA: MIT Press.

Hood, L. and D. Galas. 2003. The digital code of DNA. *Nature* 421: 444-448.

Kauffman, Stuart. 2000. *Investigations*. Oxford: Oxford University Press.

Kauffman, Stuart and Philip Clayton. 2006. Emergence, autonomous agents, and organization. *Biology and Philosophy*.

Kauffman, Stuart, Robert K. Logan, Robert Este, Randy Goebel, David Hobill, and Ilya Shmulevich. 2006. Propagation of organization: An enquiry. Submitted to *Biology and Philosophy*.

Kroker Arthur. 2000. Code of Privilege. An online interview by Sharon Grace.

Logan, Robert K. 2000. The extended mind: understanding language and thought in terms of complexity and chaos theory. In Lance Strate (ed), 2000 *Communication and Speech Annual Vol. 14*. New York: The New York State Communication Association.

_____ 2002. The five ages of communication. *Explorations In Media Ecology* 1:13-20.

_____ 2004. *The Sixth Language: Learning a Living in the Internet Age*. Caldwell NJ: Blackburn Press (1st edition 2000. Toronto: Stoddart Publishing).

_____ 2006a. The extended mind model of the origin of language and culture. In Nathalie Gontier, Jean Paul Van Bendegem and Diederik Aerts (Eds). *Evolutionary epistemology, language and culture*. Dordrecht: Springer.

_____ 2006b. Neo-Dualism and the Bifurcation of the Symbolosphere into the Mediasphere and the Human Mind. *Semiotica*

_____ in press. *The Extended Mind: The Origin of language and Culture*. Toronto: University of Toronto Press.

Logan, Robert K. and Schumann, John. 2005. The symbolosphere, conceptualization, language and neo-dualism. *Semiotica* 155: 201-14.

MacKay, Douglas. 1969. *Information, Mechanism and Meaning*. Cambridge MA: MIT Press.

Manu, Alexander and Robert K. Logan. In preparation. *The Language of Strategic Creativity*

McLuhan, Marshall. 1995. A McLuhan Sourcebook assembled by William Kuhns. In Eric McLuhan and Frank Zingrone (eds) *Essential McLuhan*. Concord, ON: Anansi, pp. 272 & 276.

McLuhan, Marshall. 2004. *Understanding Me: Lectures and Interviews*. Stephanie McLuhan and David Staines (eds). Cambridge MA: MIT Press.

Schumann, John H. 2003a. The evolution of language: What evolved? Paper presented at the Colloquium on Derek Bickerton's Contributions to Creolistics and Related Fields, The Society for Pidgin and Creole Linguistics Summer Conference, Aug. 14-17, University of Hawaii, Honolulu.

_____ 2003b. The evolution of the symbolosphere. Great Ideas in the Social Sciences Lecture, UCLA Center for Governance, Nov. 21.