Biosemiotics and the New Paradigm

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Where are we and how did we get *here*?

Of all the important and deeply pre-occupying questions that have fascinated humans through the ages, one of the most troublesome is that of the dichotomy between 'experience' and 'reality'. This dichotomy was posited as the 'essential human condition' as early as the Upanishads - Indian philosophical texts written somewhere around the 9th century BCE. (Favareau 2010:5) And it has continued to fascinate us ever since, not surprisingly given that the basis of our life experience is subjective, but we also experience a world 'out there' that appears to be independent of our minds. The history of scientific thought is too much to go into here, but suffice it to say that somewhere along the way, the idea of a 'reliably traversable bridge' between mind-dependent experience and mind-independent reality disappeared. (Favareau 2010:5-6) Francis Bacon and René Descartes certainly had something to do with it, in that they both seemed to mistrust their own minds, viewing it as somewhat like an 'impenetrable glass through which we see the world darkly, rather than face to face'. (Favareau 2010:21) The 'priority of signs to objects became lost from view and (thus the) objects of experience become not a partial revelation of surrounding nature and culture, but a screen separating the mind from things'. (Deely 2001:520) They felt that the mind clouded their quest for absolute truth, and sought a mechanism that could remove the fallibility of the human mind from science altogether. (Favareau 2010:25) Descartes was very successful in elucidating his ideas, in that following him there was a distinct split between material reality and knowing reality - the famous mind-body dualism. Along with this, both Descartes and Bacon viewed consciousness as a solely human quality, and as such it became less important in the study of the natural world - if most of its animal occupants did not have consciousness then it could not be that important. (Favareau 2010:28) Consequently we inherit the idea of mind-body dualism, and the idea that animals are like machines - just an interaction of parts with no feelings or consciousness. This led to the advent of reductionism - the idea that these 'machines' are no more than the sum of their parts, and that complex systems (e.g. an animal) can be reduced to accounts of individual components of the system. This essay will explore some ideas in science that are leading to a paradigm shift, and the idea of holism. Although there are many threads that could be followed on this subject, the focus will be on biosemiotics as a model that could provide both subjective and objective methodologies in holistic science.

Emergence of a new paradigm

Indeed, science has moved on since the time of Bacon and Descartes, and science is moving back in the direction of a unified explanation. I will discuss briefly two aspects of science that helped cause this shift - the idea in physics of oneness or holism, and the idea of epigenetics in biology.

Holism and physics

But what is holism? Very simply put holism is the idea that all is one. If we see that all is connected, the whole must necessarily include consciousness, and thus the subjective experience, as part and parcel of life. Ironically, we can take a reductionist approach to break down holism into some innate qualities that allow us to gain a deeper understanding, as detailed below.

- Wholeness or Oneness

Previously, classical science thought that elementary particles were the building blocks of the universe, and the study of them could explain everything. Einstein's theory of relativity was an indicator that science was on the wrong track though, implying that no coherent concept of independently existent particles is actually possible. So, if the particle concept was no longer to be taken as a primary basis for understanding the universe, what was to replace this idea? David Bohm found that beyond the level of the particle, is 'the complex movement of electromagnetic fields, in the form of light waves'. (Bohm 1990:174)

This unified field is an 'undivided wholeness in flowing movement...(a view) that implies that flow is, in some sense, prior to that of the 'things' (or particles) that can be seen to form & dissolve in this flow'. (Bohm 1990:151) It is from this 'field' or foundation that particles are manifest. He named this undivided, dynamically flowing wholeness, the 'holomovement', and said that 'in its totality the holomovement is not limited in any specifiable way at all....thus the holomovement is undefinable and immeasurable'. (Bohm 1990:151)

- Holographic in nature

This is the idea that, like in a holographic plate, the whole picture can be seen in each part, and each part can be seen in the whole. Henri Bortoft's distinction between counterfeit and authentic wholes rests upon this idea. (Bortoft 2007:3) Authentic wholes can be thought of as somewhat like a holographic plate. Conventional thinking follows a linear, summative course, and places the whole secondary to the parts - the whole emerges as a result of adding up the parts, but this is not how a holographic plate works - the whole is present in all the parts even if less clearly defined in small parts. But neither is the whole prior to the parts - the parts do not come from the whole, the whole is not a transcendent 'super-part', in the words of Henri Bortoft. (Bortoft 2007:10) To try to understand the whole in a linear fashion, moving either from the whole to the parts or vice versa, will always result in a counterfeit or dualistic whole. As Henri describes it; 'the whole emerges simultaneously with the accumulation of the parts, not because it is the sum of the parts, but because it is immanent within them'. (Bortoft 2007:12) He also describes the character of this emergence of the whole as the 'unfolding of enfolding, so that the parts are the place of the whole where it bodies forth into presence'. (Bortoft 2007:11) This is similar to Bohm's description of an implicate and explicate order. He describes the holomovement as a 'vast, rich, unending flux of enfoldment and unfoldment'. (Bohm 1990:51) The implicate order contains everything enfolded within it, and the explicate order is 'the place of the whole where it bodies forth into presence' through the manifest. The whole could be seen as the potential of all things. The implicate order is not manifest and so could be seen as 'empty'. This 'emptiness', however, allows for the 'fullness' of potentiality - in its emptiness it contains the potential for everything! (Bohm1990:191)

- Emergence and Unpredictability

An important part of holistic vision is the focus on the relationships between things, rather than on the things themselves. This interconnectedness of systems leads to the understanding that the behaviour of even quite simple systems is very hard to predict - there are so many connections and thus potential actions within the system. Jan Smuts defined holism as a tendency to form wholes that are greater than the parts through creative evolution. (Freeman 2005:154) It is this interconnectedness of the parts that allows flexibility in options, and thus creative evolution to occur.

Loving Compassion

A true understanding of the concept of holism naturally leads to feelings of loving compassion for all other beings. With a worldview of unity, 'other' becomes self, and loving compassion is enhanced;

"Knowing the universe to be non-dual reveals our connection with all of life. We are not apart in any sense; we do not act upon the world - we are utterly in and of the world. When that is known, our motivation becomes naturally compassionate, and our wish is to do that which circumstances show to be needed, as best as we are able to see it."

(Morgan 2010:2)

Due to these, and other ideas in physics, the role of 'information' and 'meaning' are beginning to assume a fundamental role, and a concept of 'it from bit' has been introduced, symbolizing 'the idea that every item of the physical world has at bottom, at a very deep bottom, an immaterial source and explanation, in short that all things physical are information-theoretic in origin'. (Ogryzko 1997:1)

Biology and the information problem.

Von Baer's discovery of epigenetic development of fertilized ovum into structures expressing hereditary traits added to this paradigm shift by opening up the 'problem of information' in biology. Information under the Cartesian model of mind-body dualism could be one of two things; either a relation proper only to the mind, or a pure product of material interactions. (Favareau 2010:29) Neither of these definitions were satisfactory to explain epigenetics, and so new explanations are being sought.

How can we integrate this into science?

There have been scientists in the past attempting to get at this dynamical nature of life, with the inclusion of the subjective - notably Johann Wolfgang Von Goethe. He developed a methodology that not only included the subjective, but actively used it.

Goethe outlined a four-stepped process to bring rigor to the use of sensory faculties in determining information about the external environment, and to allow the observer to 'see' the process of 'coming-into-being' - the dynamic, constantly flowing, essence of life. (Bortoft 2007:33) Although Goethe made an important contribution to the development of science with his emphasis on a new way of seeing, his methodology is limited in its applicability. For example, precisely because of the placement of the subjective at the centre of his methodology, it requires practice and time. In herbal medicine Goethean research has been conducted on the medicinal properties of plants, but because it requires time, quite a lot of people, and consensus to be reached amongst these people, it tells us not much more than whether a plant is warming or cooling. (Robertson & Robertson 2006) It is also hard to see how Goethean methodology could be applied to, for example, physiological processes inside the body. Thus we arrive at bio-semiotics - a more interdisciplinary approach to the study of information and sign processes in life, that has developed from a lineage of scientists such as Goethe.

The basics of Biosemiotics.

The word is made up from the Greek *bios*, meaning life, and *semeion*, meaning sign, and can thus be interpreted to mean the study of the production, action, and interpretation of signs in the biological realm of life. It represents this paradigmatic shift in the Western view of life, suggesting that semiosis is life's intrinsic feature. (Kull 2003:15) It could be thought of as the study of the language of life - language in this context is used in a wider sense than that of the human realm, rather of the language of *signs* that is common to all living things. It explores the *processes* by which information is generated, communicated, and acted upon in the world - it is the scientific understanding of how the subjective experience of organisms (which is different depending on their biological structure and organization) 'comes to play a genuinely causal role in the ongoing co-organization of nature'. (Favareau 2010:43) However, biosemiotics gets at the generation of information beyond the material level also, as will be revealed by Peirce's thinking below. The important points to note in this paradigm shift are; the undivided nature of the universe, the re-definition of consciousness to mean something more than just a human faculty (i.e. self-awareness of some type as an intrinsic feature of life), and the central importance of information and its processes in life and the organization of nature.

Peirce's vision

It is beyond the scope of this essay to delve deeply into biosemiotics, but a description of some of Charles Peirce's ideas are necessary for his ideas underpin much of what has since developed in this field. Rather like Bohm and Goethe, he saw the universe as a 'continuous seething fabric' of energy, that he described as being 'governed by general habit taking tendency'. (Arning 2009:97) Peirce developed a systemization of logic that was triadic. He felt that genuinely triadic relations could not be reduced to monadic or dyadic relations, and that anything that appeared as a larger polyadic relation could be analyzed in terms of a triadic relation. (Favareau 2010:39) This informed his work on semiotics, and thus he conceived of a triadic sign relation between *sign*, *object*, and *interpretant*. (El-Hani et al 2007:27) He also denoted categories that applied to this triadic relation - firstness, secondness, and thirdness. (Favareau 2010:40) For Peirce, sign relations were a species of a larger genus of relations by which 'potentiality becomes actualized, and the actualized interacts with other likewise realized actualities so as to result in a pattern'. (Favareau 2010:40) We can see that Peirce was referring to 'the scientifically examinable (and scientifically necessary) relations of *possibility*, *actualized existence*, and *law*'. (Favareau 2010:40) This reveals the profound depth of Peirce's thinking - he was tackling the subject, really, of how the universe came about and how it continues to be. As Favareau says;

> *"The very "beginning" of our contemporary cosmos was a single point of undifferentiated energy (if, indeed, "energy" is not already too sophisticated a term) whose "development" into our current universe is nothing other than the history of its successive recursive change as, at each point, literal physical possibilities are made available only as the result of immediately preceding action, and as one of those possibilities is actualized, a new and slightly changed set of possibilities (and constraints) come into being. Thus, we see (retrospectively): the uncoupling of the unified force, which results in the generation of quarks that then makes possible the generation of hadrons, the results of whose interaction in the rapidly cooling universe gives rise to the existence of neutrons, that can then later join together with the protons to form the universe of atoms that. . .ad infinitum."*
>
> (Favareau 2010:40)

A brief description of the triadic notion of sign relations and categories is necessary at this point, as detailed below.

Peirce's Categories

1. Firstness: This refers to the sign in the triadic model, and describes the current state of the world which is present to the perceiving agent as an unlabeled 'raw feel' - in its firstness. (Favareau 2010:40) It describes pure sensation, prior to the conscious perception and ascribing of meaning. Peirce talked of this phase consisting of consciousness that is not distinguished from any other 'stretch' of consciousness. (Arning 2010:111)
2. Secondness: This refers to the object in the triadic model of sign relations. This is when the sensations of firstness are *perceived*, and thus sensations are turned from a web of 'brute sensations' into a web of meaningful perceptions. (Favareau 2010:41)
3.Thirdness: This refers to the interpretant in the triadic model. Once the sensations, perceptions, and the relations within that web (i.e. of sensations to perceptions, perceptions to other perceptions) become representable as signs in their own right, the re-contextualisation of firstness and secondness (sensation and perception) into symbolic 'understanding' occurs. (Favareau 2010:41) This is the phase in which habit or pattern forms - it could be seen as a triadic relation between sign, object, and interpretant that has been played out so many times as to become 'set'.

The ever-changing interconnected web

If we look back at the description of thirdness, or the interpretant, we can see that it is a reaction to something - i.e. a change brought about due to the interpretation of a sign by an object. So an interpretant necessarily becomes a sign itself, and thus life is made up of a continual process of semiosis. (El-Hani et al 2007:29) This gives a further insight into the holistic nature of biosemiotics, in that it respects the interconnected complex web of relations, and is in constant flux - there is no final sign, only a constant generation of ever-changing signs.

The categories and Goethe's methodology

Peirce also believed that 'ultimate truth was accessible to inquiring minds through non-rational channels'. (Arning 2010:97) The categories described above have been compared to different modes of consciousness, and one author has described the stages through the process of Vipassana meditation. (Arning 2010:108-112) In this comparison thirdness has been related to the *reactions* of the human mind to sensations and perceptions - this is seen as the realm in which we are 'at the mercy of our minds', which may mistake fleeting moods for reality. (Arning 2010:108) When lost in this realm, we are often unaware of what is *happening now.* The process of Vipassana meditation encourages a move away from these reactions, into the realm of secondness - pure sensations with no analysis or judgment of them. With commitment and practice, this may lead to an experience of firstness - undistinguished consciousness. This could perhaps be comparable to Goethe's methodology, where he advocated the use of the senses to directly perceive nature - in other words, quietening the reactions of the mind to enable clearer sensation of what is really there. Henri Bortoft talks of this as a quality of seeing that can 'bring out' the seen thing - in other words it is a participatory experience between the observed and the observer. (Bortoft 2007:279) Peirce's description of firstness sounds somewhat like Goethe's description of the 'Ur-phenomenon' - the *process* that flows through *form*. This, to me, sounds almost like a stage that is in between the unmanifest and the manifest - it is the flow of energy that has some intentionality to 'become' something material. Peirce's description of a further category - zeroness - on the other hand, sounds more like Bohm's concept of the implicate order;

"Pure zero is prior to every first. The nothing of negation is the nothing of death, which comes second to, or after, everything. But this pure zero is the nothing of not having been born. It is the germinal nothing, in which the whole universe is involved or foreshadowed. As such it is absolutely undefined and unlimited possibility - boundless potential."

(Arning 2010:112-3)

Thus, it could be seen that Peirce was conceptualising a bridge between the implicate and explicate orders - a process through which the unmanifest becomes manifest, or comes-into-being as Henri Bortoft might say. Zeroness is the implicate order, firstness is the bridge between the orders where consciousness and energy are becoming organized but not yet manifest as material, and secondness and thirdness are the manifestations of that organization.

Does biosemiotics see both upstream and downstream at the same time?
Biosemiotics can be seen as sign-posts that have been erected to point at the processes that have already occurred in the 'coming-into-being' of things (downstream). But it also shows us a process by which things might, in the present, come-into-being (upstream). This can be illustrated through Henri Bortoft's discussion on language. Once language has already come-into-being, then it can be seen as just a *re-presentation* of something, and downstream. (Bortoft 2007:314) But in its creation it is 'upstream' in that the word and the meaning cannot be separated, they are created together, at the same time - as one whole. (Bortoft 2007:315) He refers to the story of Helen Keller first grasping that a particular movement of the hands was a sign, and that this sign had meaning, and says that language is unique in that it is not just perception, but meaningful perception i.e. that language is the grasping of perception and meaning *at the same time*, and that through this it represents the 'upstream' coming-into-being of things. (Bortoft 2007:315) This idea of the creation of language can likewise be applied to the creation of any kind of sign. By studying the processes of sign relations, biosemiotics tries to get at both the coming-into-being of language (i.e. the creation of signs/language), and the continuation of signs/language once meaning has been ascribed (i.e. the formation of patterns or habits).

Can biosemiotics represent both causal and non-causal relationships?
Although it has been mentioned above that biosemiotics helps to understand the subjective experience of different organisms in playing a *causal* role in the organization of nature, it is also trying to get at the *non-causal* nature of complex, living systems. If we think of Henri's description of language, when a word or a sign is first created is there a causal relationship? The assignation of meaning is novel - it was not there previously, a leap into the unknown is made, and a new connection formed - perhaps this represents the non-causal relationship.

In conclusion
We have explored briefly the historical context leading up to the emerging paradigm shift in science, what biosemiotics is, why it is holistic, and how it is qualitative and can be applied subjectively. But how is it more applicable to science than Goethe's methodology? The application of Peirce's categories to internal thought processes is somewhat like Goethe's methodology - they both require practice, commitment, and discernment. So they both face the problems of trusting one's own, and other peoples, discernment between internal and external stimuli. They also both, in this respect, are based on the subjective experience, and as such may be questionable as 'evidence' in current science. What sets biosemiotics apart is the fact that it provides a conceptual framework with which to view sign processes from an objective perspective - inasmuch as this is possible, given that our entire experience of life is subjective. Perhaps biosemiotics also provides the conceptual framework for a bridge between mind-dependent experience and mind-independent reality. The triadic model of biosemiotics can be used to try to understand the workings of, for example, the immune system. El-Hani and colleagues have applied this model to the functioning of B-cells in the immune system to try to further understand the way information is generated and communicated within the body. Of course, as in any other area of study, biosemiotics faces the 'problem of the observer' as described by Thure von Uexkull, another important figure in biosemiotics. As mentioned above, each organism's means of semiosis is constrained by their particular biological structure and organization, and thus they have different methods of sign generation and processes, and so we get the branches of phytosemiotics (plants) and zoosemiotics (animals), as well as anthroposemiotics (human). Uexkull says that within the human body we deal with phytosemiotic sign-processes that occur within and between cells, which are regulated by zoosemiotic sign-processes that occur in the physiological functioning of the body, and anthroposemiotic sign-processes in our experience of the body and in the study of it. Thus medicine constantly deals with 'the problem of how phyto-, zoo-, and anthroposemiotic sign processes are interrelated in sickness and in health'. (Uexkull 1984:187) It also deals with the problem of how the human observer can grasp the meaning of the sign processes of other living beings with only our own anthroposemiotic concepts. (Uexkull 1984:187) So, while biosemiotics reveals itself to be deeply holistic and interdisciplinary in its philosophical grounding, it requires further study into the actual practicalities of application in science. There is, however, great potential.

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