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How Can the Study of the Humanities Inform the Study of Biosemiotics?

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Abstract This essay – a collection of contributions from 10 scholars working in the field of biosemiotics and the humanities – considers nature in culture. It frames this by asking the question ‘Why does biosemiotics need the humanities?’. Each author writes from the background of their own disciplinary perspective in order to throw light upon their interdisciplinary engagement with biosemiotics. We start with Donald Favareau, whose originary disciplinary home is ethnomethodology and linguistics, and then move on to Paul Cobley’s contribution on general semiotics and Kalevi Kull’s on biosemiotics. This is followed by Cobley (again) with Frederick Stjernfelt who contribute on biosemiotics and learning, then Gerald Ostdiek from philosophy, and Morten Tønnessen focusing upon ethics in particular. Myrdene Anderson writes from anthropology, while Timo Maran and Louise Westling provide a view from literary study. The essay closes with Wendy Wheeler reflecting on the movement of biosemiotics as a challenge, often via the ecological humanities, to the kind of so-called ‘postmodern’ thinking that has dominated humanities critical thought in the universities for the past 40 years. Virtually all the matters gestured to in outline above are discussed in much more satisfying detail in the topics which follow.

Keywords Semiotics · Biosemiotics · Science · Humanities · Anthropology · Ethnomethodology · Linguistics · Philosophy · Literature · Critical theory · Ethics · Evolution · Metaphor · Poetry · Learning

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Introduction – Wendy Wheeler

As is well known, biosemiotics originated in the coming together of humanities insights into signs and meaning-making with the scientific study of biological life. Quite separately initially, semioticians in the humanities and biologists in the life sciences realised that life, right from the beginning, is concerned with the reading and interpretation of phenomena. Just as human communication has aspects which can appear mechanical (word and idea habitual associations, for example), so biological responses can appear mechanical similarly. But the idea of *information* amongst the living cannot be a mechanical thing. To be alive is to care, or to *mind*, about survival, reproduction and the capacity to adapt to change (more often than not from environmental pressures). This means to care about what appears in your world, or, more specifically, your *umwelt*. Care, however, is above all a feeling which must, perforce, be made sense of (or interpreted). But feelings, as the word suggests, arise in enworlded flesh.

In other words, in order to survive and flourish, organisms must have intentional experience and purposes. These are relations to objects, but not necessarily to things (Deely 2009b, 2015). And while to have a purpose is not necessarily to have that purpose consciously (as with all organisms, most of human cognition is not self-conscious), the having of purposes, in which some outcomes are preferred over others, means that the organism must attach significance to intentional phenomena appearing in the *umwelt*. Another way of talking about purposes and significances is simply to say that organisms simply *must* be able to make sense of news about those aspects of their environments which reach them. They *must* be able to derive meanings from the phenomena that “shine forth” for them (phenomenon, from Gk. *phainesthai* – to shine forth). The world of our senses does not reveal the whole world to us. Even at the level of simple objects, we sense only what we need to sense to get on with caring about being. This means that news of the world arrives in the form of signs that “stand in for” the world’s inaccessible plenitude: signs that shine and compel us. The world is opaque to creatures. It is, as the ancients understood it, veiled. One could say (although this would be to put things simply) that science begins when humans try systematically to understand what is hidden behind the veil of Isis. This means inspiration: first in terms of religion and philosophy, then, later, in theory, and collective rigour in observation and testing.

It should be obvious to anyone pursuing an evolutionary account of living organisms that the human use of signs and need for meanings could only be the result of similar processes in evolutionary history. Where else could human semiosis come from? We can say with some certainty that human minds are the way they are because they are a part of the natural world and they share its patterns and habits of evolutionary growth. Codes and channels, and the information they make possible, do not spring fully formed from the head of Zeus, appearing only in *Homo sapiens*. On the contrary, the species-specific form of human meaning-making (anthroposemiosis) is a particular and relatively small part of a more general semiotic capacity traceable throughout life all the way from behaviour to the primary decision-making wrapped into every cell.

But signs, as C.S. Peirce argued, have a structure, i.e. a pattern, common to all that lives. The articulation of these patterns, and their communication and meaning, in many different forms of imagining – in humans, gods, poetry, myth, and conversation with humans and nonhumans – is what the humanities study. This necessary meaning-

making capacity, common to all organisms and to the cells and systems they are made of, consists, from its most basic function to its most elaborated manifestations, in the pattern recognition and redundancy that allows the possibility of information. The world is not made of discrete and one-dimensional signals eliciting mechanical responses. The world is full of large and little changes in forms and contexts, thus potential meanings. Organisms must be able to “read” – i.e. interpret – these. Imagining this being done is what gives humans access to thinking about the possibilities of wider worlds, the makers and making of meanings, both within us and without us. (A “maker” in Gk. is a *poetes* or *poietes*.) The most basic form of this news tells us that our ontology derives from relations between semiotic objects, not simply from things. It is captured in Gregory Bateson’s well-known formulation of information as “a difference which makes a difference” (Bateson 1972: 459).

The basic patterns which shine forth for cognition, therefore, must be patterns of difference and (it follows) repetition (similarity). Based upon the primary experience of iconic signs, such patterns are lived forms of analogy, including the sufficiently analogous similarity and difference that the humanities identity as metaphor (Ricoeur 2003). In his book on metaphor, for example, Paul Ricoeur writes, about linguistic metaphor, something that we can easily translate into an evolutionary biological form whether in terms of codes or in terms of morphology:

Can one not say that the strategy of language at work in metaphor consists in obliterating the logical and established frontiers of language, in order to bring to light new resemblances the previous classification kept us from seeing? In other words, the power of metaphor would be to break an old categorization, in order to establish new logical frontiers on the ruins of their forerunners. (Ricoeur 2003: 233)

As with biosemioticians after him, Bateson recognised that there must exist a necessary unity between mind and nature (Bateson 2002). If that is the case, and the idea of natural metaphor is right, then mind and nature are joined by patterns which are rather more like poetry (which, like all literature, is semiotically recursive) than linear mechanical procedures. The more general form of semiotic organisation in which the book of nature is written (and that includes human bodies and minds, of course) is not deductive logic, but the much more widely applicable natural forms that Bateson called ‘syllogisms in grass’. Nature’s logic is informing, relational and poetic – semiotic, in other words. Thus poetry does not derive from anthroposemiosis but lives there because it belongs to the more general biosemiosis of nature. James A. Shapiro writes, “At a time when we pride ourselves for being able to read DNA sequences with increasing speed, it is salutary to keep in mind that we are still far from knowing how to interpret the complex overlapping meanings contained in the genomic texts we store in our databases. DNA, like poetry, often has to be read in several ways” (Shapiro 2012. See also Lin et al. 2011). And Bateson says similarly:

whether you approve or disapprove of poetry, dream and psychosis, the generalisation remains that biological data make sense – are connected together – by syllogisms in grass. The whole of animal behaviour, the whole of repetitive anatomy, and the whole of biological evolution – each of these vast realms is

within itself linked together by syllogisms in grass, whether the logicians like it or not. (Bateson and Bateson 1988: 27).

But as we know, evolution builds upon anterior developments. And that must mean not only that there is a place in scientific thinking for the creativity of metaphor as a real semiotically causal force of evolutionary change, but also that scientific logic itself depends, as Peirce claimed it did, upon the abductive, feelingful and aesthetic, insights – born of “*Il Lume Naturale*”, the fit between human mind and natural mind – that metaphor inscribes in living nature and in culture (Peirce 1891).

This essay – a collection of contributions from 10 scholars working in the field of biosemiotics and the humanities – considers nature in culture. It frames this by asking the question ‘Why does biosemiotics need the humanities?’. Each author writes from the background of their own disciplinary perspective in order to throw light upon their interdisciplinary engagement with biosemiotics. We start with Donald Favareau, whose originary disciplinary home is ethnomethodology and linguistics, and then move on to Paul Copley’s contribution on general semiotics and Kalevi Kull’s on biosemiotics. This is followed by Copley (again) with Frederick Stjernfelt who contribute on biosemiotics and learning, then Gerald Ostdiek from philosophy, and Morten Tønnessen focusing upon ethics in particular. Myrdene Anderson writes from anthropology, while Timo Maran and Louise Westling provide a view from literary study. The essay closes with Wendy Wheeler reflecting on the movement of biosemiotics as a challenge, often via the ecological humanities, to the kind of so-called ‘postmodern’ thinking that has dominated humanities critical thought in the universities for the past 40 years. Virtually all the matters I have gestured to in outline above are discussed in much more satisfying detail in the topics which follow.

Ethnomethodology – Donald Favareau

“How can the study of the humanities inform the study of biosemiotics?” seems like an odd question to ask, given how deeply interwoven the former is with the history and emergence of the latter. After all, Peirce was a philosopher, Sebeok was a linguist, Bateson was an anthropologist, and even Uexküll’s seminal contributions were attempts to experimentally explore the ideas of Kant.

Taking a contemporary biologist’s point of view, however, one can see how the question could reasonably arise: Humans – whose ways of being are, of course, the subject of the humanities – constitute one of the tiniest, most recent (and, in many ways, most anomalous) categories of “biological being”: What light could the study of such an unusual and highly specific way of life throw upon the more general and widespread processes of living being in toto?

What such biologists fail to realize, of course, is that for at least thirty years now, the position of biosemiotics – beginning with Sebeok and as most vociferously articulated by Deely (Deely et al. 1986; Deely 2009a) – has been to argue against a *pars pro toto* conflation of anthroposemiotic phenomena and processes with semiosis per se. Terrence Deacon captures the reasoning well when he warns that “There is a serious problem with using language as the model for analyzing other species’ communication in hindsight. It leads us to treat every other form of communication as exceptions to a

rule [that is, in fact, itself] based on the one most exceptional and divergent case. No analytic method could be more perverse” (Deacon 1997: 52).

That said, no biosemiotician believes that anthroposemiosis has arisen *de novo*, nor that many of its fundamental processes and principles are not direct extensions and carry-overs of more general forms of semiotic organization. Moreover, because the practices and principles of anthroposemiosis are more immediately accessible and intelligible to us than are those of other species, researchers in the humanities (in which we will include the social sciences, who are also researchers into anthroposemiosis) have often been far ahead of their counterparts in the natural sciences in discovering and understanding both those aspects of semiosis that are unique to human semiosis, and those that are common across one or more species. This finding should come as no surprise, since the humanities are concerned, by definition, with understanding the workings of “the symbolic species”, and thus – unlike, say, 17th to twentieth century physics and chemistry – have had no choice but to investigate the unique nature of *sign* relationships *per se*.

And what they have discovered in that regard is increasingly convergent with what even non-semiotically inclined biologists have been discovering about the nature of biological activity in *toto* – i.e., that it is processural, multi-causal, multiply interconnected, and demonstrates a recursivity of enacted, embodied, embedded and emergent (bottom up) and downwardly causal (top down) interaction that is *distributed*, in that must be *actively accomplished*, at almost every level of its expression.

Yet long before biologists were thinking that way, many in the social sciences and the humanities were already doing so, and my own first introduction to these ideas came not from reading Hoffmeyer, Kauffman, Deacon, Wilden, Waddington or Bateson, but from studying the findings and methods of Conversation Analysis, a still relatively obscure field founded by the sociologists Emanuel Schegloff (1937–) and Harvey Sacks (1935–1975). For much in the same way that the development of Biosemiotics was a response to the reductionist Dawkinsian notion of the innate, all-controlling Selfish Gene, the development of Conversation Analysis, too, was a response to the then equally dominating and reductionist Chomskian paradigm of an innate, language-controlling and individual-brain-instantiated Universal Grammar.

Rigorously empirical and devoted to an explication of how language-using agents themselves display to each other their understandings of what they are doing as they are collaboratively making meaning (as opposed to how theoreticians of such meaning-making may interpret those same displays analytically), the nascent disciplines of Conversation Analysis and Talk-in-Interaction constituted a radical departure from the formal and the neo-positivist reductionism so often prevalent in the domain of language study. Researchers in these fields have compiled compelling evidence demonstrating that it is the active co-participation of situated speakers in creating contexts of relevancy, constraint and possibility for each other’s immediately subsequent *actions* which provides the emergent structure upon which social understanding and (later) “language” ultimately rests, rather than the isolated mental computations of referential tokens within the bounds of some predetermined, category-structuring ‘syntax.’

It was this understanding – that ‘meaning’ is predicated on all points by situated interaction between agents, objects and their sign systems, and that such a triadic relation was not only irreducible, but mutually constitutive, being an objectively empirical aspect of reality, and not an individualistic mental ghost of it– that primed

my own later receptivity to the same triadic co-constitution that Biosemiotics rightly shows us is the hallmark of not only all organismic interaction with world, but with all biological being per se.

Not only have the concepts that I learned from Conversation Analysis structured much of my thinking about biological interaction, but they have also provided the basis of my own attempts to situate such research and its findings within the broader study of meaning-making among living agents that is the goal of Biosemiotics. There I have attempted to show how the former can well illuminate the latter's efforts to explicate the principles whereby not only our human social worlds – but our very biological world itself – comes into being not as a 'pre-given' in the furniture of the universe, but as a locally organized, massively co-constructed, participant-fashioned *accomplishment* in that universe instead (Favareau 2008, 2015a, b).

Nor do I think that my experience in this regard is at all unique, given the number of philosophy, literature, linguistics, psychology and other social science or humanities trained practitioners who now find themselves part of the community of biosemioticians. Such scholars often come already 'primed' or 'pre-set' to understand and accept the concepts of Biosemiotics, because they are already familiar with the real-life workings of sign phenomena, and so can fit those concepts into their already existing structures of thought. For practitioners who have been trained in only the physical sciences, however, this is not always the case. Which is precisely why, in my opinion, Biosemiotics – like all the biological sciences – needs the humanities in order to be able to see beyond its own conceptual limitations, just as the humanities need the sciences for the same reason.

Semiotics – Paul Cobley

The number of times I encounter the term 'biosemiosis' is, thankfully, small. I have heard it spoken in public and recently saw it in a largely non-semiotic volume on advertising where a discussion of biosemiotics made up about 1% of a theoretically rich book. Of course, the proper term is 'semiosis': the action of signs anywhere and anytime - as all card-carrying biosemioticians know. The prefix, 'bio' is thus spurious: in an uncharitable reading, it is thrown in to say 'Look at me – I'm being scientific'; more charitably, it is a mistake made in over-enthusiastic recognition of the sea change in semiotics over the last thirty years. Either way, my point here is not to upbraid biosemiotic rookies; rather, it is to emphasize that biosemiotics, historically, could not have existed without semiotics and, in the future, may not even need its prefix.

Odd though it may seem, it was semiotics' 'levelling of the playing field' of culture in the second part of the twentieth century which facilitated the birth of biosemiotics. That is to say, in its interrogation of culture, semiotics led the way in de-valorising *all* cultural artefacts, including those which have been said to have been born with, achieved or had greatness thrust upon them. Semiotics is a matter of understanding how sign systems – of all kinds - work. As this endeavour originally had a cultural focus, so one of the key concepts of semiotics, invented concurrently by Roland Barthes (1977a) and Juri Lotman (1974) in the early 1960s, was 'the text' (Marrone 2014). The term established a principle of 'neutrality' whereby questions regarding the value of cultural artefacts shifted towards extended enquiries into the means by which

they worked. Although first-person experience tended to get bracketed in the initial part of this shift, the gains associated with an approach that allowed all manifestations of culture to be treated in the same way constituted semiotics' primary bequest. This massive, but simply stated, remit is sometimes difficult for the lay reader to grasp owing to a range of historical and institutional determinations, as well as a general anthropocentrism that there is no space to discuss here (see Cobley 2016: 17–28). Semiotics' application to all kinds of sign systems without bias towards one or the other finally overturned the hierarchy of 'high' and 'popular' culture, a major landmark in the challenge to authority that was mounted across culture and social life, with varying degrees of success, in the last century.

Yet, the 'culture wars' that were ignited by the opening up of interpretation by semiotics were not unproblematic (Eco 1990; Dunant 1994) and semiotics' undermining of the bourgeois hierarchies of culture and 'myth' soon seemed stale. By 1971, Barthes was able to declare, in evaluating his *Mythologiques* fourteen years after its publication in French, that "denunciation, demystification (demythification)" (Barthes 1977b: 166) of the bourgeois and the petit bourgeois had become, itself, a mythological *doxa*. 'Mythoclasm' was to be succeeded by 'semioclasm', he claimed, a far-reaching interrogation of *all* sign systems and a *challenge* to their very basis. This would not simply entail unravelling the connection of denotation and connotation that sustained certain cultural hierarchies as 'natural', but a more thorough assault on the mechanics of meaning at the very level of the sign itself.

Barthes' call for *semioclasm* came shortly after the formation of the International Association for Semiotic Studies in 1969, where semioticians such as Thomas A. Sebeok broadened the entire agenda of sign study by encouraging its application to the whole of life. Barthes' subsequent 'retreat' into highly personalized writing, taken in this context, was not entirely without its political co-ordinates. However, the project of semiotics continued, with the uncovering of sign processes throughout the living world. This was not just a matter of finding more objects for semiotics. Unsurprisingly, following the fashionable moment of semiotics in the West during the 1970s and early 1980s, when semiotic analysis still had the flavour of magic, the commitment to semioclasm – even in hitherto unexplored realms for such analysis – seemed to some to amount to no more than further sterile analyses of different phenomena. In addition, it probably seemed to the casual observer that such analysis reveals very little about humans and what impinges on them in the polis. Such a view, of course, constitutes a grave error. Biosemiotics' infusion into general semiotics means that analysis no longer promises to reveal simply what the messages that humans send are like: how they are constituted and structured. Semiotics, now casting its net to analyse sign systems in the whole of nature, is thus concerned with how humans operate amidst signs, what distinguishes their cognition and their being as endosemiotic phenomena among other organisms and in the cosmos. The new horizon for semiotics that arises with the infusion of biosemiotics is analogous to the principle of neutrality that blew apart the divisions in culture. These latter had hitherto impeded not only analysis of human endeavours but also occluded a view beyond ossified and oppressive self-created human edifices.

Effectively, contemporary semiotics marks the continuation of the semiotic project whose latest guise is biosemiotics. Where human *artefacts* were the focus of post-1945 semiotics delineating its field as "the text", the focus of contemporary semiotics has

delineated its field as “nature”, embracing the human and its artefacts, as well as all other life as connected. For me, what is taking place is certainly a further articulation of the same project rather than a “branch” of the original enterprise. Fifteen years ago, Thomas A. Sebeok noted that.

The present terminological requirement to subsume a semiotics of culture, or just plain semiotics, under a semiotics of nature, or biosemiotics, might have been obviated decades earlier. As things are going now, the boundaries between the two are already crumbling, giving way to a unified doctrine of signs embedded in a vast, comprehensive life science (Sebeok 2001: 159).

A comprehensive science of life is not a new idea, although the idea has fallen into disuse. Articulation of that science through a unified doctrine of signs, however, remains as radical as it did when Sebeok started to outline it and when Barthes attempted to come to terms with it. In a following paragraph, Frederik Stjernfelt and I make suggestions for the same in our noting of the discontinuities of terminology and study that are placed on continuous processes. That is, we call for a continuous doctrine as opposed to the numerous compartmentalizing approaches to nature and culture.

Does this mean that biosemiotics can afford to ignore (general) semiotics because, eventually, semiotics will become biosemiotics? The answer has to be: not at all – for a number of institutionalised reasons that are not to be resolved here. More importantly, though, perhaps the question of why biosemiotics needs semiotics is ill-phrased. Most humans, when asked what they need, will refer to food, shelter, reproduction; a less likely answer is “oxygen”. Semiotics is biosemiotics’ oxygen. This is not to say that biosemiotics has to reference every last mythoclastic intervention into advertising or every Greimassian analysis of Islamic design. However, it does have to remain vigilant in case such analyses ever run out. If semiosis remains the object of semiotics, then biosemiotics = semiotics. Biosemiotics \neq ‘bio’ + ‘something else’.

Biosemiotics and Humanities: A Manifesto – Kalevi Kull

What connects biology with the humanities is exactly and precisely semiotics (Perron et al. 2000).¹

Semiotician and cultural theorist Juri Lotman focused his studies on poetics. He emphasised that the arts are those practices in which the *process of creating new information* is most clearly expressed and fully developed (Lotman 2011 [1967]).² This is important because the increase in information (not just its transfer) is what

¹ With this formulation, and with this collective manifesto as a whole, we attempt to specify and develop the thesis on “semiotics as a bridge”, which has been argued for on several earlier occasions. (See, for e.g., Perron et al. 2000.)

² “[...] Art means mastering the world (modelling the world) in a conditional situation. [...] Works of art [...] can increase the amount of information stored in them. This unique characteristic of works of art makes them similar to biological systems and gives them an extremely special place among everything created by the mankind. [...] Artistic models are a unique combination of scientific and play-type models, which simultaneously organize both the intellect and behaviour. In comparison to art, play is *without content*, while science is *without effect*” (Lotman 2011 [1967]: 265; 268; 269).

characterises semiosis. Deduction (the logical ideal in the natural sciences) is a mechanical transformation, while the tool of an artist to create new meanings is abduction. The problem of novelty, the question of the source of diversity and new information, is one of most fundamental questions in biology, in understanding life. Therefore, finding the poetic or poetic-like processes in living systems is what biosemiotics is about, and this is exactly where we need the humanities, the specialists in the arts (Kull 2015).³ This is what can be seen as a central point of our manifesto.

The integration of theories of biological evolution and cultural evolution cannot be based on reduction to simple biological models (of natural selection) – that would be a biologization of cultural studies and the humanities. The amplification of random mutations – which is the mechanism neo-Darwinism is based on, and which was extended to cultural processes via the concept of memes, which also change through the random mutations and amplification – is a fundamentally different process than semiosis; it does not serve as a mechanism of meaning-making. Consequently, knowledge in the humanities, which is largely the description of various aspects of semiosis, can serve as a set of guidelines in our search for truly semiotic aspects of non-human life. Here is where biosemiotics needs the humanities. The contemporary paradigm shift in the theory of evolution, from the Modern Synthesis to the Extended Synthesis, is basically a shift from a reductionist genocentric view to more holistic epigenetic and agent-based views. In other terms, this is a shift towards biosemiotic models (Kull 2016). An integration of theories of biological evolution and cultural evolution has to be based on semiotic models.

In order to professionally use semiotic models or theories, one inevitably requires a good orientation in the semiotic conceptual apparatus. Due to the current situation in semiotics, the theoretical heterogeneity is extraordinary large. Most of contemporary semiotic theory has been developed on the basis of a humanities background. There is therefore a need for a link to the humanities link for any semiotician. Semiotics itself cannot have a congruent theory without a well worked out relationship between biological semiotics and humanities semiotics. In this, much work has yet to be done.

A case of the role of the humanities for biosemiotics can be drawn from the experience of the Department of Semiotics of the University of Tartu. This department (which provides the full curriculum of semiotics for bachelors, masters, and doctoral students) carries a strong humanities tradition, as developed in the Tartu school of semiotics by Juri Lotman. At the same time, it covers a large scope of semiotic disciplines, among these biosemiotics. Thus for biosemioticians (particularly with a biological background) who are working in this department (e.g., Kalevi Kull, Timo Maran, Riin Magnus, and others), the immediate intellectual atmosphere is certainly deeply informed by the humanities (the department belongs to the Faculty of Philosophy which includes all philologists). These scholars can bear witness to the case that, without these humanities surroundings, they would not only have hardly had access to systematic knowledge in semiotics, but it would also have been much harder for them to achieve. Frequent discussions with philologists have led them to a much clearer understanding of their own biological field.

³ That Lotman's approach to semiotics of culture can be productively used for deriving the principles for biosemiotics, has been demonstrated (e.g., in Kull 2015).

Together with the question of the role of the humanities for biosemiotics, we could also ask what is the role of biosemiotics for the humanities (Cobley 2016). A short answer would be that this is the use of biological knowledge without biologization. There are several examples in the history of science where the application of biological models in the humanities led to vulgarization or even tragic results due to political consequences. As a result, the humanities caution in regard to biology has its historical reasons (Tallis 2011). Only if the life of other organisms is understood beyond mechanical explanations, can it become naturally integrated with human life in its broadest experience. Contemporary semiotics provides this possibility (Favareau and Kull 2015).

A reason for the establishment of the unnecessary boundaries (and not only between sciences or cultures) is an oversimplification of differences. There certainly are differences, but not for the denial of the other, but for the diversification of understanding. This is the source of our semiotic program for the conceptualization of biosemiotics in its relationships to the humanities.

Biosemiotics and Learning - Paul Cobley and Frederik Stjernfelt

There has been a great deal written in the field of biosemiotics which is both philosophically nuanced and sensitive with respect to issues of art, culture and human endeavour in general. From *The Garden in the Machine* (Emmeche 1994) through *Signs of Meaning in the Universe* (Hoffmeyer 1996) to *Incomplete Nature* (Deacon 2012), and in consonance with the polymath offerings of Thomas A. Sebeok, writing by scientists in biosemiotics has eschewed simplistic mechanism in the process of presenting biologically-inflected observations on the domain of culture.

Yet, there is an understandable tendency in current biosemiotic discourse to privilege functional approaches in accounts of development in the natural world. The concepts of semiotic freedom, scaffolding and agency tend to be described in functionalist terms in extant accounts of their procedures. This tendency is the *modus operandi* of strong tendencies in biology and social science and, since biosemiotics is in direct dialogue – even if that dialogue is, to some degree, one-sided at present – with such sciences, it is hardly surprising that biosemiotics sometimes has functionalist overtones. At first sight, the humanities' predominant concern with material that often has no immediate function nor discernable utility seems to offer a contrast in that it appears to be less wed to functionalism in the narrow sense. Yet, these observations require qualification. So, let us add, firstly, that we recognize that there are large domains of nature which are mostly mechanical in their operations. A small part of that mechanism is functional in the narrow sense. However, higher life has evolved from this functional substrate through a continuous and protracted process and this is something to which any amount of discontinuous dualism should not blind us. The evolutionary continuity of nature up to and through human affairs is one very pressing reason why the realm of life should not be studied through a lens promoting discontinuities (Cobley 2016). Secondly, it is not only the hard end of the sciences that has taken mechanicism as its cue. The humanities, too, has itself periodically employed functionalist and teleological conceptions in many of its branches. We are increasingly compelled, then, to avoid making quite so special a case for culture, as well as a special case for *the study and expansion of culture* through the humanities. A vision of the study of nature and the study of

culture as two iron fortresses is untenable. Diltheyan attempts at securing a special enclosure for the humanities, taken as completely different from the sciences in bearing and focus are, clearly, part of the problem rather than the solution.

Where the case of biosemiotics is concerned, we would argue that it is sometimes involved in a less than explicit functionalist discourse but that some of its key concepts map a route of escape similar to that taken by the humanities. For example, explaining semiotic freedom, Hoffmeyer refers to experiments where scientists placed artificial sweeteners rather than glucose in the environment of a chemotactic bacteria cell. As he writes (Hoffmeyer 2010: 164), the cell misinterprets such chemical signs of its environment and

Such misinterpretations are dangerous, and natural selection will favor any solution that helps the organism to better interpret the situations it meets. Indeed, selection would be expected to favor the evolution of more sophisticated forms of ‘semiotic freedom’ in the sense of an increased capacity for responding to a variety of signs through the formation of (locally) ‘meaningful’ interpretants. Semiotic freedom (or interpretance) allows a system to ‘read’ many sorts of ‘cues’ in the surroundings, and this would normally have beneficial effects on fitness. Thus, from the modest beginnings we saw in chemotactic bacteria the semiotic freedom of organic systems would have tended to increase, and although it has not been easy to prove that any systematic increase in complexity, as this concept has traditionally been defined, has in fact accompanied the evolutionary process, it is quite obvious that semiotic complexity or freedom has indeed attained higher levels in later stages, advanced species of birds and mammals in general being semiotically much more sophisticated than less advanced species.

Here, ‘interpretance’ enriches the concept of natural selection, keeping it from the one-way street of mechanism. Explaining the concept of semiotic scaffolding, Hoffmeyer notes that “The network of semiotic interactions by which individual cells, organisms, populations, or ecological units are controlling their activities can thus be seen as scaffolding devices assuring that an organism’s activities become tuned to that organism’s needs” (Hoffmeyer 2007: 154). The interactive nature of this process relativizes the strong opposition of the heredity/environment couplet.

Then, in a general statement about agency in nature, Hoffmeyer describes the way in which certain cells in a primitive sense remember the bacteria of a disease in question and are able to initiate the production of antibodies. “I consider the term ‘to remember’ appropriate in this context”, he writes (Hoffmeyer 1996: 12),

because what we are talking about here is a heavily selective retention of past events. Fortunately, the one thing the body is best at is erasing its memories, forgetting. Not everything is remembered, only those things that are of significance. Minor wounds heal, tiredness is dispelled by sleep, my own nervous tension is eased when a nice fat check drops through the mailbox, stress levels fall and stomach ulcers cease their gnawing once an exam is over, the apathy of a broken heart is conquered by love of life. Time heals – almost – all wounds.

The intelligent, agentive process of remembering gives the lie to the assumed automatic character of immune response.

Such examples mark a departure from narrow functionalism. They should not be construed as singling out Hoffmeyer, a particularly sensitive analyst, for opprobrium in respect of the functionalist inclination. Hoffmeyer inherits from others (for example, Jerome Bruner, Andy Clark) and bequeaths to others (most individuals operative in the field of biosemiotics). What is at issue is the level of discourse at which biosemiotics' concepts are couched. This is clearly evident in Hoffmeyer's discussion of semiotic freedom, where the master narrative of 'fitness' lurks behind the entire discussion. This is the discourse of teleology – albeit a reinvigorated and secular teleology which is aware of metanarratives. But, like the extended thesis and punctuated equilibrium, it does not yet offer as pronounced a vision of checks, balances, stops, starts, affordances, constraints and overdetermination that is indigenous to some traditions in the analysis of culture. Similarly, the brief description of scaffolding, above, is geared to ecology, assurances, tuning and needs – functionalist categories as opposed to the more flexible vocabulary of formations, speculations, rough fits and desires that is often necessary in the humanities.

Yet, consider the observations on agency and remembering. In the service of rhetoric, and understandably so, they constitute an example of biosemiotics rather over-egging the pudding of agency in the two decades since *Signs of Meaning in the Universe*. Hoffmeyer's remarks on memory, however, are ambiguous: "Not everything is remembered". Agency is manifested in more than one way. To phrase the matter slightly differently, there is a hint of *overdetermination* in this description of memory. The term 'overdetermination' comes, principally, from psychoanalysis but was profitably employed by the Marxist Louis Althusser in his discussions of culture. As in psychoanalysis, it refers to domains that are not just the product of one determining force but the many domains that co-exist and complement each other whilst being determined by multiple forces that are often exerting reciprocal forces on those multiple determinants. Overdetermination also envisages culture and sociality as radically uneven, with developments in different domains taking place at different paces.

In the humanities, a range of versions of overdetermination are indigenous – sometimes for the purpose of allowing credible analysis and sometimes, it has to be said, to desperately assert the autonomy of culture from nature. Nevertheless, it is largely taken for granted that spheres of cultural existence do not develop in tandem, notwithstanding numerous attempts to track artistic movements and to exercise epochal characterisations. To be sure, biosemiotics' continued dialogue with the sciences necessitates an alternative re-telling of scientific perspectives on development and function in the natural world. Yet, if there is to be an epistemological extension and rearticulation of *functionalism*, then biosemiotics needs to continue to heed the overdetermination which some traditions in the humanities necessarily foreground.

Biosemiotics as Philosophy – Gerald Ostdiek

Science is too often said to be one thing, and Humanities another. And they are, except when they are not. It must be said that humanity represents the only species known to have accomplished much at all with science, and the humanities describes the processes by which human beings process and document the experience of being human. Separated, distilled, isolated for the purposes of action, we can call one such process

science, another philosophy, another religion, etc. Through behavior, these processes come to be expressed as objects – theory or technology or art or craft, and as culture – heritages of social interaction, in interaction, that take on life and both exert and suffer selective pressure. The humanities are biological, and biology radically continuous (Ostdiek 2012, 2015, 2016).⁴

A living thing is a bordered thing that necessarily seeks outside itself for what it must ingest, or avoid, or somehow manipulate so as to go on living. This entails semiotics – reading the surroundings by standing one thing for another, so as to profit from the possible. This involves reshaping the world as selective pressures fit the signer to the world and the world to the signer; the process is not willed, but reciprocated. What humanity does differs little from other animals, but it is a little with a large consequence. We not only mind the world around us, we mind the means by which we mind the world: we not only read into being the signs that shape us, we also *see* them. In rare moments of insight, we see ourselves seeing signs see the world. This not only allows for science and philosophy, it entails them. To be human is to negotiate truth claims about the world.

A truth claim is a proposition – a single, momentary aspect of the function circle of a human person. Truth claims are at once scientific, philosophical *and* religious. To posit that biological mechanisms are semiotically realized is to posit a falsifiable notion that, if believed (acted upon, actualized), results in the realization of novel methods of looking, which results in and is novel mechanisms of living that are simultaneously epistemological and biological. This is ubiquitous to living things and becomes uniquely human only when each stage comes to life: when signs suffer selection, science speaks. Biosemiotics proposes to know what life knows, and subjects the self to science. But science is neither pure minding, nor done by pure minds: it is a consequence of human behavior. *As science*, biosemiotics methodologically rejects the notion that science can be done without philosophy.

Science neither commands nor completes the processes by which interpretation becomes interpretant; it furthers it. In some ways science is a product of reasoning about the necessity to check the validity of our imagining, and in other ways it is limited to what a culture makes philosophically available. But these are half-truths. A truth claim *makes sense* by performing a semiotic function that (potentially) furthers the living of the living thing. Science is how we do what all life does.

The behavior that shapes and is shaped by the human niche is not formed simply by making stuff up and calling it true (all living things assign meaning), but by living by the strictures of the assigning. Our attention goes not only to the sign object but also the sign. At our best, we believe our imaginings true but simultaneously see them as historically contrived fictions. Our best puts science to work. At our worst, we imagine we have ended the need to check our map against anything – that the processes that generate our mental maps are somehow exact, and our mapping (if not our maps)

⁴ The musings presented here are developed elsewhere. In Ostdiek (2012), I argue that self-awareness exists as a consequence of multiple scales of post biotic phenomena exerting selective pressure on the interactions of living things. In Ostdiek (2016), I argue that symbiosis with post-biotic living things distinguishes human experience from that of other animals. In Ostdiek (2015), I argue that religion, philosophy and science form a Neo-Peircean trinity wherein (proto)religion represents the binding of interpretation into interpretant, which results in and is the presence of *mind*, which is furthered by checking itself against the objects of the signs of which it is composed, as well as against itself. Should the argumentation of these essays prevail, the notions I present here become a mere matter of course.

complete. Our worst turns word/symbols into fiat decrees such that the invocation of *science* or *interpretation* closes minding, rejects the possible, and leads us into an epistemic and evolutionary cul-de-sac.

Our niche is more a product of our minding of the world than that of any other known species (a difference of degree, not kind). It grows as we imagine it into being, more limited by minding than mattering. And our minding is extensive and accurate: science works. Yet the territory remains larger than the map. The map, the methods of mapping, and also the methods of checking the map against the territory remain objects of semiotic symbiosis, wherein interpretation and actuality forever reconstruct the other.

So long as the map is *not* the territory (which is *always*), the success of a truth claim will involve acting on propositions, the validity of which will necessarily involve checking the map against itself for consistency of usage, symbolic coherence, readability, etc. Should a time exist when the territory is so absolutely mapped and the mapping so absolutely competent that the two have become one, science and philosophy both will be finished. But this *cannot* happen, and science necessarily begins to fail when it begins to argue otherwise. Were the territory the map, neither philosophy nor science would have consequence, and religion alone would matter; *mere* believing (that is, acting in accord with perception to thereby bind a *read* into *being* sans sceptical reflection) would shape human experience. And this defines the realm of animal faith (Santayana 1923), not human knowing. To reject the continuity of science and philosophy is to reject what is most unique to humanity.

Ethics – Morten Tønnessen

A dozen to some 20 years ago, two of the most central biosemioticians, first Jesper Hoffmeyer (1993) and then Kalevi Kull (2001), addressed connections between biosemiotics and ethics. In the last ten years, a new generation of scholars have started working out a biosemiotic ethics (see Beever 2011 for an overview). The foundational idea is that if all living systems are semiotic, then biosemiosis can serve as a basis for justifying attribution of moral status to human and non-human individuals and to various ecological entities.

Part of the appeal of biosemiotics within an ethical discourse is that it can serve as a counterweight to simplistic notions of a moral agent/moral patient dichotomy. Briefly told, quite a few ethicists, particularly of an analytic philosophy persuasion, firmly believe that human beings are the only moral agents on this planet and, furthermore, that only human beings can function as moral patients. This is because they assume that the only possible moral relationship is a reciprocal relationship between moral agents. This is but another exemplification of the old story about human exceptionalism. A biosemiotic ethics, however, can make the case that to be a moral patient it suffices to be semiotically sensitive to human actions in terms of the organism's own wellbeing. In short, if our human sign exchange directly or indirectly results in better or worse lives for another subject of biosemiosis, it is morally relevant, and we are morally responsible for how we affect other lives via our actions.

More progressive ethicists base their ethical accounts on the phenomenon of sentience. However, a biosemiotic ethics goes beyond sentience (cf. Tønnessen and Beever 2014), because semiotic agency, which a biosemiotic ethics can take as its defining morally relevant characteristic, constitutes a wider category in the realm of life than that of sentience. In this perspective, sentience is but a special case of, and an aspect of, semiotic agency. Whether a biosemiotic ethics should be regarded as a new kind of consequentialism, or should be placed within some other tradition, is open for discussion.

Biosemiotic contributions to meta-ethics, the foundational study of ethics, include Champagne (2011) and Kull (2001), with the latter stating that “the origin of value can be seen as a problem of [...] biosemiotics” (Kull 2001: 355). Champagne, on his side, indicates that normativity has its origin in the very structure of the *Umwelt*, and draws on *Umwelt* theory and Ayn Rand’s meta-ethics⁵ to show how all valuations ultimately derive from the normativity embedded in our lifeworlds. He thus sees human moral judgements as natural extensions, as it were, of animal normativity.

With an eye to normative ethics, Kull claims that a required turn to a biocentric view “may mean that the valuing process is extended so that the experiential world of any living being is included” (Kull 2001: 356). If that is our moral judgement, then it appears that the semiosphere at large (*qua* biosphere) has intrinsic value, in some sense. This might look like an Uexküllian view – but as a matter of fact, Jakob von Uexküll (1864–1944) interpreted the moral consequences of his own *Umwelt* theory quite differently (see von Uexküll 2013; Beever and Tønnessen 2013). Kull has also suggested the combining of deep ecology – a tradition within radical environmentalism – with ecosemiotics (see Kull 2011 and Kull et al. 2004). In a similar manner, Tønnessen (2003) offers a biosemiotic commentary on, and reformulation of, the Deep Ecology Platform. The common assumption in these texts is that the deep ecological outlook has a semiotic basis.

As it happens, ethics is not simply about moral conduct, it is about human nature – and the nature of semiosis. As stated in the ‘semiotic meditation’, “Signs grow – but should they?” (Tønnessen 2009: 78).

Signs can be cultivated. Signs can be grown. How else would we be able to conquer this planet? [...] Who dares to claim that the more signs grow, the better? [...] Wouldn’t such an idea be a *de facto* reproduction of [...] our culture’s naive notion of eternal, unrestricted and unlimited growth? [...] Streams and currents of semiosis flowing freely in the landscape, ruled by its own innate rhythm (down-hill, upstream; down-hill, upstream), only to be sliced up, packed and sold at the market place.

What is the nature of semiosis? And what is the *culture* of semiosis? And what is *our* nature, in this world of cultivation? Are we doomed to be [...] creatures constantly and incessantly cultivating all that *has* a nature?

⁵ Ayn Rand (1905–1982) was a libertarian, and a defender of capitalism and ethical egoism.

Why do the Humanities Matter for Biosemiotics: Anthropology – Myrdene Anderson

I would find this a more interesting topic were it tweaked, but in two complementary dimensions:

- (1) Why does semiotics matter for biosemiotics?
- (2) Why does biosemiotics matter for semiotics?

I could assert that introspection about the relations between semiotics and biosemiotics motivate the current more particular set of assignments about humanities and biosemiotics (cf. Sebeok 1984; Deely 1992).

Anthropology:

One subject matter, two cultures, three approaches, four fields, five angles

Launching the above inquiry from my home base of anthropology may be instructive, provided “anthropology” is understood to be of the holistic North American, Boasian, “four-field”, variety of anthropology—also dubbed the most humanistic of the sciences and the most scientific of the humanities. This description may be concretely sourced to Eric R. Wolf (1964), who was perhaps channeling his ancestors Alfred L. Kroeber (1876–1960) and/or Clyde Kluckhohn (1905–1960), certainly before the notion of two cultures (essentially of non/pre-science vis-à-vis science) was popularized by Charles Percy Snow (cf. 1959, 1963; contested in Anderson et al. 1984). Snow anticipated by a generation, and New York literary agent John Brockman has rendered palpable, a third culture (cf. Brockman 1995), or synthetic approach, via The Reality Club salon of New York intellectuals commencing in 1981, and coalescing on the web as the Edge Foundation from 1988 on (cf. Kelly 1998).

The four fields, or subdisciplines, of anthropology gradually crystalized a century ago: sociocultural anthropology, linguistic anthropology, bioanthropology (once physical anthropology), and archeological anthropology or prehistory. The four fields intrinsically, implicitly, yet emphatically overlap; no one has attempted to justify them deductively; they vary in their relative focus on phenomena variously situated in space and/or through time. While individual anthropological professionals almost always specialize in a more finite number of the four fields, or even something minutely interstitial to two or more of them, these specialists do so by building on a foundation in all four subdisciplines. A so-called fifth field covers variations of applied, activist, advocacy, and otherwise practicing anthropologists exploring pragmatic angles across the grain of the original and non-coordinate four fields; this fifth angle can slide into corporate and governmental and nongovernmental projects, and will not be discussed here.

Anthropology concerns itself with everything about and every aspect of our species, *Homo sapiens*, from evolution through time to dispersal across space to the imaginings of innerspace. While periodically anthropology has been contorted by discussions of whether it practices or includes science, these episodes usually pivot around the extent a particular angle of anthropology feels compelled to quantify; other inflections of anthropology remain comfortable with the issues

surrounding interpretation, that is, meaning-making, also central to semiotics. Yet, qualification underlies all quantification (cf. Anderson 2012), and even numbers demand interpretation. Finally, all data are actually *capta*, shanghaied by our conspecifics variously innocent or motivated, and in any case constrained by our bio-historico-culturo-linguistic selves.

What Comes Naturally: Anthropology and Semiotics

Appearing more broad and holistic than the typical academic disciplines, anthropology might better be dubbed a meta-discipline. So would the discipline/field/approach of semiotics. Perhaps that explains the affinity many anthropologists feel with semiotics, and for that matter biosemiotics. But anthropologists find the distinction between semiotics and biosemiotics overdrawn, even unnecessary. Could one imagine sociocultural, linguistic, or archeological anthropology without bioanthropology? Not at all. Nor the reverse. Bioanthropology practitioners are also socioculturo-linguistic members of the human species that is likewise shaped, though never determined, by its biocultural histories and prehistories, whether acknowledged or not.

I have argued that individual humans cannot but be both anthropologists and semioticians, from birth, albeit without being self-conscious about what comes naturally, unburdened by theoretical and methodological pluralism, or even prescriptions and proscriptions, surrounding issues of evidence.

Biosemiotics Meets Anthropology

Organizationally, biosemiotics might appear as a precipitate of semiotics. Some of its contributors have indeed been biologists. Also important have been practitioners from other sciences, social sciences, and humanities—particularly philosophy. At the same time, semiotics itself embraces practitioners from the same unruly breadth of fields, as does anthropology.

Looking around academe outside of anthropology and semiotics, it is difficult to find any disciplines that recognize our own human place in the cosmos, saturated as we are in our bio-historico-culturo-linguistic constitutions. Reflecting on anthropology alone, it might seem that with its four fields or five angles, this discipline can be autonomous or hermetically sealed. Not so: anthropology itself must rest on a deeper shared foundation of particular and general history and philosophy, residing in texts and oral lore and habit, perhaps summed up as the humanities. So does semiotics, not just biosemiotics.

I will close paraphrasing Eric Wolf, reflecting on anthropology ... taken as less a subject matter than a bond between subject matters ... in part history, part literature; in part natural science, part social science ... striving to study humans and the human condition both from within and without... representing both a manner of looking at our species and also a vision of our future—the most scientific of the humanities, the most humanistic of the sciences (Wolf 1964).

Won't this fit semiotics, and biosemiotics, as well as anthropology? Of course the humanities matter, for everything.

Why is Biosemiotics Relevant for the Literary Study and Vice Versa? - Timo Maran and Louise Westling

Biosemiotics could provide an alternative viewpoint for understanding literature and literary studies. Biosemiotics holds a view that sign processes take place also outside of human culture at various levels: as intra- and intercellular processes inside an organism, as signals in animal communication, and as semiotic regulation in ecosystems. Correspondingly, human cultural and literary activities should be interpreted in this wider context of semiotic processes. Literature preserves layers of the human eco-imaginary as scaffolding for cultural meanings that parallel biosemiotic scaffolding (Hoffmeyer 2008, 2014). These scaffolding layers encode deep species memories, senses of immersion and interrelations within the plant and animal world, and anxieties about violation of responsibilities within the biosphere.

In *The Epic of Gilgamesh*, for example, both King Gilgamesh and his friend Enkidu are related to wild bulls, and Enkidu begins his life as a hairy man identified with wild animals. Fatal punishment comes from the gods when the two heroes cut down the gods' sacred forest and kill its guardian associated with the powers of nature. The metamorphic and transformative powers of the Greek god Dionysos in Euripides' *Bakkhai* express archaic ecological understandings of permeable species boundaries and human relations with plants and animals. Similarly the Mayan *Popol Vuh* scaffolds human/plant/animal interrelationships that sustain human life (Westling 2014).

Biosemiotics helps support Maurice Merleau-Ponty's phenomenological description of the invisible deep meaning or Logos animating the organic world that writers from all cultures and eras make explicit and visible in literary works through differing styles (Merleau-Ponty 1968). Literature can thus be understood as a means of giving form to semiotic activities and potentials that humans experience in the biosphere. Many kinds of environmental understandings in literature metaphorically parallel scientific discoveries about semiotic processes in organisms and ecosystems. As authors and readers we are endowed with different semiotic capacities, including non-verbal zoosemiotic modelling (Sebeok 1991). Literary depictions and verbal knowledge have roots in the non-articulated tacit knowledge (Polanyi 1966) and semiotic potentiality of the environment (Gibson 1986). Literature needs non-literary and nonverbal semiotic space for its existence in the same way as culture needs non-cultural space as its context or boundary conditions. Literature represents and tries to make sense of the environment in many ways. Being rich in different artistic codes, literary works are well equipped to represent complicated and multifaceted realities, including human-environment relations (Lotman 1977). In this context, works of nature writing can be seen as models of human environmental relations of the given culture and environment (Maran 2014a).

By being a process-oriented and dynamic discipline, biosemiotics could also inspire new modes of literary criticism. Attention could shift to more relation-oriented reading: how texts relate to particular cultural and environmental settings, how they emerge, inspire action and if and how they are applied back to the environment. Also the research process could be reinterpreted as a meta-communication that on its own takes part in cultural dynamics. There are important underlying ecological implications in this view as culture is considered to be a particular, local phenomenon and not a formal system or a static construct. A biosemiotic approach could lead us to reconceptualize our relations with research subjects by including also the biological context from which

we come: our own personal, cultural and evolutionary histories, human *umwelt* and environmental experiences.

Literary studies can provide to biosemiotics a rich understanding about the narrative strategies used in human culture as well as relations between symbolic modelling and other modelling types. This would help to better analyze relations between human culture and the environment, especially the *semiotization* of the environment, in the course of which the human cultural forms (e.g. technical designs, mapping, abstract ideas) are used as a source for changing the physical environment (Maran 2014b). Environment semiotized by humans may become a source of problems for other animals, as for instance natural landscape fragmented for agricultural purposes may hinder the communication of the passerine birds. Literary studies may also be used for discussing ethical and moral positions of biosemiotics. Being scientifically oriented, biosemiotics is not predominantly focused on ethical matters. But at the same time, biosemiotics often deals with morally sensitive topics: agency in other animals, non-cultural component in humans etc. Therefore, biosemiotics may unwillingly become a part of critical argumentation, and literary studies may help biosemiotics to develop its own position on these questions.

Critical Theory – Wendy Wheeler

The human animal is an evolutionary and meaning-concerned part of an evolutionary and meaning-concerned living world. Nature-culture is clearly a continuum in which culture is an evolutionary development of nature in humans, and to some extent in some other animals also (how could it be otherwise?). But many, if not all, the things which we think of as ‘culture’ long pre-existed humans. The aesthetic dimension studied by much of the humanities is one such example. We are made in the present of patterns and relations, natural and cultural, which precede us and which turn up again and again in the world. In being, and becoming aware of, these patterns, organisms find meaning. This logic of pattern, which is the species recognition of a natural logic to phenomena, is essentially repetition and difference (including mimicry. See Maran 2017). Patterns repeat on the basis of similarity (visual or haptic or chemical or neurochemical, and so on), but that similarity is capable of containing aspects of difference. Organisms build their ontological forms and maps in their encounters with the world they live in. Both form and context act as constraints on ontological expression. In humans, these forms are expressed not only in evolutionary bio-ontology and in human mind, but also in the forms and content of the stories human animals tell.

The most straightforward way of understanding the logic these processes obey is to recognise that they are essentially living metaphors, as Gregory Bateson suggested. Strung together like beads on a necklace of habit and chance, they form biosemiotic stories (Wheeler 2016). From an evolutionary perspective, this means not only that we can derive insights about the present from the past (biologically and culturally), but also that we can derive insights into cultural patterns from biological patterns. Even more germane to the topic of this particular essay, and as implied by Roman Jakobson (Wheeler 2016), we can derive insights about biological expressions and behaviours from cultural ones. And of course molecular biologists trying to understand the workings of DNA molecules have, indeed, been obliged to borrow their lexicon from the languages of semiotics (codes, expressions, reading, transcriptions, translations,

interpretations, and so on). Like small societies, bacteria interpret conditions and make decisions through what is aptly called quorum sensing. Similarly, recent research on viral macrophages indicates that they, too, communicate across the generations, like humans, by ‘writing’ chemical messages which are read by descendants (Calloway 2017).

The culture/nature distinction grows increasingly irrelevant. A biosemiotically informed critical theory of subjects, society and culture might well help us to move beyond the problems which have driven critical theory in the humanities for the past 35 to 40 years. That formation was largely derived from two sources: a Marxist theory of false consciousness critical of Enlightenment reason and claims to truth, and the ‘post-modern’ theory which says that all meanings are made by humans and that human meanings are just a ceaseless circulation of signifiers unanchored from bodies and Earth. The biosemiotic realisation that meaning-making belongs to all living things, and that human meaning-making, although distinctive of *Homo sapiens*, has its roots in the common descent of non-human semiotic life, indicates that reality is *not* ‘constructed in human language’. It is experienced in sign relations that are anchored in bodies and in the shared Earth. All other organisms make meanings too, and human life is lived amongst those meanings. Organisms continually both shape and are shaped by the embodied and enminded semiotic relations which both scaffold matter and energy, and also constitute life and meaning on this planet. Human beings are but a part of that global semiosis in which the biosphere is at the same time the semiosphere. In the light of all this, we might conjecture that an environmental ethic of biosemiosis strongly implies the reality of many different readings – among both human and nonhuman organisms – and an imperative to listen and take heed.

The modern sciences and humanities have both tended toward inadequate models of mind and subjectivity. Computational models produce the problem of mechanistic genetic determinism versus free will. Computers have no real choice about their inputs. On the humanities side, *tabula rasa* models have produced a socio-linguistically deterministic model of human selves that is both biologically and semiotically shallow. Critical theory in the humanities has tended to reject scientific accounts as reductive, and as especially simplistic in their gene-based attempts to explain cultural experience and meaning-making.

But as biological ideas themselves expand beyond a gene-centric account, contemporary ideas of ‘mind’ and ‘meaning’ equally require expansion. Mind does not require a brain. From a biosemiotic point of view, and like the sign itself, mind must be composed of three necessary aspects: a semiotically active body in a semiotically active world and some form of (conscious or nonconscious) system capable of memory. DNA fulfils the latter function in important ways. Its processes, along with evolutionarily and developmentally subsequent ones in organisms, appear to depend upon on the ability to register forms of similarity and difference (Wagner 2014; Wheeler 2016). This – “a difference which makes a difference” – was, of course, Gregory Bateson’s basic definition of information (Bateson 1972: 459). This is the basis of metaphor and also what Charles Peirce described as abductive guessing. It is what lead Bateson to the insight that all of nature depends on this form of logic:

It becomes evident that metaphor is not just pretty poetry, it is not either good or bad logic, but is in fact the logic upon which the biological world has been built,

the main characteristic and organizing glue of this world of mental process that I have been trying to sketch for you. (Bateson and Bateson 1988: 28)

In addition, brains are developmentally specialised and enfolded skin. We can thus surmise that the forms of encoding found in complex molecular systems within the primal membranes by which selves are primarily constituted are subsequently evolved in the sensual relations between bodies and environments, and that these form the basis of phenomenologically enhanced mind in evolved animals. Eventually, human capacities for abstraction, representation and formal logic build upon these semiotic processes. However, the active bases upon which such subsequent levels depend remain essentially aesthetic forms which are more like natural metaphors, poems and music than they are like machines. The understanding that the forms, structures and processes of life begin in sensation and feelings which are thus essentially aesthetic is a very good reason for biosemiotic science to value the humanities. As Bateson wrote:

On the whole, it was not the crudest, the simplest, the most animalistic and primitive aspects of the human species that were reflected in the natural phenomena. It was, rather, the more complex, the aesthetic, the intricate, and the elegant aspects of people that reflected nature. It was not my greed, my purposiveness, my so-called 'animal', so-called 'instincts', and so forth that I was recognising on the other side of that mirror, over there in 'nature'. Rather, I was seeing there the roots of human symmetry, beauty and ugliness, aesthetics, the human being's very aliveness and little bit of wisdom. His wisdom, his bodily grace, and even his habit of making beautiful objects are just as 'animal' as his cruelty. After all, the very word 'animal' means 'endowed with mind or spirit (animus)' (Bateson 2002: 4-5).

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