Biosemiotics and Constructivism: Strong Allies

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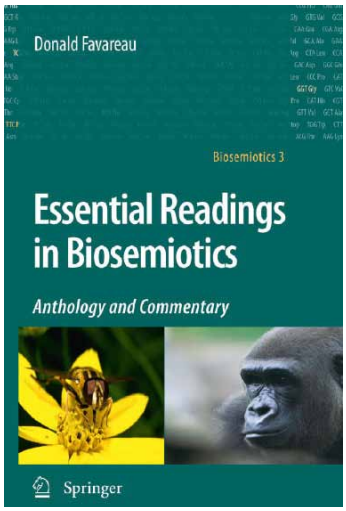
> Upshot • The reader presents a unique collection of the most important works in biosemiotics. It spans 880 pages, describing classical and modern theories, with excerpts from the most significant papers on the topic of biosemiotics, as well as suggesting further reading on the topic.



Review of *Essential Readings in Biosemiotics* edited by Donald Favareau. Springer, Dordrecht Heidelberg New York, 2010. ISBN 978-1-4020-9649-5. 880 pages.

Biosemiotics is an alternative to information-based approaches that explain life and cognition purely syntactically or formally, thereby making both utterly passive. It deals with perennial problems of meaning and representation by examining them in the light of biology and evolution. As it focuses on action as the origin of signs and representation (and misrepresentation), it shares interests with constructivist approaches in cognitive science: in particular, enactivism.[1] One could argue that it is biosemiotics that is able to vindicate dynamical and enactive ideas of embodiment, embeddedness, and the extended mind and make sense of notions of meaning and representation. Far from rejecting the notion of representation completely, it conceives it in a radically different way by relying on the concept of sign.

At the same time, it does not collapse meaning to a set of social or textual conventions that could lead to the sort of idealism of cultural semiotics that treats everything as a meaningful text or a sign. The power of biosemiotics can be found in investigation of the roots of language in nature, without forgetting the active role of the organisms that use the language or signs. Signs are in fact natural constructions of biological organisms that actively pursue their goals.

In the introduction to his reader on biosemiotics, Donald Favareau pledges that "sign," as well as other similar terms, will be rediscovered in science. It had been long implicitly assumed that the use of terms such as "message," "signal," "code," and "sign" with respect to non-linguistic biological processes ultimately had to be metaphoric. So it had been hoped that such terms could someday be reduced to the mere chemical and physical interactions underlying such processes. But this is no longer tenable, and the prospects for such extreme reductionism are rather dim. The interdisciplinary conglomerate of biosemiotics is attempting to integrate and unify the life sciences – as well as the life sciences and the humanities – by pointing out that these "problematic" terms, such as "representation," "sign of," and "meaning" may be successfully used to describe living, interactive, complex adaptive systems (Favareau 2010: v).

Biosemiotics considers the notion of a sign to be crucial for biological sciences, and also understands it as the key to explaining representation. Biosemioticians accentuate two very important notions, closely related to each other, i.e., Peirce's *interpretant*:

> "I define a sign as anything which is so determined by something else, called its Object, and so determines an effect upon a person, which effect I call its interpretant, that the later is thereby mediately determined by the former." (Peirce 1977: 80–81)

and Jakob von Uexküll's *umwelt*:

> "The term 'Umwelt' […] means the subjective world of what is meaningful impingement for the living being in terms of its own information processing equipment, sign systems, and codes… 'Umwelt' is not to be confused with 'environment'… The structure of connection between a living being and its Umwelt is mediated by sign processes." (Favareau 2010: 263–264)

The Peircean interpretant, or the effect of a sign on someone, is the core part of the representing relation, while umwelt, as considered by an agent, is necessary for understanding the notion of self-organization and the internal structure of cognitive agents. Umwelt is understood as a "self-centered world" (Kull 1998). Hence, different organisms have different umwelten while they share the same physical environment. Both Uexküll's flavor of biological Kantian constructivism and Peircean pragmatism are the key inspirations for modern constructivist ideas. In his chapter "The Cybersemiotic

1. While biosemiotics includes a variety of ways of thinking, in this review I will mainly focus on relevant links between biosemiotics and constructivism.

Model of Communication," Søren Brier insists that Perceian biosocial constructivism is very close to Humberto Maturana's bioconstructivist theory of autopoiesis (Favareau 2010: 707). The concept of autopoiesis together with cybernetics assumes that living systems' self-organizing, self-maintaining, and self-producing ability clarifies their special self-preserving ability and cognition as well as the creation of an individualistic point of view. This is quite obvious when one considers that what was defined by Uexküll as the *function cycle* – the cyclical organization of how organisms create and change their own umwelt during interaction with the world – is a predecessor to Maturana's theory of autopoiesis. This is the kind of cyclical causality that supports the idea of the agent's autonomy. The book under review clearly shows that these ideas are useful for a detailed empirical inquiry into the biological world, and thereby at least partially vindicates the constructivist approach to the mental, and to the concept of "representation" in particular.

So how would the notions of "interpretant" and "umwelt" contribute to a better understanding of "representation" than the correspondence theory of representation, which is explicated in terms of simple passive mappings or encodings that are usually defined in terms of already present representations? Passive encodings, conceived as stand-ins for reality, "cannot be representations, cannot carry any representational content, except via such stand-in relationships" (Bickhard 1993: 287). Hence, we cannot understand where meaning comes from if we conceive representation merely as a passive encoding, as the classical correspondence theory would have it. Correspondences analyzed in terms of iso- or homomorphisms, often touted as an explication of representation, do not determine the relata of representational relations. Even the proponents of homomorphism as an explication of representation (such as Bartels 2006 and Cummins 1996) admit that determining the reference of a representation requires not only a homomorphic mapping but also the intention of a user of this representation or a causal process that selects the referent (called *target*). It means that the very mapping relation is not sufficient for this determination. For example, the image of a dog represents a dog – but how a conscious agent selects properties of a dog as relevant for representing it and how they become mental entities also needs to be analyzed, e.g., in terms of action and the overall functioning of the agent in its umwelt. Otherwise, we still do not understand why it is that they become represented. Correspondence-based theories of representation also make it a dyadic relation, which makes it impossible to explain misrepresentation and empty reference. No wonder that this kind of theory may lead to the rejection of representational notions, as some of the radical constructivists did.

But is such a rejection really substantiated? Alternatively, one could think of identifying the sign with a purely causal mediator of action, which is popular in today's sensorimotor theories of representation. Yet this was already challenged by one of the classical biosemioticians, Thomas Sebeok, who argued that it is not enough that animals use signs unless they are signs *for them*. The causal function is not enough to analyze misrepresentation as well (Dretske 1986) and that is why we need a more sophisticated notion of a sign. This naturally leads biosemioticians to a constructivist way of understanding representation in terms of affordances in the animal's umwelt, rather than to a wholesale rejection of the notion of representation. The whole story is, of course, much more complex – the complexity of which is to be witnessed by reading the contemporary works included in this volume.

In cognitive science, the notion of a sign was too long conceived in purely syntactical terms, or alternatively, as a kind of cognitivist "reflex arc," a causal mediator between action and perception, but without any distinctive causal role as a sign. Originally, in the fields of what was to become cognitive science, there were researchers (such as pioneering psycholinguist Charles E. Osgood) who shared the evolutionary perspective on the development of language. But later, cognitivism took a step back: it considered language as an intrinsic human ability while suggesting that animal cognitive abilities are merely analogical to human language – the only rational representing system. It shut the door to those who understood that animals have their own communication systems, which are not radically different from human natural language. One of the most prominent biosemioticians, Terrence Deacon, whose book *The Symbolic Species* (1997) is reprinted in excerpts, investigates human language as a system already rooted in animal cognition. He portrays human cognition as animal through and through and tries to understand what is unique for humans: which is certainly not an ability to map gestures into referents but an ability to manipulate representations of non-present conditions.

Biosemiotics is therefore an alternative to reductionist anthropomorphism in which language is isolated from the whole system of signs and is understood as anything but a product of evolution. Language emerges naturally as a process having its own dynamics and a role in coordination and communication. It is studied as a special semiotic system for animals and humans. As such, biosemiotics offers an integrated, evolutionary perspective on representational phenomena in animal behavior in general and on its subjective experience. Not only does it focus on mental representation, but also supplies a theoretical framework for talking about communicative interaction among various biological systems.

The reader under review is a bible of biosemiotics and there are no similar books on the market. It offers 24 classical and contemporary papers in this field, spanning 880 pages of dense print. The ordering of chapters is chronological and the material is also sorted by main trends in biosemiotics. The book is divided into four sections. It has a detailed introductory chapter that is very informative and up-to-date (it includes developments up to 2010!). The first section is about the precursors of biosemiotics that situates the roots of the discipline in the works of the fathers of general semiotics, such as Uexküll, Peirce, Charles Morris, and Yuri Lotman. Their ideas influenced Sebeok and his followers, who are the focus of the next section. This section investigates biosemiotics in more detail, finding its roots in Sebeok's programme. It covers special domains of the new approach, such as phytosemiotics, zoosemiotics or anthroposemiosis. In particular, phytosemiotics might seem quite extravagant but the idea that plants use signs may not be so outrageous after all: "Krampen's interior design

based research on the semiotic effects that plants have on the habitats of humans led him to investigate the viability of thinking about the semiotic interactions taking place within plants themselves" (Favareau 2010: 259). As empirical investigation shows, plants respond to environmental stimuli (by tropic and nastic responses). Being ontogenetically adaptive and interactively territorial, plants can transfer information by a kind of sign-based system that allows them to react to the impingements of moisture, light, gravity, sun direction, barometric pressure, etc.

The third section is devoted to the applications of classical ideas, taken mostly from the works of Sebeok and developed by influential works of Kalevi Kull, Gregory Bateson, Terrence Deacon or Howard Pattee.

The last section, called "The Contemporary Interdiscipline of Biosemiotics," includes approaches to biosemiotics inspired by modern theories such as a theory of information (Jesper Hoffmeyer) or second-order cybernetics (Søren Brier, whose work is deeply engaged with the main ideas of constructivism) and sheds light on various kinds of Darwinism. At the end of the book, one can find a commented bibliography and suggestions for further readings. Favareau, himself an enthusiast of biosemiotics, who insists on the "silent revolution" that semiotic approaches effectuate in biology, offers a reader a variety of different approaches to biosemiotics, which span a wide spectrum. Some are closer to Ferdinand de Saussure, even if most follow Peirce; some favor classical representationalism, even if the majority seems to prefer a notion of representation that is not reducible to correspondence. But the richness of material provides food for thought for any student of representational phenomena.

Although the book is at times a bit too scholarly – in particular for those unacquainted with semiotics – it nevertheless raises unobvious and often difficult questions. The primary audience for the book are all people interested in the fields of semiotics, general linguistics, biology, cognitive science, and philosophy, regardless of whether they are undergraduate students, professors or somewhere in between.

There is much to be gained from integrating the insights of biosemiosis with cognitive science and psychology, all under the constructivist umbrella. And, indeed, this task seems to be entirely in accordance with research on the emergence of human communication and social coordination (Galantucci 2005; Steels 2006) that tries to tackle exactly this question of meaning and its evolution in human community. By taking the evolutionary and biological perspective seriously, biosemiotics offers a new perspective on the underpinnings of animal and human behavior.

A Ph.D student of Philosophy at Warsaw University, **Krystyna Bielecka**'s main research interests include the concept of representation in philosophy of mind and cognitive science. The role of mental misrepresentation in the modern theories of representation is the focus of her doctoral thesis. She is a member of the European Network for the Advancement of Artificial Cognitive Systems, Interaction and Robotics (EuCogIII).

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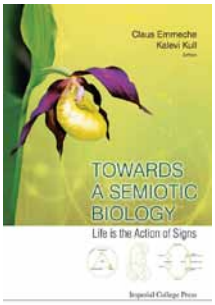

OF RELATED INTEREST **TOWARDS A SEMIOTIC BIOLOGY**
Towards a Semiotic Biology: Life is the Action of Signs edited by Claus Emmeche and Kalevi Kull, presents programmatic texts on biosemiotics, written by world leading scholars in the field (Deacon, Emmeche, Favareau, Hoffmeyer, Kull, Markoš, Pattee, Stjernfelt). Furthermore, the book includes chapters which focus closely on semiotic case studies (Bruni, Kotov, Maran, Neuman, Turovski) and conversations among biosemioticians. Imperial College Press, London, 2011. ISBN 978-1-84816-687-5. 304 pages.