

## Biosemiotics

Timo Maran

Biosemiotics, or semiotic biology, is the study of qualitative semiotic processes that are considered to exist in a variety of forms down to the simplest living organisms and to the lowest levels of biological organization. Biosemiotics can be seen as an alternative to the mainstream approaches of contemporary evolutionary biology that use reductionist quantitative methodologies and tend to objectify living processes. Emphasizing the role of sign processes in nature makes it possible to restore the “subjectness” or agency of living organisms that in turn are considered to influence larger ecological and evolutionary processes. Here, a sign process or “semiosis” is defined as a process, in which something—a sign—stands to somebody for something in some respect or capacity (Peirce 1931–1935, 228). A simple example is a bird song that indicates to the singer’s species mates that he is guarding his nesting ground. In biosemiotics, processes taking place inside an organism, such as interpretation of DNA for protein synthesis by a cell, are also regarded as sign processes. Although, up until now, biosemiotics has been a paradigm mostly in the biological sciences, this field of study is increasingly referred to in cultural and literary studies.

As a discipline, biosemiotics emerged from comparative studies of animal communication conducted by the Hungarian-American semiotician Thomas A. Sebeok in the 1960s (and referred to, at the time, as “zoosemiotics,” Sebeok 1972, 1990). Semiotic approaches to animal

communication provided biosemiotics with the concepts of repertoire, code, and context that connect the parties of communication and make mutual understanding possible. Later reconstructions of the history of biosemiotics trace the field back to German biology, mostly to the *Umwelt* theory of Jakob von Uexküll (1982), and to theories of the American philosopher and semiotician Charles S. Peirce. Uexküll’s *Umwelt* theory gives biosemiotics its subject-centered perspective. *Umwelt* theory describes an organism’s relations with its environment as shaped by its species-specific perceptual and cognitive capacities and organized by meanings that bind the animal to living and nonliving entities in its environment. An important principle for biosemiotics is to consider semiotic and biological processes as they appear to the organism and to treat biological communities as the sum of interconnecting *Umwelten*. Relying on Peirce’s semiotics helps biosemioticians to study semiotic processes in other species. Peirce’s understanding of sign differs in important respects from the other major semiotic tradition, the semiology of Swiss linguist Ferdinand de Saussure, who proposed a two-part model of the sign. In contrast, the Peircean sign is tripartite (including the “object” that can also be an environmental object) and does not rely on the existence of (human) language. These properties make Peircean semiotics suitable for describing sign processes occurring outside the human species.

Synthesizing different intellectual traditions allows biosemioticians to raise questions about both the general properties of biological communication systems and the special position of human language therein. For instance, is the combination of digital and analogical codes (such as DNA and behavioral codes) necessary for the development of any complex biological system (Hoffmeyer and Emmeche 1991), are there any special rules for communication between the members of the

different species (Maran 2012), or what are the similarities and differences between the codes that cells use for interpreting DNA and the codes of human language? Early efforts to organize the field of biosemiotic studies followed largely taxonomical logic by distinguishing zoosemiotics (semiotic study of animals, see Maran, Martinelli, and Turovski 2011) and phytosemiotics (semiotic study of plants, Krampen 1981). Later alternative classifications following hierarchical logic were proposed that distinguished between endosemiotics (study of semiotic processes inside organism), zoosemiotics (study of semiotic processes between animal organisms), and ecosemiotics or ecosystem semiotics (study of semiotic aspects of ecological processes, Nielsen 2007) or were based on the mechanisms of sign processes, distinguishing between the study of vegetative (based on analogical relations and recognition), animal (based on physical linkage and associations), and cultural (based on symbolic relations and conventions) semiosis (Kull 2009).

In the last decade, biosemiotics has advanced significantly, as exemplified by the establishment of the International Society for Biosemiotic Studies, the launch of the journal and book series, both named *Biosemiotics*, and the emergence of biosemiotic courses in curricula of many universities (for historical overviews, see Kull 1999; Favareau 2009). At present the most intriguing topics in biosemiotics seem to include the role of codes and coding in semiotic processes (Barbieri 2010; Markoš and Faltýnek 2011), as well as developing semiotic views on biological evolution (see Schilhab, Stjernfelt, and Deacon 2012). The logic of biosemiotic inquiry can be demonstrated by research questions provided by Kull, Emmeche, and Favareau's 2008 essay, "Biosemiotic Questions": what are the major modes of biosemiosis? How does the world appear to the organism, and what are the methods that allow the study

of subjective worlds (*Umwelten*)? What are the general biological functions that are made possible through the phenomenon of semiosis? These questions can be used, for instance, to think about the process of recognition. Recognition is clearly an *Umwelt*-specific phenomenon, as humans do not perceive the same signs (or at least not in the same way) as other animals. Recognition may be a key for important biological functions: for instance, reproduction in most cases is not possible without recognition of the mate. Being a qualitative process, recognition requires special methods of study (*Umwelt* modeling, participatory observation). One example of practical research where biosemiotics has been applied includes the ongoing search for minimal biological entities that show any activity in perceiving and producing signs (e.g., "autocell" in Deacon 2006). Biosemiotic concepts have also been fruitfully applied in landscape ecology to study the engagement of different species with the environment, their use of resources, and their interaction and conflicts both with one another and with human influences (Farina 2008).

Biosemiotics is also contributing to studies of human culture as it is taken up by ecocritics (see Garrard, this volume), ecofeminists (see Gaard, this volume), and multispecies ethnographers (see Rose, this volume), among others. "Biosemiotic criticism," as I have termed it (Maran 2014), is attracting a number of scholars from environmental literary criticism and other environmental humanities (e.g., Wheeler 2008; Coletta 1999; Maran 2010; Tüür 2009; Siewers 2011). Biosemiotics broadens the reach of sign processes into the biological realm as well as into the inner milieu of the human organism, providing the humanities a substantiated expansion beyond human cultural processes and artefacts. There are several possible approaches in biosemiotic criticism. For instance, biosemiotic tools can be applied to cultural phenomena on the basis of analogies between

biological organisms and human culture, or through study of different ways that humans and other animals model their surrounding environment (Sebeok 1991), or through study of representations of semiotic processes either from inside or from outside the human body or from the environment. An example of the latter would be to inquire into the ways in which human bodily perceptions and reactions (having a cold, developing an immune reaction, recovering from an injury or a shock) relate to creation and interpretation of literary and artistic works.

Biosemiotic criticism can be invoked to ask questions such as, what are the roles and relations between different modeling processes in cultural representations? Thomas A. Sebeok has distinguished between linguistic and zoosemiotic types of modeling. Linguistic modeling based on human language is specific to the human species, whereas zoosemiotic modeling unites humans with other animals. Zoosemiotic modeling is based on *Umwelt* structure, where signs distinguished by the organism's species-specific perceptual organs are aligned with its behavioral resources (Sebeok 1991). On the basis of this distinction we can ask, where and in what forms does prelinguistic zoosemiotic modeling occur in humans? In literary studies, what is the role of the author and readers as biological semiotic creatures in literature and other cultural artifacts? Are there traces of zoosemiotic modeling in nature essays and in other cultural representations of nature? In which ways do different models and representations of nature loop back to influence the material structures of the world? For instance, in nature essays, authors are often present in the text as bodily creatures perceiving their environment by sights, sounds, smells, and touch. From the perspective of biosemiotic criticism, representing not just the environment but also subtle semiotic ways of relating to the environment (so-called sensory sign, Hornborg

2001) appears to be an important communicative and didactic strategy.

The research program of biosemiotic criticism is still at a very early stage of development and is waiting for further practical applications to different research objects as well as for syntheses with paradigms of both environmental humanities and semiotics of culture. In any case, biosemiotic criticism is coming to be considered a viable alternative to other paradigms, like Darwinian literary studies or posthumanism, that seek to overcome the culture-nature divide.