Cybernetics and Human Knowing. Vol. 22 (2015), no. 1, pp. 93-96

Biosemiotic Theses on the Door of Conventional Biology

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A review of *Towards a Semiotic Biology: Life is the Action of Signs*, edited by Claus Emmeche and Kalevi Kull. Published by Imperial College Press, London, 2011 (distributed by World Scientific Publishing Co. Pte. Ltd., Singapore). 288 pages, ISBN 13 978-1-84816-687-5.

This book, *Towards a Semiotic Biology: Life is the Action of Signs*, is a collection of articles, published in London in 2011, with a very ambitious goal: to apply biosemiotics as a paradigm throughout the range and extent of biology. The authors include many of the key figures in the biosemiotic revolution, such as Kalevi Kull, Claus Emmeche, Jesper Hoffmeyer, Howard Pattee, Donald Favareau, Terrence Deacon and others.

One of the origin myths of biosemiotics, usually but not exclusively told by Jesper Hoffmeyer, is reminiscent of Moliere's figure of the bourgeois gentleman who was astonished to find out he had been speaking prose all along. In this case, though, it is the biologists who had been speaking biosemiotics all along, because they were unable to discuss how living systems worked without using words like *genetic code*, *chemical message*, *information*, *communication,* and the like. But, as Hoffmeyer and Emmeche first articulated in 1991, conventional biologists do not theorize these words. They treat them as common sense metaphorical expressions which, if they wanted, could be translated easily into mechanistic, efficient-cause explanations that fit a restricted practice of natural science.

Biosemiotics, of course, argues that the very presence of these supposedly insignificant metaphors throughout every textbook of biology should be taken as a kind of Sherlock Holmes clue, that something is happening here that the usual investigators are overlooking. But before this clue could be noticed and made use of, semiotics itself as a theory of meaning and significance had to develop in a way that could be usable by those who study nonhuman animals and plants. Much of the semiotics that is fashionable in literary studies and the social sciences uses human language, in its fully developed referential and symbolic form, as its type case and central paradigm. Of course this kind of human-centric semiotics cannot be extended usefully throughout biology.

But it is not the only semiotics available. Today's biosemiotics, the kind of semiotics that believes it can transform biology, comes from the confluence of a number of streams of thought. One of these has its wellsprings from Jakob von

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Uexküll, the theorist of *Umwelt*, the lived perceived world of the organism. (Von Uexküll was not the first nor the last of biosemiotics' precursors and exponents to originate in Estonia, today the home of Kalevi Kull who is one of the most important authors in this collection.) Of course another of the source waters of biosemiotics comes from the semeiotic thought of Charles Sanders Peirce, the American polymath scientist and pragmaticist philosopher.

The book being reviewed can be seen as a multi-authored expansion upon what I have been arguing above as the rationale and apologia for biosemiotics as a new paradigm for biology. The title of the first chapter asks, "Why Biosemiotics?" In this chapter Kull, Emmeche and Hoffmeyer make an initial case. After this introductory chapter the book divides into three parts. Part I sets forth General Principles. Chapter 2 nails to the cathedral door eight theses, from five collaborating authors, setting forth the biosemiotic perspective. In chapter 3, Hoffmeyer expands on the principle that I touched on above, that conventional biology, as he proclaims in the chapter title, is immature biosemiotics, or to put it differently, that the biosemiotic approach gives us new ways to approach a number of the questions that biology has set for itself since becoming a modern science. But the new paradigm also generates, as Kull, Emmeche and Favareau note in the title to chapter 4, "Biosemiotic Research Questions" of its own.

In chapter 5, Claus Emmeche sets out his view in "Organism and Body: The Semiotics of Emergent Levels of Life." He is interested not only in observed biology but also in "artificial life research" (p. 91), and sees both of these as importantly concerned with a hierarchical, nested organization of levels of embodiment. Biosemiotics from several streams of thought is brought to bear on this question. Chapter 6 by Kalevi Kull is entitled, "Life is Many, and Sign is Essentially Plural: On the Methodology of Biosemiotics." Interpretations of this complex article could also be manifold, but to me one of its key messages derives from the very fact that each organism has its own lifeworld or Umwelt, in the tradition of von Uexküll. Semeiotics is interpretation and always relates to the interpretant, so there is an irreducible multiplicity to meaning in the living world. For its part the sign, which is the basis of semeiotics as a discipline, is always relational, "an object that cannot be reduced to itself" [p. 116].

Part II of the book is devoted to applications. In chapter 7 Aleksei Turovski turns to the 20th Century zoologist Hans Hediger who explored animal lifeworlds and social relationships. He explores the question of freedom, and its limitations, in animal worlds, in the von Uexküllian tradition. In chapter 8 Luis Emilio Bruni explores the semiotic dimension of ecological relations and ecosystem functioning, applying it to a spectrum of relations whether these be plant to plant, plant to herbivore, parasite to host, or pathogen to host. The recasting of ecological relations using biosemiotics yields novel perspectives and surprising insights. In Chapter 9 Timo Maran explores biological mimicry as a semiotic system. Chapter 10 continues the biosemiotic rewriting of ecology. Kaie Kotov and Kalevi Kull examine the concepts of semiosphere and biosphere, showing how the idea of biosphere, which emphasized

the physical and chemical dimension of the living globe, can be refined using the concept of semiosphere originated by Juri Lotman and developed comprehensively by Jesper Hoffmeyer. These are related to, but different from, de Chardin's noosphere, which is seen here as emphasizing the material aspect (though I wonder about this).

The last article in this section is by Yair Neuman and takes its central question as its title: "Why Do We Need Signs in Biology?" This is one of the most ambitious articles in the book and addresses, first, the physics of life as described by Polanyi as involving boundary conditions. But these can only arise out of what Bateson calls "differences that make a difference" (p. 202; see also Bateson, 2000, p. 249). Consequently Neuman derives an informational version of autopoiesis, as follows:

> An organism is constituted as a recursive hierarchy that turns differences (i.e. discrete physical states) into informational content for the active production of other discrete physical states (i.e., its self-creation, or autopoiesis). [p. 203]

Neuman then postulates that living systems are computational systems which necessarily involve irreversible loss of information as part of their self-construction. "That is, at the heart of emerging biological structures is the idea that something is necessarily gained and something is necessarily lost when we shift between levels of the biological hierarchy" [p. 203]. However, this metaphor of computation is complicated by the analog component within living systems, which are "not Turing machines but machines of interaction" [p. 205]. The discussion of analog and digital of course brings to mind the code duality concept of Hoffmeyer and Emmeche, from their original 1991 paper.

From code duality Neuman shows that what enables a DNA genetic "code" to stabilize the form of the organism and at the same time to allow for novelty, is not its static nature but rather its place as a node of interpretive activity, with the activity of the organism revolving around recursive processes of interpretation at every level beginning with the chemical and the cellular. Interpretation, even at the basic level of DNA→RNA →protein→cell, transcends the static nature of code by bringing code to bear on the ongoing activity of life.

Part III of the book is perhaps its most enjoyable, consisting of three conversations among the theorists already encountered in the book, and a few others. In chapter 12, Howard Pattee and Kalevi Kull discuss the relation of physics and semiotics. Pattee is eloquent on the role of constraint in establishing a hierarchy of structure and dynamics in both nonliving and living systems, from molecules to computers to living beings. He also notes the role of memory, interestingly showing its inverse relation to physical law.

> The existence of any memory requires many law-equivalent states. In fact, the information capacity of a memory is defined in terms of the number of law-equivalent (equiprobable) states. [p. 220]

In general Pattee does a great deal to elucidate how a biosemiotic perspective addresses what he prefers to call the *symbol-matter problem*. He brings information theory as well as physics to bear on this knotty question.

Chapter 13 is entitled "A Roundtable on (Mis)Understanding of Biosemiotics." It is a transcript of a roundtable at the Ninth World Congress of the International Association for Semiotic Studies, at the University of Helsinki in 2007. It covers most of the questions discussed in this review and probably should be read first by anyone new to the field. The book concludes in chapter 14 with "Theories of Signs and Meaning: Views from Copenhagen and Tartu," in which Hoffmeyer and Kull go into fascinating detail into questions of their own intellectual journeys, their intellectual forebears, their own contributions to the field, and the role of biosemiotics in relation to other academic disciplines. The final question they ask themselves has to do with the most important open problems of the field and its prospects for progress, and part of Kull's answer to this deserves reprinting.

> The problem of semiotic balance:
>
> Stability/ instability of semiosic processes includes a peculiar set of phenomena, and its importance stems from the importance of preserving diversity and humanity. The study of organic balance will be a guide and the basis here. This is because the balance of life (which is an assumption for an ecological balance) by its very nature is a semiosic balance. Which means that the problem of peace, of the balance of cultures, will converge with the problems of ecological balance and the balance of health; thus the protection of biodiversity and protection of cultural diversity turn out to be the same – the protection of diversity, or quality as such. [p. 284]

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