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Thomas A. Sebeok and biology: Building biosemiotics

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Abstract: The paper attempts to review the impact of Thomas A. Sebeok (1920–2001) on biosemiotics, or semiotic biology, including both his work as a theoretician in the field and his activity in organising, publishing, and communicating. The major points of his work in the field of biosemiotics concern the establishing of zoosemiotics, interpretation and development of Jakob v. Uexküll's and Heini Hediger's ideas, typological and comparative study of semiotic phenomena in living organisms, evolution of semiosis, the coincidence of semiosphere and biosphere, research on the history of biosemiotics.

Keywords: semiotic biology, zoosemiotics, endosemiotics, biosemiotic paradigm, semiosphere, biocommunication, theoretical biology

> *"Culture," so-called, is implanted in nature; the environment, or Umwelt, is a model generated by the organism. Semiosis links them.*
>
> T. A. Sebeok (2001c, p. vii)

When an organic body is dead, it does not carry images any more. This is a general feature that distinguishes complex forms of life from non-life. The images of the organism and of its images, however, can be carried then by other, living bodies. The images are singular categories, which means that they are individual in principle. The identity of organic images cannot be of mathematical type, because it is based on the recognition of similar forms and not on the sameness. The organic identity is, therefore, again categorical, i.e., singular.

Thus, in order to understand the nature of images, we need to know what life is, we need biology — a biology that can deal with phenomena of representation, recognition, categorisation, communication, and meaning. This is a special kind of biology, richer than the one built according to the rules of the methodology of natural science. A powerful contribution to such extended general biology has been made by Thomas A. Sebeok. The following words can be found in Winfried Nöth's *Handbuch der Semiotik*:

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> Als Pionier der Semiotik des 20. Jahrhunderts verdient Thomas Albert Sebeok (geb. 1920[2]) besondere Erwähnung. … Sebeok hat sich durch umfangreiche editorische Tätigkeiten um die internationale Verbreitung der Semiotik Verdienste erworben. … In seinen eigenen Arbeiten zur Semiotik … plädiert Sebeok für die Erweiterung der Semiotik und die Überbrückung der Grenzen zwischen den Geistes- und Naturwissenschaften im Rahmen der Semiotik. Die Entstehung und Entwicklung der Zoosemiotik, der Biosemiotik und der Evolutionären Semiotik als neue Teilgebiete der Semiotik in Erweiterung der Anthroposemiotik sind wesentlich mit dem Namen T. A. Sebeoks verbunden. (Nöth, 2000, pp. 42–43)

On December 21, 2001, T. A. Sebeok died in Bloomington (Indiana, USA), the city where he lived and worked most of his life (Figs. 1 and 2). As a great designer of semiotics, his importance is far more fundamental than can be described here, or in any single article. A good minimal account of him has been collected in an obituary by J. Bernard (2002), in addition to other recent obituaries (Hoffmeyer, 2002; Kull et al., 2002; Petrilli, 2002; etc.), numerous writings from Sebeok's lifetime (Baer, 1987; Deely, 1995a, 1998; Danesi 2000, 2001; Nuessel, 2000; Petrilli & Ponzio, 2001; Ponzio & Petrilli, 2002; etc.), and large collective *festschrifts* (Bouissac et al., 1986; Bernard et al., 1993; Tasca, 1995; Tarasti, 2000). Almost all of these, at least to some extent, mention Sebeok's work in relation to biology. As E. Baer (1987, p. 182) has said, "the point of departure for Sebeok's doctrine of signs is found in biology." However, until now there does not exist, according to my knowledge, any writing that would try to review his biological work. Let me put the latter as the aim of the current writing. And since, for Sebeok, the scholarly research was always intertwined by developing the web between scholars, this aspect will also be reflected here.

Thus, on one hand, this paper unintentionally belongs to a series of studies that we have planned together with Tom Sebeok, about the classical figures whose work has been important for the formation and development of biosemiotics, or semiotic biology.[3] On the other hand, I want to stress here that Sebeok's work described below belongs to true biology, it is about the foundations of biology, which is more than an application of a semiotic approach in certain aspects of biology or an analysis of biological aspects of semiotics. This is an extension of biology beyond the natural science, beyond a subjectless biology. Actually, an evident step that had to be taken anyway, in order to understand life and not just to describe it.

Synopsis

The work and impact of Thomas A. Sebeok on the development of biosemiotics require a special volume, because studying his works will be a necessary part of

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2. Born on November 9, 1920, in Budapest, Hungary.
3. This series already includes publications on semiotics classics in their relationship to biology, exempli gratia, on Ch. S. Peirce (Santaella, 1999), Ch. Morris (Petrilli, 1999b), R. Jakobson (Shintani, 1999), J. Lotman (Kull, 1999b), V. Welby (Petrilli, 1999a), as well as on biologists and others who have made a remarkable impact for biosemiotics, as on J. v. Uexküll (Kull, 2001), G. Prodi (Cimatti, 2000), H. Hediger (Turovski, 2000; Sebeok, 2001b; see a review of the latter in Carmeli, 2002), F. S. Rothschild (Kull, 1999c), G. Bateson (Brauckmann, 2000), G. E. Hutchinson (Anderson, 2000).

education for everybody who wants to inquire into the semiotic basis of life science. Here, I will list very briefly a few points of his foundational work in this field.

Much of Sebeok's effort has been concentrated on one central question: "whether a truly comparative science of signs is possible" (Sebeok, 1972, p. 1). In the context of semiotic biology, the following points in Sebeok's work should be emphasised:

(a) Establishing zoosemiotics. Sebeok is the author of the term 'zoosemiotics' (from 1963), and he has published widely on the problems of animal communication. This includes the compiling of zoosemiotic bibliography (Sebeok, 1969), numerous papers and books in the field (Sebeok, 1963, 1969, 1972, 1990), and the editing of large volumes of collective works on zoosemiotics (Sebeok, 1968; Sebeok & Ramsay, 1969; Sebeok & Umiker-Sebeok, 1980; Sebeok & Rosenthal, 1981).
(b) Analysing the basic sign types in their applicability and use by non-human organisms (e.g., Sebeok, 1977, 1991).
(c) Introducing the endosemiotic sphere — signs in the body — as different from zoosemiotics (Sebeok, 1976).
(d) Analysing the concept of biosemiotic self (Sebeok, 1992).
(e) Discussing Lotman's typology of sign systems, and arguing for the existence of primary modelling systems as those of the pre-linguistic or non-verbal ones; then, the linguistic modelling systems will be the secondary ones (Sebeok, 1994, 1996b).
(f) Discussing on Lotman's concept of semiosphere, and arguing for the inclusion of non-human sign systems into it (Sebeok, 2000); i.e., broadening the scope of semiotics to include the biosphere (Sebeok, 2002).
(g) Introducing the methods of semiotic analysis for biosemiotic systems (Sebeok & Danesi, 2000).
(h) Organising, supporting, and editing many collective works on biosemiotics (e.g., Sebeok & Umiker-Sebeok, 1992).
(i) Working on the history of biosemiotics. This includes the writings about Jakob von Uexküll (1864–1944) (Sebeok 1977, 1998), Heini Hediger (1908–1992) (Sebeok, 2001b), and framing the history of biosemiotics in general (Sebeok, 1996a, 1999a, 2001a).

Below, these points will be described in few more details.

Zoosemiotics

Sebeok started his scientific work as a Finno-Ugric linguist, coming from Hungary. Among his major teachers were Charles Morris in Chicago and Roman Jakobson at Princeton.[4] Trying to trace the signs of his movement towards biology, one can mark his early interest in general and interdisciplinary problems. For instance, his paper together with Giuliano Bonfante (Bonfante & Sebeok, 1944) argued for the

4. Both are also mentioned by Sebeok (2001c, p. 3) as directing the attention of semiotics towards biology.

applicability of a (originally) biological 'age and area' hypothesis (or Willis' law, according to English plant geographer John Cristopher Willis who has described this rule in his book of 1922) in linguistics — of course, with interesting exceptions. After 1954, Sebeok also wrote on psycholinguistics, where some of his zoological interests are seemingly rooted, [5] but the first appearance of directly zoological topic dates only to 1962 (Sebeok 1962).[6] Since then, animal communication has become a frequent topic of his publications (Sebeok, 1963, 1965a, 1968). Most of Sebeok's publications in the field from this first decade have been included in his book *Perspectives in Zoosemiotics* (Sebeok 1972).

At first, his interest turned to the study of codes in animal communication (Sebeok 1962, 1965c). According to his definition, "by code is meant everything that the source and the receiver know *a priori* about the message" (Sebeok, 1972, p. 9). Therein, one of the questions he paid attention to was the relationship between analog and digital coding.[7] Sebeok developed "the hypothesis that whereas subhuman species communicate by signs that appear to be most often coded analogically, in speech … some information is coded [analogically] and other information is coded digitally" (Sebeok, 1972, p. 10). Sebeok's interest clearly reflects the general influence that the developing fields of cybernetics and information theory had on linguistics of that period. These, altogether, led to interdisciplinary communication studies in animals and men.[8]

About the same time when zoology started to be his field, he also enters the field of semiotics.[9] The remarkable fact that these turns were closely related for Sebeok clearly helps in understanding his thinking.

Quite soon after that, he started to use the term 'zoosemiotics' (Sebeok, 1965b). Most probably, this term was first coined by him (in Sebeok, 1963, p. 465).[10] He started to pay attention to the relationship between ethology and semiotics. He tried to review the field of animal communication research, compiling a bibliography of the field and publishing it in several versions (Sebeok, 1969, pp. 210-231, 1972, pp. 134-161). He could indeed collect an amazingly rich library on animal communication studies (Fig. 3). Sebeok provides many examples of sign use in animals, and classifies them on the basis of sign types. He tends to claim that the decisive role in animal behaviour belongs to indexical signs: "The survival of all species, and of each

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5. About this first period of research, see his own description in Sebeok, 1986a, pp. ix-xi, 65; 1995. Cf. Baer, 1987, p. 181.
6. There exists a comprehensive bibliography of Sebeok's writings of 1942–1995, published by John Deely (1995b).
7. It is interesting to mention in this respect that one of the first works of Danish biosemioticians Jesper Hoffmeyer and Claus Emmeche (1991) was devoted to the same problem.
8. An expression by Hans Kalmus (1906–1989) may illustrate this: "Nevertheless no organism, solitary or social, is conceivable, which has not grown up under the control of a well-integrated communication system, the element of which are the genes" (Kalmus 1950: 22; see also Kalmus 1962).
9. "By 1962, I had edged my way into animal communication studies. Two years after that, I first whiffled through what Gavin Ewart evocatively called 'the tulgey wood of semiotics'" (Sebeok, 1986a, p. ix).
10. A detailed story can be found in the chapter "The word 'zoosemiotics'" in Sebeok, 1972, pp. 178–181.

individual member of every species, depends on the correct decipherment of indexical signs ceaselessly barraging their Umwelt" (Sebeok, 1997b, p. 282).

Then, he enters into a discussion on the existence of language in animals, denying it on the basis of an analysis of the example of Wilhelm von Osten's trained horse Kluge Hans, which was studied already by Oskar Pfungst (Sebeok, 1980; Umiker-Sebeok & Sebeok, 1980; Sebeok & Rosenthal, 1981). The period coincided with an intensified work on teaching language to human apes, and Sebeok began to be strongly critical towards these approaches which were blind to the categorical difference between language and animal communication.[11]

Sebeok's position in using the term 'language' was very clear: "Expressions such as 'language of the bees', even when used with the authority of a Nobel Laureate, Karl von Frisch, are metaphors;" "picturesque combinations of the word 'language' with the generic word 'animal' … ape or dolphin, or a category of domestic pets (cat, dog), or in phrases like 'the language of flowers', are unscientific nonsense, examples of *petitio principii*" (Sebeok, 1996b, pp. 105–106). Another statement defines the difference:

> All the animals paleontologists classify generically as *Homo*, and only such, embody, in addition to a primary modelling system …, a secondary modelling system, equivalent to a natural language. The difference amounts to this: while the Umwelten of other animals model solely a (for each) 'existent world', man can, by means of the secondary system, also model a potentially limitless variety of 'possible worlds' (containing sentences with alethic, deontic, or epistemic modalities). (Sebeok, 1996b, p. 106)

Despite the great influence Sebeok's works have had on the study of semiotics of animal communication (and on linguistics and biology; see, e.g., Smith, 1974; Ruse, 1998), the responses he personally received from the specialists in the field were not always satisfactory to him. Those who worked in ethology (mostly within the neo-Darwinian paradigm), did not see the zoosemiotic approach as operational enough. And those who studied the linguistic behaviour of apes thought that Sebeok's critique had not been entirely to the point. This has probably been an additional reason for his search for more fundamental principles of biosemiotics.

Biosemiotics

The step Sebeok was able to make from zoosemiotics to biosemiotics has quite evidently been a result of, on one hand, reading the classical works of Jakob von Uexküll at the end of 1970s, and on the other hand his conversations with Thure von Uexküll and Giorgio Prodi. He has himself described the details of these meetings on several occasions (e.g., Sebeok, 1998). This turn also had a Russian dimension, via a book by Stepanov (1971) which he came across probably soon after its publication

11. In Sebeok (1986a, pp. 189-213), one can find the reprintings of his reviews on the works of Rumbaughs, Premacks, and others who attempted to teach human language to apes. These discussions are reminded until today (e.g., O'Connor, 2002).

and which opens with a chapter titled 'Biosemiotics'. However, Sebeok himself hesitated to use this term for a long time. For instance, the collective paper that appeared in *Semiotica* in 1984 (Anderson et al., 1984)[12] and has formulated a direct research program for semiotic biology, still avoided this term, as well as his dictionary of 1986 (Sebeok, 1986b).[13]

In a way, the turn toward biosemiotics has probably something to do with changes in general semiotics. This becomes clear when semiotics of the 1960s and 70s is compared to semiotics in the 1990s. For instance, if in the first period Roman Jakobson's influence was considerable, then in the second period an emphasis on the theoretical concepts of Charles Peirce became a dominating one. This also means a change in the central concepts, from message, sender, and receiver, to sign (or text), semiosis, and interpretant.

Since 1977, Sebeok became interested in the concept of "the semiotic self" (Sebeok, 1986a, p. xi, 1992, p. 335). This includes a problem of "how are self-images established, maintained, and transmuted into performances" (Sebeok, 1992, p. 334). He pointed out that "bodily sensations and the like, most saliently among them those connected with illness, are not amenable to verbal expression because they lack external referents" (Sebeok, 1992, p. 336). He proposed "to discriminate between two apprehensions of the self, (a) the immunologic or biochemical self, with, however, semiotic overtones, and (b) the semiotic or social self, with, however, biological anchoring," thus showing that "the self is a joint product of both natural and cultural processes" (Sebeok, 1986a, p. xi).

The problem of semiotic self is inherently related to the notion of endosemiosis — a field introduced very much due to Sebeok (in Sebeok 1976, this concept has been proposed; see also Sebeok, 2001c, p. 20).

There has been a well-known debate about the concepts of primary and secondary modelling systems (see, e.g., Sebeok & Danesi, 2000). According to the initial formulation by Lotman, language is the primary modelling system, whereas culture comprises the secondary one. Later, Sebeok argued that there exists the zoosemiotic system which has to be called the primary one, leaving the secondary status to language, and the tertiary one to culture (e.g., Sebeok, 1994). Sebeok's view has been supported by many later authors (cf. Moriarty, 1994).

T. A. Sebeok, who has argued for introducing semiotics into all areas of biology, has found it reasonable to specify the terms in corresponding ways. All main types of living creatures serve as an object for semiotic analysis:

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12. The writing of this *manifesto* has been proposed by Sebeok. The drafts were written by M. Anderson and circulated for comments and additions among other authors. About more details on the formation of this paper see Sebeok, 1986a, pp. 17–18.
13. I also remember how curiously Sebeok questioned me about the term 'biosemiotics' when I freely used it during my talk at the Glottertal meeting, 1992. As we learned much later, the term had been used already in 1962 by F. S. Rothschild (Kull, 1999c).

> According to one standard scheme for the broad classification of organisms, five superkingdoms are now distinguished: protists; bacteria; plants; animals; and fungi. In each group, distinct but intertwined modes of semiosis have evolved. (Sebeok,1997a, p. 440)

Indeed, as the first major distinction is into kingdoms, and biology is using corresponding divisions in scientific inquiry as bacteriology, protistology, botany, mycology, and zoology, one can, correspondingly, apply biosemiotic divisions for each kingdom — e.g., *bacteriosemiotics, phytosemiotics, mycosemiotics, zoosemiotics,* etc. Such a terminology would emphasize that there exist two principal ways in studying the organisms — (a) on the basis of a methodology of natural science, and (b) on the basis of an extended — semiotic — methodology, which is the methodology of the sciences of meaning (*Bedeutungswissenschaften*).

Sebeok, whose particular emphasis is on the plant/animal/fungus trichotomy, does not take these categories as levels, but more as the complementary ones:

> These three categories, distinguished by taxonomers according to the nutritional patterns of each class, that is, three different ways in which information (negentropy) is maintained by extracting order out of their environment, are complementary. (Sebeok, 1997a, p. 441)

He also notes, but does not explore, "the remarkable parallelism between this systematists' P-A-F [plant-animal-fungus] model and the classic semioticians' O-S-I [object-sign-interpretant] model" (Sebeok, 1997a, p. 441). This is because "on this macroscopic scale animals can be catalogued as intermediate transforming agents between two polar opposite lifeforms: the composers, or organisms that 'build up', and the decomposers, or organisms that 'break down'" (Sebeok, 1988, p. 65; see also note 1 in Sebeok, 1988, p. 72). "According to this, in general, a fungus/interpretant is mediately determined by an animal/sign, which is determined by a plant/object (but plant/fungus are likewise variant life forms, of course, just as object/interpretant are both sign variants)" (Sebeok, 1999b, p. 391).

In the framework of endosemiotics, a special area of *immunosemiotics* (and semioimmunology) has also been noted as a field dealing with the immunological code, immunological memory and recognition (Sebeok, 1997a, p. 438, 2001c, p. 21; Sercarz et al., 1988).

As E. Baer (1987, p. 206) says, "Sebeok's work marks a transition of semiotics from a one-sided subjection to the linguistic model to a biologically oriented investigation of Umwelt." In his papers of different topics, Sebeok has tried to emphasize and demonstrate the existence of semiosic phenomena in non-human organisms, and to analyse the biological basis of various sign processes. This includes, among others, the biological derivation of non-verbal art forms (Sebeok, 1984).

While discussing the view held by semiotics of culture that the appearance of culture provides the semiotic threshold, there is surprisingly much in what Sebeok incorporates from the Tartu School. Particularly, the concept of modelling systems as introduced into semiotics by Juri Lotman and his colleagues (e.g., the Kääriku Summer Schools on Secondary Modelling Systems, in 1960s). The book *Forms of*

Meaning (Sebeok & Danesi, p. 2000) uses the concept of the modelling system as the central one. Also, "many of Sebeok's studies constitute fundamental continuations of Uexküll's project of Umwelt research" (Baer, 1987, p. 205).

When describing the semiotic behaviour of animals and other organisms, Sebeok does not apply a gradualistic approach. He sharply distinguishes life as the arena of semioses from non-life, as well as human semioses from non-human semiosis.

In addition to specifically biosemiotic problems, Sebeok also touches, in some of his writings, on the area of representations of (and approaches to) nature in cultures (as can be illustrated, for instance, by the quotation that heads this paper). This field, nowadays known as (cultural) *ecosemiotics,* should be taken as different from biosemiotics, because it does not deal with biological problems and belongs rather to the domain of the semiotics of culture.

The core statements of biosemiotics

It will be fascinating to try to formulate briefly, in a thesis-like form, the main statements of Sebeok on biological semiotics.[14] The version of these 'theses on biosemiotics' that follows below is compiled from his various writings on the issue. Among his own papers, the article 'Signs, bridges, origins' includes some of these statements, formulated in terms of 'theorems' and 'lemmas' (Sebeok, 1996b, also published in a slightly edited version in Sebeok, 2001c, pp. 59–73).

(1) *Life is semiosis.* Semiosis, or a triadic cooperative production involving a sign, its object, and its interpretant , is as much a criterial attribute of all life as is the ability to metabolize (Umiker-Sebeok & Sebeok, 1980, p. 1).
(2) *Umwelt is a model.* The recalcitrant term Umwelt had best be rendered in English by the word model (Sebeok, 1988, p. 72). All, and only, living entities incorporate a species-specific model (Umwelt) of their universe (Sebeok 1996b: 102).
(3)) *There exists a global communicative network in the biosphere, formed in its lowest level by bacteria.* The earliest, smallest known biospheric module with semiosic potential is a single bacterial cell. The largest, most complex living entity may be Gaia. Both units at the polar ends display general properties of autopoietic entities, but it is now bacteria that merit, in my opinion, special consideration on the part of all who would work at semiotics professionally (Sebeok, 2001c, p. 12).
(4) *Protists, plants, fungi, and animals represent different basic communication strategies, and accordingly, correspondent branches of biosemiotics are relevant.* Just as there are different sorts of strategies for

14. Two other recent attempts to formulate the main theses of biosemiotics (mainly referring to J. Hoffmeyer's writings) can be found in Emmeche et al., 2002, pp. 13-24, and Stjernfelt, 2002.

metabolic activity, there are also various kinds of communication devices (Umiker-Sebeok & Sebeok, 1980, p. 1).

(5) *Endosemiosis occurs in organism — with multiple (genetic, immune, metabolic, neural) codes.* These four codes (with references to relevant literature) are mentioned, e.g., in Sebeok (1996b, pp. 107—108).

(6) *Symbiosis is a token of semiosis.* The biologist s notion of symbiosis is equivalent to the philosopher s notion of semiosis (Sebeok, 1988, p. 72). Inasmuch as processes of sign transmission outside and inside organisms are at play, it appears not unreasonable to suppose symbiosis to be a token of semiosis and endosymbiosis to be a token of endosemiosis (Sebeok, 1996b, p. 102).

(7) *Language appears with syntax. There are no syntactic structures in animal sign systems.* What we know of zoosemiotic processes furnishes no evidence of syntactic structures, not even in any of the alloprimates (Sebeok, 1996b, p. 108).

These and a couple of other statements of the same kind form some important knots in the network of Sebeok's ideas, which are also illustrated by him through a large number of examples, references and citations from a big variety of sources he has used in compiling his texts.

Building a field: The biosemiotic web

Despite the many fields to which Sebeok contributed, his work in biosemiotics was evidently seen by him to be of central importance. When he understood that the building of semiotic biology would mean a paradigmatic change, he consciously wanted to establish the necessary attributes for this area to become a recognised independent field of research. This means, above all, the publications, particularly thematic volumes and monographs, and the history of the field.

An important event in this direction has been the publication of English translations of Jakob von Uexküll's two books as special issues of *Semiotica* (vol. 42(1), 1982, & vol. 89(4), 1992). Certainly Sebeok's role has been most helpful in getting Uexküll acknowledged as one of the major classics of contemporary semiotics.

Sebeok was an engine behind the first specialised meetings on biosemiotics, in 1991 and 1992. These took place in Glottertal, a village near Freiburg am Main in Germany.[15] As Jesper Hoffmeyer (2002, p. 385) has said, "these early Glotterbad meetings were perhaps especially important because they left an impression on everybody that biosemiotics was now for real."[16]

15. About that meeting, see also in Hoffmeyer, 2002, pp. 384-385, and Sebeok, 2001a, p. 65; 2001c, p. 170.

In 1992, the first collection of papers on biosemiotics has been published under his editorship (together with his wife Jean Umiker-Sebeok — see Fig. 4) (Sebeok & Umiker-Sebeok, 1992).

Sebeok's support of biosemiotic publications has been remarkable. For instance, this concerns a series of writings by Thure von Uexküll, a translation of Giorgio Prodi's work, the spread of phytosemiotic papers by Martin Krampen (1981, and its several later versions), and the English translation of a book by Jesper Hoffmeyer (1996). On the latter, Sebeok organised a series of reviews that were published as a special issue of *Semiotica* (vol. 120(3/4), 1998). Without Sebeok's enthusiastic support, the two large special volumes on biosemiotics would not have been published – *Semiotica* vol. 127(1/4), 1999, edited by J. Hoffmeyer and C. Emmeche, and vol. 134(1/4), edited by K. Kull.

Sebeok devoted many of his conference lectures to the various aspects of history of biosemiotics. Large number of his writings include descriptions of the work and views of Jakob von Uexküll (e.g., Sebeok, 1977, 1998). In several of his papers he tried to frame the history of biosemiotics in general (Sebeok, 1996a, 1999a, 2001a).[17] During the second half of 1990s, a conscious attempt has been made to produce a systematic series of papers on the history of biosemiotics. This has resulted in a series of papers that reviewed the biological aspects in the works of semiotics classics — Peirce, Morris, Jakobson, Lotman, and few others.[18] We talked about this plan several times, during our meetings in Imatra and elsewhere.

Still, despite the large number of writings, there seem to be a couple of biosemiotic problems that Sebeok almost did not touch. One of these concerns his avoidance of the topic of (biological) epistemology, otherwise quite intensively discussed in biosemiotic literature (e.g., Hoffmeyer, 1996; Pattee, 2001; Vehkavaara, 2002). I would hypothesize that Sebeok's position has to do with his use of the concepts of model and modelling. Indeed, "in a biosemiotic paradigm, the function of singularized modelling is viewed as a general strategy for giving the perception of single objects, unitary events, individual feelings, etc. a knowable form …. Signs are … 'recognition-enhancing forms,' which allow for the detection of relevant incoming sensory information in a patterned fashion" (Sebeok & Danesi, 2000, p. 20). Also, a very interesting paper "What do we know about signifying behavior in the domestic cat (*Felis catus*)?" (Sebeok, 2001c, pp. 74–96) asks and sheds light on several questions about the ways of knowing the worlds of other organisms (Fig. on the cover).

Another problem, scarcely analysed by Sebeok, is the methodology of biosemiotic inquiry. One can be referred to the works of Jakob von Uexküll as the

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16. Glottertal meeting in 1992 was also the one were I first met Thomas Sebeok. After that we had a chance to meet quite many times — in Tartu (Sebeok, 1997, 1999), in Imatra (Sebeok, 1998, 1999, 2000), in Toronto (Sebeok, 1997), in Siena (Sebeok, 1998), in Dresden (Sebeok, 2000), in Bloomington (Sebeok, 1999). I was particularly glad to make a two-week visit to Bloomington in 1999, where I spent many hours every day at the Sebeoks' home and could work through many tens of meters of Tom's bookshelves (Fig. 3).
17. However, he never wrote a general review on the history of biosemiotics (cf. Kull, 1999a).
18. See footnote 3.

ones that provide the necessary approach. However, in addition to the points described by Sebeok, the practical questions of how the non-verbal sign systems of non-human organisms should be studied, and which are the criteria that allow us to assign them the usage of meaning, still require a profound elaboration. Otherwise the step from ethology to biosemiotics is hardly thinkable.

Building biosemiotics exceeds the borders of biology. "Indeed, there is a lot of work to do for serious philosophy, considering how many central philosophical topics — of mind, language, epistemology, and metaphysics — that cannot remain unaffected by the biosemiotic turn" (Emmeche, 2002, p.158).

Credo

It is interesting to remember how Sebeok has characterised himself:

> I firmly believe that there are, and should be, two complementary sorts of scholars: I call them moles and bees. Moles have tough nuzzles and powerful forefeet for burrowing ever deeper in one and the same spot. Such a profound scholarly mole I am not.
>
> Bees, by contrast, dart solitary from flower to flower, sipping nectar, gathering pollen from flowers, serendipitously fertilizing whatever they touch. I fancy that I have always been something of a, maybe superficial, academic *Apis mellifera.* This honeybee is the semiotic species par excellence, possessed, next to our own, of the most elaborate social communication system thus far recognized by ethologists. Too, it seldom stings unless its budget is threatened. (Sebeok, 1995, p. 121)

There also exists an earlier version of this characterisation that uses an example of laboratory rats.[19] It is important to understand that there is much more than an allegory in these slightly humoristic accounts. Because, according to Sebeok, the life process is the same in all living, and since this is a semiotic process, these comparisons state something about the ways of life in general. This can be illustrated by a reference in his book entitled *I Think I Am a Verb* to his two daughters as his "immediate and emotional *interpretants*" (Sebeok, 1986a, p. vii; my emphasis).

Thomas Sebeok's credo is something that we should all learn from him. In his own words (Sebeok, 1995, p.125; my emphasis):

> To conclude … on a semiotic note, and drawing on an image from Samuel Butler, I would observe that an academic is a sign's way of spawning further, more developed academics. The administration's task is to ensure that this process works smoothly. There are two fundamental strategies to accomplish these ends: first, by *publishing and teaching as much as possible;* and, equally important, by *doing one's best to facilitate the success of one's colleagues* in these respects. These are the only things I have ever wanted to do in my academic life.

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19. "There appear to be two antipodal sorts of bookmen. There are those who derive endless delight from their solitary pleasure, which they pursue like self-stimulating laboratory rats, with electrodes implanted in their anterior hypothalamus, unceasingly bar-pressing in preference to any other activity. Then there are those of us whose bar-pressing habit is rewarded solely by a change in the level of illumination – in a word, novelty" (Sebeok, 1986a, p. x).

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