

Modelling, dialogism and the functional cycle: biosemiotic and philosophical insights

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Abstract. Charles Peirce, Mikhail Bakhtin and Thomas Sebeok all develop original research itineraries around the sign and, despite terminological differences, can be related with reference to the concept of dialogism and modelling. Jakob von Uexküll's biosemiotic "functional cycle", a model for semiotic processes, is also implied in the relation between dialogue and communication.

Biological models which describe communication as a self-referential, autopoietic and semiotically closed system (e.g., the models proposed by Maturana, Varela, and Thure von Uexküll) contrast with both the linear (Shannon and Weaver) and the circular (Saussure) paradigms. The theory of autopoietic systems is only incompatible with dialogism if reference is to a linear causal model which describes communication as developing from source to destination, or to the conversation model governed by the turning around together rule. Dialogism understood in biosemiotic terms overlaps with the concepts of interconnectivity, interrelation, intercorporeity and presupposes the otherness relation.

As Uexküll says, the relation with the *umwelt* in nonhuman living beings is stable and concerns the species; on the contrary, in human beings it is, changeable and concerns the single individual, which is at once an advantage and a disadvantage. Thanks to "syntactics", human beings can construct, deconstruct and reconstruct an infinite number of worlds from a finite number of elements. This distinguishes human beings from other animals and determines their capacity for posing problems and asking questions. The human being not only produces his or her own world, but can also endanger it, and even destroy it to the point of causing the extinction of all other life forms on Earth. The unique capacity for reflection on signs makes human beings responsible for life across the planet, both human and nonhuman. Such reflections shift semiotic research in the direction of *semioethics*.

Keywords: Bakhtin, biosemiotics, dialogue, Uexküll, *umwelt*

1. Conditions and aspects of communication: modelling, dialogism and the concept of umwelt

“Modelling”, “dialogism” and “communication” are central notions in present-day biosemiotic research and are closely interconnected. More precisely, “modelling” and “dialogism” are complementary concepts and are presupposed by “communication” generally. This is to say that they underlie all communicative processes, verbal and nonverbal, *in* and *beyond* the sphere of anthroposemiosis. To this let us add that biosemiotic research has evidenced that communication occurs within the limits of the world as modelled by a given species, and given the species-specific capacity for modelling an indefinite number of possible worlds among human beings, the most complex form of communication in the biosphere is traceable in the human world (Vernadsky 1926).

In a biosemiotic framework the concept of dialogism overlaps with the concepts of interconnectivity, interrelation, intercorporeity, and presupposes the otherness relation. Most significantly, dialogism is a necessary condition for life and in fact can be traced in the larger biosphere beyond the strictly human. From a semioethical point of view, to recognize this means to take a step forward towards improving the quality of life over the entire planet (Petrilli, Ponzio 2001, 2003, 2010). And in the face of the threats presented to life in today’s global communication world, recognition of the persuasive role of dialogism is now urgent.

As used in biosemiotics today, the concepts of “modelling”, “dialogism”, and “communication” largely derive their meaning from the encounter between J. von Uexküll (though implicit in his research) and the Tartu-Moscow School (Lotman 1977). They are also pivotal in “global semiotics” as conceived by Thomas A. Sebeok (2001b) who posits that life and semiosis converge. The project for global semiotics finds an important expression in *Semiotik/Semiotics. A Handbook on the Sign-Theoretic Foundations of Nature and Culture*, edited by Roland Posner, Klaus Robering and the same Thomas Sebeok (1997–2004).

In the framework of modelling systems theory, semiosis – which involves all life forms – is defined as “the capacity of a species to produce and comprehend the specific types of models it requires for processing and codifying perceptual input in its own way” (Sebeok, Danesi 2000: 5), and the study of modelling behaviour in and across all life forms requires methodological instruments developed in the field of biosemiotics. Reference here is specifically to *modelling systems theory* or *systems analysis* as proposed by Sebeok in his research on the interface between semiotics and biology. Modelling systems theory analyses semiotic phenomena in terms of modelling processes (Sebeok, Danesi 2000: 1–43).

The applied study of modelling systems theory is called *systems analysis*, which, differently from the Tartu-Moscow School, distinguishes between primary,

secondary and tertiary modelling systems (Zaliznjak et al. 1977). On the basis of research in biosemiotics, the modelling capacity appears to be operative in all life forms and is species-specific.

Sebeok distinguishes between primary, secondary and tertiary modelling thereby offering a powerful instrument for a better understanding of the distinction between modelling and communication in a relation where modelling is foundational for communication. Primary modelling is the innate capacity of organisms for simulative modelling in species-specific ways. With reference to the species *Homo* it is also called “language”, which should not be confused with “verbal language” (as occurred in the Tartu-Moscow School). “Language” understood as “verbal language” indicates a *communication system* distinct from “language” understood as a *species-specific modelling device*.

Secondary and tertiary modelling systems presuppose primary modelling, therefore they too indicate uniquely human capacities. In Sebeok’s terminology, the secondary modelling system is verbal language or *speech*, while tertiary modelling systems indicate all human cultural systems, symbol-based modelling processes grounded in *language* understood as modelling and in *speech* (Sebeok 1986, 1990, 1991a, 1991b, 1998, 2001a).

Charles Sanders Peirce, Mikhail Bakhtin and Thomas Sebeok each develop original research itineraries around the sign and, despite important differences in their work, they are easily related precisely on the basis of the concept of dialogism (Petrilli 1999a, 2005, 2010a, 2012). Also, the biologist Jakob von Uexküll’s concept of “functional cycle” is another model for semiotic processes and it, too, is closely connected to the problem of dialogism and communication. The “functional cycle” has a dialogic structure and involves inferences of the “if... then” type which may even occur on a primitive level, as in Pavlovian semiosis, or as prefigurations of the type of semiosis taking place during cognitive inference (with a “quasi-mind” interpreter). However, Uexküll does not set out to use a dialogic model.

In the “functional cycle”, the *interpretandum* produced by the “objective connecting structure” becomes an *interpretatum* and (represented in the organism by a signaling disposition) is translated by the interpretant into a behavioural disposition which triggers a behaviour into the “connecting structure”.

In his *Handbook of Semiotics* Winfried Nöth (1990: 176–180) analyses the implications of Uexküll’s biosemiotic “functional cycle” for the concepts of dialogue and communication as they are commonly understood. He discusses different communication models maintaining that biological models contrast with both linear (Shannon and Weaver) and circular (Saussure) paradigms. Biological models, such as those proposed by Humberto Maturana, Francisco Varela, and Thure von Uexküll, describe communication in terms of self-referential, autopoietic and semiotically autonomous systems whose reactions to the environment are regulated

by inner needs. Maturana (1978: 54–55) maintains that dialogic exchange conceived in terms of linear or circular communication processes is “pre- or anticommunicative interaction” (see also Maturana 1980; Maturana, Varela 1980). The theory of autopoietic systems is only incompatible with dialogism if dialogue is reductively based on linear or circular communication models. All the same, the theory of autopoietic systems calls for a new notion of creativity to deal with the difficult question of how to reconcile the principle of autonomous closure and dialogue (conceived as the inner structure of the individual) with creativity and learning.

From a philosophical point of view, the phenomenologist Edmund Husserl also introduces the idea of an interactive, that is, dialogic relation between human beings and the world (Husserl 1948). As a major Italian phenomenologist Giuseppe Semerari (1964) observes in his monograph on Maurice Merleau-Ponty, the human being does not exist separately from the world it enters and cannot be thought of independently from it. The world is the *pre-condition* of any experience – which is interactive and dialogic experience – for all living beings.

Ludwig Landgrebe (a renowned Husserl scholar and editor of the 1948 *Erfahrung und Urteil*) rightly maintains that phenomenological thought has rectified our conception of the world where even Kant’s critique failed. For Kant, the world is the idea of the totality of phenomena, therefore a construction through reason. Instead, according to Husserl, the world is what is implied in the experience of each individual being (Landgrebe 1953: 13). We can only construct a given theory or scientific model of the world – e.g., the Newtonian or the Einsteinian model – because we are already, and always have been, in the world. As Landgrebe (1953: 14) says, we can consider the world as the set of deferrals presupposed in every living being.

Husserl uses the expression *constitutive correlation* to indicate the fact that the world is the individual’s sphere of action. The individual, integrated in the unity of body-consciousness, is included in a given world horizon, without which neither one’s actions nor the fact of being an individual could even be imagined. As Husserl (*Ideen*, 2, X: 327) says, every reality has an environment of reality, that is, an “operative field” which provides the sphere of conditions for its activity. Therefore, each individual also belongs to its “companion’s” operative field in this “environment”. The reality of living beings requires the reality of things, but the reality of things also requires the reality of living beings.

In his pivotal essay, “Umwelt and modelling”, Kalevi Kull (2010) defines J. von Uexküll’s “umwelt” as “the self-centred world of an organism” and draws his English translation of “models” from Thomas A. Sebeok and the Tartu-Moscow School’s conception of semiotic systems as modelling systems. Kull underlines the relation of interdependency established by Uexküll between “umwelt” and “functional cycle” (*Funktionskreis*). According to Uexküll, says Kull (2010: 47) “[...]”

the functional cycles build the self-centred world of any animal. The functional cycles of the organisms are bridged (both intraorganismally and interorganismally), forming together the functional world of living beings [...]. Different species may have different functional cycles, which entails the species-specific *Umwelten* or objective worlds.”

Kull cites Deleuze and Guattari¹ and observes that the threshold from animal to human *umwelt* implies a deterritorialization of signs. Kull (2010: 53–54) claims:

What we will see with the appearance of language is the “creation” of time. The appearance of language becomes possible due to the appearance of signs that signify a relation itself. Such is, for instance, the sign “and” whose object is just a relation, a free relation-as-such, a relation that can be universally built between anything and which is independent of the items between which it is the relation. These signs of relation can be called “syntactic signs”, and it is in this sense that Sebeok assigns syntax characteristic status for human language. The syntactic aspect can be distinguished in any sign system, but syntactic signs are a characteristic feature of language alone; they are absent in animal and vegetative sign systems.

These considerations can be related to research by Ferruccio Rossi-Landi. With reference to verbal language, the Italian philosopher and semiotician criticizes the traditional distinction between *syncategorematical signs* (“and”, “of”, “with”, etc.) and *categorematical signs* (“idea”, “book”, “table”, etc.): all terms have a syntactic valency and their own logic concerning the operations they can be used to perform (Rossi-Landi 1961; Ponzio 1986: 155–157).

2. Biosemiotics and “the Estonian connection”

Chapter 10 in *The Sign and Its Masters* (1979) by Thomas A. Sebeok (1921–2001) is entitled “Neglected figures in the history of semiotics: Jakob von Uexküll” (derived from a paper originally presented at the Third *Wiener Symposium über Semiotik* in August 1977). Sebeok maintains that J. von Uexküll (now commonly recognized as the founder of biosemiotics, see Sebeok 2010) helped provide the theoretical groundwork for modern ethology (Konrad Lorenz describes Uexküll as one of the “most important teachers”; see Lorenz 1971: 274). He also describes Uexküll as one of the greatest “cryptosemioticians” of the first half of the 20th century. In fact, with the French topologist René Thom (1968: 220) and the

¹ See Deleuze, Gilles; Guattari, Félix 1988. *A Thousand Plateaus* (London: Athlone Press) for a selection of their writings in English.

Russian linguist and semiotician Jurij S. Stepanov (1971: 27–32), Sebeok (1968, 1972: 160, 1977) was among the first to acknowledge him as a “pioneer” in sign studies and to appreciate the originality of his contribution.

Uexküll’s work has become widely known in the sphere of semiotic studies largely thanks to publications by Sebeok as well as by Uexküll’s son, Thure von Uexküll (1908–2004), a scholar of endosemiotics (the study of trains of sign transmission inside the organism), microsemiotics, medical semiotics and psychosomatic medicine. Thure developed his father’s approach to the study of living systems and applied it to the medical sphere (T. von Uexküll 1986). Furthermore, since 1993, the Jakob von Uexküll Centre in Tartu, Estonia (Uexküll studied zoology at the University of Tartu from 1884 to 1889), now directed by the biosemiotician Kalevi Kull, has fostered research on the legacy of J. von Uexküll (Kull 2001: 1–59, 2010; T. von Uexküll 1981, 1989; Hoffmeyer 2010; Petrilli, Ponzio 2011).

The term “biosemiotic” was first used by Friedrich S. Rothschild (1899–1995) in 1962 (Kull 1999; Petrilli 2012: 85–92). Since then both Sebeok and T. von Uexküll have done much to popularize the field and the term, referring to the concept of semiotics in a Peircean framework (Sebeok et al. 1999; Sebeok et al. 2001a). However, as in the case of iatric semiotics (symptomatology, diagnostics, etc.), the ultimate cradle of biosemiotics remains, even if tacitly, in ancient medicine, practiced and theorized by physicians like Hippocrates of Cos or Galen of Pergamon.

Biosemiotics differs greatly from semiotic inquiry as commonly practiced throughout Western history with its focus on verbal and nonverbal conventional signs and intentional messages, and anthropocentric and logocentric bias. Uexküll explicitly challenged widespread anthropocentric prejudice. At the same time, biosemiotics incorporates “traditional” semiotics, embedding it in the far vaster domain of “nature semiotics”, as denominated by the Italian medical oncologist Giorgio Prodi (1928–1987; see Prodi 1977, 1982, 1983, 1988; on Prodi, see Sebeok in Ponzio 2002: 63). The study of communication in the biological sphere can be traced back to J. von Uexküll and his classic work, *Theoretische Biologie* (1973[1920]). In biosemiotics, particularly as developed in a global semiotic framework (Sebeok 2001b, 2001c), the “semiosphere” is theorized as converging with the “biosphere”, effectively a “semiobiosphere”.

The expression “semiosphere” was first coined by Juri Lotman (1922–1993) – by analogy with the term *biosphere*, introduced by Vladimir Vernadsky (1863–1945) in 1926 – and is connected with Uexküll’s concept of *umwelt* (Kull, Lotman, M. 1995; Lotman 1984; Kull 1998). In the semiosphere sign processes operate in relation to the set of all interconnected *umwelten*. *Umwelt* is the world of an organism, the world centred around the self of that organism, an individually

(species-specifically) modelled world. In other words, *umwelt* is a species-specific network of relations developed by an organism as it becomes aware of its environment. Specifically, the *umwelt* is the *modelled* part of the species-specific world, whereas *modelling* processes belong to the *Innenwelt*, as described by Uexküll. Uexküll developed a specific method for the experimental study of different *umwelten* which he termed *umwelt-research* (J. von Uexküll 1909, 1940, 1946, 1973).

Lotman's *semiosphere* only refers to the human sphere, anthroposemiosis, the world of culture modelled by natural language. Instead, biosemiotics uses the notions of "semiosphere" and "model" as proposed by the so-called Tartu-Moscow School (J. Lotman, A. Zaliznjak, V. V. Ivanov, V. Toporov, B. Uspensky, etc.), conferring upon them a meaning derived from *umwelt* theory as formulated by J. von Uexküll. In this semantic enhancement Sebeok played a pivotal role.

The concept of modelling is of fundamental importance in Sebeok's own semiotic research. He adapts and develops it from the Tartu-Moscow School – where it was introduced to denote natural language ("primary modelling system") and other human cultural systems ("secondary modelling systems") – and extends it beyond the domain of anthroposemiotics. In the light of the concept of *umwelt* as formulated by Uexküll, Sebeok interprets "model" as an "outside world model", and maintains, on the basis of recent research in biosemiotics, that the modelling capacity is observable in all forms of life (Sebeok 1991a: 49–58, 68–82; Sebeok 2001a[1994]: 117–127; Anderson, Merrell 1991; Deely 2001, 2007; Petrilli, Ponzio 2001, 2002, 2005; Petrilli 2010b).

In his essay "The Estonian connection", originally published in the journal *Sign Systems Studies* (Sebeok 1998), and subsequently in his monograph *Global Semiotics*, the last to be published before his death in 2001, Sebeok describes the encounter between two great masters of the sign, ultimately between the concepts of "semiosphere" and "biosphere" – Juri Lotman, "a 'Russian' from Petrograd, who settled in Estonia in the 1950s" (Sebeok 2001b: 160), and Jakob von Uexküll, "a Baltic 'Prussian' from Keblas, who emigrated from Estonia to Hamburg in the 1920s" (Sebeok 2001b: 160):

"The Estonian Connection", as I chose to call this article, endeavors to set in motion the seeds of a fascinating dialectic between Jakob von Uexküll, emigrant from Dorpat to the West, renowned as the scientist who had the creative power to imagine and delineate what we now call biosemiotics, and Yuri M. Lotman emigrant from Russia to Tartu, the celebrated visionary humanist who invented the notion of what we now call the semiosphere. Seemingly polar opposites, they both formulated and brought into being vast subcontinents of global semiotics: von Uexküll life itself in its multiform complexity, Lotman the universe of the human mind in its profusion of profound discernment. At

bottom, of course, the biosphere and the semiosphere must be the same, for semiosis is the criterial attribute of all life, inclusive of the mind observing the universe, which comprehends life, the biosphere. (Sebeok 2001b: 170–171)

3. Dialogism and semiosis, more insights

The concept of interrelation can be developed in terms of “dialogism”, while the notion of dialogism, as anticipated above, can be extended beyond the sphere of anthroposemiosis and applied to all communication processes. In turn, “communication” is not only grounded in the concept of modelling, but also in dialogism. And given that the concept of dialogue is fundamental in Charles Peirce’s thought system, to proceed in this direction also opens to developments in biosemiotics in terms of Peircean semiotics. In fact, the relation between *sign* and *interpretant*, as understood by Peirce, is a *dialogic* relation. Peircean semiotics effectively evidences *the dialogic nature of the sign and semiosis*. Therefore, dialogism is not a prerogative of discourse. Not only verbal signs, but any situation or *semiosis* is a relational process at different degrees of dialogism (Petrilli, Ponzio 2008; Ponzio 1999, 2007a, 2007b).

The interpretant of a sign is another sign, which the previous sign creates in the interpreter. The interpretant sign is “an equivalent sign, or perhaps a more developed sign” (CP 2.228). Therefore the interpretant sign *cannot be identical* to the interpreted sign, it cannot be a repetition, nor is it a mere mechanical effect, precisely because it is *mediated*, interpretive and as such it is always new. As to the previous sign, the interpretant is a *response* to it and as such it inaugurates a new sign process, a new semiosis. In this sense it is a “more developed sign”. As a sign the interpretant produces *another* sign that acts, in turn, as another interpretant: therefore, the interpretant opens to a new semiosis, it develops the sign process, it is a new sign occurrence.

Each time there is a sign occurrence, including the “First Sign”, there is a “Third”, something mediated, a response, an interpretive novelty, an interpretant. Consequently, a sign is an interpretant by constitution. The fact that the interpretant (Third) is in turn a sign (First), and that the sign (First) is in turn an interpretant (already a Third) places the sign in an open network of interpretants: this is the Peircean principle of infinite semiosis or of the endless series of interpretants (CP 1.339).

Therefore, the meaning of a sign is a *response* by another sign, the interpretant, that calls for *another response*, another interpretant. This implies *the dialogic nature of sign and semiosis*. A sign has its meaning in another sign that responds to it and is, in turn, a sign if there is another sign to interpret it and to respond to it, and

so forth; it is a process *ad infinitum*. In other words, something urges a response and becomes a *sign*, that is, something has meaning, if there is another something which interprets it and therefore plays the part of response, that is, of interpretant; this interpretant, in turn, means something and becomes a sign, if interpreted as something which calls for *another response*, another interpretant.

Therefore, a sign is a dialogue between an interpreted and interpretant, and semiosis is an open dialogue among various interpreted and interpretant signs. In our terminology, the fundamental terms that constitute a sign include the *interpreted*, and the *interpretant*, in a relationship where the interpretant makes the interpreted possible (Ponzio 1990). For a sign to subsist there must be an interpreted sign and an interpretant sign, in other words, an object that acts as the interpreted of an interpretant (see Petrilli 2001[1998]: Ch. 1; Ponzio 2006). And it is important to underline that when we speak of the “interpreted-interpretant” relation, our reference is to a (minimal and abstract) *triadic* relation. The interpreted implies the object of interpretation, so this expression must always be understood as a relation among “object-interpreted-interpretant”.

The interpreted becomes a *sign component* because it receives an interpretation, but in turn, the interpretant is also a sign component with the potential to engender a new sign: therefore, where there is a sign, there are immediately two, and given that the interpretant can engender a new sign, there are immediately three, and so forth, as described by the Peircean concept of “infinite semiosis” or unending chain of deferrals from one interpretant to another.

In our opinion – and in accordance with Peirce who reformulated the classic notion of *substitution* in the medieval expression *aliquid stat pro aliquo* in terms of *interpretation – the sign is firstly an interpretant* (see Petrilli 2001[1998]: I.1).

To analyse the sign starting from the object of interpretation – the interpreted – means to start from a secondary level. In other words, to start from the object-interpreted means to start from a point in the chain of deferrals, or semiotic chain, which cannot be considered as the point of departure. Nor can the interpreted be privileged by way of abstraction at a theoretical level to explain the workings of sign processes.

For example, a spot on the skin is a sign insofar as it may be interpreted as a symptom of sickness of the liver: this is already a secondary level in the interpretive process. At a primary level, retrospectively, the skin disorder is an interpretation enacted by the organism itself in relation to an anomaly which is disturbing it and to which it responds. The skin disorder is already in itself an interpretant response.

To say that the sign is firstly an interpretant means to say that *the sign is firstly a response*. We could also say that the sign is a reaction: but only on the condition that by “reaction” we mean “interpretation” (similarly to Charles Morris’s behaviourism, but differently from the mechanistic approach).

There are two main types of interpretant: *interpretant of identification*, which is connected to the *signal*, code and sign system; this kind of interpretant allows for recognition of the sign, that is, identification of something; *interpretant of responsive understanding* (or *answering comprehension*) which, instead, is the specific interpretant of the sign, that is, that which interprets the specific sense or meaning of a sign.

This second type of interpretant does not limit itself to identifying the interpreted, but rather expresses its properly *pragmatic meaning*, by installing with the interpreted a relationship of involvement and participation; in fact it responds to the interpreted and takes a stand towards it.

Therefore the original modality of being a sign is otherness and dialogue. By contrast with univocality, reiteration, identity which characterize signals, dialogue and otherness are the original, constitutive modality of that which emerges as a sign in the proper sense. In other words, the sign subsists and is characterized as a sign insofar as it is a response and in relation to that which is other from itself. In fact, the sign is differentiated both from the object acting as a referent and from another sign acting as interpretant, without which it could not be a sign.

Developing the important semiotic implication of his father's work in biology, Thure von Uexküll describes the body as a living semiotic system engaged in *dialogue* with its environment and internally with itself (see Staiano-Ross 2010: 348). He identifies three different types of semiosis which he characterizes in terms of the different roles carried out by emitter and receiver (T. von Uexküll 1997: 447–456, 1992b: 455–470): (1) semiosis of information or signification; (2) semiosis of symptomatization; and (3) semiosis of communication.

Dialogue and semiosis coincide not only in the sense that *dialogue is semiosis* but also in the sense that *semiosis is dialogue*. Dialogue does not only subsist in *semiosis of information or signification* where an *interpreted* (inanimate environment, object, act, or process, that is, a 'quasi-emitter') becomes a *sign* only because it receives an interpretation by the interpretant which is a response to the former.

Dialogue also subsists in *semiosis of communication*. In this case, the interpreted sign is already an interpretant response in itself, *therefore an interpretation*. It is addressed to somebody before it is interpreted as a sign by the subsequent interpretant. As an interpreted sign it calls for interpretation both in terms of *mere recognition* or *identification*, and of *answering comprehension*.

Semiosis of symptomatization also involves dialogue. Here too the interpreted is an interpretant response (*symptom*) which, however, as in *semiosis of information or signification* does not originally arise for the sake of being interpreted as a sign.

Therefore, dialogue does not originate with signalling behaviour from a sender intending to communicate something about an object, which responds to the linear communication model. Rather, the semiotic process taken in its entirety is

dialogic. The interpretant as such is “a disposition to respond”. This expression is used by Martin Krampen (1997: 259) to describe the dialogic interaction between a sender and a receiver.

As anticipated at the beginning of this paper, a dialogic relation can be established in the “functional cycle” between an interpreted (*interpretandum*) and an interpretant (interpreted by another interpretant, and so forth). The interpretant does not limit itself to identifying the interpreted, but rather establishes an interactive relationship with it. Moreover, not only is the structure of the “functional cycle” dialogic, but dialogue in communication (understood in a strict sense) can also be analysed in the light of the “functional cycle”. In other words, the dialogic communicative relationship between a sender who intends to communicate something about an object and a receiver can, in turn, be considered on the basis of the “functional cycle” model.

4. Bakhtinian architectonics and umwelt

In Bakhtin’s interpretation “dialogue” cannot be reduced to the communication of messages, nor does it depend on initiative taken by self (Bakhtin 1963; Petrilli, Ponzio 2005: 144–150; Ponzio 2003). The self is always in dialogue with the world and with others, whether it knows this or not (Petrilli 2013). Identity is dialogic. Dialogism is at the very heart of the self. The self, “the semiotic self” (Sebeok et al. 2001), is dialogic in the sense that it is involved with the world and with others according to species-specific modalities. Self is implied dialogically in otherness, just as the “grotesque body” (Bakhtin 1968) is implied in the body of other living beings. From a Bakhtinian perspective *dialogue* and *intercorporeity* are closely interconnected: dialogue is not possible among disembodied minds, and is only adequately understood in light of the biosemiotic conception of sign.

It is worth pointing out in passing that some of Bakhtin’s main interpreters have fundamentally misunderstood his concept of dialogue (Ponzio 2008). This is confirmed by interpretations of Bakhtinian dialogue in terms theorized by such authors as Plato (1961), Buber (1947), Mukařovsky (1977).

Instead, for Bakhtin (1968), dialogue is embodied, intercorporeal expression, and as such it is associated with the “grotesque body”. This metaphor portrays the idea of the vital and indissoluble interconnectedness of one’s own body (which is never a separate and autonomous body, if not seen as a delusory mystification) with the world and with the bodies of others.

The shift in focus from identity (whether individual, as in the case of consciousness or the self, or collective, that is, a community, historical language, or a cultural

system at large) to alterity represents a sort of Copernican revolution involving all living beings and not just the human. Also Bakhtin conducted research in the field of biology and, in fact, developed his conception of dialogism keeping account of recent developments in life sciences. He was particularly interested in Vladimir Vernadsky and his conception of the biosphere. As Bakhtin (1986: 137) says:

When consciousness appeared in the world (in existence) and, perhaps, when biological life appeared (perhaps not only animals, but trees and grass also witness and judge), the world (existence) changed radically. A stone is still stony and the sun still sunny, but the event of existence as a whole (unfinalized) becomes completely different because a new and major character in this event appears for the first time on the scene of earthly existence – the witness and the judge. And the sun, while remaining physically the same, has changed because it has begun to be cognized by the witness and the judge. It has stopped simply being and has started being in itself and for itself [...], as well as for the other, because it has been reflected in the consciousness of the other.

Dialogism according to Bakhtin means that in biosemiotic terms the living being cannot be cut off from the environment, it cannot be indifferent to its surroundings, but rather it constitutes a system with the latter. Using a Kantian term, Bakhtin calls this system *architectonics*. Both Bakhtin and J. von Uexküll were influenced by Kant, but not passively. In line with the spirit of Kantian critique, their attitude was critical.

Uexküll and Bakhtin both criticized mechanist behaviourism and reduction of self (whether human or nonhuman) to the status of an object, or machine. As Uexküll (1992[1967/1934]: 320) remarks, descriptions by mechanistic theorists are made

in terms of rigid mechanics or more plastic dynamics. They brand animals as mere objects. The proponents of such theories forget that, from the first, they have overlooked the most important thing, the subject which uses the tools, perceives and functions with their aid. The mechanist have pieced together the sensory and motor organs of animals, like so many parts of a machine, ignoring their real functions of perceiving and acting, and have even gone on to mechanize man himself. According to the behaviourists, man's own sensations and will are mere appearance, to be considered, if at all, only as disturbing static.

Instead, if we focus “on the *operator*” rather than on mechanical structures, men and animals can be regarded “as subjects whose essential activity consists of perceiving and acting” (Uexküll 1992[1967/1934]: 320). This is Bakhtin's aim as well,

which explains his interest in literary writing and specifically in Dostoevsky's "polyphonic novel". Literary writing does not reduce what it describes to the status of object; rather, it allows the subject to be a subject "whose essential activity", in the words of Uexküll just cited above, "consists of perceiving and acting".

Bakhtin's architectonics with its space, time, and values very closely resembles Uexküll's *umwelt*. Like Bakhtinian architectonics, the Uexküllian *umwelt* is the world centred around the self of an organism – the world in which an organism lives, which it recognizes and constructs (Kull 2010: 43). The expression "architectonics" refers to a unit formed by all that a subject perceives, the *perceptual world* (*Merkwelt*), and by what it does, the *effector world* (*Wirkwelt*), in J. von Uexküll's words, the *Umwelt* (Uexküll 1992[1967/1934]: 20).

In *Toward a Philosophy of the Act*, Bakhtin formulates the following expressions: "the concrete architectonics of an actually experienced world"; every world "is arranged around a sole centre, that constitutes the starting point of the once-occurrent participation in being"; it is "the world in which a performed act orients itself on the basis of its once-occurrent participation in being"; this world is the "unitary and unique world that is experienced concretely", and "it is given in individual emotional-volitional tones" (Bakhtin 1993[1920–1924]: 53–54, 56–58):

But these concretely individual and never-repeatable worlds of actual act-performing consciousness (of which, *qua* real components, unitary and once-occurrent being-as-event comes to be composed) include common moments – *not* in the sense of universal concepts or laws, but in the sense of common moment or constituents in their various concrete architectonics. It is this concrete architectonics of the actual world of the performed act [that has to be described], that is, *not* the abstract scheme but the concrete plan or design of the world of a unitary and once-occurrent act or deed, the basic concrete moment of its construction and their mutual disposition. These basic moments are I-for-myself, the other-for-me, and I-for-the-other. [...] All spatial-temporal values and all sense-content values are drawn toward and concentrated around these central emotional-volitional moments: I, the other, I-for-the-other [and the other-for-me]. (Bakhtin 1993[1920–1924]: 53–54; translation revised by the authors of this essay)

A semiotic task carried out by von Uexküll, and inspired by Kant is his description of the forms of space and time in biological terms as part of the *umwelt*. He casts them in a semiotic frame, showing their different functions in different worlds. Without a living subject there is neither space nor time. "With this", as Uexküll (1992[1967/1934]: 326) says, "biology has ultimately established its connection with the doctrine of Kant, which it intends to exploit in the *Umwelt* theory by stressing the decisive role of the subject".

Bakhtin is the real author of the essay “Contemporary vitalism”, published in a scientific journal of biology in 1926 under the name of his friend, the biologist Ivan I. Kanaev (Kanaev 1926). Kanaev subsequently revealed the true origin of the text which, authored as it was by no more than an amateur in the field, could never have been published in a specialized journal (Depretto 1997).

This article is an important tessera for the reconstruction of Bakhtin’s thought system from the time of his early studies. In it Bakhtin discusses problems of the biological and philosophical orders together. Like the biologist J. von Uexküll whom he mentions in this text, Bakhtin evidences a close relation between biology and the study of signs at a very early stage in his studies. What varies is the starting point: in Uexküll’s case, an interest in biology; in Bakhtin’s case, a focus on the study of signs (on the relation between life sciences and sign sciences, see Petrilli 1999b, 1999c, 2008; Petrilli, Ponzio, 2001, 2002).

Kanaev contributed to Bakhtin’s interest in biology and introduced him to the physiologist Aleksej Ukhhtomsky from whom he derives his concept of the “chronotope”, which he then applies to the novel.

Bakhtin criticizes vitalism, the conception of a special extramaterial force in living beings that underlies all life processes. In particular, he criticizes the biologist Hans Driesch who interpreted homeostasis in the organism in terms of total autonomy from its surrounding environment (Driesch 1915). In his own description of the interaction between organism and environment, Bakhtin, on the contrary, opposes the dualism of life force and physical-chemical processes and maintains that the organism forms a monistic unit with the surrounding world (Ponzio 2002; Petrilli, Ponzio 2000b). As we have somehow anticipated, the relation of body to world is dialogic in the sense that the body responds to its environment modelling its world.

In his preface to J. von Uexküll, *Stroll through the Worlds of Animal and Men*, Thure von Uexküll observes:

This book appeared more than half a century ago, at a time when scientists were convinced that “science” had to be physics and chemistry. In this frame, Jakob von Uexküll’s work was considered “vitalism”, which meant unscientific and metaphysical. [...] For the positivistic understanding of Science in his time, speaking of *Planmässigkeit* in nature means inhibiting research. In von Uexküll’s view, however, research had to begin with the proposition that *Planmässigkeit* could be an aspect of nature, for the presupposition that nature is meaningless and senseless is itself a metaphysical presupposition. (T. von Uexkull 1992a: 277)

5. The primary modelling device or language, and human responsibility

As anticipated, the relation with the *umwelt* in nonhuman living beings is generally stable and concerns the species; in human beings it is, on the contrary, changeable and concerns the single individual (see the final part of Uexküll 1992 [1967/1934]). The difference can be explained in terms of the human species-specific primary modelling device or “language” (Sebeok). As a biological organism, the human being flourishes in the great biosemiotic network interconnectedly with other biological organisms populating the biosphere.

All living beings are endowed with a capacity for *modelling, communication* and *dialogism* with the difference that the “primary modelling device”, or “language”, is exclusive to human beings. Sebeok was ironical about projects developed to teach verbal language to captive primates. Such projects were based on the false assumption that animals might be able to talk, or, even more scandalously, that they are endowed with a capacity for language understood as a modelling device. The distinction established by Sebeok between *language* and *speech* is not only a response to false conclusions regarding animal communication, but is also a general critique of phonocentrism, of the general tendency to base scientific investigation on anthropocentric principles.

Sebeok described language as *a human primary modelling device*. Every species is endowed with a model that “produces” its own world. “Language” is the name he chose for the human model. However, this human primary modelling device, or language, is completely different from modelling devices in other life forms. Its distinctive feature is what the linguists call *syntax* – though in this context the term “syntactics” is preferable –, that is, the capacity to order single elements on the basis of operational rules (Morris 1938).

Yet, while for linguists these elements are the words, phrases, and sentences, etc. of historical-natural languages, Sebeok referred to a mute syntax. Thanks to syntax, or, rather, syntactics, human language (understood as a modelling device and not as a historical-natural language) is similar to Lego building blocks. It can reassemble a limited number of construction pieces in an infinite number of different ways. As a modelling device, language can produce an indefinite number of models. In other words, the same pieces can be taken apart and put together to construct an infinite number of different worlds.

Therefore, thanks to language as modelling, human animals, similarly to other species, not only can produce worlds, but they can also produce and organize an infinite number of possible worlds, an undetermined number of worlds (Deely 2002; Petrilli 2009). This leads back to the question of the “play of musement”

(Sebeok 1981), a human capacity that Sebeok, following Peirce, considered as fundamental. Human evolution itself from the *hominid* to *Homo habilis*, and subsequently to *Homo erectus* through to *Homo sapiens* and *Homo sapiens sapiens*, can be explained on the basis of this modelling device called language (present in hominids from their origins). The human being is able to construct, deconstruct and reconstruct an infinite number of worlds and worldviews on the basis of a finite number of elements. This capacity distinguishes human beings from other animals.

Sebeok attributes this creative capacity for constructing new worlds, for the “play of musement”, to the fact that the human being is a syntactical animal, which is to say that the human being is endowed with a capacity for *ars combinatoria*. Human beings are not only capable of using signs, but also of reflecting on signs, of talking about signs, and of planning. In other words, the human being is not only capable of semiosis like all other animals, but also of *metasemiosis* which ensues from language understood as modelling. Consequently, on the basis of this species-specific characteristic the human animal can be defined as a *metasemiotic animal* or as a *semiotic animal* (Deely et al., 1995).

Like language (i.e. primary modelling), speech, too, made its appearance as an adaptation, but *for the sake of communication*, and much later in evolutionary development than language, precisely with *Homo sapiens*. Speech organizes and externalizes language. Subsequently, through processes of *exaptation*, speech became a (secondary) modelling process, thereby enhancing nonverbal capacities already possessed by human beings (Gould, Vrba 1982: 4–15).

Therefore, if we ask the question whether the human capacity for reflection, that is, *metasemiosis*, is a question of adaptation, the answer is *no* even in the case of human species-specific secondary modelling, that is, modelling by verbal language (Merrell 2001: 229–262). In other words, not even rationality, a capacity considered specific to human beings, is described to satisfaction solely in terms of adaptation. *Exaptation*, that is, a shift in original function, or readaptation, is the preferable explanation (Gould, Vrba 1982: 4–15). In fact, the original function of verbal language (without which rationality cannot be conceived) is communication. Only subsequently (and this marks the passage from *Homo sapiens* to *Homo sapiens sapiens*) did verbal language come to be used for a different function, that is, to contribute and empower the human capacity for modelling (see Fano 1972). Consequently, via a process of *exaptation* another form of modelling, that is, the secondary modelling of languages, which is multiple and varied as well, is added to the human being’s original modelling (primary modelling).

In spite of insistence on the “creative character of (verbal) language”, Chomsky’s linguistics is unable to explain the plurality of natural languages (nor “inner plurilingualism” in any single natural language) (Chomsky 1976, 1986, 1988). The

reason is that Chomsky's linguistics presupposes an innate Universal Grammar. However, the fact that human beings should have invented numerous natural languages is the direct result of the primary modelling capacity, therefore of the capacity to invent multiple worlds. In other words, the plurality of natural languages derives from the propensity of language for the "play of musement" or, in tune with Giambattista Vico, for "poetic logic", characteristic of human beings.

In the case of nonhuman animals (unlike human animals), the relation between modelling and *umwelt* is univocal, unidirectional (J. von Uexküll 1909, 1992; Hoffmeyer 1996). We know that nonhuman animals are born into a world which they are not programmed to modify, if not according to an original *Bauplan* as established by the genetic patrimony of the species they belong to. Thanks to *syntactics*, human beings, on the contrary, are endowed in such a way as to be able to interrogate their own *umwelt*, as much as that of others.

The semiotic or metasemiotic capacity entails a capacity for the suspension of action and for deliberation, therefore, for conscious awareness and critical thinking. The immediate implication is that by contrast with other animals the human being is invested biosemiosically and phylogenetically with a unique capacity for responsibility, for making choices and taking standpoints, for creative intervention upon the course of semiosis throughout the whole biosphere. In this sense the "semiotic animal" is also a "semioethic animal" (Petrilli, Ponzio 2003, 2010; Petrilli 2010a).

Though the capacity to produce and organize many worlds, an undetermined number of worlds, is a characteristic of the species, the initiative for invention and change is ultimately individual. That initiative should be individual is both a resource and a problem, for while this facilitates transformation, innovation and construction of multiple and different *umwelten*, it is also the cause of uncertainty, insecurity and conflict (Sebeok 1981). The human being not only produces its own world, but is also capable of endangering it and even of destroying it to the point of causing the extinction of all other life forms on Earth. Moreover, the capacity for reflection on signs, unique to the species, makes human beings the only responsible living being we know of, not only for their own life, but for all life across the whole planet. Such issues shift semiotic reflection in the direction of what we have proposed to denominate *semioethics*.

As part of a sign network characterized by continuity in deferral from one sign to the next, typical of semiotic fluxes, and taking into account Sebeok's axiom that semiosis and life converge, human beings are invested biologically with a capacity for responsibility. Responsibility understood as responsibility/responsivity entails the capacity to care for semiosis globally, which is to say to care for life in its interactive and dialogical multiplicity across the entire planet.

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Моделирование, диалогизм и функциональный цикл: биосемиотические и философские озарения

Чарльз Пирс, Михаил Бахтин и Томас Себеок развивали оригинальные концепции знака, которые, несмотря на терминологические различия, можно рассматривать как соотносимые с понятиями диалогизма и моделирования. «Функциональный цикл» Якоба фон Юкскуля – модель для семиотических процессов – также включается в отношение между диалогом и коммуникацией.

Биологические модели, которые описывают коммуникацию как автореферентную, «автопойэтическую» и семиотически закрытую систему (например, модель, предложенная Матураной и Варелой или же Туре фон Юкскулем), контрастируют как с линейной (Шеннон и Уивер), так и с циклической (Соссюр) парадигмой. Теория «автопойэтических» (*autopoietic*) систем только в том случае несовместима с диалогизмом, если отсылает к линейной каузальной модели, которая описывает коммуникацию как развивающуюся от источника до пункта назначения, или к модели беседы, управляемой вращением вокруг правила. Диалогизм, понимаемый в биосемиотических терминах, связан с понятиями взаимосвязи, взаимоотношения, «интертелесности» (*intercorporeity*) и предполагает инаковость отношения.

Как говорит Юкскуль, отношение с *умweltom* у не-человеческих живых существ устойчиво и касается разновидностей; у людей это, напротив, изменчиво и касается конкретного человека, что является одновременно преимуществом и неудобством. Благодаря «синтактике» люди могут построить, вскрыть противоречия и восстановить бесконечное число миров от конечного ряда элементов. Это отличает людей от других животных и определяет их способность задавать вопросы. Человек не только производит его или ее собственный мир, но и может также подвергнуть опасности и даже разрушить его, послужив причиной исчезновения всех других форм жизни на Земле. Уникальная способность к размышлению о знаках делает людей ответственными за жизнь на планете, как человеческой так и не-человеческой. Такие размышления перемещают семиотическое исследование в направлении семиоэтики.

Modelleerimine, dialoogilisus ja funktsiooniring: biosemiootilisi ja filosoofilisi vaateid

Nii Charles Sanders Peirce, Mihhail Bahtin kui ka Thomas Sebeok kujundasid välja oma algupärase teadusliku lähenemise märgile ning terminoloogilistele erinevustele vaatamata on neid võimalik seostada, viidates dialoogilisuse ja modelleerimise mõistetele. Dialoogi ja kommunikatsiooni vahelises suhtes on implitseeritud ka Jakob von Uexkülli “funktsiooniring”, semiootiliste protsesside mudel.

Bioloogilised mudelid, mis kirjeldavad kommunikatsiooni eneseleevitava, autopoieetilise ning semiootiliselt suletud süsteemina (nt mudel, mille pakuvad välja Maturana ja Varela, nagu ka Thure von Uexkülli), vastanduvad nii lineaarse (Shannon ja Weaver) kui ka tsüklilise (Saussure) paradigmaga. Autopoieetiliste süsteemide teooria on dialoogilisusega sobimatu üksnes siis, kui osutatakse lineaarsele kausaalsele mudelile, mis kirjeldab kommunikatsiooni allikast sihtpunktini arenevana, või vestlusmudelile, mida valitseb kooskeeramise reegel. Biosemiootilistes terminites mõistetud dialoogilisus kattub interkonnektiivsuse, interrelatsioonilisuse, interkorporaalsuse mõistetega ning selle eelduseks on teisesussuhe.

Nagu ütleb Uexküll, on mitteinimestest elusolendite suhe omaailmaga stabiilne ning puudutab liiki; inimestel on see, vastuoksa, muutlik ning puudutab üksikindiidi, mis on ühtaegu nii eelis kui ka puudus. Tänu "süntaktikale" suudavad inimesed konstrueerida, dekonstrueerida ning rekonstrueerida lõplikust arvust elementidest lõpmatu arvu maailmu. See eristabki inimest teistest loomadest ning tingib nende võime esitada küsimusi. Inimene mitte üksnes ei loo omaenda maailma, vaid võib seda ka ohustada ja isegi hävitada, kuni selleni välja, et võib põhjustada kõikide teiste eluvormide väljasuremise Maal. Ainulaadne võime märkide üle reflekteerida muudab inimesed vastutavaks nii inimliku kui ka mitteinimliku elu eest kogu planeedil. Sellised mõttekäigud suunavad semiootilist uurimistegevust semioeetika poole.