The circulation of meaning: a biosemiotic perspective on the functional circle

punctum.gr

BY: **Nicola Zengiaro**

ABSTRACT

The research field of contemporary biosemiotics is heir to the thought of Jakob von Uexküll, who focused on investigating the subjective world of animals. The Estonian biologist's theory showed how sense-motor organisms' perceptual and operational worlds are expressed in coordination based on signification. The umwelt comprises the interwoven relationship between organisms' operational and perceptual marks. In this sense, the 'functional circle' notion has particularly interested investigations in biosemiotics. According to Uexküll, the functional circle is a general pattern that underlines the relationship between any animal and the world. Thus, the relationship between the subject and the world can only occur through recursiveness that constructs a semiotic signifying circle. The circulation of meaning has ripple effects concerning recursiveness: memory, anticipation, perception, and learning. The semiotic circle is thus the condition of possibility for experience, perception, and movement in the world. This article aims to analyze the idea of circularity within the research field of biosemiotics, with particular attention to Uexküll's legacy, which is also carried on by cybernetics. Also, we will try to show how biosemiotics investigates the emergence of meaning in this signifying circle. The main aim is to show that recursiveness and circulation of meaning originate from a cognitive semiosis of a corporeal type.

ARTICLE INFO:

Volume: **09**

Issue: **02**

Winter **2023**

ISSN: **2459-2943**

DOI: **10.18680hss.2023.0026**

Pages: **209-225**

KEYWORDS:

Biosemiotics

Ecosemiotics

Functional circle

Jakob von Uexküll

Umwelt theory

Punctum. International Journal of Semiotics | **09:02:2023**
ISSN 2459-2943 | DOI: 10.18680/hss.2023.0026 | **punctum.gr**

1. Introduction

The thought of Jakob von Uexküll (1864-1944) is crucially important in building the theoretical foundations of contemporary biosemiotics. Described as a "crypto-semiotician" by Thomas Sebeok (1979: 9), Uexküll is unanimously considered one of the fathers of biosemiotics – along with Charles Peirce. Although he never described his biology in semiotic or biosemiotic terms, with the publication in 1940 of his major work *Bedeutungslehre*, he indirectly influenced part of the semantics and phenomenological currents of the time, as well as the revival of his thought by philosophical anthropology, ethology, and ecology.[1] Born in Estonia, he studied zoology first at the University of Tartu (Dorpat), after which he moved to Germany, initially to Heidelberg and later to Hamburg. He did much of his experimental work in Italy, at the Zoological Station in Naples, spending summers with his family in Estonia, writing in Germany, and periodically to Capri, Italy, where his grave is currently located.

In the first part of the article, I will briefly introduce the spirit of the time in which Uexküll worked. This will enable us to understand how his theory could have arisen amid this great panorama of scientific innovations in biology and the life sciences. The historical reconstruction is not intended to be complete, but it will try to weave those relationships necessary to understand how biosemiotics emerged from these assumptions. Indeed, the second part will attempt to frame the legacy of Uexküll's thought by tying it to the field of biosemiotics. This will show how "functional circle theory" and the notion of "umwelt" have enormously impacted semiotic theory. This will be seen from the fact that the functional circle can theoretically be identified as an intrinsic circulation of the meaning of the living. In this way, the idea is to show that the circulation of meaning occurs in organic life even before the complexity of society and culture. In a broad sense, this is meant to present itself as a suggestion to show that the circulation of meaning between texts in semiotics can and perhaps should take its cue from the circulation of meaning in organic bodies. Finally, from a biosemiotic perspective, we propose that functional circle theory can be considered a good indicator of cultural theoretical change.

2. The uexküllian time

Biosemiotics appears today as a new branch of not only semiotics but also theoretical biology. This new paradigm in biology (Anderson et al. 1984, Eder and Rembold 1992, Kull 1993, Anderson 1990) and the goals of the emerging field of research were defined by Claus Emmeche and Jesper Hoffmeyer in 1991:

[1] See the special issue dedicated to him in the journal *Semiotica*: "Jakob von Uexküll: A paradigm for Biology and Semiotics", Vol. 134 (1/4), and (Deely 2004).

> What we propose, then, is that the traditional paradigm of biology be situated by a *semiotic paradigm*, the core of which is that *biological form is understood primarily as a sign*. (Emmeche and Hoffmeyer 1991: 138)

The innovative view of biology through biosemiotics derives from an extraordinary scenario of innovations that animated the debate in the scientific field throughout the twentieth century. Kalevi Kull (2005), tracing the atmosphere of biology during the period when Jakob von Uexküll was giving birth to his theory of biology, cites different breakthroughs in the scientific field: (i) the beginning of genetics through the rediscovery of Mendel's laws, (ii) the beginning of mathematical biology and research in population variability, under the name of biometrics (K. Pearson), (iii) the beginning of biophysics (D'Arsonval et al. 1901), (iv) the first book on theoretical biology (Reinke 1901), (v) the expansion of neovitalism (H. Driesch), (vi) intensive work in the field of morphogenesis (W. Roux) and (vii) the establishment of ecology as an independent science.

All these advances in the scientific field affected biology in the 20th century and influenced the theoretical discussion of biology in the 21st century. As Kull (2001: 1) rightly notes, Uexküll was "a starter and a pioneer of the semiotic approach in biology in the twentieth century" because he was the first to propose the idea that "sign systems embrace all living systems." Kull references Jakob von Uexküll's historical period because he was one of the most critical figures in biosemiotics for the first half of the twentieth century. Indeed, to his research, we owe the early development of biological semiotics. His books *Umwelt un Innenwelt der Tiere* (1909, 1921), *Bausteine zu einer biologischen Weltanschauung* (1913), *Theoretische Biologie* (1920, 1928), *Bedeutungslehre* (1940), and the more popular *Biologische Briefe an eine Dame* (1920), *Streizüge durch die Umwelten von Tieren un Menschen* (Uexküll and Kriszat 1934), as well as his many articles, introduced new terminology and approaches initially accepted by a small group of researchers, but later founded an innovative vision in the works of semioticians and also psychologists, anthropologists, ecologists, philosophers, and computer scientists.

J. v. Uexküll's approach, as he himself pointed out, derives from the development of the view of German physiologist Johannes Müller (1801-1858), whose laws of sensorimotor energy state that "the modality of sensation depends immediately only upon what region of the central organism put into a corresponding excited state, independent of the external causes bringing about the excitation" (Schlick 1977: 165). From this idea, Uexküll builds on to later construct an epistemology regarding the subjective animal world. Already in 1909, he used the term Umwelt, whereas earlier in his 1907 article, he still used the notion of *Milieu*.

Punctum. International Journal of Semiotics | **09:02:2023**
ISSN 2459-2943 | DOI: 10.18680/hss.2023.0026 | **punctum.gr**

Another point of reference for Uexküll's theory was embryologist Karl Ernst von Baer (1792-1876), especially concerning the theory of biological time, an author that was considered as important in the field of biology as Darwinism (Gould 1977, Salthe 1993). But it is equally well known that although Uexküll was not directly familiar with semioticians, he knew people who remained on the periphery of the field of semiotics, such as Ernst Cassirer (1874-1945) and Heinz Werner (1890-1964). In the same period, new holistic views about biology began to emerge by Gustav Bunge (1887), for example, when neovitalism re-entered the scene (Hartmann 1906), and an innovative definition of "theoretical biology" appeared in the research of neovitalist biologists. It is important to note these nuances since the vibrant theoretical renewal of the life sciences also led Hans Driesch (1867-1941) to construct a view of biology that is not far from recent analyses in biosemiotics (Karpinskaya 1994). His study of biological forms underscores the positive importance of neovitalist opinions of the time, in which holistic concepts could introduce a complex view of life forms (Kull 1999). Ernst Mayr himself, referring to the soft versions of neovitalism, calls them organicist since "vitalism has become so disreputable a belief in the last fifty years that no biologist alive today would want to be classified as a vitalist" (Mayr 1988: 13).

In this context, different anti-Darwinist theories (in which Uexküll is included) arise, developed through an immanent (intrinsic) view of evolutionary change in organisms, concerning not only the diversification of structures but also of behavior (Csanyi and Kampis 1985).

> Indeed, the belief in a teleological force in nature was so firmly anchored in the thinking of many that even among the evolutionists, this belief had more followers in the first 80 years after 1859 than Darwin's theory of selection. (Mayr 1988: 59)

3. The uexküllian legacy

In 2001, a special issue dedicated to Jakob von Uexküll was published in *Semiotica*. Barbieri (2002) stated that biosemiotics had two phases: first from 1961 to 1977 and second from 1977 to 2001. This second phase was remarkably influenced by Thomas Sebeok, who succeeded in giving impetus to this innovative field of research that needed to unify a collective ground. Sebeok (2001) recalls that the great desire to bring together heterogeneous ideas under the same field came to him from intellectual influence and encounters with other leading biosemioticians of those years. Sebeok mentions three figures in reconstructing the roots of biosemiotics: J. von Uexküll (1864-1944), Heini Hediger (1908-1992), and Giorgio Prodi (1928-1987).

Sebeok was crucial for internationally disseminating Uexküll's thoughts (Kull 2003). J. v. Uexküll's book, *Theoretische Biologie*, was first published in 1920 and republished as

wholly revised with a new edition in Hamburg 8 years later and reprinted posthumously in 1973. The unique English translation was published in 1926, a translation of the first edition that appeared in 1920. Sebeok (1998) suggests that the delay in receiving Uexküll's theories internationally must have been caused precisely because the first translation was of mediocre quality and referred to a first edition that was not mature. Sebeok first read the English edition in 1936 and found that book obscure and, to a large part, hard to understand. But when he read the second German edition in 1976, he found it much more understandable. Subsequently, in the late 1970s, Sebeok began researching Jakob's writings at the Netherlands Institute for Advanced Study while he was there as a Fellow.[2] The result of his research is the famous [3] paper entitled "Neglected figures in the history of semiotic inquiry: Jakob von Uexküll," first presented in 1977 in Vienna and later appearing in an expanded version in his book *The Sign & Its Masters* (1989 [1979]). Sebeok, on that occasion, strongly asserted that Uexküll, with his theories, introduced a new domain (*Umweltlehre*) and, in so doing, placed him in the new field of study of biosemiotics as an incomparable pioneer.

Jakob's son Thure was among the audience members at the Vienna conference. This is how the friendly collaboration between Thure von Uexküll and Thomas Albert Sebeok began, leading to a series of ideas that would later form the pillars of modern biosemiotics. The first idea was to hold a series of annual international conferences devoted to biosemiotics (Sebeok 2001: 65). But before that, in the late 1980s and early 1990s, Thure organized several conferences held at the Glotterbad Clinic for Rehabilitative Medicine in Glottertal, Baden-Württenberg, Germany, under the direction of Jörg M. Herrmann, director of the clinic. There, during the introduction to one of the sessions titled "Models and methods in biosemiotics," he indicated explicit goals, including supporting the experiment of uniting the humanities, represented by semiologists, natural sciences, represented by molecular biologists, medicine, discussed by internists, psychiatrists, and clinical psychologists (Sebeok 2001: 65). From that series of conferences, Sebeok announced that in May 1990 together with Thure he would found the *International Biosemiotics Society*: "the foundation of the IBS took place in May 1990 […] with the new society beginning to function fully in May 1991" (Sebeok 1991:7).[4] Here Sebeok had the opportunity to meet and share the results of his research with two other scholars who were dedicated to the theoretical enrichment and promotion of biosemiotics: Jesper Hoffmeyer and Kalevi Kull.

---

[2] Precisely in 1973/74 as is indicated in the *Fifty Years of academic freedom. The Netherlands Institute for Advanced Study in the Humanities and Social Science*, published in the 2021. https://nias.knaw.nl/wp-content/uploads/2021/10/NIAS-Fifty-Years-of-Academic-Freedom.pdf, visited 12/12/2023.

[3] "Famous" because this would properly mark the beginning of a new phase for biosemiotics.

[4] Although, as Donald Favareau (2005) noted, the time was not yet mature enough to draw attention to this new field of research, so it remained a dream for quite some time.

Punctum. International Journal of Semiotics | **09:**02**:**2023
ISSN 2459-2943 | DOI: 10.18680/hss.2023.0026 | **punctum.gr**

4. The functional circle

Among the many concepts offered by Uexküll's theoretical biology, we can note the importance of the notion of "functional circle" [*Funktionskreis*], which appeared clearly in the second edition of his book *Umwelt und Innenwelt der Tiere*. Although the term presumably first appeared only in 1919 (Uexküll 1919: 144), the formulation of this concept began with Uexküll's work on neural feedback mechanisms of animal muscle activity and tonus in the Heidelberg Physiological Laboratory and at the Naples Biological Station in the 1890s. Investigating the realization of these functional circles, his theories continued to develop with increasing evidence from studying the rules of the excitation process (Uexküll 1905). Indeed, his early interests were in invertebrate physiology and sea urchins, later formulating a law relating nerve excitation to muscle stretching. With this law, it was discovered that the nervous system's activity tends to shorten a stretched muscle by counteracting it. The nervous system's activity partly caused this type of negative feedback. Uexküll's law formulation is the first articulation of the principle of negative feedback taking place within an organism.

The development of the functional circle from the reflex arc led his theory to rethink the relationship between the animal and its environment completely. He emphasized the existence of an inner environment (*Innenwelt*) of the animal subject. Animal subjectivity arises in encounters between the inner and outer worlds, expressed through the different functional circles.

The concept of the functional circle, in its most mature form as a fundamental model of behavior and meaning-making, is described in the second edition of Uexküll's (1921) monograph. As pointed out by Carlo Brentari (2015), in the first version of the book, a chapter was entitled "The reflex," which was replaced in the second edition with the title "The functional circle" [*Der Funktionskreis*]. In the reconstruction offered by the Italian philosopher, there are two reasons behind this change in terminology: the first is that in the scientific research of the time, especially in the first two decades of the 20th century, the reflex movement model (understood as stimulus/response) had severe limitations. Indeed, in high-complexity behaviors, applying this notion to describe the general coordination of a complex living system in a given environment was challenging. The hegemony of the reflexive model in animal behavior, of particular importance to Jacques Loeb and Ivan Pavlov, was sharply criticized by scientists (Jennings 1906), psychologists, and philosophers of the time. The criticism was based on the fact that this model could not fully satisfy the interaction between the external stimulus and the cause of behavioral action. In determining the cause of action in animal behavior, a more complex view of the situation had to be maintained, considering intra-organic conditions, autogenous rhythms of arousal, threshold values, and other factors internal to the organism.

Second, in the first edition, Uexküll had already incorporated a different view of the stimulus model, in which the stimulus was seen as a part of a larger ordered whole, namely the environment. However, from his perspective, the stimulus depended on the animal's receptor organs. Thus, the stimulus was a part of the plan for constructing the animal environment, of which the organs are components. The change in outlook occurs precisely when Uexküll theorizes that the stimulus is neither an original nor isolable cause but is dependent on the overall structure of the organism. Here, the finalistic interpretation and the first cause status of the stimulus, as it had always been defined, is lost. The most innovative cue of Uexküll's functional circle theory lies in determining the overall structure of the organism as one that actively selects sensory influences from the particular needs of the species to which it belongs. Thus, the holistic view emerges in a rational and scientifically justified explanatory context, whereas before then, the teleological principle dominated the scene in the life sciences.

In his 1913 essay *Bausteine zu einer biologischen Weltanschauung*, Uexküll distinguishes three spheres of the animal subject: the perceptual world (*Merkwelt*), the operational world *(Wirkungswelt*) and the surrounding environment (*Umwelt*). The perceptual world consists of the features the animal can perceive from the external world. The perceptual markers the animal discerns in the world depend on the organization of the animal's sense organs and nervous system. In other words, what the animal perceives of the world is what its species-specific physiological constitution allows it to perceive. The relevant signs to which it has access are, in this sense, determined by the functionalities of its biological organization. The perceptual world, however, is complemented by the operational world as a complementary counterpart of a single process. The operative world includes all those objects adapted to the animal's organs of feeding and locomotion. Uexküll defines the functional circle in this way:

> In any action, the subject and object are linked by a closed chain of cause and effect. This chain starts from the objects' perceptual mark carriers, in the form of one or more stimuli that affect the animal's receptors. In the animal, the latter are connected in the perceptive network and then have an effect on the operative one. The operative network transmits to the effector organs a certain motor modality, which becomes part of the operative carriers of the object. The perceptive mark carriers are connected to the operative carriers by the counter-structure. This is how the circle I defined as a 'functional circle' is closed. (Uexküll 1921: 46)

Punctum. International Journal of Semiotics | **09:02:2023**
ISSN 2459-2943 | DOI: 10.18680/hss.2023.0026 | **punctum.gr**

However, we should point out that the objects with which an organism comes into contact are not necessarily perceived cognitively by the subject. In other words, to perceive such objects, the animal needs to be made aware of them or have complex levels of interpretation or representation. The environment, which surrounds and constitutes the animal's surroundings, is but the union of the perceptual and operational worlds. And the umwelt, because it is the union of these two worlds, becomes a complex layering or, rather, a circle that complexly connects multiple worlds (Fig. 1). As John Deely wrote:

> Each biological life-form, because of its distinctive bodily constitution (its "biological heritage," as we may say), is suited only to certain parts and aspects of the vast physical universe. And when this "suitedness to" takes the bodily form of cognitive organs, such as our own senses or the often quite different sensory modalities discovered in other lifeforms, then those aspects and only those aspects of the physical environment that are proportioned to those modalities become "objectified," that is to say, made present not merely physically but cognitively as well. (Deely 2001: 126)

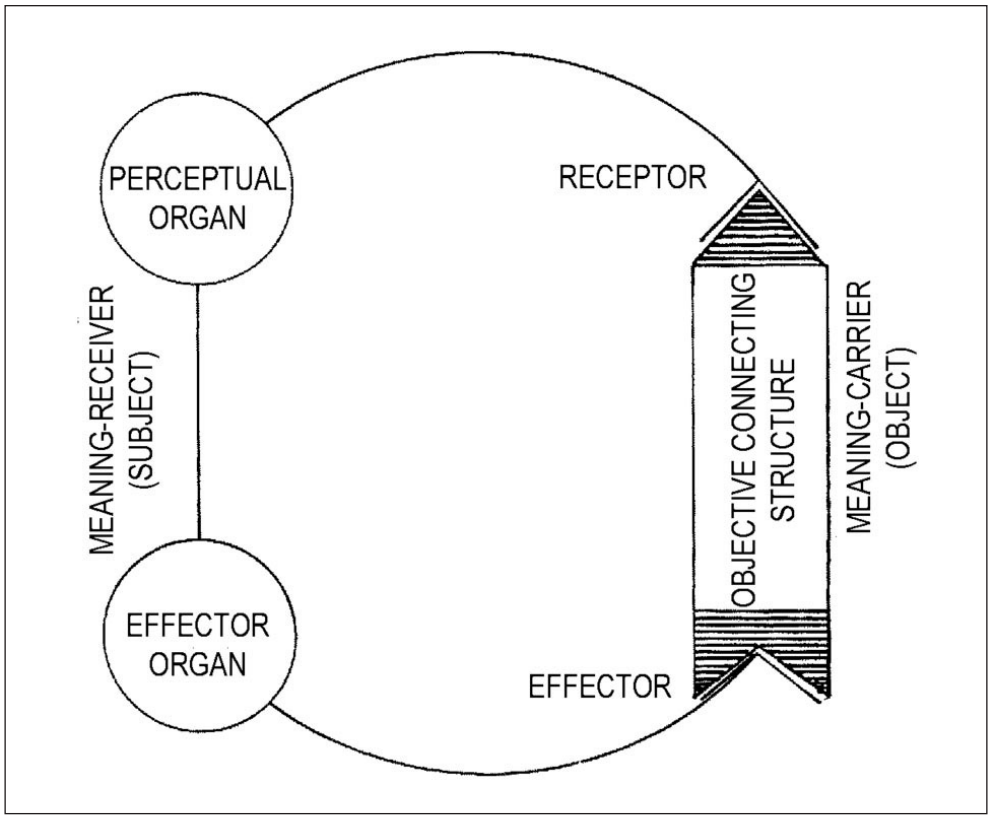

Figure 1. «In Jakob von Uexküll's model of a functional cycle, the subject and the object interrelate via the perceptual world (merkwelt O → S) and the operational world (wirkwelt S → O) (after Uexküll 1982: 32)». Source: Maran (2002: 72).

Brentari analyzes the same pattern of connection, which shows three essential and innovative features of the functional circle. 1) The organism's very high selectivity toward the stimuli that trigger the functional circle. The important thing is that there is a principle of selectivity that, at the same time, functions as a blocker for the rest of the stimuli. This explains why, for certain animals (such as the tick analyzed by Uexküll), the world of stimuli is reduced to a few environmental signs. The fact is that these few signs relevant to the animal are its entire world, that is, all that it can experience of that world. 2) The functional circle is not merely a substitute for reflex behavior; instead, it is a highly differentiable structure within which there are different dynamics of different complexities, divided initially into four functional circuits: the medium, nutrition, enemy, and reproductive circles. Entering one of these circles can cause others to be closed to stimuli of other kinds. In this sense, a chronological framework represents various circles depending on the stages of the organism's life and its intra-organic conditions (birth, growth, reproduction, and death). 3) The moment a given perception-action sequence in a single functional circle is concluded, the object disappears from the animal environment (either physically, as in the case of nutrition, or cognitively speaking). Disappearance is a cognitive event. To explain this event, Uexküll speaks of predator receptors that make the object disappear from the environment once the appetite stimulus is satisfied. In a certain way, the "hunting" mode and the "prey" object switch off. The mode by which such objects are extinguished is crucial. What interests us most is that each functional circle, concerning this idea of the object's disappearance, is disconnected from the others even when it invests the same object. The idea that supports the distinction between different functional circles is found under a different name in *Leiftaden in das Studium der experimentellen Biologie der Wassertiere* (Uexküll 1905).

5. Influences on cybernetics

In theoretical biology, Uexküll can be seen as the precursor and conceptual pioneer of the study of feedback and control in the functioning of complex adaptive self-organizing systems. After nearly a century, his work brought out the terminologies we commonly use today in different fields of knowledge regarding autopoietic explanations. As Donald Favareau has correctly pointed out,

> Yet Ludwig von Bertalanffy's (1901-1972) "general systems theory" – as well as its increasingly sophisticated descendants (i.e., cybernetics, catastrophe theory, chaos theory, and complexity theory) – all issue from von Uexküll's notion of the Funktionskreis or "functional cycle" of perception and action that effectively 'couples' the ever-changing system that is the organism to the ever-changing system that is the world. (Favareau 2010: 42)

Punctum. International Journal of Semiotics | **09:02:2023**
ISSN 2459-2943 | DOI: 10.18680/hss.2023.0026 | **punctum.gr**

Uexküll's approach influenced the development of organismic biology and systems theory by Ludwig von Bertalanffy (1901-1972) and ethology by Konrad Lorenz (1903-1989) and Niko Tinbergen (1907-1988). As early as the early 20th century, Uexküll recognized the vital role of negative feedback and afferent control in organisms; similarly, the concept of the functional cycle, to illustrate behavior as a regulated process, can be seen as a predecessor of cybernetic models. For these assumptions, Uexküll has been discussed as a pioneer of cybernetics and artificial intelligence (Lagerspetz 2001, Emmeche 2001, Roepstorff 2001).

We can take, thus, J. v. Uexküll as a precursor of contemporary biocybernetics and ethology. But in semiotics, especially in cognitive semiotics and biosemiotics, these theories are crucial because they explain that every animal, be it an amoeba, a grasshopper, or a tiger, behaves meaningfully based on sign processes with a functional cycle that forms signs and by its corresponding signals as meanings.[5] This *Umweltlehre* justifies how the organism and the environment are connected, indirectly showing the existence of an "intrasemiotic" (Brier 2003) whose meaning can arise from the generative functional cycle of perception, action, and consequence.

6. The subject-environment circle

The Umwelt is how aspects of the environment accessed by sensation are related. Importantly, this Umwelt explains how objects are constituted as "objects of experience." It is well known that during the Gymnasium, Uexküll had read Immanuel Kant's *Critique of Pure Reason*, which greatly influenced his whole research. Uexküll's desire to understand the cognitive modes that shape the perception of the environment in animal species came from the Kantian thesis that *a priori* categories determine the experience of living beings. Uexküll's idea was to apply Kantian transcendental analysis not only to humans but also to other animals. In other words, he carried the study of the transcendental structures of the mind inside the field of natural sciences, that is, cognitive sciences.[6] With such spirit, Uexküll not only argued that our bodily constitution filters and limits sensations within our perceptions of the world.

[5] Niccolò Monti (2023) provides an interesting historical overview, emphasizing the relationship between Umberto Eco's semiotic theory and cybernetics.
[6] One of the first attempts to apply Kant's philosophy to biology is found in his 1902 essay *Im Kampf um die Tierseele* [In Battle over Animal Psyche]. (Brentari 2015)

> But what my eyes objectify and what my mind makes of that vision remain as distinct as sensation as such in contrast to perception, which alone transforms sensations into experienced objects, like dark rectangles against lighter surfaces "seen" to be chalkboards on walls. (Deely 2001: 127)

Due to his theories, ecosemiotics developed in a manner that has allowed us to rethink animal subjectivity in relation to the ecosystem. However, the relationship between the organism and its environment remains largely an abstraction in modern evolutionary biology (Maran 2002). For this reason, biosemiotics and ecosemiotics play an influential role in resetting the space for the emergence of meaning in the organism-environment relationship. Viewing organisms as subjects makes it possible to examine the qualitative side of the relationship between different living things in each ecosystem. Indeed, from the semiotic point of view, when we discuss this relationship, the placement of living things in a particular environment becomes essential (Maran 2014). The relationship between the subject and its environment determines a series of typically semiotic phenomena of the individual, such as that of experience and memories, but also of species (integrating features that develop only partially during evolution) because the environment prescribes certain characteristic features to the living subject. In other words, the subject's interpretive activity bases its dynamics on a series of functional circles that stand out between the inner and outer worlds, between perception and action. Therefore, the environment's characteristics are the source of semiosis, with direct and indirect effects on the processes according to which the subject assigns reflexive meanings. This is demonstrated by the fact that if we change the environmental elements, the whole system of meanings changes. Any pattern of feedback communication between a subject and its environment can be analyzed as a fundamental mechanism that leads to the development of a series of inescapable correspondences, namely adaptation or what Jesper Hoffmeyer (1998) later called "semiotic fitness": the indicator that characterizes the relationship between the subject and its environment.[7]

The innovative proposals of biosemiotics *vis-à-vis* Uexküll's theories have opened the door to several new dynamics for biology and general semiotics (Cobley 2016, Zengiaro 2023). Indeed, although we do not have a definitive description of these mechanisms in living systems, it is still possible to approach this question from a semiotic perspective. All these mechanisms in living things are part of a summation of interpretive and meaning-making processes. What can be said with certainty is that Uexküll's functional circle model remains at the center of the biosemiotic debate, along with the whole range of phenomena that the functional circle creates meanings, signs, and semiosis in the umwelt (Kull 2020).

[7] For the difference between adaptability and semiotic fitness see (Maran 2002).

Punctum. International Journal of Semiotics | **09:02:2023**
ISSN 2459-2943 | DOI: 10.18680/hss.2023.0026 | **punctum.gr**

7. The circulation of meaning

The metaphor of the circle, relating to the spread of the image proposed by Uexküll in his drawing (Fig. 2), an actual graphic scheme of the circulation of sense, was very influential in the articulation of the paradigms of the life sciences in the first half of the twentieth century.[8] His drawing appeared in 1920 in the first edition of *Theoretische Biologie*. Still, its argumentative framework had already appeared in *Umwelt und Innenwelt der Tiere* of 1909, and in its problematic methodological theorizing in the introduction to the second edition of *Theoretische Biologie* of 1928, we immediately detect the semiotic marker.

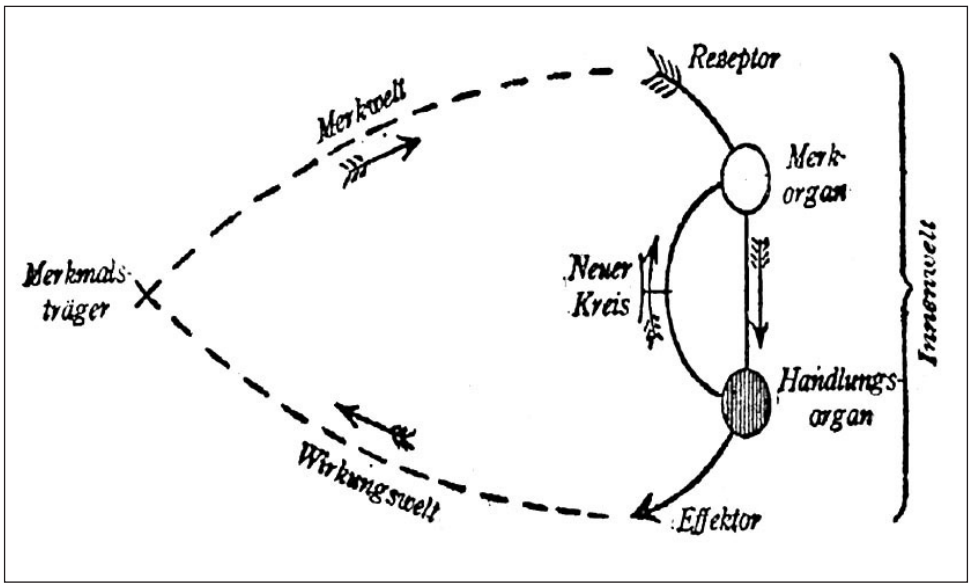

Figure 2. Early Scheme for circular Feedback Circle, from von Uexküll (1920: 117).

If we look closely at the drawing, the object of environmental interaction, the 'x,' is reduced to a punctiform *Merkmalsträger*, the semiotic marker that would later be profoundly rethought (Uexküll and Kriszat 1956). 'Merkmals' are the semiotic markers, what Leibniz and Christian Wolff would have called *notae*, representations. In the drawing, it becomes clear that the graphic circulation represents the semiotic system, in which the object becomes the bearer of a semiotic mark open to cognitive reading. Thus, the circle is the semiotic space *par excellence*, and the resulting circulation describes the process of functions (nutrition, sexuality, defense, etc.). The circle

[8] It would be very interesting to do a semiotic analysis like Françoise Bastide's on the figurative meaning of the circle in the life sciences. Unfortunately, we do not have the opportunity to carry it out here, however, as far as I know, there is still no semiotic analysis on the relationship between circle design and scientific theory in J. v. Uexküll (and other authors).

is also a visualization of what, for Uexküll, was a kind of 'predetermined harmony' under the sign of the semiotic relation (Tedesco 2014). The geometric form of the design indicates the 'adaptedness' [*Einpassung*] of the animal to its environment, aimed to replace the Darwinian term 'adaptation' [*Anpassung*]. Semiotic adaptedness is properly seen as a theory of perception or immanence of perception (Uexküll 1922). Thus, it is interesting to note how the relationship between the subject and the external world in processing and transposing signs to the external world that makes up the environment can be described as "a true *transcendental biosemiotics*" (Brentari 2015: 111).

We find the structural aspect of circularity in other authors, such as Juri Lotman and his notion of semiosphere.[9] The dynamics of these complex semiotic systems, cultural or biological, present isomorphisms yet to be investigated. Both culture and the individual world are fields of sign processes that co-implicate each other. According to the biosemiotic and ecosemiotic perspectives, it is impossible to understand culture without integrating the ecological dimension (Kull and Maran 2014). Human semiotics, in its circulation of meaning among texts, codes, practices, and interactions, are part of a more extensive ecological system. Understanding the semiosphere of the living, or what has recently been called the *ecosemiosphere* (Maran 2021), helps us understand that the circularity of meaning does not exist only in a culture, but stands in an ancient, embodied relationship between the organism and the environment. The semiosphere is a necessary medium for all sign processes, just as the biosphere, the organic totality of living matter and the precondition for the persistence of life, is the precondition for the development of culture.

8. Conclusion

In contemporary semiotic and biosemiotic studies, the circularity of meaning in its embodied aspect, as in embodied cognition, and enactivism, shows how J. v. Uexküll's theories can offer a solid starting point for understanding meaning formation differently. It is a matter of identifying the points of contact between the theory of perception and communication from the idea of functional circles in organisms. The functional circle model gives us a broad spectrum of applications of semiotics related to the possibility of interpreting entities interconnected by their own values and meanings.

[9] Taken up from Vernadsky.

Punctum. International Journal of Semiotics | **09:**02:2023
ISSN 2459-2943 | DOI: 10.18680/hss.2023.0026 | **punctum.gr**

Functional circle theory has historical and theoretical implications for the theory of culture and the study of culture in semiotics (Magnus and Kull 2012). In our biosemiotic perspective, the theory of culture is nothing but an extension of the same interaction between functional circles, where it is presented as a process of evolution from previous morphological and physiological features within a symbolic and complex structure. This allows us to consider the circulation of meaning as a possible semiotic pursuit common to all living beings. All this gives a certain innovative emphasis to biosemiotic theory, which is presented as a reinterpretation of cultural meaning from the point of view of an organicity of social relations. Breaking through the nature-culture dichotomy brings us precisely this legacy: reconsidering culture and the circulation of meaning as something not external to the nature of the human and nonhuman environment (Zengiaro 2022). Faced with this evidence and the fact that the circulation of meaning exists in the lowest living things, what can still lead us to think that semiotics is not closely related to every form of life on this planet? This is what biosemiotics, with all its forces, is trying to understand along the pathways that intersect life, semiosis, and the circulation of meaning.

References

Anderson, M., Deely, J., Krampen, M., Ransdell, J., Sebeok, T. A. and T. von Uexküll 1984. A semiotic perspective on the sciences: steps towards a new paradigm. *Semiotica* 52 (1/2): 7-47.

Anderson, Myrdene 1990. Biology and semiotics. In: Walter A. Koch (ed.) *Semiotics in the Individual Sciences. Part I*. Bochum: Universitätsverlag Brockmeyer, 254-281.

Barbieri, Marcello 2002. Has Biosemiotics Come of Age? *Semiotica* 139 (1): 283-295.

Barbieri, Marcello 2009. A Short History of Biosemiotics. *Biosemiotics* 2: 221-245.

Brentari, Carlo 2015. *Jakob von Uexküll: The discovery of the Umwelt between biosemiotics and theoretical biology*. Dordrecht: Springer.

Brier, Søren 2003. The Cybersemiotic Model of Communication: An Evolutionary View on the Threshold between Semiosis and Informational Exchange. *TripleC* 1 (1): 71-94.

Bunge, Gustav 1887. *Lehrbuch der physiologischen und pathologischen Chemie: In zwanzig Vorlesungen für Artze und Studierende*. Leipzig: Verlag Vogel.

Cobley, Paul 2016. *Cultural Implications of Biosemiotics*. Dordrecht: Springer.

Csanyi, Vilmos and Gyorgy Kampis 1985. Autogenesis: the evolution of replicative systems. *Journal of Theoretical Biology* 114: 303-323.

D'Arsonval, J. A., Chauveau, G. M. and M. Weiss (eds.) 1901. *Traité de Physique Biologique* 1. Paris: Masson.

Deely, John 2001. Umwelt. *Semiotica* 134 (1/4): 125-135.

Deely, John 2004. Semiotics and Jakob von Uexküll's Concept of Umwelt. *Sign Systems Studies* 3 (1): 11-34.

Eder, J. and H. Rembold 1992. Biosemiotics – a paradigm of biology: biological signaling on the verge of deterministic chaos. *Naturwissenschaften* 79 (2): 60-67.

Emmeche, Claus 2001. Does a robot have an Umwelt? Reflections on the qualitative biosemiotics of Jakob von Uexküll. *Semiotica* 134(1/4): 653–693.

Favareau, Donald 2005. Founding a world biosemiotics institution: The International Society for Biosemiotic Studies. *Sign Systems Studies* 33 (2): 481-485.

Favareau, Donald 2010. Introduction: An Evolutionary History of Biosemiotics. In: Donald Favareau (ed.) *Essential Readings in Biosemiotics*. Anthology and Commentary. Dordrecht: Springer, 1–77.

Gould, Stephen Jay 1977. *Ontogeny and Phylogeny*. Cambridge: The Belknap Press.

Hartmann, Eduard von 1906. *Das Problem des Lebens: biologische Studien*. Bad Sachsa: Haacke.

Hoffmeyer, Jesper 1998. The Unfolding Semiosphere. In: G. Van de Vijver et al. (eds) *Evolutionary Systems. Biological and Epistemological Perspectives on Selection and Self-Organization*. Dordrecht: Kluwer Academica: 281-293.

Jennings, H. Spencer 1906. *Behavior of the lowest organisms*. New York: Columbia University Press.

Karpinskaya, Regina 1994. S.V. Meyen's contribution to the foundation of biology. *Rivista di Biologia* 87 (1): 113-117.

Kull, Kalevi 1993. Semiotic paradigm in theoretical biology. In: Kalevi Kull and Toomas Tiivel (eds.) *Lectures in Theoretical Biology: The Second Stage*. Tallinn: Estonian Academy of Science, 52-62.

Kull, Kalevi 1999. Biosemiotics in the twentieth century: A view from biology. *Semiotica* 127 (1/4): 385-414.

Kull, Kalevi 2001. Jakob von Uexküll: An introduction. *Semiotica* 134 (1/4): 1-59.

Kull, Kalevi 2003. Thomas A. Sebeok and biology: Building biosemiotics. *Cybernetics And Human Knowing* 10 (1): 7-20.

Kull, Kalevi 2005. A Brief History of Biosemiotics. *Journal of Biosemiotics* 1 (1): 1-25.

Kull, Kalevi 2020. Uexküll studies after 2001. *Sign Systems Studies* 48 (2/4): 483-509.

Lagerspetz, Kari 2001. Jakob von Uexküll and the origins of cybernetics. *Semiotica* 134 (1/4): 643–651.

Magnus, Riin and Kalevi Kull 2012. Roots of Culture in the Umwelt. In: Jaan Valsiner (ed.) *The Oxford Handbook of Culture and Psychology*. Oxford Library of Psychology, 649-661.

Maran, Timo 2002. Ecosemiotic Basis of Locality. In: V. Sarapik, Tüür, K. and M. Laanemets (eds.) *Koht Ja Paik: Place and Location II*. Tallinn: Estonian Academy of Arts, 68-80.

Punctum. International Journal of Semiotics | **09:02:2023**
ISSN 2459-2943 | DOI: 10.18680/hss.2023.0026 | **punctum.gr**

Maran, Timo, 2014. Place and sign. Locality as a foundational concept for ecosemiotics. In: Alfred Kentigern Siewers (ed.) *Re-Imagining Nature: Environmental Humanities and Ecosemiotics*. Lewisburg: Bucknell University Press, 79-89.

Maran, Timo 2021. The *Ecosemiosphere* is a Grounded Semiosphere. A Lotmanian Conceptualization of Cultural-Ecological Systems. Biosemiotics 14: 519-530.

Maran, Timo and Kalevi Kull 2014. Ecosemiotics: main principles and current developments. *Geografiska Annaler*: Series B, *Human Geography* 96 (1): 41–50.

Mayr, Ernst 1988. *Towards a New Philosophy of Biology: Observation of an Evolutionist*. Harvard: Harvard University Press.

Monti, Niccolò 2023. The Unmeaning Machine. Cybernetics from Semiotics to AI. *Philosophy Kitchen* 18 (1): 89-103.

Reinke, Johannes 1901. *Einleitung in die theoretische Biologie*. Berlin: Verlag Paetel.

Roepstorff, Andreas 2001. Brains in scanners: An *Umwelt* of cognitive neuroscience. *Semiotica* 134(1/4): 747–76.

Salthe, Stanley 1993. Should prediction or historical uniqueness be the central focus of biology? *Folia Baeriana* 6: 247-260.

Schlick, Moritz 1977. Notes and comments. In: Hermann von Helmholtz (ed.) Epistemological Writings. Dodrecht: D. Reidel, 163-185.

Sebeok, Thomas A. 1976. *Contribution to the Doctrine of Signs*. Bloomington: Indiana University Press.

Sebeok. Thomas A. 1979. *The sign & its masters*. Austin: University of Texas.

Sebeok, Thomas A. 1986. *Think I Am a Verb: More Contributions to the Doctrine of Signs*. New York: Plenum Press.

Sebeok, Thomas A. 1991. *A Sign Is Just a Sign*. Bloomington: Indiana University Press.

Sebeok, Thomas A. 1992. Tell me, where is fancy bred? The biosemiotics self. In: Thomas A. Sebeok and J. Umiker-Sebeok (eds.) *Biosemiotics: The Semiotic Web 1991*. Toronto: University of Toronto Press, 333-343.

Sebeok, Thomas A. 1998. The Estonian connection. *Sign Systems Studies* 26: 20-41.

Sebeok, Thomas A. 2001. Biosemiotics: Its roots, proliferation, and prospects. *Semiotica* 134 (1): 61-78.

Sebeok, Thomas A. 2001a. *Global Semiotics*. Bloomington: Indiana University Press.

Tedesco, Salvatore 2014. Funktionskreis e Gestaltkreis: la metafora del circolo nella biologia teoretica. *Aisthesis. Pratiche, Linguaggi E Saperi dell'estetico* 7(2): 177–185.

Uexküll, Jakob von 1905. *Leitfaden in das Studium der experimentellen Biologie der Wassertiere*. Wiesbaden: J. F. Bergmann Verlag.

Uexküll, Jakob von 1913. *Bausteine zu einer biologischen Weltanschauung*. Gesammelte Aufsätze. München: Bruckmann.

Uexküll, Jakob von 1919. Biologische Briefe an eine Dame. *Deutsche Rundschau* 178: 309-323.

Uexküll, Jakob von 1920. *Theoretische Biologie*. Berlin: Gebrüder Paetel.
Uexküll, Jakob von 1921 [1909]. *Umwelt und Innerwelt der Tiere*. Springer: Berlin.
Uexküll, Jakob von 1922. Technische und mechanische Biologie. *Ergebnisse der Physiologie* 20: 129–161.
Uexküll, Jakob von, and Georg Kriszat 1956 [1934/1940]. *Streifzüge durch die Umwelten von Tieren und Menschen: Ein Bilderbuch unsichtbarer Welten*. Hamburg: Rowohlt.
Zengiaro, Nicola 2022. Ecosemiotics of the City. Designing the Post-Anthropocene. *European Journal of Creative Practices in Cities and Landscapes* 5(2): 204–228.
Zengiaro, Nicola 2023. Latour and Biosemiotics. The Hybrid Notion of Life. *E/C* 37: 130-145.

AUTHOR

Nicola Zengiaro PhD candidate at the Department of Philosophy and Communication, University of Bologna, Italy.