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Table of contents

Reviews

From the editors of this volume

Current volume of *Sign Systems Studies* is reflecting two remarkable events that took place in 2004.

First, this was the establishing of *Jakob von Uexküll Archive for Umweltforschung and Biosemiotics* at the University of Hamburg, accompanied with an international conference "Signs and the Design of Life — Uexküll's significance today" held for the inauguration of the *Archive* in Hamburg in January 2004 (see a detailed review by T. Rüting in the end of this volume).

Second, there was the meeting "Cassirer, Lotman, Uexküll: Between biology and semiotics of culture", held in Tartu in May 2004. This has been organised by John Michael Krois from the Humboldt University of Berlin (at that time the first Ernst-Cassirer-Professor at the Swedish Collegium for Advanced Study in Social Sciences) together with the Department of Semiotics of Tartu University.

Most of the papers of the current volume were presented in one of these conferences. The volume altogether has been prepared in collaboration with Hamburg University, particularly its *Jakob von Uexküll Archive for Umweltforschung and Biosemiotics*.[1]

Although there has been some mentioning of Jakob von Uexküll's work in several papers published in *Sign Systems Studies* earlier, this is the first case to devote a focused attention to his works. This can be seen as a follow-up to the special issue of *Semiotica* vol. 134(1/4), 2001, that has been entirely devoted to the interpretation of Jakob von Uexküll's legacy and role in semiotics.

We also thank Han-liang Chang from the National Taiwan University, who has organised the translation of a 1943 paper by J. and T. Uexküll into English and provided it for publication here.

Kalevi Kull
Torsten Rüting

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[1] The related projects were also SF0181789s01 and ETF5230.

Sign Systems Studies 32.1/2, 2004

Semiotics and Jakob von Uexküll's concept of umwelt

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Abstract. Semiotics, the body of knowledge developed by study of the action of signs, like every living discipline, depends upon a community of inquirers united through the recognition and adoption of basic principles which establish the ground-concepts and guide-concepts for their ongoing research. These principles, in turn, come to be recognized in the first place through the work of pioneers in the field, workers commonly unrecognized or not fully recognized in their own day, but whose work later becomes foundational as the community of inquirers matures and 'lays claim to its own'. As semiotics has matured, the work of Jakob von Uexküll in establishing the concept of Umwelt has proven to be just such a pioneering accomplishment for the doctrine of signs, and in this paper I trace out some of the lines of development according to which Uexküll's concept came to occupy its central place in semiotics today.

> *Nature may be compared to a composer who listens to his own works played on an instrument of his own construction. This results in a strangely reciprocal relationship between nature, which has created man, and man, who not only in his art and science, but also in his experiential universe, has created nature. [...] The formula of the reciprocal relationship between man, who must, in his self-world, create nature, and nature, which has brought forth the human species, requires us to consider the relationship between sign processes in nature and in language.*
>
> T. von Uexküll 1992: 281, 282

In speaking about one of the central concepts from the work of Jakob von Uexküll, namely, the concept of Umwelt, I will be addressing the matter not from the point of view of a scholar who has been steeped in the original writings themselves of Uexküll, but from, as it were, an ecumenical point of view,[1] from the point of view of the unmistakable influence that Uexküll has exercised over approximately the last quarter-century on the development of theoretical semiotics in the United States. So I present to you a snapshot from what Sebeok hoped would develop into "a program for the amalgamation of main trends" (Sebeok 2001: xvii) in the development of semiotics as we crossed the threshold of the 21st century.

1. Jakob von Uexküll as cryptosemiotician

The American who should be standing before you to speak on this matter today is Thomas A. Sebeok. Professor Sebeok would have rejoiced in this occasion, and would even have attached to it, I dare say in the tones of German philosophy, a world-historical importance. My own acquaintance with and interest in the work of Jakob von Uexküll stems directly from my long association with Sebeok, beginning indeed about seven years prior to his influential identification of Uexküll as a "cryptosemiotician" and "neglected figure in the history of semiotic inquiry" (Sebeok 1979).

Now the concept of a cryptosemiotician is very interesting. It names that considerable group of intellectuals whose work is intrinsically semiotic, but who themselves have or had no awareness of semiotics as a distinct perspective with a paradigm of its own. As a consequence of the very nature of their work, these thinkers would benefit enormously were they to become aware of semiotics and the vantage it affords. Of course, the achievement of an explicitly semiotic consciousness is possible only for present and future workers of the mind. The only alternative available to past workers — those who are dead by the time semiotics became established — is that their work be taken up anew among the living to be reclaimed and re-established from within the perspective of the doctrine of signs. This is the task of semiotic historiography, as Sebeok put it, to "assess the contributions

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1 Cf. Sebeok 1976; 1977.

of a host of 'neglected' giants", among whom Jakob von Uexküll ranks foremost among the moderns.

By the time I made my own attempt to lay out the "basics of semiotics",[2] it was clear to me that Uexküll was "the single most important background thinker for understanding the biological conditions of our experience of the world in the terms required by semiotic" (Deely 1990: 120). His concept of Umwelt is at the center of this importance. So what I would like to speak to you about this morning is how I came to this assessment of the importance of Uexküll for semiotics today, and how my understanding of semiotics has influenced my understanding of the concept of Umwelt.

2. Sebeok's introduction of Uexküll to the Semiotic Society of America

I was together with Sebeok in Tampa, Florida in 1975, as the secretary of the committee charged with drafting a Constitution for the Semiotic Society of America (SSA), and with him in 1976 when the SSA held its first Annual Meeting as officially incorporated under United States law. At the 7th Annual Meeting held in Buffalo, New York, Sebeok brought to the occasion as a plenary speaker Jakob's son, Thure von Uexküll. Thure addressed the meeting on "Semiotics and the Problem of the Observer". It is some measure of the significance of the occasion, certainly a sign of the import that Sebeok attached to it, that this presentation by Thure was published not only in the *Semiotics 1982* Annual Proceedings volume (T. v. Uexküll 1987a), but was published also in *Semiotica* under Tom's editorship.[3] In addition, Sebeok organized for the meeting a Plenary Session on the theme of "the role of the observer".[4] As one of Sebeok's younger associates, I had the privilege at that occasion of meeting Thure von Uexküll in person. I am quite sure that the occasion did not have for him at the

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2 Deely 1990, described by Sebeok at the time (on the book's flyleaf) as "the only successful modern English introduction to semiotics".

3 T. von Uexküll 1984. In this *Semiotica* publication, p. 195, the Buffalo SSA 7th Annual Meeting is incorrectly reported as the 10th Annual Meeting.

4 Williams 1987 was presented in this session; no others prepared their remarks for publication.

time the same importance it had for me, and I doubt even that he would remember the meeting.

In the Spring of the following year, 1983, Sebeok proposed that he and I, working together with Thure von Uexküll and Martin Krampen, should write what he called a "Semiotic Manifesto". This document aimed to declare and to show to the intellectual world at large that semiotics provides a new paradigm on the basis of which (an interdisciplinary framework within which) the long overdue reintegration of the natural and human sciences could be wrought. To this end, two additional collaborators were eventually brought on board; and the final text of our "manifesto" was published in a 1984 issue of *Semiotica* under the title "A Semiotic Perspective on the Sciences".[5] One of the beliefs animating this "manifesto" was that semiotics achieved a level of intellectual synthesis capable of showing that the "multifarious, stale oppositions of realism and idealism" in philosophy were the offspring of a dichotomy misbegotten in the first place.

Perhaps I should not have been surprised, as I was as the time, that precisely from this presemiotic philosophical opposition definitive of modernity in philosophy sprang the one near-acrimonious exchange among the co-authors of the then *in nuce* semiotic manifesto.

2a. A technical point concerning sensation

Jakob von Uexküll had received his main philosophical formation, I take it, from the German writings of the Master of the Moderns, Immanuel Kant. I, quite the contrary, had received my main formation in philosophical thought from the Latin writings of Thomas Aquinas on Aristotle. Between these two masters there is one principal divide. It concerns a very technical point in the matter of how one is to interpret the activity of so-called external sense. For Kant, the intuitions of sense are already perceptual cues to which the organism in responding gives formation according to its own basic constitution — in the human case, the joining to sensory intuition of a-priori forms of understanding. The concepts of the understanding yield to "the unknowable", however (according to Kant), in two instances: if I try

5 See Anderson *et al.* 1984.

to extend my intellectual knowledge beyond the intuition of sense to the stimulative source of the content of that intuition, I hit the wall of the Ding-an-sich as unknowable; or, again, if I try to extend my intellectual knowledge beyond the giving of structure to sense perceptions, I hit the wall of the Noumenon as likewise unknowable.[6]

The position of Aquinas is more subtle than this, in a way that leaves abundant space for what is *unknown*, but no space at all for what is *unknowable* (according to the common medieval maxim: *ens et verum convertuntur*, *omne ens est verum*).

The position of Aquinas as ruling out the concept of "unknowable" as a legitimate category of understanding, equally on the side of things and on the side of concepts, requires a prescissive distinction between *sensation* (as the action of the environment upon the animal body objectifying certain aspects only of the surroundings) and the higher-level *perceptual response* to that stimulus (wherein the "data" of sensation, never atomic but already a complex and multiple network of naturally determined sign-relations, wherein differentiations of light reveal also shapes, positions, and movements, etc., are *further* structured into *objects* of experience). It is here in the active perception of objects that the animal classifies them, as Sebeok so often put it, as to be sought (+), to be avoided (–), or to be safely ignored (0). The human understanding adds to these objects of perceptual experience so classified perceptually — to the Umwelt as a whole, let us say — a "relation of identity", or "relation of the object to itself", which does no more than sever the exclusive link of the perceived objects to the perceiver, but which by this very fact allows the objects to be considered instead (in the terms of Aquinas) as *beings* (this is a very different matter than "neutral or 0 objects") — entities which may or may not have an internal structure or constitution independent of their relevance to me as an animal among other animals. In instituting rational investigation of objects experienced, the human animal soon enough discovers that not all objects reduce to our experience of them, although some objects do indeed so reduce.

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6 Hence Kant's famous formula (1787: 75): "Gedanken ohne Inhalt sind leer, Anschauungen ohne Begriffe sind blind" — "Concepts without percepts are empty; percepts without concepts are blind." Extended commentary in Deely 2001b; see in particular the Index entry for "Unknowability" and "Unknowable", p. 1009.

The question of "which is which" within experience becomes the story of science, literature, and philosophy.

2b. The coextensiveness of communication and being

In this way of considering the matter, there is no "unknowable" in principle, only many "unknowns" in fact. That there are, in principle, "unknowns but no unknowables" was also the view of Sebeok and semiotics (in contrast to semiology,[7] as to all the aspects of intellectual life influenced by Kant's distinctive epistemological thesis), as Petrilli and Ponzio so nicely summarized the matter in their recent biography of Sebeok (which had the good fortune of appearing before Tom's final illness settled on in earnest):[8] "Communication and reality, communication and being, coincide", *ens et verum convertuntur*.

In other words, astonishingly, the postmodern interpretive horizon at the heart of semiotics — a horizon abandoned by modern philosophy, but never wholly by modern science (which only added to it the notion of reality as socially constructed, in addition to the medieval *ens reale* notion of reality as given in advance of human action) — depends upon the truth of a medieval conviction that *ens et verum convertuntur*, "communication and being are coextensive", as Petrilli and Ponzio put it in Sebeok's behalf. But from this formula, it seemed to me (as to Peirce[9]), that semiosis itself, the action of signs, could be traced also in the inorganic realm prior to and apart from (indeed as preparatory for) the advent of organisms *as well as* within and among living things. That "Umwelt-theory draws the line between

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7 See Deely 2001b: Chapter 16. On the question of terminology alone as such, see Deely 2003a; 2004.

8 Petrilli, Ponzio 2001: 54. Jakob von Uexküll learned a lot from Kant, and may not have conceived of the Umwelt without the stimulus of Kantian philosophy. Yet it remains the case that "a science that embraces natural systems of signs alongside and before the human system of signs" not only "breaks down our traditional division into natural sciences and human sciences" and is the shortest route to overcoming "many of the misinterpretations" of Jakob von Uexküll's Umwelt theory, as his son Thure points out (T. v. Uexküll 1987a: 3); such a science, semiotics by name, is also incompatible with the Kantian *Critique of Pure Reason*, if it is true that communication and being coincide.

9 See Deely 1996 for full discussion.

animate and inanimate nature" rather than "between nature and man"[10] à la the modern philosophers seemed to me no less a mistake, for inanimate nature is still nature, and nature in a sense presupposed to and essential as a context for the dimension of organisms, living things as such. The fact that plants as such do not even have Umwelts[11] does not help to understand why a distinction that seems quite unessential to the theory should be regarded as necessary to or entailed by it. It was my unresolved disagreement with Sebeok, unfortunately, for by the time I realized its dimensions he was no longer with us, or at least not sufficiently so to leave his own final response.[12] The "central preoccupation" of semiotics may be, à la modernity, exactly as Sebeok said,[13] "an illimitable array of concordant illusions"; but "its main mission", as he went on to say,[14] is "to mediate between reality and illusion." Let us put the matter this way. For Aquinas, the species-specifically distinctive awareness of the human animal is the awareness of being, which includes illusions (under his rubric of *entia rationis*, where fall logical relations as well), yes, but also the whole realm of nature. For Kant, by contrast, as for the moderns he synthesized, precisely this *ens reale* is what passes 'under erasure'.

Once I had come to look on the situation of semiotics today in this light, I realized also that not only was semiotics in its essence "postmodern", because it brought this world of nature back out from under the erasure in which modern philosophy had placed it, but so was Sebeok himself, *malgré lui*, postmodern in his understanding of things (Deely 2001c). Petrilli and Ponzio, in their recent study of Sebeok's work (which, as I said, had something of his endorsement), capture the postmodern essence of the way of signs as Sebeok envisioned it exactly: "there is no doubt that the inner human world, with great effort and serious study, may reach an understanding of non-human worlds and of its connection with them" (Petrilli, Ponzio

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[10] Thure von Uexküll 1992: 284: "The Umwelt-theory draws the line not between nature and man, but between animate and inanimate nature. The structural laws which it postulates as nature-plans, and which are analogous to the structural laws of linguistics, are applicable only to living organisms."

[11] Cf. Krampen 1981; Deely 1987.

[12] I refer to our e-mail correspondence around the American Thanksgiving holiday in 2001. See the further discussion below, p. 11 to end of essay.

[13] In his Presidential Address to the Semiotic Society of America, Sebeok 1984: 77–78.

[14] *Ibid.*

2001: 20). Unknowns, yes, in abundance. Unknowables, no, at least not in principle.

2c. The status of objects as perceptible

But to get back to the one misunderstanding in the generation of the manifesto. That all animals in perception organize and classify objects as +, –, or 0 was well agreed among all the participants. But the 0 objects, the *Gegenstände*, what status do they have in the Umwelt? Thure von Uexküll suggests that they have no status at all, that they "do not exist" for the nonhuman animals, and I would not doubt that in this he expresses exactly his father's view as well. I am not so sure. I think that the animals often — I think of the so-called "higher" animals, those able to 'learn from experience', that is[15] — have an awareness of the "zero-object", in that "zero" here does not mean 'non-existent for awareness' but rather 'something that may be in awareness neither as to be sought nor to be avoided but simply as to be safely ignored'. And in this +. –, 0, perceptual classification, of course, the animal can be mistaken! I do not think that the awareness of neutral objects is what characterizes the semiosis of the human animal, anthroposemiosis, but rather the awareness of *any* object and *every* object under the guise of being, 'that which is', to be sorted out as mind-dependent or mind-independent (for "being is said in many ways", as Aristotle early noticed).

Thus, where Uexküll in his original work speaks of the subject-object dichotomy, a split very comfortable in modern thought, I, coming from my Latin background, did not and do not find the dichotomy comfortable at all. This discomfort went back to my student days reading the Latin commentaries on Aristotle. It was, if not the first, certainly one of the first, times that I went to the room of my then-professor, eventual doctoral dissertation advisor, and after that life-long friend, the Dominican friar Ralph Austin Powell, that I posed to him the idea that Kant, in his *Kritik der reinen Vernunft*, had precisely confused what was true of sense perception prescissively distinguished from sensation as such (namely, that it introduced into the organization of objects the needs and desires of the animal's subjective constitution as an organism) with what ought to be

[15] Deely 1971.

said rather of understanding or "reason" (namely, that it was capable of investigating the objects of perception according to what they are and require to be as they are both within and apart from the perception of human animals).

What distinguished human understanding from animal perception in that case would be precisely that sense perception is *completely* biologically determined. Perception arises from sensation as a need to structure objectivity, and perception returns to sensation with the objects structured. Understanding, by contrast, begins from the world of perceived objects, exactly so, but by presenting those very objects in a biologically underdetermined way, namely, as not only +, –, 0, but also as having an intrinsic determination involved with but not wholly reducible to their appearance as +, –, 0.

2d. Objects as intelligible

As involving sensations at their core, the perceived objects necessarily involve something of the physical environment in its physical being, proximally depending upon the type of animal body involved, it is true, but in a selective rather than interpretive fashion.[16] As involving perception, this core is *further* structured and presented as objective in a species-specific way — interpreted, that is, according to the constitution or 'nature' of the particular animal which is perceiving. But as *further* involving understanding, the actually perceived objects are presented rather as actually intelligible, that is to say, as objects *able to be investigated* according to the being they have as involving subjects in their own right, as involving a world of things manifested within objectivity but extending in some ways (*ens reale*) and not in other ways (*ens rationis*) beyond the objectivity constitutive of experience as a whole. The Latins put this well: "aliae enim sunt divisiones entis in esse rei, aliae in genere scibilis".[17]

For this picture, the "subject-object" split of modern philosophy, where the subject is one kind of being in its own right, and the object quite another, will not do. As has so often proved to be the case in

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16 See Deely 2001b: 341–357, esp. 435–347.

17 Poinsot 1632: 149/44–46, and *passim*: "for the divisions of being in the order of physical existence are one thing, while divisions in the order of the knowable are quite another". Cf. also Cajetan 1507.

semiotics, a trichotomy is here necessary. For there is in the world of experienced objects not only what exists as known — namely, the object as such. There are also elements within the objects which human experience tells us exist whether or not any organism is aware of them — things, let us call them, these aspects of objects which may happen to be known but which can exist also apart from the awareness. And both of these are distinct from (even when factually coincident with) the so-called "signs" whereby one thing, one object, one element within awareness, points or leads to another awareness. For signs in this sense can belong to either order. Clouds, for example, as signs of rain exist as signs in the experience of many animals. But clouds have a connection with rain, not only one that is revealed in that experience but also one that is knowable in that same experience as going beyond that experience; whereas flags have a connection to country nowhere but within the experience of human animals.

You can see, in these terms, that Jakob von Uexküll's "subject" belongs to the world of things, but that his "objects" involve a confusion or mixture, an amalgam, even, of objects *and* things. You can see further that the Umwelt is an exclusively objective world, not because it does not involve things, but because it involves things only in *known* aspects.

2e. Language as modeling system and exaptation

The Innenwelt is subjective; it is the modeling system not only species-specific to each variety of animal, but also intrinsic to each individual of whatever variety. But the Umwelt is objective, a public realm within each species yet between all individuals of that species and, to some measure (if never completely), public even across some species. The human Umwelt is first of all an animal Umwelt, a species-specific objective world, but it is based on a biologically under-determined Innenwelt or modeling system. This modeling system, the species-specifically human Innenwelt, Sebeok came to call[18] "language" in the root sense, in contrast to the common (mis)use of the term "language" to mean what is in reality the exaptation of language to communicate and to constitute *linguistic communication* as the species-specifically

[18] Sebeok 1984, 1986a, 1987, 1987b; cf. 1978, 1981, 1981a, 1981b.

human communicative modality. I may mention that this distinction between language as a modeling system and language as a communicative exaptation also explains why Baer (1987: 203) said that, "from Sebeok's biological vantage point", the thesis "of the linguistic mediation of the world does not entail acceptance of the position that the linguistic model should dominate semiotic analysis".[19]

This biological underdetermination of the human modeling system introduces into the Umwelt the "relation to itself" (or of "objects to themselves"), and by so doing presents the perceived objects as actually intelligible.[20] That is, the objects of awareness become, perceived as beings, susceptible of being investigated according to whatever intrinsic constitution they may have subjectively speaking (and this whether ultimately a being of the order of *ens reale*, *ens rationis*, or some mixture of the two as a socially constructed reality, such as the witches of Salem; for, remember, "being is said in many ways"). By this measure what was a closed Umwelt becomes "open", not in the sense that the organs of sensation or perception are any different, but in the sense that the Umwelt becomes permeable to the physical environment explorable as an order of things that involves also physical structures that (unlike perceived objects) remain in some ways indifferent to the kind of animal perceiving it (if not *for* the animals perceiving it).

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[19] This is an important point I have developed elsewhere (Deely 1980; further in 1994); but here let me remark simply that, for want of understanding the semiosic context of linguistic communication, linguistic philosophy as it developed in the English-speaking world after Russell and Wittgenstein (early or late), which one would prima facie regard as a natural ally of semiotic development, proved on the contrary to be a natural enemy of semiotic understanding (Deely 2003: Part I).

[20] So we have from semiotics the answer to the question posed by Heidegger on the last page of *Being and Time* (1963: 437): "Why does Being get 'conceived' 'proximally' in terms of the present-at-hand *and not* in terms of the ready-to-hand, which indeed lies *closer* to us? *Why* does this reifying always keep coming back to exercise its dominion?" For Ready-to-hand is the manner in which objects exist within an animal Umwelt. Human beings are animals first of all, but they have one species-specifically distinct feature of their Innenwelt or modeling system brought to light in the postmodern context of semiotics Professor Sebeok, namely, the ability to model objects as things. Thus the human modeling system or Innenwelt includes the ability to undertake the discrimination within objects of the difference between what of the objects belongs to the order of physical subjectivity ("*ens reale*") and what belongs wholly to the order of objects simply as terminating our awareness of them ("*ens rationis*"). Cf. Deely 2001d: 724–725.

2f. The species-specifically human Umwelt

I suggested to Sebeok, on a number of occasions, and in some extended correspondence we had on the point, that we semioticians ought to take a cue here from Edmund Husserl and the late-modern phenomenologists by calling the human Umwelt in its species-specific sense rather a Lebenswelt. While he sympathized with the suggestion and recognized the utility for a name for what distinguished the Umwelt in the case of the human animal from the Umwelt as common to all the other kinds of animals, his experience with the Nazis in the Word War II period (an experience which was extensive) made him always associate the term "Lebenswelt" with the distasteful Nazi speech about "Lebensraum", and by reason of this distasteful association in his own Innenwelt, as far as I could guess, Sebeok could never bring himself to accept "Lebenswelt" as a synonym expressive of the human Umwelt in its species-specific sense.

In any event, for purposes of our "manifesto", I suggested along the above lines that Uexküll's term "Umwelt" ought best to be translated as "objective world", in contrast with the notion of the physical environment common to all life forms. Note that this idea of the physical environment common across the Umwelts is a species-specifically human hypothesis that, exactly as Thure von Uexküll reported,[21] "belongs to a realm which passes all sensoric conception", even though, as Aquinas would insist, just such an environment is partially included, precisely objectively — as cognized or 'known' in the perceived world of objects — as something of which the animal is in a limited sense aspectually aware. I hope you can see in this extended context, now, why I proposed (and in my own writings have stuck to) this rendering of Umwelt as "objective world": for the objective world is not opposed to the subjective world *tout court*, and in fact partially or aspectually includes something of that very subjectivity through sensation.

However, this extended context here provided existed at the time reported only between Sebeok and me, not even between me and the other collaborators on the manifesto manuscript, Thure von Uexküll in particular. Hence, when my proposal in written lines reached Thure

[21] Thure von Uexküll 1987a: 7. Thure von Uexküll 1984 reads here: "belongs to a realm that goes beyond all sensory conceptions."

via Sebeok, Thure rejected it vehemently and — as I recall the note of response passed on to me by Sebeok — almost with acrimony. At the time I was at my then-home in Dubuque, Iowa, and Sebeok was in New York for some professional affair. It was evening when I received his note which sided with Thure in rejecting out of hand my proposed translation for "Umwelt". I was furious. I picked up the phone at once and dialed Tom's hotel, and he happened to be in. "How can you take sides on this matter without even discussing it further?", I demanded to know. Tom, in his manner (it was a lengthy phone conversation), patiently pointed out to me that we are dealing here with Jakob von Uexküll's son, who has a right to be considered *primus inter pares* when it comes to how we should express his father's work, even in English; and that it was further important that we not let our collaboration founder on an unnecessary point, which even I, as a brash young professor then, had to concede. So we dropped the matter for the purposes of our manifesto, and, under the collaborative genius of Tom's guiding hand, the text came eventually to a successful conclusion. The manifesto stands to this day as a clarion call for a new paradigm and a new perspective, the paradigm and perspective proper and indigenous to the doctrine of signs, which I did not yet then see[22] as quintessentially postmodern. I have since come so to see the doctrine of signs as just that, in unmistakable terms — at least so far as philosophy is concerned within intellectual culture as a whole.

[22] Cf. Deely 1982: 3, "Objectives": "All previous semiotic 'theories' [...] be they Greimasian, Saussurean, Peircean, Poinsotian, have come to the study of signs late in the day, on the basis of a thoroughly worked out system of concepts, a 'pre-existing philosophical paradigm'. To this prejacent paradigm, then, their subsequent notions of signification were referred and required to conform. The coming of age of semiotic as a perspective in its own right requires exactly the reverse. It can have no paradigm of philosophy given in advance. Beginning with the sign, that is, from the function of signs in our experience taken in their own right (semiosis), it is the task of semiotic to create a new paradigm — its own — and to review, criticize, and correct so far as possible all previous accounts of experience in the terms of *that* paradigm." Cf. "Conceptual Revolution" in Sebeok 2001: xix–xxiii.

3. "The Dominican tradition"

Over the years, right up to his last book,[23] Sebeok would occasionally refer to "the Dominican tradition" within semiotics. The reference always mildly annoyed me, especially as he would never explain it when asked (I tried) but afterward continued to insist on the reference in subsequent publications. This tradition, in his last enumeration of protagonists,[24] is the semiotic tradition stemming "from Aristotle, then, via Aquinas, Poinsot, and Maritain," extends through "engaged contemporaries like Herculano de Carvalho, Beuchot, Deely, and others."

A Dominican tradition stemming from Aristotle seems a little odd; but it is true that Aquinas, Poinsot, and Beuchot are Dominicans, and that I was one for four years. But what about Maritain, Carvalho, and "the others"? In any event, it is true that Aquinas cannot be well understood apart from Aristotle; that Aquinas and Poinsot are by far the largest-looming figures in this pantheon; and that Maritain, who regarded Poinsot as among his foremost teachers, was the greatest easily of the 20th century's self-styled followers of Aquinas (the "neothomists"[25]). So the name Sebeok chose for this subtradition within his semiotic ecumenism is not without its jusfifiability,[26] even if it has puzzling aspects. And there is no doubt that, given the lineage Sebeok assigns, that this is the evolving standpoint from which I came to semiotics, to the reading of Uexküll, and to the interpretation of the expression "Umwelt".

And, thinking from that point of view, it has always struck me as one of history's ironies that Jakob von Uexküll, the great inconscient pioneer of zoösemiosis, took his original inspiration for the animal Umwelt, precisely a world of percepts without concepts (if we regard concepts as the species-specifically human products of *Vernunft*), from the Kantian theory of mind.

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23 Sebeok 2001: xvii–xviii.

24 *Ibid.*

25 With the caveat entered in Deely 2001b: 342n200.

26 And here I might note that a well-known German Thomist never mentioned by Sebeok, as far as I know, namely, Josef Pieper, made a central use of Uexküll's Umwelt concept in one of his most famous books (Pieper 1998: 80–97, esp. 81–84).

In a wholly logical world, I thought, the study of the purely perceptual intelligence of animals might rather have been an inspiration for the jettisoning of Kantianism when it came to the philosophy of the human mind.[27] For the human mind is like the mind of any animal in consisting of a modeling system; but it is unlike the mind of any other animal — at least on this planet — in being biologically underdetermined in what it models, that is to say, in possessing "language" in Sebeok's sense.[28] Hence the human Innenwelt can represent things not only on the basis of sensation and as sensed objects are perceptually given, but as intelligible as well, i.e., able to be investigated and studied on the hypothesis that they have an internal constitution or "essential structure" of their own which may look like nothing we have ever seen or could see with the eyes of our animal body.

A subjectively determined objective world which is that and nothing besides, nothing more, makes perfectly good sense within the framework of a Kantian philosophy of mind. Indeed, we may say that Kant did more to make that phenomenon, the animal Umwelt so far as sense-perception is concerned, thinkable than did any thinker before him. But, within that same framework of his philosophy, there is room neither for a universe of things in contrast to objects, nor for a Way of Signs leading "everywhere in nature, including those domains where humans have never set foot."[29] Yet along a way of signs in just this sense is where semiotics leads us, and gives us the means integrally to explore. The choice is not between holding "that signs are nothing but rather dry and boring linguistic concepts that have to do only with syntax and grammar" or recognizing "the exciting fact that signs are in reality magic formulae whose creative power changes our world and ourselves" (T von Uexküll 1982: 12). To pose the matter in the terms of this either/or is already to have accepted the modern idealist/realist

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[27] Consult "Jakob von Uexküll" in Deely 1990: 119–124; and compare the discussion of the relation of understanding to sense intuition in Poinsot 1632a: Book II, Questions 1 and 2, and in Deely 2002.

[28] See n. 19 above.

[29] Emmeche 1994: 126; staying silent for the moment on the question over which Sebeok turned conservative, the question of whether semiosis is coterminus with the emergence of life, or whether there is not indeed a broader origin in which semiosis must be seen as coterminous with the physical universe *tout court*: see Nöth 2001.

opposition as something unsurpassable; whereas semiotics has its point of departure in a standpoint superior to both. (Among the proto-semioticians,[30] Poinsot was the first explicitly to point this fact out;[31] but of course his work in this regard was unknown till quite late in the 20th century, and it is not widely known even as we gather here in Hamburg today.)

4. The postmodern synthesis in semiotics

We start out from the fact that things can be understood which can neither be sensed nor perceived without the understanding, such as the fact that Michael Miller in five days from today will become the titular Archbishop of Vertara. We start out from the fact that among the things which can neither be sensed nor perceived without the understanding are signs, in contrast to sign-vehicles. For I think it is not too much to say that the single most important upshot of semiotic developments in the 20th century has been the realization that, strictly speaking, nothing that can be seen with the eyes or heard with the ears is in the technical sense a sign, but rather and only a sign-vehicle. This sign-vehicle owes its being as such first of all not to anything in its physical, material, or subjective constitution[32] as much as to its place within a triadic relationship. It is this triadic relation which constitutes the sign *as such and as a signifying whole*, and that relation has this in common with all other relationships, triadic or not, namely: that it can be neither seen nor touched in its suprasubjective being as relation, but

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[30] Sebeok called "protosemioticians" the pioneers or founding figures of semiotics as such, that is, those thinkers who first undertook consciously (in contrast to his "cryptosemioticians") the struggle to establish the essential nature and fundamental varieties of possible semiosis.

[31] Poinsot 1632: Book I, Question 1, 117/18–118/18, esp. 117/28–118/9. See the discussion in Deely 1988.

[32] But of course physical constitution will be involved where it is a question of any natural signification, by reason of what Poinsot analyzed as the irreducible element of "transcendental relation" which permeates the realm of nature and *ens reale*, just as ontological relation permeates semiosis whether involving *ens reale* or *ens rationis*.

only understood; so that the animals other than human use signs without the possibility of knowing that there are signs.[33]

Objectified things can be seen and touched. Objectified things can be related, and are perceived (granted, sometimes mistakenly) as related. And, if they are related in a certain way, perceived things — that is to say, rather, *objects* — can be seen to function as signs. But their *being related in a certain way* is what makes them appear as *signs*, not anything about their being as *objects*, or even as *things*. We *call* objects related in that certain way "signs". But, if we are sufficiently sophisticated semiotically, we well know that what in ordinary language are *called* signs are in fact but *sign-vehicles*, and that what are signs in their very being are only the triadic relationships under which the sign vehicles occupy temporarily the position of "standing for" something other than themselves "to" some third, be it an organism or not, an observer or only some prospective observer under conditions not yet prevailing.

Now it is true, as Thure von Uexküll (1984: 187) says, that a sign "is a unit with several elements that are functionally related to each other and to the whole", similar in this respect to cause and effect. But to say that these elements have none of them "any significance by themselves" is to go one step too far, for it erases the profound difference between conventional and natural sign. For the three elements involved in a given sign may themselves be subjective structures able to be objectified independently of the particular signifying. They will then become mere objects in their own right, signified, it is true, but not as sign-vehicle and interpretant in the case supposed. Yet, whether natural or conventional, a sign consists *as such* in a triadic relation whose elements or 'parts' are determined by their position and role within the relation: the one in the foreground of representing another than itself is determined to be the representamen or sign-vehicle; the one in the position or role of being the represented other is determined to be the object signified; and the one in the background of that object for or to which the other-representation is made is determined to be the interpretant. And yet further still, each of these three elements can shift place with the other, becoming then (so far as the signification is

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[33] This is why I have proposed "semiotic animal" on several occasions (most recently Deely 2003b) as the postmodern definition of human being, to replace the modern definition of *res cogitans*.

concerned) no longer sign-vehicle but object, or interpretant, etc., in the famous "semiotic spiral".[34]

Yet, in the animal case, it is the natural sign (or 'sign-vehicle') that carries the burden of the signifyings, not because *entia rationis*, mind-dependent relations of signification, are not involved (they are), but because the animal's survival depends on getting right the manner in which the physical environment is incorporated into its world of objects, its Umwelt, when it comes to food, sex, and danger.

François Jacob, in a passage Sebeok was fond of citing, liked to point out that there is what I would call an "animal realism" which philosophers can ill-afford to ignore:

> No matter how an organism investigates its environment, the perception it gets must necessarily reflect so-called "reality"[35] and, more specifically, those aspects of reality which are directly related to its own behavior. If the image that a bird gets of the insects it needs to feed its progeny does not reflect at least some aspects of reality, there are no more progeny. If the representation that a monkey builds of the branch it wants to leap to has nothing to do with reality, then there is no more monkey. And if this did not apply to ourselves, we would not be here to discuss this point. (Jacob 1982: 56)

Never mind for the moment Kant. Aquinas would say that the perception necessarily reflects so-called "reality", i.e., something true about the world of things as constituting a physical environment upon which all living things depend (even though different ones upon different parts and in different ways), because in sensation the action of the sensible upon the sense guarantees that the material the perception has to work with is rooted in the reciprocal reality (the transcendental relation) of organism and physical surroundings. The ontological and triadic relations which turn all this physical interaction and subjective actions and reactions into a semiotic web[36] sustaining objectivity (which is the Umwelt of any given animal) come from both sides, from the animal mind and from nature, to the sole end of the animal surviving at the least, flourishing if possible. The animal cares not a whit if it be the sun that moves round the earth or the earth

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34 Diagram in Deely 1985: 321; 2001a: 28; 2003: 164.

35 Here precisely in the Latin sense of *ens reale*, the physical environment in its properly subjective being.

36 To use the expression Sebeok 1975 fashioned from his reading of Jakob von Uexküll.

round the sun. We humans know now that the former relation is an *ens rationis*, the latter an *ens reale*. Neither can be directly perceived as relations (only the sun and stars and their apparent movement relative to the animal perceiving), yet both are functionally equivalent within the objective world of animals for purposes of environmental orientation. That is why animals can perceive related objects and sign-vehicles as objects, but they cannot come to know that there are signs; for signs consist strictly and essentially in relations of a certain kind, while relations of no kind can be perceived as such by sense. Yet what the Umwelt is above all is a lattice and network of ontological relations between organism and environment, elevating the latter to the level of the animal's awareness, and organizing it according to the animals need and desires, even hopes.

The environmental niche beloved of North American biologists is a physically reductionist conception by comparison to the Umwelt. Uexküll's work in biology provides the clearest proof yet of the error of nominalism in philosophy in denying reality to relations except as fashioned by human thought.[37] For if that were true, neither Umwelts nor animals could be in the first place.

5. Labyrinthine entwined issues yet to be resolved

My good friend Sebeok died with the issue unresolved between us as to whether semiosis is coextensive with or exceeds the biosphere.[38] Nonetheless, we were well in agreement, by that point,[39] that, as far as

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[37] For the details on nominalism so defined I must refer the present reader to Deely 2001b.

[38] Deely 2001a and 2001d.

[39] December 21, 2001, was Sebeok's last day. Just six months earlier, in the framework of the June 12–21 Imatra meeting of the Nordic-Baltic Summer Institute for Semiotic and Structural Studies, I had the privilege to make an oral presentation of my paper on Umwelt (Deely 2001), which had been written under the prompting of Kalevi Kull for his monumental Uexküll Special Issue of *Semiotica* (Kull 2001), to an audience of which Tom Sebeok was a member. In the months subsequent, I was gratified to have him refer several e-mail inquirers to me as an "expert" on the concept of Umwelt. I took the referrals less as a tribute to my German than as an expression of his satisfaction, for the purposes of the ongoing development of semiotics, with the articulation the concept had received in that paper and session.

the understanding of earthly life goes, and presumably life as well anywhere in the physical universe, "prospects for a viable comprehensive synthesis of the doctrine of signs, a new paradigm if you will, loom on the horizon in 2001 under the banner of *biosemiotics* (a.k.a. the Jakob von Uexküll 'tradition')" (Sebeok 2001: xviii). The advent of this paradigm, he continued,[40] "under the more restricted German label of *Umweltlehre*, that is, the study of modeling, was far from an epiphany. Quite the contrary, it took well nigh a century to season." That century was the 20th century, modernity's last. As we enter postmodernity's first full century in the clear, this "fleshing out of a number of labyrinthine entwined issues" may be expected to occupy more and more of our intellectual culture as semiotics comes into its own, forming the center of gravity for the postmodern epoch of philosophy.

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[40] *Ibid.* xix. I take the liberty of replacing his semicolon after "epiphany" with a period, then capitalizing "quite".

[41] The "second epsilon" mentioned on p. 304 of this work is a blunder, for the "first epsilon" in the Greek "semeiotic" is not an epsilon but an eta, thus: Σημειωτικ.

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Семиотика и понятие умвельта Якоба фон Юкскюлла

Семиотика, т.е. наука, которую развивает изучение знаковых процессов, зависит (как и любая другая живая специальность) от содружества исследователей, которых объединяет признание и применение основных принципов, составляющих основу исследовательской работы. Эти принципы осваиваются прежде всего благодаря работам пионеров этой специальности, которые в свое время могли быть непризнаны, но впоследствии приобрели известность вместе с созреванием содружества исследователей, которые признают их своими. В ходе становления семиотики именно понятие умвельта Якоба фон Юкскюлла стало таким путеводным понятием для учения о знаках. В данной статье рассматриваются те пути развития, которые привели к тому, что концепция Юкскюлла заняла центральное место в современной семиотике.

Semiootika ja Jakob von Uexkülli omailma mõiste

Semiootika, s.o. teadmiste kogum, mida arendab märgiprotsesside uurimine, sõltub (nagu iga teinegi elus eriala) uurijate kogukonnast, keda ühendab uurimistöö alus- ja juhtmõisteid moodustavate põhiprintsiipide

tunnustamine ja rakendamine. Need printsiibid võetakse omaks eelkõige selle eriala pioneeride tööde kaudu, mis ilmumise ajal võisid tunnustuseta jääda, kuid mis saavad rajavateks koos uurijate kogukonna küpsemisega, kes nad omaks kuulutavad. Semiootika küpsedes on Jakob von Uexkülli omailma mõiste osutunud just niisuguseks teerajajaks märgidoktriinile. Käesolevas artiklis vaadeldakse neid arenguteid, mille läbi Uexkülli kontseptsioon haaras oma keskse koha tänapäeva semiootikas.

History and significance of Jakob von Uexküll and of his institute in Hamburg

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Abstract. This paper aims to give an insight into developments that contributed to the significance of the work of Jakob von Uexküll and stresses the importance of his occupation in Hamburg. A biographical survey pays tribute to the implication of the historical pretext and context. A scientific survey describes findings and ideas of Uexküll that proved important for the development of biology and the cognitive sciences. In addition, this paper sets out to reject the common notion that Uexküll's concepts were ideas of a purely theoretical and philosophical character. It confirms that in fact the central aims of his work were to sustain the empirical method in biology and to give biology a sound epistemological basis. Some examples show how historical and theoretical developments converged at Uexküll's *Institut für Umweltforschung* in Hamburg and ignited a productive research activity.

1. Introduction

Realisation of ideas in Hamburg

At the age of 61 Jakob von Uexküll (1864–1944) came to work and teach at the University of Hamburg. In April 1925 he was employed as "*Wissenschaftlicher Hilfarbeiter*" (scientific assistant worker), "a position almost comically beneath a man of his years and experience" (Harrington 1996: 35). However, at the end of the year he was appointed *Honorarprofessor*. For Uexküll these were the first paid positions in his career, and it seems that his long lifespan as an independent biologist was both an expression and guarantee for the creativity of his mind. Uexküll's career in Hamburg can be taken as a demonstration of the unbroken vigour of his mind and his creativeness. He founded the *Institut für Umweltforschung* and Hamburg became the place where the wealth of his ideas and his original ideas about biological research, summarised in his *Theoretische Biologie* (1920a), could be realised within an academic institution for the first time. Uexküll turned out to be a talented director and manager, who mastered the obstacles of bureaucracy and deficiency in inter-war Germany. His winning personality and intellectual spirit attracted and motivated scientists of different educational backgrounds and origins to take part in research at the institute. Besides teaching, supervising students and co-workers, and managing the institute, Uexküll found time to unfold his creativity and published many books that made his insights popular and won him fame.

In Hamburg Uexküll (Fig. 1) put into action his continuous striving for a sound foundation of biology in epistemology and experimentation. In his publications from around 1900 Uexküll had already emphasised that biology had gone astray into speculation and had to win back the experimental method from physiology. This was after more than ten years of thorough studies on the physiology of invertebrate animals in the laboratories of Wilhelm Kühne (1837–1900) in Heidelberg and Anton Dohrn (1840–1909) in Naples, where Uexküll had introduced innovative experimental technology like the cinematograph. Uexküll's promotion of the experimental method in biology went hand in hand with a revision of its epistemological foundations. In his second book, *Umwelt und Innenwelt der Tiere* (1909), he simultaneously criticised the positivistic idea of scientific progress and of progress in evolution. He dedicated a whole chapter to the problem of "the observer" — the main problem of epistemology in science. According to Uexküll, studying the biology of animals provided basic insights into the process of investigation itself.

However, not until the mid-twenties did the *Institut für Umweltforschung* become the place where Uexküll's *Theoretische Biologie* was used for heuristic orientation by a larger group of scientists for the first time. Uexküll's original concepts were the guidelines for research in the *Institut für Umweltforschung* and his theoretical thoughts structured the explanation of its results. The number of students and researchers at the institute grew rapidly and by 1934 more than 70 papers had been published. Nevertheless, Uexküll's ideas were not acknowledged unanimously by his colleagues in the faculty and *the Institut for Umweltforschung* barely survived the death of its founder. It was finally closed in 1960 — as early as the 1970s this was regretted as being untimely, since new institutions for the investigation of the so called *Umweltproblem,* "environmental problem", were to be founded anew.

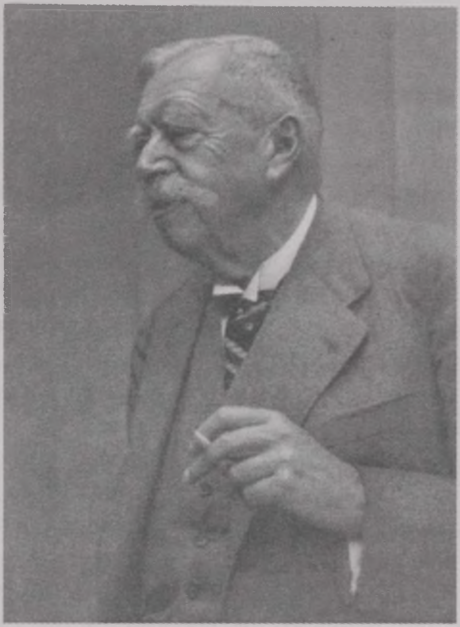


Figure 1. Jakob von Uexküll celebrating his 70th birthday in his institute in Hamburg.

Significance of Uexküll to 20th and 21st century thought

In the eyes of contemporary biologists, Uexküll often appeared arrogant, and his sharp tongue provoked tensions and incomprehension; his unfamiliar ideas were rejected and he himself was labelled a vitalist, anti-evolutionist or mystic (e.g., by Goldschmidt 1956). However scholars in different fields of science and the arts, like psychology, anthropology, philosophy, linguistics, architecture and literature, have recognised the resourceful significance of his challenge (for a detailed list see Kull 2001). Most notably Uexküll's approach influenced the development of the *Organismic Biology* and *System Theory* of Ludwig von Bertalanffy (1901–1972) and the ethology of Konrad Lorenz (1903–1989) and Nico Tinbergen (1907–1988) (Schmidt 1980).

The topicality and inter-disciplinarity of Uexküll's ideas has been demonstrated at several conferences over the last decade. A special issue of the journal *Semiotica* (vol. 134, 2001) brought together the contributions of scholars from linguistics to cybernetics and molecular biology, who explored the legacy of Uexküll in their fields of research. In addition to the rise of the "semiotic turn", the renewed interest in Uexküll's works has been explained as coinciding with a "trend from temporal (evolutionary, genetic, "vertical") biology towards spatial (organismic, genomic, "horizontal") biology" (Kull 2001: 4). Uexküll's agenda is seen as "a main contribution to the 'developmental' or 'epigenetic' trend in the biology of the recent centuries; a lineage involving scholars like Karl Ernst von Baer, d'Arcy Thompson, Hans Spemann, Hans Driesch, Conrad Hal Waddington, Brian Goodwin, René Thom, Robert Rosen and Stuart Kauffman" (Stjernfelt 2001: 79).

The significance of Uexküll's writings is also demonstrated in the recent works of philosophers. Peter Sloterdijk (2004) acknowledges Uexküll's conception of Umwelt and his critique of metaphysics as being relevant for the description of the ethical crisis immanent in the processes of modern society and globalisation. Giorgio Agamben (2002) discusses the relevance of Uexküll to the development of modern philosophy and ideology in the sense of bioethics. The historian of science Anne Harrington (1996) recently described Uexküll in the context of holistic thought in interwar Germany.

2. Biographical survey

Youth in the Baltic aristocracy

Jakob von Uexküll was born on the manor of Keblaste (Mihkli) in Estonia on the 8th of September 1864. He was the fifth child in an aristocratic German-Baltic family. His mother Sophie von Hahn was from Kurland. His father Alexander von Uexküll had broad interests. During his young years as a geologist he had explored the natural history of the Urals. Between 1875 and 1877 the family went to Germany were Jakob attended the *Gymnasium* in Coburg. In 1877 his family returned to Estonia were his father had been appointed mayor of Reval (now Tallinn). Jakob was sent to the *Domschule*, whose rector was at that time the father of the future *Gestalt*-psychologist Wolfgang Köhler. In 1884, on completing his *Abitur*, Uexküll studied zoology in Dorpat (now Tartu). He graduated with the academic degree *Kandidat der Zoologie* (candidate of zoology) and during his life never took another academic examination. At first attracted by the materialistic and deterministic world view, Uexküll became critical of the simplistic explanations of the Darwinists. One of his teachers in Dorpat was Julius von Kennel (1852–1939), whose speculations about the ancestral lines of animals left Uexküll dissatisfied with the science of biology (G. v. Uexküll 1964: 35ff).

From experimental physiology to a new conception of biology

In 1890 Uexküll went to study physiology in Heidelberg at the physiological laboratory of Wilhelm Kühne (1837–1900), who had been born in Hamburg. He introduced himself to Kühne as "deserter from biology" and worked and studied in this famous laboratory for more than a decade. Uexküll thought that physiologists had refrained from speculation and that their experimental methods could serve to renew biology. He specialised in the fields of muscle and neurophysiology, and from 1892 to 1903 he regularly spent many months of the year in Naples at the famous Zoological Station of Anton Dohrn (1840–1909).

Uexküll adapted the methods developed by Kühne for frogs to the investigation of marine animals. He aimed to reveal the principles underlying the muscular movements and reflexes of sea urchins, brittle stars, peanut worms and octopuses. He designed several devices for the observation and recording of the physiology and behaviour of animals (Mislin 1978). In 1899 he went to Paris to study in the laboratory of the physiologist Etienne Jules Marey (1830–1904), the master of the "graphical method" for the recording of body movements and one of the pioneers of the cinema. Marey had constructed a camera for *chronophotography* that produced the first short "movies" of moving animals. Uexküll bought himself a camera and used the *chronophotographic method* for studying the details of, for example, the movements of starfish and the flight of dragonflies and butterflies.

Together with his colleagues in Naples, Albrecht Bethe and Theodor Beer, Uexküll produced an influential paper (Beer, Bethe, Uexküll 1899) that attacked the use of anthropomorphic terminology in sensory physiology and proposed a new "objective" terminology, substituting ,for example, *seeing* with *photoreception* or *smelling* with *stiboreception*. This paper turned out to have a broad impact on the development of behaviourism in the US and on the reflex concepts of Pavlov and Bekhterev in Russia (Harrington 1996: 42).

After a conflict about his application for a position at the Zoological Station, and the rejection of this by Dohrn, in 1903, Uexküll went to marine research laboratories in Berck sur mer, Monaco, Roscoff and Biarritz. He married the German countess Gudrun von Schwerin. Their daughter Dana and sons Thure and Gösta were born in 1904, 1908 and 1909.

In 1907 Uexküll was given an honorary doctorate by the University of Heidelberg for his studies in the field of muscular physiology, especially for his discovery that excitation is facilitated to flow towards the stretched muscle (Uexküll 1904a; 1904b). This finding, known as *Uexküll's law*, proved to be useful in orthopaedics (Kull 2001: 5). In 1913 Uexküll applied for the post as head of the newly founded *Kaiser-Wilhelm-Institute for Biology*, but he was rejected by most of the biologists there (Sucker 2002: 136–151). But with the help of influential persons on the board of the *Kaiser-Wilhelm-Gesellschaft,* Uexküll's idea of establishing a "Flying Aquarium" was supported with 10,000 Marks. Having been used to carrying his equipment from place to place, Uexküll had developed concepts and devices that allowed him to do research outside the established institutions and without a fully equipped laboratory. According to his plans the aquaria of zoological gardens all around Germany could house small laboratories that would give the opportunity for occasional scientific research on a great variety of subjects (Sucker 2002: 136f). But with the beginning of World War 1 such plans lost priority.

World War One and political publications

Uexküll did not restrict himself to scientific publications. He expressed his active engagement in the social and political sphere in the media. This revealing public engagement has to be described in the context and under the significant influence of the First World War.

Before WW1 Uexküll had only published in the general interest press to popularise biology and his ideas about it. During WW1 and its aftermath, he started to write articles on political and social matters as well, and produced nearly 100 popular pieces on politics, morals, and spirituality before his death. The beginning of WW1 was greeted by Uexküll with patriotism. He and his family stayed on a family estate in Pomerania. As Balts they had Russian passports, but they were received well in Germany. Uexküll ascribed holy ideals to the German family, which for him was the true elementary unit of the nation. In 1915 under the title "Volk und Staat" he wrote in the magazine *Die Neue Rundschau*:

> Why did even foreigners staying in Germany have the impression that this war was a holy war? Because German family life suddenly revealed itself before all the world, because the holy fire of idealism that had illuminated and warmed individual homes shot up toward heaven like a single mighty flame. (Harrington 1996: 55)

Uexküll hailed idealism as a holy feeling for unity and responsibility, which, according to him, were the fundamentals of harmonic national association. And he ascribed this idealism mainly to a German type. This ethnocentristic is well documented in his correspondence with the philosopher and writer Houston Stewart Chamberlain (1855–1927). Uexküll was deeply disappointed when England, supposed to be a Germanic nation, sided against Germany. In a letter to Chamberlain on August 11, 1914, he wrote:

> How does England come to make common cause with these culture-hating bandits? Genuine human culture can be sustained only through England and Germany together. (Harrington 1996: 55)

The Englishman Chamberlain had become a German by choice. He had studied physiology and biology, turned to philosophy and married Richard Wagner's daughter Eva. He won the friendship of Kaiser Wilhelm and later that of Adolf Hitler. The relationship between Uexküll and Chamberlain, especially the fact that Uexküll edited Chamberlain's book *Natur und Leben* (1928) was often taken as an argument to prove a close connection between Uexküll and Nazi-ideology. When trying to understand the development of Uexküll's worldview, one has to see his life in its context and have a closer look at the relationship to Chamberlain. The Uexküll–Chamberlain correspondence has been analyzed by Schmidt (1975) and she describes some of the anti-semitic sentiments shared by the writers. But Schmidt also cites from a letter that Uexküll wrote to the widow of Chamberlain in 1933: "Not purity of race, but purity of ideas, Chamberlain demanded from the Germans" and Chamberlain's motto could be summarised as " reverence for the personality, be it arian or Jew, is the highest Demand" (Schmid 1975: 127). Though Uexküll tried defend Chamberlain from Nazi-protagonists claiming him for their movement, and though Hitler and his clique were not sympathetic to him, the Baltic aristocrat blamed the parliamentary system for the crisis in Weimar Germany and as many German conservatives saw a last hope in Hitler. In the second edition of *Staatsbiologie* Uexküll expressed his aspiration that Hitler would save Germany from the avarice of international capitalistic forces. (Uexküll 1933: 78)

The nationalistic mindset of Uexküll had developed during WW1. In 1914 Uexküll urged Chamberlain to call on his countrymen to support Germany, but like many Germans Uexküll changed his mind quickly when England failed to come to its senses. The English and their culture became his main target, his object of contempt, to whom he projected all his dissatisfaction with the state of development of human relations. Here he found the opposite of his ideals. In the English mind he discovered "an irresponsible consciousness" which he identified to be the counterpart of the German *Gewissen*, that made the Germans so superior in matters of morality. Uexküll expanded his critique of Darwinism from biology to politics. In his article "Darwin und die englische Moral" of 1917, on more than 25 pages Uexküll declared Darwin's doctrine to be ungrounded and false, but he said it reflected very much of Darwin's own thought about the behaviour of his fellowmen: Darwin truly describes their inferior morals and their brutal market ethics. Uexküll concluded:

> The German imperative of Kant requires every individual to be an autonomous lawgiver on moral issues. In contrast , Darwin exonerates the individual from this responsibility with his English imperative. [...] Darwin's position can be briefly summarised in the following way: the bigger the herd,

> the higher the morality) [...] From the English character, there is no way to pure humanity — but many ways to its opposite. (Uexküll 1917: 229)

Uexküll gave examples to demonstrate how cruelly and irresponsibly the English had treated the people under their rule; e.g., that they let starve to death one million people in Ireland and nineteen million in India. These acts of cruelty could, according to Uexküll, never be performed or tolerated by their ideal counterpart, the Germans; his sons would learn how much their father had erred in his blind nationalism.

Uexküll concluded that the English expand their capitalistic system and use their monopolistic trade in order to force the rest of the world into slavery. He even accused the British of being so cunning as to make the world blame the Jews for the results of British politics. According to him, this was possible because England dominated international public opinion with its newspapers and was able to extend its influence into all countries who had adopted parliamentary democracy. Thus, parliamentary democracy, "the rule of the crowd", was the dangerous foe of real democracy which could be established only by German idealism (Uexküll 1917: 242),.

> The alliances of the western democracies, and most of all that of America with Russia, whose medieval methods, not least concerning the Jews, seemed to be amoral to Uexküll. He wrote: "Thousands of Jews are being tortured and burned in Russia. That is well known in America, but they continue their dirty trade of arms with Russia." (G. v. Uexküll 1964: 101)

After the war had begun to drag on and its disastrous consequences had become clear, Uexküll came to see hope only in biology. The poet Rainer Maria Rilke, who had been a friend of the Uexküll family since 1904, turned to the scientist in 1917 to take some lessons in biology. Rilke wanted to find relief from his depression in the science of organic life and its harmonic. Uexküll reassured Rilke's notion, that a new era was near and went on:

> The war of minds has begun.[...] in this battle biology will be the leader, because she has to fight with physics and chemistry, who up to now have filled the armoury of man. (G. v. Uexküll 1964: 123)

Later, in 1921, after his *Theoretical Biology* had been published and well received, Uexküll wrote to Chamberlain: "I have noticed that the biological mode of expression is more attractive to our contemporaries than the abstract philosophical" (Harrington 1996: 56).

Uexküll had recognised that the language of biology helped him to popularise his views of law and order in politics. It gave him powerful metaphors to naturalise his worldview in the general interest press.

During WWI and the Russian revolution the Uexkülls and other Baltic-Germans lost most of their property in the Baltic states, which they had hoped would be annexed and integrated into the Reich. Uexküll compared the German republic to a corrupt organism that accepted its own dismemberment. He described the turmoil in Russia following the October revolution of 1917 as the deterioration of a giant amoeba into a blob of rotting protoplasm. As early as November 20th 1917 he wrote in a letter to Chamberlain:

> In Russia the long awaited moment has come, the protoplasm of the giant amoeba is fully in the process of decomposition, and it is no longer possible to stop this natural process. Senseless pillage and murder are on the increase [...]. (Harrington 1996: 57)

With the end of the war and the defeat of Germany foreseeable, Uexküll became more and more convinced of the necessity of a strong state. Only this could, according to him, stop the "putrefaction of the nation".The holy idealism of the German family seemed to be destroyed, and bereft of their elementary relations the individuals were no longer able to autonomously associate into a harmonious political organism. The greed of the masses to seize power had to be restricted by a mighty government. He worked out a whole metaphoric description of society at large, his *Staatsbiologie*, *Biology of the Stat*e (Uexküll 1920b).

After he had lost most of his possessions during WW1 and the Russian Revolution Uexküll could no longer pursue his research in the far off laboratories in France and Italy. But the restrictions might have helped to bring Uexküll to sift through and summarise the results of many years of work and in 1920 his *Theoretische Biologie* was published. In 1921 the thoroughly revised edition of *Umwelt and Innenwelt der Tiere* was published by Julius Springer. In 1924 Uexküll's 60th birthday was celebrated by his disciples and friends with the publication of a jubilee edition of *Pflügers Archiv für die gesamte Physiologie* (Bd. 205) containing 19 papers of authors from all over the world. But still Uexküll yearned to see the fruitful development of his ideas put into action in practical research. His art of experimenting, investigating and observing could find continuity only in a laboratory supervised by himself.

Realisation of an institution and an intellectual school in Hamburg

In 1913 Otto Cohnheim (1873–1953), who had admired Uexküll ever since he had been supervised by the latter in Naples and Heidelberg, had been called to head the Physiological Institute of the Eppendorf Hospital in Hamburg. Cohnheim became famous for his research on enzymes, respiration and the physiology of UV-light. He changed his Jewish name into Kestner in 1917. In 1919, when the University of Hamburg was founded and the hospital in Eppendorf became an institution within the university, Kestner became *Ordinarius* of physiology. In this position he was allowed to nominate people for the Nobel Prize and he did not hesitate to suggest Uexküll twice. Kestner also used his good contacts to the administration of the university and the head of the zoological society in Hamburg to find his teacher a place.

The old zoological garden in Hamburg, which had been founded and headed by the famous Alfred Brehm (1829–1884) from 1863 to 1866, had suffered during WW1 and the period of inflation in Germany. It could no longer compete with the new zoo of Carl Hagenbeck (1844–1933). However, it was decided to keep some of its attractions. One of them was the aquarium, which had been built in 1864 under the supervision of William Lloyd. Lloyd had constructed the aquarium at the London world fair exhibition. By introducing new architecture, illumination and technologies he helped to sustain temperature and water quality and made the aquarium more attractive to the public. After having built the aquarium in Hamburg he went to Naples to build the aquarium inside Dohrn's station.

In the 1920s the aquarium in Hamburg had been neglected for years and needed to be revived. Cohnheim suggested that Uexküll was the right man for the job and Uexküll got his first paid position as scientific assistant in charge of the reconstruction and reorganisation of the aquarium. Moreover, he was given the opportunity to use the aquarium as a research station. Starting a *Laboratorium für Umweltforschung* in a kiosk adjacent to the aquarium in 1925, Uexküll managed to found the *Institut für Umweltforschung* in 1926. The institute flourished into a vital research centre and until 1934 produced more than 70 papers under the direct supervision of its head (Kühl 1965; Hünemörder 1979). Konrad Lorenz visited the institute in the 1930s and dedicated his monograph "Der Kumpan in der *Umwelt* des Vogels" (Lorenz 1935) to Uexküll.

Intellectual "Umwelt" in Hamburg

The University of Hamburg was not one of the old established institutions. Founded in 1919 with democratic aspirations in the young German Republic it soon became known for its liberal spirit and for the support of unconventional and interdisciplinary scientific developments. It gathered a circle of scholars that became very influential for the development of 20th century thought. The Philosopher Ernst Cassirer (1874–1945) had founded the Philosophical Seminar and became head of the university in 1929. Elaborating his neo-Kantian ideas, Cassirer looked for the foundations of epistemology and his ideas belong to the classics of semiotics. His *Philosophy of Symbolic Forms* (1923–1929) was meant to found a theory of meaning to understand the creation of reality by human culture. Cassirer made himself familiar to contemporary psychological and neuro-physiological research and was closely connected to the Psychological Institute of the university founded and headed by William Stern (1871–1938). According to Uexküll's wife, in 1931 Cassirer commented on a lecture which Uexküll had given at the Congress of German Psychologists. Uexküll had described how dogs claim their territories by putting down scent marks. Cassirer reminded the audience that Rousseau had condemned to death the first man who had erected a fence and claimed the territory for himself. Cassirer explained that after the Uexküll's lecture it had become clear that this execution would not have been sufficient — in order to prevent privatisation, the first dog would have to have been killed. The same lecture of Uexküll had provoked another kind of scholar. Josef Goebbels, later Hitler's Minister of Propaganda and Culture, wrote an article that described Uexküll as a representative of the German professors who follow ridiculous occupations instead of giving the German Volk a feeling for its "real responsibilities" (G. v. Uexküll 1964: 168f).

In the second chapter of his "Essay on man" (1944), entitled "A clue to the nature of man: the symbol", Cassirer referred to Uexküll and his description of the functional cycle as a clue to the understanding of meaning in biological terms. But he came to explain that man by developing a symbolic system inside the cycle is more detached from nature than animals, and is by this qualitative innovation to be distinguished from animals (Heusden 2001).

Cassirer worked in the *Psychologische Institut* of the University of Hamburg in close cooperation with William Stern (1871–1938), who had taught in Hamburg since 1916 and was one of the universities founding fathers. Stern developed his "Differentielle Psychologie" (1911), as an attempt to integrate biomedical sciences into the philosophical, ethical and social framework of contemporary psychology. The epistemological approaches at his institute centered around the concept of the person and his subjective experience. New experimental methods were established and the laboratory of the Institute was built up consequently. Stern's coworker Heinz Werner (1890–1964) became famous for developing an organismic approach to developmental psychology and language which tried to counter the "geometic-technical model of communication". Werner put forward an integrating model of human perception, development and meaning in language (Nehrlich 1992). In the second edition of his book *Einführung in die Entwicklungspsychologie* (Werner 1933: 39), Werner refers to the latest experiments performed in cooperation with Uexküll's laboratory, especially the work of the psychologist Emanuel Sarris on the dog's ability to understand human language (Sarris 1931; in Uexküll's *Nachlass* several offprints and Werner's *Einführung in die Entwicklungspsychologie* (1926) with dedications to Uexküll document the contacts between the scientists).

A closer alliance developed between Uexküll and the philosopher and historian of science Adolf Meyer (1893–1971) or Meyer-Abich as he named himself after 1945, after adding the name of his wife to his, who was a prominent representative of holism in Germany. He had studied philosophy in Göttingen with Edmund Husserl (1859–1938) and in Jena with Rudolf Eucken (1846–1926). He came to Hamburg in 1921 to take care of the natural sciences at the State- and University-Library. In 1925 Meyer-Abich was the first to get an interdisciplinary *Habilitation* for "*Philosophie der Naturwissenschaften und Geschichte der Naturwissenschaften*" in Germany. Following the Neokantian trend of the time, his thesis *Logik der Morphologie* was a critique of biological epistemology. After getting acquainted with the work and person of Jakob von Uexküll and Hans Driesch (1867–1941), who had been born in Hamburg, Meyer in his second monograph *Ideen und Ideale der biologischen Erkenntnis* (1934) treated the conflict between vitalists and mechanists. Together with Uexküll, Meyer gave a number of seminars on the philosophy of science. Meyer-Abich taught in Hamburg until 1969 and became one of the founding fathers of the Institute of the History of Science (*Institut für Geschichte der Naturwissenschaften, Mathematik und Technik*), which today looks after the Jakob von Uexküll Archive. In spite of the apparent success and creativity of the *Institut für Umweltforschung*, Uexküll had to struggle hard for the survival of the institute for several reasons. He himself was beyond the regular age of retirement. His chair was essential for the institute, but only his reputation could convince officials to prolong his employment. The established zoologists questioned the legitimacy of *Umweltforschung* and refused to examine Uexküll's disciples. Many of them went to the university of Kiel instead, where animal psychologist Wolfgang von Buddenbrock (1884–1964), *Ordinarius* of zoology until 1936, and his successor Adolf Remane (1898–1978) acknowledged the discipline of *Umweltforschung*. Uexküll and his assistant Friedrich Brock (1898–1958) had to fight hard before Brock, after his *habilitation* in Kiel in 1938, could be nominated successor to Uexküll in 1940. Uexküll, aged 75, set off to retire on the island of Capri, but went on discussing and propagating scientific and philosophical aspects of his approach to biology. Some of his unfinished bio-philosophical works could be published after Uexküll's death in 1940 by his widow and his son Thure (Uexküll 1944; 1947; 1949; 1950).

3. Scientific survey

Biology as epistemology

Uexküll's ideas decisively contradicted the mainstream of thought in 20th century science. When confronted with his writings, it helps to remember their history and to recognise the central theme of Uexküll's scientific agenda: his philosophy of science and his concern for creating foundations for a renewed integration of biology and epistemology.

In the modern era, physical science attained a dominating role as a model for the production of all knowledge. The ideal of positivist objectivism was shaken before the turn of the 19/20th century, but, despite the findings of Einstein and Mach, biologists grounded their young science on mechanistic concepts and attempted to resurrect scientific realism in the fin-de-siécle world of increasing relativism. This conception of biology and epistemology was challenged by the physiologist Uexküll. He turned against objectivism and offered a subjectivist epistemology based on biology. His main concepts aimed to re-introduce the autonomous organism as subject into the life-sciences and at the same time to make subjectivity the object of the scientific method. Uexküll pointed out that all scientific investigation is an act of human subjects, ruled by biological processes not sufficiently explicable by physics. Thus, biology, not physics, should be the basis of all science. Uexküll focused on meaningful responses which enable every organism, humans included, to actively realise its own life-world — it's unique *Umwelt.* Consequently, scientists were subjects interpreting and constructing their objects. Besides this refutation of scientific objectivism, Uexküll's concept of the universe as the creation of countless individual *Umwelten* challenged the idea of one universal objective world. Refuting reproaches of solipsism, Uexküll did not deny the existence of a physical world, but rejected the claims of its universally equal intersubjective significance and labelled them "meta-physical", However, Uexküll emphasised that intersubjective (interspecies) understanding is the central aim of biological investigation. In his research, called *Umweltforschung*, he explored the creation and interplay of the unique life-worlds of animals and independently developed an approach, labeled posthumously as "cryptosemiotic" (Sebeok 1979). This biology, conscientious of its subjectivity and the interdependence of organisms, provided him with arguments against the modern worldview, which he saw as being misguided by anthropocentrism, speculative Darwinian theories and the misuse of machine analogies.

Uexküll's concepts were based on empirical physiological studies of the movements of invertebrate animals and developed under the influence of Kant's philosophy.

Physiology, biology, Umweltforschung

Disappointed by his teachers' speculative views on biology Uexküll found his field of mastery in physiology, especially of invertebrate animals. But he went on to broaden the scope of the science of living matter and did not give up trying to save the science of biology from the fundamental errors which he saw within it. In his first monograph Uexküll (1905a) had already assigned different roles to physiology and biology. Physiology should organise the knowledge about organic systems by looking for causalities. Having preserved the advantage of the experimental method, physiology should help to renew biology. In contrast to physiology, biology should empirically go beyond the investigation of causalities by exploring the laws that ensure the purposefulness (*Zweckmässigkeit*) of living matter. Therefore biology should study organisms not as objects, but as active subjects. This would mean a shift of focus onto the organism's purposeful abilities that enable its active integration into a complex environment. Biology therefore had to deal with holistic units and to maintain a broader scope than physiology in order to grasp the interactive unity of the organism and the world actively realised by it. In order to describe this unity, Uexküll introduced the term *Umwelt* (Uexküll 1909). *Umwelt* as a term and concept became most significant in 20th century thought and it is on account of it that Uexküll is most frequently cited in contemporary literature (Sutrop 2001). In *Umwelt und Innenwelt der Tiere* (1909) he introduced the term *Umwelt* to denote the subjective world of an organism. For him *Umwelt* was the unique phenomenal world embracing each individual like a "soap bubble". He stressed, that the individual organism is always *actively creating* it's individual *Umwelt* and that this creative process is related to meanings determined by the animal's internal states, needs, design (*Bauplan*) etc. These interrelated factors that determine the process of the creation of *Umwelten* were the subjects of the scientific investigation called *Umweltforschung*.

The discovery of negative feedback control in organisms

At the beginning of the 20th century, Uexküll recognised the important role of negative feedback control in organisms. He used the concept of the *Funktionskreis* (functional cycle) to illustrate behaviour as a regulated process. Uexküll's models can be seen as the predecessors of cybernetic models. Recently Uexküll has been discussed as a pioneer of cybernetics and artificial intelligence studies (Lagerspetz 2001; Emmeche 2001; Roepstorff 2001).

In 1904 Uexküll formulated a law of neuro-motor regulation (Uexküll 1904a; 1904b). *Uexküll's law* stated that 'nervous excitation always flows towards the stretched muscles'. This law helped to explain how muscular tone and position maintenance is regulated in animals. Uexküll findings were useful in orthopaedics (Haupt 1913; Wieser 1959). The finding that the activity of the nervous system facilitates the contraction of stretched muscles and thereby counteracts and regulates the stretching of muscles can be considered to be the first formulation of the principle of negative feedback inside living organisms. In his *Theoretische Biologie* Uexküll developed these early cybernetic ideas and used little diagrams to illustrate them (Fig. 2; Uexküll 1920a: 201; 1928: 209).

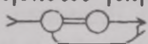
Viel häufiger findet die Kontrolle innerhalb des Körpers statt. Hier sind zwei Fälle zu unterscheiden: entweder wird die Bewegung der Effektorenmuskeln durch besondere sensible Nerven rezipiert, wie das beifolgende Schema zeigt.  Oder es wird die den effektorischen Nerven übertragene Erregung durch besondere zentrale Rezeptoren zum Teil aufgefangen und dem Merkorgan zugeführt.  Diese Rezeptoren bilden das zentrale Sinnesorgan von Helmholtz, das anatomisch noch völlig im Dunkeln liegt.

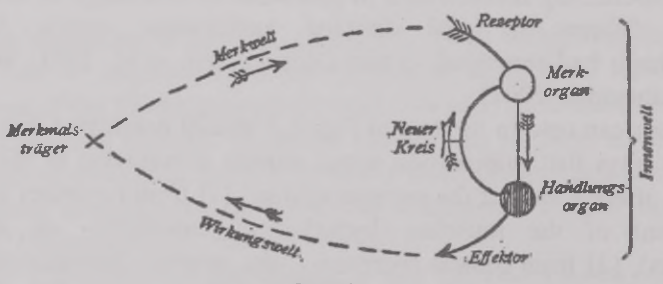
Figure 2. Little diagrams in the text illustrating a description of feedback and reafferent control (Uexküll 1920: 201).

These figures already show the now familiar outline of feedback loops and may be seen as their early graphical representations before the science of cybernetics had been inaugurated. However, Norbert Wiener developed his ideas in the 1940s, when he was working on servomechanisms for anti-airplane guns and compared problems of automatic-steering mechanisms to problems of neurology in order to explain failures in goal directed movements, which Arturo Rosenblueth had presented to him (Rosenblueth *et al.* 1943; Wiener 1948; Lagerspetz 2001).

As one can read in the text to Fig. 2, Uexküll postulated that there are two ways that information about muscle movements is fed back into the afferent side of the nervous system: (1) from receptors for the movement of the muscles (hypothetical movement- or stretch receptors), (2) from central receptors ("*das zentrale Sinnesorgan*" of Helmholtz) that take up a part of the excitation sent to the efferent nerves and make it available to information processing in the afferent net of nerve cells. This second control principle was inaugurated by Holst and Mittelstaedt at the end of the 1940s as "*Reafferenzprinzip*" (Holst, Mittelstaedt 1950).

Overcoming the reflex-concept by the functional cycle

Since his early work on the movements of the brittle star in 1904, Uexküll had tried to work out a more general concept to explain the control of behaviour in moving animals. By developing the functional cycle Uexküll tried to extend the concept of the reflex arc. In the second edition of *Umwelt und Innenwelt der Tiere*, Uexküll replaced the chapter on reflexes written in 1909 with a chapter on the functional cycle (Uexküll 1921). A section about "Die Funktionskreise" had already been included in the first edition of *Theoretische Biologie* (Uexküll 1920a). Uexküll had illustrated his description of the new concept with little schemes inside the text (Uexküll 1920a: 116–117; Fig. 3, 4.) Most notably, Uexküll already had described the principle of reafferent control by feedback of motor commands and graphically represented it in another early scheme (Fig. 3): an inner cycle, "*Neuer Kreis*", stands for a connection within the nervous system, which ensures the direct flow of information from the *Handlungsorgan*, which generates the impulses for the effectors to the *Merkorgan*, which is processing it together with information from the sensory system. Uexküll already recognised that this embodied self-reference not only serves to control movements, but is a central prerequisite for a coherent perception of the world (Uexküll 1920a: 117). The enduring relevance of this idea can be seen in its place in current neuro-scientific concepts of embodied cognition (Kelso 1995; Rizzolatti *et. al* 1997).



Figur 4.

Figure 3. Functional cycle with reafferent cycle (Uexküll 1920a: 117).

According to Uexküll, the modelling of functional cycles should help to conceptualise the functional organisation of behaviour as an ongoing process of regulation. It represents the animal organism as a subject that is integrating objects into its *Umwelt*: this process is depicted as a closed loop of interactions. A modern description of the ongoing process in English terms was tried by Figge (2001). The following attempt uses his terms and some of the terminology introduced by Urmas Sutrop in Fig. 4.

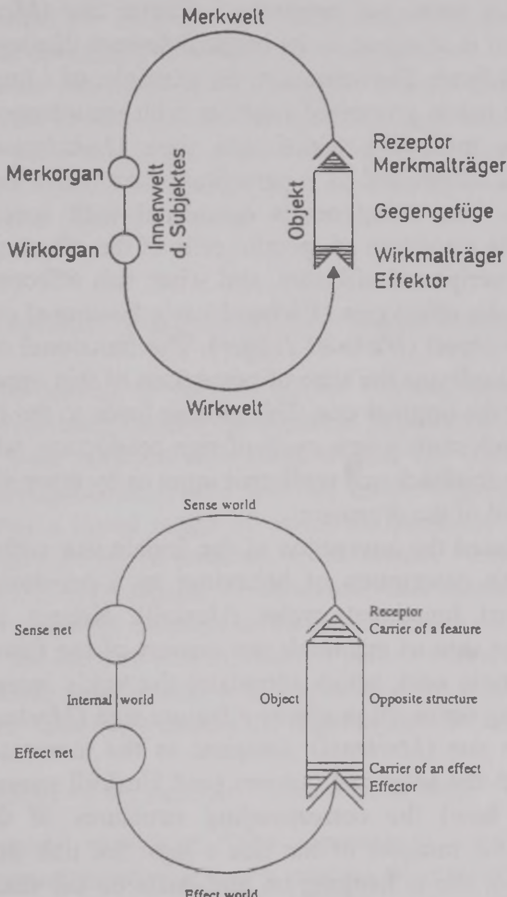


Figure 4. Funktionskreis or functional cycle with German and English terms (Uexküll 1921 and Kull 2001, translated terms by Urmas Sutrop).

The organism's nervous system is equipped with receptors and sense nets (*Merkorgane*), effectors and effect nets (*Wirkorgane*). The sense net is able to discriminate and represent particular features of the organism's *Umwelt.* The representation produced by a distinct receptor unit is called *Merkzeichen,* which can roughly be translated as "feature sign". The effect net is tuned to produce muscle impulse patterns and to stimulate effector cells thus producing an effector sign (*Wirkzeichen*). If a particular quality of an object in the organism's *Umwelt* stimulates the cells of the peripheral receptors, the corresponding sense net produces a feature cue (*Merkmal*) for the object, which is assigned to its original feature display on the object (*Merkmal-Träger*). The sensation, for example, of a huge green shade in the sense net is processed together with simultaneously produced feature-signs indicating space and time (*Lokalzeichen*, *Moment-zeichen*) and recognised as a perceptual cue, which is assigned to a tree outside. The effect net is connected with specific peripheral effectors. The activation of specific cells of the effect net orchestrates the cells of peripheral effectors, and when this effector acts upon an object, then the effect sign (*Wirkmal*) as a functional cue is displayed on or by the object (*Wirkmal-Träger*). The functional cue effected on the object transforms the state of perception of this opposite structure, thus erasing the original cue. This change leads to the perception of a new cue which starts a new cycle of sign production, which is attuned according to feedback and reafferent input or by other signs within the internal world of the organism.

Uexküll used the interaction of the female tick with a mammal to exemplify his description of behaviour as a pre-designed chain of interconnected functional cycles (Uexküll, Kriszat 1934: 7). The glands on the skin of mammals are carriers of the feature (*Merkmal-sträger*), butyric acid, which stimulates the tick's receptor cells. The corresponding sense net produces a feature sign (*Merkzeichen*), which is used as a cue (*Merkmal*), assigned to the mammal. The central processing in the sense net induces (and Uexküll stressed that it was not known how) the corresponding structures of the effect net, innervating the muscles of the tick's legs: the tick detaches herself from the twig she is hanging on and lands on the mammal, thereby putting an effector cue onto the hairs she is touching. The hairs are thus carrying the feature for the next cue received and turned into the feature cue of hairiness, which is assigned to the mammal and at the same time has "erased" the olfactory sign, so that a new cycle has started. The cue of hairiness induces the effect web to orchestrate the movements for crawling through the mammal's hair until the tick reaches bare skin, which "erases" the cue of hairiness and leads to the perception of the thermic cue of body temperature which induces the movements of drilling into the skin, where blood is the cue for the next cycle of sucking. Internal receptors produce signs of saturation that induce the tick to leave the skin, to drop, and to lay her eggs.

The example of the tick was advantageous because just a few cycles are needed to describe the ticks behaviour and because experiments had revealed that a few cues (butyric acid, hair and body temperature) were sufficient to induce the corresponding behaviour and link one cycle to another. Uexküll said that the *Umwelt* of the tick was simple or "poor" in comparison with the *Umwelt* of mammals, but "poverty" of the *Umwelt* is a prerequeisite for the ensured success of the ticks behaviour (Uexküll, Kriszat 1934: 8).

4. Umweltforschung in action — some examples

The researchers coming to the *Institut für Umweltforschung* of the University of Hamburg came from different faculties of science and often brought their subjects with them so that the works produced were very heterogeneous. There was no model organism and the subjects covered a broad range of scientific questions. There were works on the physiology of muscles, sense organs, body movements and works on different aspects of behaviour and communication in animals, performed with different animals from cockroaches to snakes to dogs. Since the institute was founded as part of the aquarium of the zoological garden, and Uexküll was a specialist for the behaviour of marine animals, these were among the first subjects to be investigated.

Sensory physiology — the basis for "Umweltforschung"

Thure von Uexküll explained: "The approach of *Umweltforschung* aims to reconstruct creative nature's process of creation". It can be described as "participatory observation". "This method of observation, in the sense of Uexküll [...] means first of all ascertaining which of those signs registered by the observer are also received by the living being under observation" (T. v. Uexküll 1987: 149). Essential for this was the investigation of the capacity of the sense organs. Sensory physiology had to pave the ground for further research into the problem of access to the *Umwelt* of animals. This basic research could only reveal a first outline of the realisable *Umwelt* of the animal. However, by investigating the animal's ability to perceive and discriminate different physical stimuli, Uexküll tried to get initial indications of their significance for the animal's behaviour — first ideas about the signs that possibly constitute the animal's *Umwelt*. For Uexküll this was the basic methodology to analyze the "subjective space" (*der subjektive Raum*) of the animal (Uexküll, Brock 1927; Uexküll, Kriszat 1934).

Uexküll and his assistant Friedrich Brock tried to give the reader a vivid demonstration of the results of basic Umweltforschung in the new laboratory and published illustrations of the different *Umwelten* of different living beings (Fig. 5). Normal photographs presented the human Umwelt. By using grids with different pitches of the matrix, the resolution of the compound eye of a fly (*Musca*) or the eye of a mussel (*Pecten*) was emulated. The pitch of the raster was corresponding to the frequency of sensory elements within the eyes of the animals. These dots were called "Sehorte" — visual locations in the visual space. In order to eliminate the artifacts of the grid, aquarell paintings of the supposed Umwelten were produced. However these peaces of art were based on scientific grounds and were later reproduced in the famous *Stroll through the Umwelten of animals and humans* (Uexküll, Kriszat 1934). The pictures helped to make conscious to the reader how differently humans and animals perceive the world they share. They thus served as a method for intersubjective and interspecies understanding — as the first fascinating steps into the *Umwelten* of other organisms.

A street in a town, seen through the eyes of a human

The same street seen with the eyes of a fly

The same street in the eyes of a mussel

Figure 5. Illustrations of the different visual Umwelten of a human, a fly and a mussel (Uexküll, Brock 1927).

Uexküll explained that the optic world is constructed out of elementary units that correspond to the sensory cells. The cells' position in the eye corresponds to the site in the optic space (*Sehraum*) and in his cryptosemiotic language he talked of local signs (*Lokalzeichen*). The number of receptor cells limits the number of sites and thus the amount of, or complexity of, signs to be perceived.

8

Thus it can be predicted that the complexity of the optic sense world (*Merkwelt*) of the snail or fly is much smaller in comparison to the human visual space. Uexküll exemplified that this was the reason why a fly could not detect a spider's web before it was trapped (Uexküll, Kriszat 1934: 21).

The Umwelt of the fighting fish

Hans Werner Lißmann, who later continued his career in Cambridge and became famous for his pioneering investigations on fish electroreception (Lissmann 1951), under Uexküll's supervision started to investigate the behaviour of the Fighting Fish (Lißmann 1932).

In order to identify the physical features that function as signs of rivalry, Lißmann made extensive use of the concept of a dummy. He could count the attacks that were elicited by dummies with different body marks. He thereby assessed their significance as signs (*Merkzeichen*) in the functional cycle of rivalry (Fig. 6). Lißmann's method of analysis of behaviour was a forerunner of the famous studies of the behaviour of the stickleback which Nikolas Tinbergen performed some years later and described as a method for the "objectivistic study of the innate behaviour of animals" (Tinbergen 1942).

Lissmann was also a pioneer of the so called mirror image stimulation (MIS) (Rowland 1999). In order to study the specific perception of time, the *Moment* or *Momentzeichen*, as Uexküll called it, Lißman used the agonistic behavior of the Fighting Fish *Betta spledens*. Today we would say, he went to determine the "flicker fusion frequency". Lissmann constructed an ingenious apparatus and conducted an experiment that was hence used to test the perception of time or movement for visual signaling in other species:

> By requiring subjects to view their mirror image through evenly spaced slits in a rotating wheel, Lissmann in effect presented subjects with a series of still images in more or less rapid succession. As the male began to 'interact' with its mirror image, Lissmann slowed the wheel until the male ceased to react to its mirror image. At this point the separate views through the slit no longer followed each other soon enough to fuse into a moving image and probably appeared to the fish as a succession of still frames of its mirror image. (Rowland 1999: 291)

Die Umwelt des Kampffisches (Betta splendens Regan). 89

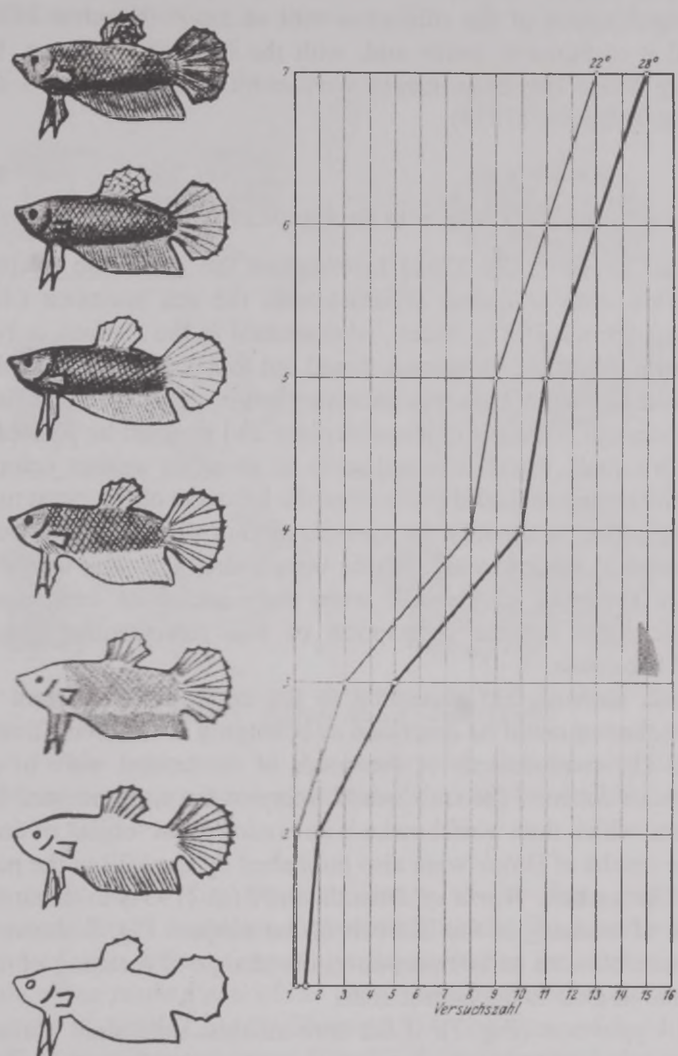


Abb. 8. Bildserie mit steigender Ähnlichkeit. Mit jedem Bild wurden bei 22° und 28° je 16 Versuche gemacht (Abszisse). Auf der Ordinate sind die Bilder mit steigender Ähnlichkeit aufgetragen. Die Kurven geben die Anzahl der Erregungen an, die das betr. Bild bei 16 maligem Zeigen beim Kampffisch auslöste.

Z. f. vergl. Physiologie Bd. 18 6b

Figure 6. Diagram showing the frequency of aggressive reactions to dummies with different signal cues (Lißmann 1932: 89).

This method had been developed in the institute in cooperation with Gerhard Brecher. In his Dissertation on the "Development and biological significance of the subjective unit of time" (Brecher 1932) he applied it to humans, snails and, with the help of Lissmann, to the Fighting Fish. The experiments were continued and refined in the institute by Beniuc (1933).

The hermit crab and changes in the significance of a sea anemone

Friedrich Brock (1898–1959) investigated the symbiotic relation of the hermit crab (*Pagurus arrosor*) with the sea anemone (*Actinia sagartia*) (Brock 1927). Brock, who worked in the stations in Naples and on the island of Helgoland, found out that a complex interplay of the two different animals was necessary before the crab could find the right anemone, induce it to leave its place and let itself be planted onto the crab's shell, where it would serve as protector against octopuses, while the anemone would profit from the leftovers of the crabs meals.

Brock tried to identify the specific stimuli that were sent out and interpreted as signs to start specific behavioural acts. His works show that the concepts of Uexküll were very useful as conceptual or heuristic tools for the description of this interspecific symbiotic animal behaviour.

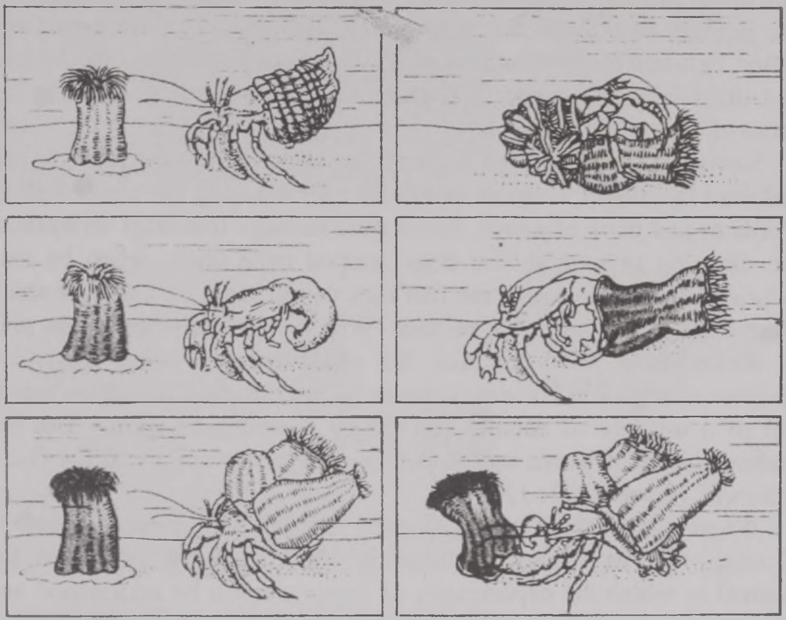
Brock showed that according to the conditions, different interaction schemes could be described as belonging to different functional cycles. The requirements or the needs of the animal were of prime importance for how the crab would interpret the signs emitted by the anemone which then would make it its predominant 'object of desire'.

The results of Brock were also published by Uexküll in the popular *Stroll Through the World of Animals and Men* (1934) to illustrate the change of meaning in the Umwelt of the subject. Fig. 7 shows three different situations and demonstrates the change of meaning of the sea anemone *Actinia* to the hermit crab:

(1) Upper row (Fig. 7): if the crab inhabits snail shell without an anemone, an anemone is seen as a welcome partner for symbiosis. The anemone is "hugged" and forcefully persuaded by rhythmic drumming to loosen its hold and then put upon the crab's house.

(2) Middle row: if the crab is naked it will try to use the anemone as substitute for the protecting shell.

(3) Lower row: if the crab is already in symbiosis with anemones, then it interprets the appearance of another anemone as a welcome prey and starts to feed on the animal.



Farbbild 1 Seerose und Einsiedlerkrebs

Figure 7. The interaction of the hermit crab and the sea anemone, changing according to change in meaning (Uexküll, Kriszat 1934: 55).

Brock could show that the significance of the signs emitted by anemones changed according to the crab's needs. The perceived signs are marked with different meanings: depending on the subject's needs they are either made a part of the protection functional cycle or of the food cycle. Uexküll (Uexküll, Kriszat 1934: 55) wrote of the different "tones" of the percepted image (*Merkbild*) changing with the situational significance.

Dogs, human language and the effect world (Wirkwelt)

The last example is the work by Emanuel Sarris (1931), "*Sind wir berechtigt vom Wortverständnis des Hundes zu sprechen*" ("Can we talk about the dog's understanding of words") which was published in the journal *Zeitschrift für angewandte Psychologie*. The communication between humans and animals was of special interest to Uexküll and these were the works that came the closest to linguistics in the sense of a semiotic discipline.

Sarris trained his dogs to react to command sentences in two different languages, German and Greek. By reducing the commands to words or just parts of words, Sarris tried to show that dogs understand the meaning of words. The dogs jumped on a chair, when he said "chair". But he also found out that they would jump on a sofa or small table if the chair was not to be seen. With his methods Sarris was able to demonstrate how complex the cognitive and even analytical abilities of dogs are. He stated that dogs could indeed recognise words out of a mixture of sounds and assign meaning to them. "But the understanding of words by the dog is always appropriate to the dog's Umwelt" (Sarris 1931: 126).

When asked about the biological approach to language by the German linguist Heinrich Junker in 1937, Uexküll explained the context in which the experiments of Sarris were to be understood and the meaning that they could have for linguistics:

> My main interest in language as a means of communication between man and animal is in connection with the means of communication that animals have among themselves. As means of communication, animals use sequences of movements as well as of sounds, the knowledge of which is innate in animals. [...] Many animals have the ability to distinguish sounds or sequences of sounds as secondary cues of perception — Pawlow could show that dogs, that were accustomed to hearing the sound of a bell before getting food, reacted by salivation already at the sound of the bell alone. Pawlow called this a 'conditioned reflex'. The same effect can be obtained by saying the word 'meat'. Still, from this one cannot conclude that the dog understands the word meat. The experiments carried out by Dr. Sarris at the *Institut für Umweltforschung* are a different matter. A dog was trained to jump upon a chair at the command `chair'. When the chair was removed and the command was repeated the dog jumped up on anything a dog could sit upon. We express this as follows: certain objects have for a dog a 'sitting tone'. The word 'chair' for the dog is not the name of a thing [*einen bestimmten Gegegenstand*] but of a performance [*eine Leistung*]: to sit. To me this seems a fundamental feature

A room as a human *Wirkwelt*, with objects of a sitting-, an eating-, a dringking and a reading-tone

The same room as a *Wirkwelt* of a dog, showing no reading tone

The same room as a flies *Wirkwelt*, showing even no special sitting-tone

Figure 8. The different Wirkwelten (effect worlds) of a human, a dog and a fly (Uexküll, Kriszat 1934: 56–58).

> of language as a means of communication between human beings as well. The spoken word, a certain sequence of sounds as carrier of sense and meaning, relates primarily to performances and not to things [*nicht auf einen bestimmten Gegenstand*]. I have taken up the parts of your questions that were closest to me personally. Linguistics proper is far from me — but I am convinced that you are on the right path towards making it a biological science. (Uexküll 2001: 445–446)[1]

In his *Stroll Through the World of Animals and Men* (Uexküll, Kriszat 1934: 57f) Uexküll used the experiments of Sarris to demonstrate the difference of the *Umwelten* of humans and animals. He makes clear that the difference is due to the difference in the effect world (*Wirkwelt*) of animals. The difference of the worlds of a dog, a fly and a human are simply illustrated by three drawings of a room with the furniture and things in it coloured differently according to the different meanings the animals ascribe to the objects — according to the different use the animals and the human make of the objects the objects bear a different "performing-tone" (*Wirkton*), which is shown as a different colour in the original pictures (Fig. 8).

5. Concluding remarks

These examples of the work done in the *Institut für Umweltforschung* represent just a small part of the diversity of works performed, but they show that Uexküll's *Umweltlehre* and his Institute provided a roof under which many different researchers, approaches and disciplines could gather and work creatively. Interdisciplinarity was also fostered by the fact that Uexküll's *Umweltlehre* helped to find a common language. And this language and the approach of *Umweltforschung* countered contemporary reductionistic trends in the analysis of animal and of human behaviour. These are aspirations that fit well into the objectives of Biosemiotics today (Schult 2004).

Transcending machine metaphors. Uexküll — the first biosemiotician

It has been shown that the attempt to substantiate Kant's philosophy in biology helped Uexküll to precede the cybernetic approach, the biosemiotic explanation and modern conceptions of cognitive psycho-

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[1] German version in T. v. Uexküll (ed.) 1980: 297–298.

logy. Uexküll had developed his ideas directly from his research on the physiology of movements and the observation of behaviour. His agenda had been to demonstrate the difference between the living organism's autonomous organization and the predetermined mechanisms of the machines of his age. In contrast to Norbert Wiener, who loved to describe biological functions in mathematical terms, Uexküll avoided mathematics and discovered a semiotic language appropriate to embody Kantian philosophy with observations in biology. So Uexküll followed an independent path before the cybernetic approach, and, since his language and methods were developed to explain the fantastic regulation of animal movement and behaviour, it was fruitful in ethology. It allowed Uexküll and his readers to envision a multitude of different functional cycles corresponding to and sustaining the animal within its *Umwelt*, enabling it to relate to prey, to enemies, to sexual partners, to different objects and media. But it also paved the way for a cybernetic view. With the appearance of the new techniques of computing and the wonderful automatic machines themselves, the acceptance of technical metaphors in biology increased. The emerging image of multiple types of different and interrelated closed control loops could explain body movements and also induced new ways of imagining, illustrating and calculating the complexity of interrelations of organisms and their environment in modern ethology and ecology (Lagerspetz 2001). But it seems that thereby one of the main aspects and advantages of Uexküll's theoretical thinking was left behind — the semiotic description and analysis of life.

However Uexküll was a pioneer of the semiotic approach in biology. In 1977 the hungarian-american linguist Thomas A Sebeok (1920–2001) discovered Uexküll to be a "neglected figure in the history of semiotics" and celebrated Uexküll as one of the "Masters of the sign" (Sebeok 1979). Already at the beginning of the 20th century Uexküll had recognised that the fascinating abilities and behaviour of animals are based on sign processes — the perception and transmission of signs onto which meaning is marked according to their significance. He had therefore introduced terms like *Merkzeichen, Wirkzeichen, Lokalzeichen, Momentzeichen,* and *Merk- und Wirkmal*.

The special issue of the journal *Semiotica* dedicated to Jakob von Uexküll in 2001 termed Uexküll "a starter and pioneer of the semiotic approach in biology in the twentieth century" (Kull 2001: 1). The editor stressed the fact that decades before semiotics was applied to biology, Uexküll had already commenced studying organisms as subjects at the center of sign processes (Kull 2001; 1999). Uexküll was recognised by Semioticians after his death. After meeting Sebeok, Uexküll's son Thure von Uexküll, a famous physician who had inaugurated psychosomatic medicine in Germany, started to explain his fathers biology as a semiotic concept (Uexküll 1979; 1980; 1981). He stated that "one can truly understand his [Jakob's] terms only, if one sees them on the background of a theory of signprocesses and makes clear to oneself, that *Umweltlehre* is a science of signs sent and received by living beings" (Uexküll 1980: 292). The recognition of the semiotic character of Uexküll's approach implies the fact that a biologist, who was not familiar with linguistics, Peircean, Saussurian or any other semiotic approach, was able to develop an elaborated terminology and concept for studying sign systems in the animal world. The historical perspective shows that Uexküll developed this approach also as an alternative to the mechanistic and reductionistic trends in biology that he encountered at the beginning of the 20th century.

Uexküll's significance today

According to Uexküll, biology should focus on the organism's abilities to integrate itself into a complex environment, of which it is a part and which is constantly created by it. He called this investigation of the communicative unity of the organism and the world sensed by it "*Umweltforschung*". His ideas, terms and models became influential and innovative in the development of science and the humanities in the 20th century. Thure von Uexküll's (Uexküll 1980) interpretation of his father's writings in semiotic terms shows convincingly how the new concept could make biology a meaningful (*bedeutungsvolle*) science, able to serve as a unifying paradigm for other sciences, like medicine, psychology, economy, ecology and sociology. This Uexküllian interpretation also makes us to acknowledge that our cognition and epistemology are developed in close interdependence with our technological imaginations that have a growing significance in our world. It demands not not to lock up ourselves in these circles of meanings and to open up our senses for the significance of other life forms in order to sustain a rich life in a rich world:

> As long as we use technical models in biology without being fully aware that by applying these models we just imply that nature performs according to the projected human requirements and guidelines, we are "blind to the significance (*bedeutungsblind*)" as Jakob von Uexküll expressed it. We are incapable of putting up questions about the origin and legitimacy of our own needs nor are we capable of asking about the origin and legitimacy of the needs of other living beings. We also cannot investigate the ways in which the needs of the different living beings on this planet are dependent on each other. (T. v. Uexküll 1980: 42–43)[2]

Uexküll described the universe as a creation of countless individual *life-worlds* and thus challenged the idea of one universally valid world. According to him the idea of the universal world was a "metaphysically" constructed worldview (Sloterdijk 2004: 249), which by globally expanding the reality of one life-form is blinding it from acknowledging the significance of the reality of other life-forms. Uexküll emphasised that inter-subjective (inter-species) understanding is a central aim of scientific investigation. His science of life is making us responsible for our decisions to acknowledge or to ignore the worlds of our fellow organism. So Uexküll became influential - not only for the development of modern ecology and ethology, but also for the development of post-modern philosophy. It provides for an substantial ethical viewpoint in a globalised world – a viewpoint that transcends our presumptuousness and reminds us, that accepting autonomy and diversity helps creating sustainable interrelations. Jakob von Uexküll Jr. (this volume), Jakob von Uexküll's nephew, who founded the Right Livelihood Award in 1980, is encouraging people, who take this viewpoint and act responsible to it.

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Якоб фон Юкскюлл и его институт в Гамбурге: история и значение

Цель статьи — показать, какие исторические процессы привели к признанию работ Якоба фон Юкскюлла, и подчеркнуть важность гамбургского периода Юкскюлла. Краткий биографический обзор позволяет выявить роль его предшественников, исторического претекста и контекста. Научный обзор описывает результаты исследований Юкскюлла и идеи, которые оказались важными в развитии биологии и когнитивных наук. В статье также опровергается высказываемый иногда тезис, будто идеи Юкскюлла были чисто теоретического или философского характера. Утверждается, что главной целью его работ было сохранение эмпирического метода в биологии и снабжение биологии прочным эпистемологическим основанием. В статье предлагаются некоторые примеры использовании продуктивного сближения истории и теории в исследованиях Юкскюлла, проведенных им в стенах института в Гамбурге (*Institut für Umweltforschung*).

Jakob von Uexküll ja ta instituut Hamburgis: Ajalugu ja tähtsus

Artikli eesmärgiks on pakkuda sissevaadet arenguisse, mis aitasid kaasa Jakob von Uexkülli tööde esiletõusule, ning rõhutada Uexkülli tegevuse tähtsust Hamburgis. Lühike biograafiline ülevaade toob esile ajaloolise eelloo ja konteksti osa. Teaduslik ülevaade kirjeldab Uexkülli uurimistulemusi ja ideid, mis osutusid oluliseks bioloogia ja kognitiivteaduste arengus. Lisaks püüab artikkel ümber lükata vahel esitatud arvamust, nagu oleks Uexkülli ideed olnud puhtalt teoreetilise või filosoofilise iseloomuga. Kinnitatakse, et tema tööde keskseks eesmärgiks oli empiirilise meetodi säilitamine bioloogias ning bioloogiale kindla epistemoloogilise aluse andmine. Artikkel pakub mõningaid näiteid ajaloo ja teooria lähenemisest teineteisele ning selle tulemuslikust kasutusest Uexkülli uurimistöödes, mis tehti *Institut für Umweltforschung*'is Hamburgis.

Uexküllian Planmässigkeit

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Abstract. In strict opposition to the prevailing positivist conception of nature as senseless and deprived of meaning Jakob von Uexküll claimed that a certain *planmässigkeit* was operative in nature. This idea however might be taken to mean that organic evolution is not itself a creative process but a gradual, if majestic, unfolding of Nature's own master plan. Such an idea would threaten to restore determinism in the center of biological theory, and this would seriously contradict the vision of biosemiotics shared by most of its proponents. It lies at the heart of biosemiotics and of Peircean cosmological philosophy that indeterminacy is primary, that "habit taking" or interpretation are real processes in the world, and therefore that belief in the law of necessity is unfounded. It is suggested that Uexküllian planmässigkeit is in fact reconcilable with a modern non-deterministic understanding. In a certain sense the Umwelten of animals have indeed developed in accordance to a natural *planmässigkeit*, but this is a plan that incessantly traps life in certain strategic choices and in the same time diversifies the dimensionality of options for dealing with these choices, i. e. "the adjacent possible" in the terms of Stuart Kauffman.

The problem of *Planmässigkeit*

The opening in Hamburg of *Jakob von Uexküll-Archiv für Umweltforschung und Biosemiotik* is one of those rare instances where foresight and retrospection meets while both are still in need of each other. Jakob von Uexküll's pioneering contribution to the study of life, his *Umweltlehre*, is still in need of clarification, and at the same time the biosemiotic reframing of biological theory, which owes so much to his work, has only recently taken its first serious steps and can still be fruitfully informed by the work of the pioneer. To create an institutional framework for this kind of meeting place between historical writings and emerging new agendas in science is the principal purpose for an archive, and seen in this light the establishment of the Jakob von Uexküll archive in Hamburg in 2004 is timely indeed.

As is always the case when an institution like this is opened there are some risks to consider: Will the veneration one feels for the pioneer tend to bias critical enquiry? Will the modern perspective, in this case biosemiotics, tend to bias our evaluation of work done nearly a hundred years ago? And will the "Uexküllian" perspective, which the archive is supposed to throw on biosemiotics, tend to blind us from such areas in the field where a modern approach may require a paradigmatic distance from the old master? To counter such risks head-on from the beginning is clearly essential for the intellectual success of this new initiative.

I am not in a position to discuss these risks here, and I shall focus my discussion on only one particular aspect of von Uexküll's work, which to a biochemist like myself, trained in the very Anglo-Saxon tradition of contemporary molecular biology, is likely to provoke some discomfort. This aspect may shortly be labeled through a concept upon which Jakob von Uexküll himself put very much emphasis, the concept of *Planmässigkeit.*

In the introduction to the English-language version of *Streifzüge durch die Umwelten von Tieren und Menschen,* Thure von Uexküll tells us that his father, Jakob von Uexküll, saw mind "as an organ created by nature to perceive nature" (T. v. Uexküll 1992b: 281). And further:

> Nature may be compared to a composer who listens to his own construction. This results in a strangely reciprocal relationship between nature, which has created man, and man, who not only in his art and science, but also in his experiential universe, has created nature. (T. v. Uexküll 1992b: 281)

In the preface to this same volume of *Semiotica,* which he himself guest edited, Thure von Uexküll accentuates the point even further:

> In Jakob von Uexküll's view the task of biology is the examination of *Planmässigkeit* in nature, which means the examination of the composition of systems and of the sign processes which produce and maintain them. For the positivistic understanding of Science in his time, speaking of *Planmässigkeit*

> in nature meant 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. v. Uexküll 1992a: 277).

Now here comes my discomfort: the institution of such a plan inherent to nature might be interpreted as meaning that organic evolution is not itself a creative process but a gradual, if majestic, unfolding of Nature's own master plan, i.e. evolution would not figure as a real historical process in the sense that something happened through evolution which was not already determined beforehand. The idea of such a plan thus in a strange way restores determinism to the center of biological theory. Or to state it differently, in such a universe a wise demon might indeed tell fortunes in the cards. This however would seriously conflict with the vision of biosemiotics that I think most of its proponents share. For it lies at the heart of biosemiotics and of Peircean cosmological philosophy that indeterminacy is primary, that "habit taking" or interpretation are real processes in the world, and therefore that belief in the law of necessity is unfounded.

It is therefore a matter of great importance to analyze the nature of the teleological principle that Jakob von Uexküll invoked in his work. The automatism by which positivistic science quite automatically shies away from any suggestion of final causation in nature is indeed very unsatisfactory because it leaves such a heavy burden of explanation on efficient causation as sole legitimate agency in the world. Not surprisingly several theoretical biologists recently called for an eventual return to a richer notion of causality in biology (Rosen 1991; Salthe 1993; Riedl 1997; Ulanowicz 1997). Mainstream biologists, however, consider the teleological nature of living entities and the processes they engage in to be only an "as if" teleology or what they call *teleonomy*. In Darwinian explanations for the purposeful nature of adaptive traits one does of course make reference to the consequences of those traits for fitness, but, as has often been remarked, the consequences that explain the existence of adaptive traits are the consequences those traits *have had*; they are not the consequences that they *will have* or *can have*. And since the consequences precede the effects, no violation of the general scheme of efficient causation is implied.

In a sharp analysis of the debates on teleology in Darwinian explanations the philosopher T. L. Short has nevertheless recently claimed that "Darwin's use of 'final cause' accords with the Aristotelian idea of final causes as explanatory types — as opposed to mechanical causes, which are always particulars" (Short 2002: 323). Buried in this subtle formulation lies the presupposition that final causation, as the concept was originally conceived by Aristotle, is different from the "externalist" or vitalistic kinds of teleology which were ultimately implied rather by Plato's idea of a divine craftsman who creates things intentionally to satisfy the ends of his own.

> Aristotelian teleology, by contrast, is "internal" or "immanent". An organism's ends are not given to it by an external agent. It is that of the organism itself, but not in the vitalistic sense that there is an agency within the organism that holds this end in some sort of quasi-conscious intention. The end is "internal" to the organism because it is the organism's form. (Short 2002: 325–326)

It is also worth realizing that contrary to modern conceptions of final causation Aristotelian final causation does not imply simple human purposes such as desires or wants. In fact the desire, e.g. the desire to be healthy, is not the real final cause behind a person's acts, e.g. that he takes long walks. Rather, in this case, the desire to stay healthy is an efficient cause that not only precedes but also brings about the act of walking. What needs be explained is the reason for the concrete desire, and this reason, Aristotle says, is the general attractiveness of health: "It is health itself, as a general type of possible outcome, which explains — by its attractiveness, hence, as a final cause — one's desire for it" (Short 2002: 327).

Essentially, then, final causes, as Aristotle conceived them, are *types of outcomes*. As such they are potentialities, whether or not actualized, as for instance an acorn, whose 'destination' it is to grow into an oak, not into a birch or a salamander — but which, as is well known, most often doesn't grow at all. Furthermore, as types of outcome Aristotelian final causes are never particulars — in the future or in the past — and thus the term "backward causation" has nothing to do with final causes.

Based on this understanding of Aristotelian teleology Short can clarify his claim on Darwinian explanation in the following way:

> What I am suggesting is that we take seriously the currently popular talk of "selecting for" a property or type of trait (Sober 1984). Taking it seriously means accepting that talk at its face value: it describes evolutionary processes as shaped by types of outcome and it explains outcomes by citing the types

> those outcomes exemplify. But a type of outcome that explains its own exemplification is what translators of Aristotle have named a "final cause", as Darwin appears to have recognized. (Short 2002: 337)

Short's conclusion may come as a surprise to many scientist who have thought that Darwinian natural selection was the ultimate assurance against any supposed need for teleology in science. On the other hand it explains the otherwise quite contra-intuitive claim that purposive behavior would somehow ensue if only chance mutations and "blind" selective force worked long enough upon non-purposive systems. Natural selection is not blind, it searches types of outcomes, or in bio-semiotic terms:

> Chance mutations are not selected because they are beneficial; they are beneficial because they happen to appear in a relational system which was already well prepared for them. That blind selection should be the sole cause of evolution is one of the mightiest fictions of our time. Selection is never blind; it is always guided by the prior formation of developmental and semiotic integration. (Hoffmeyer 2001b: 393)

Louis Pasteur put it very clearly in his famous: "Chance favors only the prepared mind".

Teleology then does not in itself contradict a scientific understanding of the world or of evolution and biosemiotics is in fact deeply dependent on the acceptance of that kind of final causation which Charles Peirce described in the following terms

> [...] we must understand by final causation that mode of bringing facts about according to which a general description of result is made to come about, quite irrespective of any compulsion for it to come about in this or that particular way; although the means may be adapted to the end. The general result may be brought about at one time in one way, and at another time in another way. Final causation does not determine in what particular way it is to be brought about, but only that the result shall have a certain general character. (CP 1.121)

Contrast this to Peirce's conception of efficient causation:

> Efficient causation, on the other hand, is a compulsion determined by a particular condition of things, and is a compulsion acting to make that situation to begin to change in a perfectly determinate way; and what the general character of the result will be in no way concerns efficient causation. (CP 1.121)

Natural laws operate like final causes when they are used as explanatory tools. As Lucia Santaella-Braga has explained, quoting Peirce:

> A law is something general and for that reason, it is not a force. 'For force is compulsion; and compulsion is *hic et nunc*. It is either that or it is no compulsion. Law, without force to carry it out, would be a court without a sheriff; and all its dicta would be vaporings'. Thus the relation of law, as a cause, to the action of force, as its effect, is final, or ideal, causation, not efficient causation (CP 1. 213). [...] Final without efficient causation is helpless, but efficient without final causation is worse than helpless, 'by far, it is mere chaos; and chaos is not even so much as chaos, without final causation; it is blank nothing' (CP 1. 200). (Santaella Braga 1999: 502)

Semiosis, or sign action, is always embedded in sensible material processes and for that reason has a dynamic side, that allows the communicative process to run, as well as a complimentary or mediating side. The first of these sides is governed by the compulsive force of efficient causation, the second expresses the controlling agency of final causation.

Much confusion in these matters stems from the lack of understanding of this intimate interplay between efficient and final causation. For example, as Short points out, a vital force is *not,* no matter how mysterious and goal-directed it is, a final cause; it is an efficient cause: "it is not itself a goal. It is not a type of outcome. It is a particular force that already exists" (Short 2002: 328). Thus the taboo against final causation has worked its way into our tacit thought patterns to such an extent that even the adversaries of scientific mechanicism, tried to counter it by reducing final causation to an efficient causative agency, a vital force. No wonder, then, that this attempt ended in ridicule. This however doesn't solve the problems which so disturbed the minds of the vitalists and of Jakob von Uexküll. In retrospect we may perhaps better see that the failure of thinkers such as Driesch and Bergson was due, at least to a large extent, to the fact, that thermodynamics was still at their time limited by the near-equilibrium perspective, which was transcended by Ilya Prigogine only much later (Prigogine 1980). When these thinkers made their contribution to natural philosophy the second law of thermodynamics might well be understood as an implicit finality inherent in our universe, but the perspective was still that of an irreversible and destructive dynamic. The interpretation of the second law as a fundamentally constructive power and the alliance of this power with emergentist ideas based in non-linear dynamics and complexity theory had not yet any chance of being proposed (Brooks *et al.* 1989; Kauffman 1993; 1995; Salthe 1993; Depew, Weber 1995; Weber 1998). The sense of telos in nature had hardly any legitimate *Lebensraum* in science unless it disclosed itself in anti-Darwinian clothes. A contemporary reading of Jakob von Uexküll's work should be aware of this state of affairs.

There is of course a tension in Uexküll's writings between harmony and freedom. The more nature's composition is described as harmonious, the less freedom can be ascribed to it, for how could a perfect world be free to change — unless for the worse? A nature that listens to its own composition is not a metaphor that easily mingles with the idea of a deteriorating harmony. The contrapuntal duets, Uexküll's famous vision of a Goethean reciprocity, such that the beetle is pea-like and the pea is beetle-like, tends, as Frederik Stjernfelt observes, to make the whole of nature fuse with meanings in such a way that all Umwelten marvelously fit each other locally. But Stjernfelt also points to a solution of this dilemma:

> While the naturalized subjectivism tends to make it impossible to see beyond the horizon of the Umwelt, the musical metaphor makes possible an inference to mend this problem. [...] The melody — arch-example for the Gestalt theorists from von Ehrenfels, Stumpf, and the early Husserl onwards to the Berlin and Graz schools — articulates an organized structure disconnected from the here-and-now of physics and implying a teleological circle foreseeing the last note already by the intonation of the first. Thus — as Merleau-Ponty remarks [Merleau-Ponty 1995: 233] — this metaphor makes it possible to see the life of the individual organism as a realization, a variation of the theme, requiring no outside vitalist goal — a variation, we may add, which constitutes the condition of possibility of the modification of the animal's system of functional circles and hence the acquiring of new habits, possibly to govern evolutionary selection in Baldwinian evolution. [...] Music may be perfect, but it is far from always the case. (Stjernfelt 2001: 87–88)

Interpreting Uexküll's work in this way, we can see that *Planmässigkeit* does not imply a deterministic unfolding of a preordained order, and although the telos involved in *Planmässigkeit* is of course very different from Peirce's vision of evolutionary cosmology, it is not necessarily antagonistic, either to Peirce or to modern day biosemiotic understanding.[1]

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[1] See also chapter 10 in Sebeok 1979.

"Goal" and "plan" in Uexküll's biology

Let us now proceed to consider more concretely how "plan" and "goal" is connected in Jakob von Uexküll's biology. The example of different species of night moths reacting to audible danger signals is illuminating (Uexküll 1992). According to Uexküll all night moths respond to alarming sounds with a species specific reaction pattern. Species that are easily visible because of their light coloring invariably fly away upon perceiving a high tone, whereas species that have protective coloration alight in response to the same tone. The same sensory cue has the opposite effect, and Uexküll comments:

> It is striking how the two opposite kinds of action are governed by a plan. There can be no question of discrimination or purposiveness, since no moth or butterfly has ever seen the color of its own skin. The plan revealed in this instance appears even more admirable when we learn that the artful microscopic structure of the night moth's hearing organ exists solely for this one high tone of the bat. To all else, these moths are totally deaf. (Uexküll 1992: 352–353)

Even more instructive perhaps are the examples he gives from experiments on the behavior of grasshoppers and crickets (Fig. 1; Uexküll 1992: 353–354).

A female grasshopper is placed under a glass bell before a microphone. When the grasshopper fiddles, the sounds will be transmitted to a loudspeaker just outside the glass bell, which is thick enough to stop any fiddling sounds getting through. When grasshoppers of the opposite sex are placed outside the glass bell these grasshoppers, as the experiment shows, direct their attention only to the loudspeaker, ignoring the grasshopper which can be seen fiddling in vain inside the bell. The partners make no advances whatsoever, the optical image being ineffectual.

As Uexküll explains, in this case:

> [...] a specific receptor cue initiates a functional cycle, but, since the normal object is eliminated, the proper effector cue, which would be necessary to extinguish the first perceptual cue, is not produced. Normally, another receptor cue should intervene at this point and activate the next functional cycle. The nature of this second receptor cue must be investigated more closely [...]. In any event, it is a necessary link in the chain of functional cycles which lead to mating. (Uexküll 1992: 354)

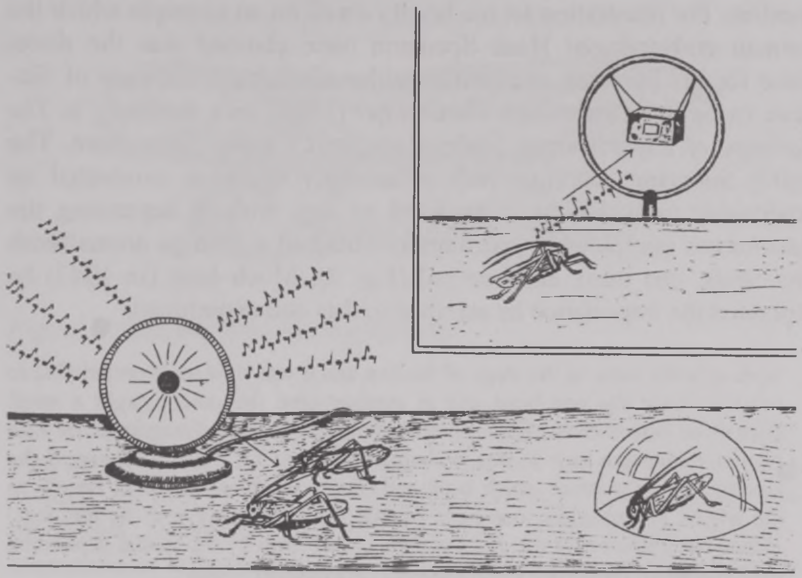

Figure 1. Grasshoppers in front of a loudspeaker (from Uexküll 1992: 353).

So, Uexküll explicitly rejects the notion of a goal to describe the behavior of these animals and instead prefers talking about a "coordination of the manifestations of animals" under the viewpoint of a *plan.* He does, however, admit that "perhaps later certain actions of the highest mammals may prove to be teleological actions, which in turn are dovetailed into the over-all plan of nature" (Uexküll 1992: 352).

However, in rejecting individual goals and also rejecting natural selection, one would indeed like to know how this plan of nature could actually be brought about at all, and how it manages to sustain itself. One might think that organisms would be able somehow to learn to do things they didn't do before, to acquire new habits or changed systems of functional cycles, but to the modern mind the why question, e.g. why would the animal learn this or that, does indeed seem to be in need of an answer. Or differently stated, the plan or final cause must have means at its disposal, efficient causalities. What are these? Where are they to be found?

I would submit that maybe Uexküll's sharp rejection of any goal directed behavior in animals may hide a possible answer to this question. For illustration let me briefly dwell on an example which the German embryologist Hans Spemann once claimed was the direct cause for his life long occupation with embryology, the case of Siamese twins in salamanders. Hamburger (1988) tells the story in *The Heritage of Experimental Embryology*, and I quote from there. The young Spemann working with salamander embryos conducted an experiment in which he constricted an egg without separating the blastomeres completely.[2] He thereby obtained a strange animal with two heads, one trunk and one tail (Fig. 2). Much later (in 1943) he explained the importance he ascribed to this one experiment:

> Such animals came to the stage of feeding and it was now most remarkable to see how once the one head and at another time the other caught a small crustacean, how then the food moved through the separate foreguts to the joint posterior intestine [...]. It was probably irrelevant for the well-being of the strange double creature which head had caught the food; it was of benefit to the whole. Nevertheless, one head pushed the other away with its fore legs. Hence two egotisms in the place of one, called forth by the spatial separation of the anlagen. (Spemann 1943; quoted in Hamburger 1988)

Normally this "egotism" of an animal is taken for granted and it doesn't strike us as odd at all. But the case of an animal possessing two opposed "egotisms" immediately shows us how much in need of an explanation this property is. By the very failure to serve its ordinary purpose in these poor creatures, we are directed to the question what agency brings about "egotism" in normal organisms. What does this agency consist of? How could it be created in the first place? It is easy enough to say that organisms without an "egotism" would disappear because they would be expected to be outcompeted by organisms possessing this peculiar property, and that may indeed explain why "egotism" has survived once it happened to come about. But it doesn't explain what it is or how it works, and accordingly it doesn't account for the question of how it appeared — out of nowhere, i.e. out of non-egotistic systems? Must not Spemann's "egotism" be pushed backwards in time to the very first organisms on earth? Could there have been life-forms without this "egotism"?

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[2] I am grateful to Scott F. Gilbert for directing my attention to Hamburger's book for a comment on Spemann's work on Siamese twins in salamanders.

Figure 2. Siamese twins in salamanders.

But if this is so — and I find it hard to see how one could deny it — then Spemannian “egotism” is an irreducible holistic property of life as such, for clearly “egotism” doesn't make any sense at levels below the whole organism. Thus to the extent single tissues or cells in multicellular organisms also posses a kind of “egotism”, which as a matter of fact they do (Buss 1987), then the higher level “organismic egotism” must normally be capable of inducing its objectives upon the lower level units (cancer and birth are well known exceptions where a lower level “egotism”, i.e. the interests of single tumor cells or the of foetal system respectively, win over the holistic “egotism”).

Now, the question is: what is the relation between Spemannian egotism and an individual goal? If the term goal is understood to refer to the conscious kinds of purposes to which we as human beings are so accustomed, then of course a goal is a very different thing from Spemann's egotism, but taken in a broader sense goals might be seen as far more widespread in nature. Even the chemotactic behavior of a bacterium swimming upstream in a gradient of nutrients reflects the holistic interest of the bacterial system in getting as much nutrient molecules as the receptor capacity allows for. Is not this interest a goal? All living systems have insides, or else are organized in such a way that somehow they produce activities aimed at sensing, catching, fleeing from, mating with ... something outside the system (Hoffmeyer 1998; 2000; 2001a). In each case biochemistry or physiology may eventually fully explain the efficient causalities involved in these activities — as has for instance largely been done for bacterial chemotaxis — but this does not catch the holistic dimension: why is the system organized to carry out such a holistic intentionality, or "aboutness"?

To answer this question modern biology invariably invokes natural selection. Countless minute changes along thousands and even millions of generations gradually tuned all proteins in the whole organism to work as one integrated seemingly intentional system for the sake of survival efficiency. As already noted this hardly explains the appearance of "egotism" in the first place, but it does of course give an important — though in this author's view by no means full — explanation for the concrete elaboration of the holistic intentionality acquired by each separate case of species.

We are thus not opposed to the idea that the efficient causality, the force, so to say, that brings about evolutionary change to a large extent may be accounted for in terms of selective processes acting upon the reproductive efforts of populations situated in a restricted space of solutions. But from a biosemiotic point of view this selection force is itself blind and only gets direction through the semiotic potential inherent to living systems. Organisms need their environments, and since these environments mostly consist of other organisms, an elaborate intra- as well as interspecific semiotic dynamic is established from the very beginning of life around organismic needs. Only because of this semiotic dynamic does the evolutionary process have direction and creativity. Explaining the holistic intentionality of organisms thus requires an historical account of the situatedness of the organism in question in the holistic semiotic dynamics to which it belongs. Holistic intentionality cannot just be explained reductively through an account of the selective tunings of myriad biochemical processes characteristic for the efficient operation of the individual self-interest considered in isolation from its biosemiotic historical roots.

And this is finally what brings us to von Uexküll's *Planmässigkeit.* Individual organisms, grasshoppers, bacteria or human beings, do in fact have goals in the sense just outlined, but these goals are irreducibly bound to the whole biosemiotic setting. And as we shall see in the following paragraphs this biosemiotic setting of nature's individual species is itself a product of endless diversifications of holistic patterns.

Diversification as plan

I remember how as a young student of biochemistry I wondered why it is that textbooks always equated oxidative processes with exergonic or energy harnessing processes, whereas reductive process were always equated to endergonic or energy consumptive processes. The core of the matter is, of course, that oxidative processes are also always reductive processes, one component becoming oxidized at the same time as another component is reduced. In the paradigmatic case of animal respiration the oxidative process consumes oxygen that ends up as carbon dioxide, i.e. 2 atoms of oxygen (O) bound to one atom of carbon (C), but at the same time oxygen itself becomes reduced in that it goes from free oxygen in the air to chemically bound oxygen in carbon dioxide. This last aspect of the process, the reduction part of it, is always tacitly presupposed but is rarely explicitly mentioned, and thus tends to become forgotten by naive students.

At the other end of life, the photosynthetic activity of plants consists of a reduction of carbon dioxide to carbohydrate. As is well known, this process depends on the ability of the green plants to take up energy from solar radiation and use it for splitting water into oxygen and hydrogen in such a way that oxygen is set free to the atmosphere whereas hydrogen is used for reducing carbon dioxide to carbohydrates and all the other organic molecules making up plant material.

It was not until I saw how photosynthesis and respiration fitted into each other, that I realized the true character of this grand process, which is in fact the essence of biospheric chemistry on earth: see Fig. 3. Seen from above, what takes place in the biosphere is nothing but the diversifications of the grand scheme, whereby solar energy drives the splitting of water into hydrogen and oxygen, whereas animals reunify these two constituents through the food chains, making sure that every bit of energy obtainable in the process is used up. As if — one might be tempted to say — the whole trick of animate nature is to disturb water so that oxygen and hydrogen are separated from each other, thereby introducing a kind of "longing" between them that drives the two atoms forward through their complicated pathways, leading in due time to an extinction of the longing through a reassembling of the disturbed water molecule.

A.	Plant life:
	$6\,H_2O + 6\,CO_2 ==> C_6H_{12}O_6 + 6\,O_2$
	PHOTOSYNTHESIS

B.	Animal life:
	$6\;O_2 + C_6H_{12}O_6 ==> 6\,CO_2 + 6\;H_2O$
	RESPIRATION

C.	Life
	$H_2O\;==>\;2H + O\;==> H_2O$
	SUM

Figure 3. When the processes of respiration (A) and photosynthesis (B) are summed the diversity of biochemistry disappears under the overall process which simply consists in the molecular splitting and reassembling of water (C).

In Stuart Kauffman's recent book "Investigations", an important part of the analysis turns on the question of the non-ergodicity of the universe, meaning that the universe never had the time it would have needed should its present state of affairs in any way be representative of its inbuilt possibilities (Kauffman 2000). The persistent movement of the universe into the "adjacent possible" precludes its ever reaching a state that depends on statistical likelihood. In stead the universe is historical, for "history enters when the space of the possible that might have been explored is larger, or vastly larger, than what has actually occurred" (Kauffman 2000: 152). And as Kauffman points out:

> Even if we consider the universe as a whole, at the levels of molecular and organizational complexity of proteins and up, the universe is kinetically trapped. It has gotten where it has gotten from wherever it started, by whatever process or flow into a persistently expanding possible, but cannot have gotten everywhere, The ergodic hypothesis fails us here on any relevant timescale. More, the biosphere, and the universe as a whole, may well be

> kinetically trapped into an evermore astonishingly small region of the entire space of the possible it might have reached. Stated otherwise, the set of actual small molecules and large molecules such as proteins that do exist now is presumably an increasingly tiny subvolume of the total set that might have arisen by now in the biosphere or the universe since the big bang. (Kauffman 2000: 145)

Perhaps somewhat paradoxically, then, the diversification of entities and processes occurring in the universe necessarily, according to Kauffman's analysis, goes hand in hand with an increasing load of lost opportunities, things that might have happened, structures that might have been formed but did not in fact happen or form. The point of the matter is that both of these trends, the trend toward increased diversity and the trend toward lost opportunities, are of an increasing dimensionality. It is probably the most bold conjecture in Kauffman's book, a conjecture he argues persuasively for, that "our biosphere and any biosphere expands the dimensionality of its adjacent possible, on average, as rapidly as it can" (Kauffman 2000: 151). Kauffman is well aware, that this "burgeoning order of the universe" cannot be reduced to matter alone, to entropy (or the negation of entropy for that matter), to information, or to anything that simple. The propagation of organization and the subsequent growing diversification of the world is taken care of by *autonomous agents* and these agents are semiotic creatures. An autonomous agent may be defined quite rigorously according to Kauffman as an "autocatalytic system able to reproduce and able to perform one or more thermodynamic work cycles", and in earlier work he has shown how such agents will be expected to self-organize given the kind of world our Earth system belongs to (Kauffman 1993). But, as explained in the present book, Kauffman is acutely aware that this definition leads to more intractable questions of "measuring" or "recognition". For, if work is defined as "the constrained release of energy", where will the constraints come from? At least it will take work to produce them, and this is not all:

> Autonomous agents also do often detect and measure and record displacements of external systems from equilibrium that can be used to extract work, then do extract work, propagating work and constraint construction, from their environment. (Kauffman 2000: 110)

And this definitely brings us to the core of biosemiotics, and also poses the question of the origin of life in a new way which shall not, however, be further explored here (Neumann 1966; Pattee 1977; Hoffmeyer, Emmeche 1991; Hoffmeyer 1998; 2000; 2001a).

Returning to the discussion of water it should now be admitted that photosynthetic water splitting was not at all the original source of energy flow through biotic systems. Fermentation and redox processes involving inorganic materials, as well as photosynthetic processes departing from nitrogenous or ferrochemical compounds, considerably preceded the appearance of water splitting in the biosphere. The summative harmony indicated in figure 3 between photosynthesis and respiration also only established itself several billions of years after the origin of life, when sufficient stores of oxygen had been built up in the atmospheric system. This reflects the fact that photosynthetic water splitting, as well as the respiratory utilization of free oxygen, are both hard jobs to tackle from a biochemical point of view, and autonomous agents capable of carrying them out were not among the simplest kinds of autonomous agents to be invented. But, as we know, the problems were eventually solved and the successive diversification of the biosphere gradually came to reflect the efficiency of this particular energy flow scheme.

Whether the water splitting scheme may be said to represent the best available choice for a biotic energy flow scheme on earth, I do not know and it is probably not easy to know. Most biochemists would perhaps think that it was, but, as we all know, unexpected possibilities may often hold surprises. The question may not however be especially relevant to the biosphere anymore since a quite new dimension of the "adjacent possibles" were eventually realized in the middle of the animal kingdom, a dimension which slowly unfolded its potentials for hundreds of millions of years and has now with the human species finally expanded the range of energy sources available to living systems far beyond anything known before. We might call this dimension the neurosemiotic dimension of life. The whole work of von Uexküll focused on aspects of this dimension.

We can summarize the discussion so far by noting that the Umwelten of animals certainly have developed in accordance to a plan of nature, a plan that all the time traps life in certain strategic choices and at the same time diversifies the dimensionality of ways to deal with these choices. The Danes, having been trapped by historical incident to a shrinking nation (from a territorial point of view that is) have developed a dictum which strangely catches this aspect of evolution: "what is externally lost, shall be internally gained" said the Danes (to the extent that the educational system in Denmark was considerably strengthened as a strategy inside this perspective, it actually did work well for a century or more). What goes on in the biosphere seems to accord very much with this same fundamental principle: having lost a large majority of the options originally available for the evolutionary path, diversification nevertheless has expanded the field of future options by inventing radically new and sophisticated life strategies based on highly developed semiotic competences — not least, we shall claim, the strategy of experienced Umwelten — and this is why the biosphere has increasingly become a *semiosphere* (Hoffmeyer 1996).

The experienced semiosphere

Eliminativist philosophers have claimed that human experiences are epiphenomenal on brain activity, illusions, so to say, that strangely accompany our dealings with the world. We do not run because we are afraid of the attacking bear — to use the classical example — rather our fear is a registration of our own escape behavior. This understanding does of course save the materialist ontology from having to accord direct causal effects to mental phenomena, but it also leaves the phenomenological world as a complete mystery. What is the good of it? Why is it there? Since scientific theories themselves can only serve us to the extent that we can experience them, i.e. understand them, this eliminativist view of things is in fact quite paradoxical: only because we have a psychic life can we develop theories according to which psychic life is not for real.

To get rid of this absurd logic in a non-dualistic way we need to understand experienced life as both real and based on bodily existence. There is — biosemiotics will claim — nothing mysterious about the phenomenal world, for it is deeply embedded in bodily semiotics. Because human beings are highly organized unities of some 50,000 billions of cells, each of which have a limited but real semiotic competence, the mystery of the experienced world has to find its solution by considering the kind of semiotic skills such unities might develop. An evolutionary account of experience does require us to accept that at least some big-brained animals do posses a rudimentary kind of an experienced Umwelt in the sense experienced Umwelten are known to ourselves. The main question then will be to identify the type of needs such an experienced Umwelt might satisfy better than any instinctive or reflex-based behavior would do. An additional question of course is how this ability for experiencing is rooted in the emotional brain. We shall suggest some possible answers to the first of these questions, whereas the latter question will only be slightly touched upon.

The key to our problem is to be found in the already mentioned holistic "egotism" of animals. We saw that the evolution of a holistic organismic intentionality (in the sense so clearly absent from Siamese twins in salamanders) required us to think of natural selection as being elaborated inside the constraints of situated ecosemiotic interaction patterns (called *ecosemiotic motif*s in Hoffmeyer 1997). Thus, for instance, mammalian species in general seem to master significantly more sophisticated ecosemiotic motifs than do reptilian species. The Swedish ethologist Sverre Sjölander has pointed out that while for instance a dog need not have a full picture of the hare all the time for hunting it efficiently, a snake will stop hunting its prey whenever it disappears from view (Sjölander 1995). The snake may well go on searching for the prey at the spot, where it disappeared, but it will not calculate the eventual path the prey may have taken. The dog on the other hand will proceed away, guided by an anticipation of where the hare would be expected to turn up next. "Thus it seems as if the representation or construct of the hare is 'running' in the internal world in a way corresponding to the actual hare in the actual world" writes Sjölander, so that "the sense organs are just used to correct the representational happenings and not to create them" (Sjölander 1995: 3). In the snake, on the contrary, hunting appears to be guided by a succession of quite independent sense modalities. Thus, striking of prey is governed by sight (or temperature sense organs); location of the struck prey is detected by smell, and the swallowing procedure is governed by touch. This lack of true intermodality in the snake makes it "hard to imagine that the snake can harbor some form of a concept of a mouse in its brain" (Sjölander 1995: 5). The snake apparently can not integrate its sense modalities to form a central construct.

This does not necessarily mean that snakes are totally deprived of an experienced world, but if indeed they have experiences, these must be lacking in inner coherence and would certainly be very different from our own kinds of experiences. Snakes have survived well on Earth for a long time, and to the best of my knowledge are still doing fine in their distinctive niches, but it is indeed striking, as Sjölander observes, that the fanciful catastrophic schemes for explaining how reptiles were superseded by birds and animals presently adopted by most scholars do not account for why the reptiles did not just repopulate their old niches after the dust had settled down again in the aftermath of the catastrophe. Here the ability of birds and mammals to produce central internal constructs of their Umwelten does indeed offer an attractive alternative explanation for the fact that these taxonomic groups did ultimately become the successful groups among vertebrates.

A moving animal in a moving world is confronted with a perpetual need for making split-second choices of behavior. Such choices evidently will serve survival the best if they are based on some kind of anticipatory calculation which integrates inner body parameters such as emotional states, fatigue, hunger, memory into a range of external parameters as registered by the sense organs. As long as the animal is small and has a survival strategy based on simple activity schemes in a predictable range of challenges, these behavioral decisions may well be accounted for in terms of instinctive patterns of sensomotoric reflex circles. Such a direct connection between a stimulus and a corresponding behavioral act is perhaps what takes place in the snake, so that in its Umwelt there is indeed no mouse, but only things to be searched for, things to be stroked, and things for swallowing, whereas for animals dealing with more complex patterns of challenges a direct coupling of stimulus and behavior is no longer sufficiently flexible. Instead, the brained body as an holistic intentional unity must now make decisions based on split-second evaluations of unforeseeable events. Judging from the efficiency of modern computer programming in producing virtual realities, there is probably no a priori reason why brains could not have solved this problem by a sophisticated elaboration of the reflex circuit principle. But while computers are designed to obey strategies decided by the programmer, organisms had to develop designs obeying their own interests, and this is where the computer analogy may mislead us. Organisms must integrate their life project into their calculatory potential. The body as flesh and blood therefore from the very beginning has to be part of the anticipatory and inventive brain models. We shall suggest this is the reason why nature invented the trick of producing an experienced holistic virtual reality, an internal icon more or less isomorphic in its properties with those parts of the real world that the animal could not safely ignore.[3] The exciting (threatening, attractive etc.) aspects of the outer world in this way became internalized as inner threats, attractions etc., thereby assuring the necessary immediate emotional bias in all choices of action. The hard problem was not just to calculate the path of action but to make sure this path of action was the most relevant given the life project of the animal, and this is where the emotional apparatus enters the scene. The iconic inner experience works as a holistic marker focusing the enormous diversity of calculations upon a single path of action.

As Maxine Sheets-Johnstone has repeatedly pointed out, movement is not just doing, it is also always sensing (Sheets-Johnstone 1990; 1998). Millions of proprioceptive sense cells are distributed in our muscles throughout the body, perpetually measuring the tension between cell layers and sending messages thereabout to the brain. Brain models governing motoric activity anticipate the eventual signals they receive from proprioceptive organs, perpetually calibrating their dynamics to the delayed response from tissues. Organisms model their own bodies as much as they model the outer world — or as Sheets-Johnstone puts it: "creatures know themselves" (Sheets-Johnstone 1998: 285) — and they do so while their tissues are bathed in endocrine secretions, constantly updating their emotional response parameters to the experienced icons running in the brain. Sheets-Johnstone indeed suggests a natural history for proprioception tracing this kind of self-knowledge in movement right back to the chemotaxis in bacterial cells depending on flagellar movement. And since consciousness is as Merleau-Ponty has explained (Merleau-Ponty 2002: 160) not primarily an "I think that" but an "I can", proprioception might be understood, as Sheets-Johnstone observes, as a kind of "corporeal consciousness":

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[3] John Deely pointed me to this very apt formulation of the Uexküllian conception of neutrality in the Umwelt (originally suggested by Thomas Sebeok).

> Corporeal consciousness thus evolved from its beginnings in tactility into kinesthesia, into a direct sensitivity to movement through internally mediated systems of corporeal awareness, In effect, through all the intricate and changing pathways of descent with modification, *know thyself* has remained a consistent biological built-in; a kinetic corporeal consciousness informs a diversity of animate forms. (Sheets-Johnstone 1998: 286)

It seems plausible to suppose that experiential life is not an either-or phenomenon, but a thing that comes in many grades and in a multitude of versions depending on the ecosemiotic motifs, which are most vital to the particular species. Furthermore, just like we ourselves are not aware most of the time of things around us, or even our own presence, other creatures' experienced life may also possibly appear only in distinct glimpses of "enlightened" activity, and very likely in most species only little connection occurs between such glimpses of awareness, even when they happen more or less contemporaneously. We also know that we can do lots of complicated kinds of work without even being aware of it, awareness being perhaps instead directed to chatting with friends or looking at TV. This shows us that experience is not necessary for doing routine work, and you can even sometimes get away with routine talking when your mind is on other matters (though usually this is immediately perceived and considered highly impolite). But the very fact that routine work can be efficiently effectuated without us being aware of it immediately poses the problem of why we are aware of anything at all. And obviously, the answer is that the experienced world is a tool for solving non-routine problems, or, in general, for dealing with events which could not be foreseen. And a certain capacity to deal with the unforeseen is probably a help for most organisms capable of moving, which in multicellular organisms implies the presence of a neurosemiotic control system. Lacking movement as part of their survival tool kit, plants most likely never developed experiential worlds, whereas a graded series of such worlds may well occur as glimpses of awareness throughout the animal kingdom. But only in mammals and birds do these phenomenal worlds operate on constructed virtual items behaving very much like things and creatures outside of the head. And only in the human animal are these constructs understood as constructs, i.e. as different from the things and animals they are supposed to represent in the real world.

Our virtual worlds are tools for survival and as such they remain constrained by the very same rules that are operative in the real world. One should not therefore believe that our virtual worlds, the Umwelten, are all we have access to, and that the real world, the Ding an Sich, is unapproachable. On the contrary, the semiotics of corporeal life in any creature — ourselves included — does take part in the dance of ecosemiotic motifs, the local Planmässigkeit, which has been framing the evolutionary processes and has formed the particular form of the Umwelt of each species. The Umwelt must serve to guide the animal's activity in the semiotic niche, i.e. the world of cues around the animal (or species) which the animal must necessarily interpret wisely in order to enjoy life. The semiosphere, as I use the term, i.e. the totality of actual or potential cues in the world, is thus to be understood as an externalistic counterpart to the totality of Umwelten. Together they form, in the term of Jakob von Uexküll, an unending set of 'contrapuntal duets'.

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“Плановость” Юкскюлла

В противовес преобладающему позитивисткому воззрению на природу как на нечто свободное от значения, Якоб фон Юкскюлл утверждал, что определенная “плановость” в природе имеет место. Увы, данное утверждение можно понимать и как взгляд, в соответствии с которым сама органическая эволюция не является созидающим процессом, а постепенным (но все же величественным) выявлением строительного плана самой Природы. Подобная идея может вновь способствовать утверждению в центре биологической теории детерминизма, что радикально противоречило бы биосемиотическому взгляду. Одним из источников как биосемиотики, так и космологической философии Пирса является мысль, что неопределенность первична, что “привыкание” или интерпретация являются реальными процессами природы, и поэтому вера в предначертанность необоснована. В статье утверждается, что “плановость” Юкскюлла можно сопоставить с современным недетерминистским пониманием. В определенном смысле умвельты животных действительно развивались согласно природной “плановости”, но это такой план, который беспрерывно держит жизнь в оковах определенных стратегических выборов и одновременно разнообразит измерения условий этих выборов, т.е., согласно Стюарту Кауффманну, “сопутствующую возможность”.

Uexkülli ‘plaanipärasus’

Otsese vastandina valdavale positivistlikule looduse mõistele — loodusele, mis on mõtteta ning tähendusest vabastatud — väitis Jakob von Uexküll, et teatud *plaanipärasus* on looduses toimiv. Seda võib paraku võtta kui vaadet, mille kohaselt orgaaniline evolutsioon ise pole loov protsess, vaid on järkjärguline (ometi küll majesteetlik) Looduse enese ehitusliku plaani väljakoorumine. Selline idee võib kaasa aidata determinismi taaspüstitamisele bioloogilise teooria keskmes, mis räägiks tõsiselt vastu biosemiootika vaatele. Nii biosemiootika kui Peirce’i kosmoloogilise filosoofia lähtekohti on, et määramatus on esmane, et “harjumine” ehk interpreteerimine on reaalsed protsessid looduses, mistõttu usk ettemääratusse on põhjendamatu. Väidetakse, et Uexkülli plaanipärasus on kokkusobitatav tänapäevase mittedeterministliku arusaamaga. Teatud mõttes on loomade omailmad tõepoolest arenenud vastavalt looduslikule *plaanipärasusele*, kuid see on plaan, mis lakkamatult hoiab elu teatud strateegiliste valikute kütkes ja ühtaegu mitmekesistab nende valikute tegemise tingimuste mõõtmelisust, s.t. "külgnevat võimalikkust", Stuart Kauffmani järgi.

Uexküll and the post-modern evolutionism

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Abstract. Jakob von Uexküll's evolutionary views are described and analysed in the context of changes in semiotic and biological thinking at the end of Modern age. As different from the late Modernist biology, a general feature of Post-Modern interpretation of living systems is that an evolutionary explanation has rather secondary importance, it is not obligatory for an understanding of adaptation. Adaptation as correspondence to environment is a communicative, hence a semiotic phenomenon.

What does it mean, no longer being able to think a certain thought? Or to introduce a new thought?
Foucault 1989 [1966]: 56

When we can once establish a music theory of life, these simple examples will build its basis.[1]
Uexküll 1937: 195

The typologies of the ages of understanding that Arthur Lovejoy (1964 [1936]) or Michel Foucault (1989 [1966]) have applied to biology and that John Deely (2001) has developed for a whole philosophical thought on the basis of semiotic approach are attractive enough to try to use their models in interpretation of otherwise difficult or even controversial cases of biological thought.

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[1] Wenn wir einmal eine Musiktheorie des Lebens werden aufstellen können, werden diese einfachen Beispiele die Grundlage bilden.

Jakob von Uexküll's views on biological evolution provide a good example of controversial interpretations. As a non-darwinian, he has been occasionally considered an anti-evolutionist. However, it may also be that the conclusions of such kind strongly depend on the typology of views applied, and thus in case if a non-darwinian evolutionism is feasible and scientifically acceptable — and it evidently is feasible — Uexküll's role just changes, becoming an example of evolutionism of a special kind.[2]

A reason why it has been difficult to some interpreters to understand the Uexküll's view, is due to the negligible role he gives to an evolutionary explanation.

This paper has two aims: (1) to review the evolutionary views of Jakob von Uexküll, and (2) to describe very briefly the distinction between the main types of evolutionism, particularly in the context of biosemiotic approach.

Evolutionism in biosemiotics

What happens to evolutionism, when the modernism is finished? When asking this, I am going to apply here John Deely's (2001) principal division of the history of western thought into four ages – Greek, Latin, Modern, and Post-Modern – to the history of natural sciences. The Modern age, accordingly, has lasted from the 17th to the 20th century, and one of its characteristic features has been a belief into a possibility to improve the nature. Particularly in the 19th century, it took a form of a view about a self-improvement of nature – i.e., the progressive evolution.

The end of Modernism, as described by John Deely, is characterized by the rise of semiotics. On the one hand, this is exemplified by works of Charles S. Peirce, on the other hand — as Deely emphasizes — via the concepts introduced by Jakob von Uexküll: "[…] 'Umwelt' […] is a term singularly suitable to the needs of semiotics in arriving at the paradigm proper to itself" (Deely 2002: 129–130).

This is a paradigm that can be best characterized by the metaphor of *web*, as used by Thomas A. Sebeok in the expression of "the semiotic web", and as introduced by Jakob von Uexküll (1992: 327):

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2 Uexküll's views on evolution have been discussed recently also by Hoffmeyer (2004) and Chien (2004).

"every subject spins his relations to certain characters of the things around him, and weaves them into a firm web which carries his existence" — the latter formulation being said by Deely (2001: 605) the ever best characterization for experience.

Thus, what happens with evolutionism when moving from Modern to Post-Modern, is that we leave behind the whole concept of life's progress as expressed in the *tree of life* and instead understand the evolution as modifications in the *web of life*. This is an analogical step to the one that took place in the 17th century, when the Latin concept of the *ladder* of life was replaced by the *tree* of life (Lovejoy 1964; Kull 2003).

Uexküll identifies his views to the one that is opposed to the entire different worldview of the modernism, as he says: "We can indeed fix the date of the change [...]. It lies between Kepler and Newton" (Uexküll 2001: 114). He explains: "Kepler suchte nach dem *Plan* — Newton nach der *Ursache* der gleichen Erscheinung. [...] Seit Darwin waren die Biologen eifrig bemüht, die Merkseite der Lebewesen zu unterschlagen und nur ihre Wirkseite zu beachten"[3] (Uexküll 1937: 188–189).

Though, Uexküll's views on evolution may look unusual — rather these represent an old, pre-modern position. Here, a reference, e.g., to J. Deely's (2001) analysis can be relevant, which demonstrates a series of similarities between the late Latin and Post-Modern approaches.

Uexküllian view on evolution is also a non-cartesian, and an ecological one. In this kind of biology, phylogeny does not serve (in most cases, at least) the role of an ultimate explanation of the design of structures. Instead, for the understanding why biosystems behave like they do, their holistic features, their systemic functioning, or, in other terms, the communicative mechanisms have to be discovered.

Neo-darwinian evolutionism (e.g., Dobzhansky *et al.* 1977) is modern. Also Lamarckian and Darwinian ones were modern. The evolutionism of modernism is the evolutionism of progress. Ecologicity of neo-darwinism differs from the post-modern ecological view — an emphasis of the former is put on the Red Queen, on competition and the co-evolutionary race of survival, whereas the latter view interprets competition as a special case (imbalance) in symbiotic relationships.

The autogenetic view of biology, developed by Humberto Maturana and Francisco Varela (1980) in their work on autopoiesis, can be

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[3] Kepler searched for the *plan*, and Newton for the *cause* of all manifest creation. From Darwin on, biologists have carefully tried to evade the perception of living beings and have only noted their operation.

seen, at least partly, similar to that of Uexküll, which was initially inspired by the Kantian view as applied to biological systems. Maturana and Varela (1980: 11) also state that "reproduction and evolution are not essential for the living organization, but they have been essential for the historical transformation of the cognitive domains of the living systems on Earth."

It would not be very easy to classify semiotics into evolutionary sciences, despite of the fact that at least its post-structuralist period deals much with diachronic aspects and historical discontinuities. Ch. Peirce's description of the evolution of habits deals more with developmental continuities, however, it can hardly be taken as a serious model of evolution by a biologist describing the numerical mechanisms in the dynamics of allele frequencies in a population. Nevertheless, semioticians in any case do not deny evolution.

Indeed, the topic of evolution has not been entirely avoided in the writings about the semiotics of nature. Particularly those authors who support Peirce's views, together with Ch. Peirce himself, speak about the growth and development of semiosis. There are for instance works by W. A. Koch (1992), F. Merrell (1992; 1996), W. Nöth (1994) etc. which touch the evolutionary levels of semiosis. However, they very rarely write anything specific about the possible mechanisms of evolution. For instance, a review paper by T. A. Sebeok (1997) entitled "Evolution of semiosis" refers to semiosis in different levels of biological organization without speaking about the evolutionary process itself or its mechanisms. Few exceptions, of course, exist (e.g., Deacon 1997; Heusden 2004; Kull 1992).

As a matter of fact, biosemiotics has been, from its very beginning, quite cautious in making evolutionary statements. In particular, the mechanisms of evolutionary change are rarely analyzed in these works, and the same can also be said about the biosemiotic writings of recent years. "Zumindest aber würde *neben* eine allgemeine Semiotik, wie wir sie heute kennen, eine allgemeine 'Entwicklungssemiotik' oder besser eine *allgemeine genetische Semiotik* als Forschungsgebiet und Theorienansatz treten, ähnlich, wie dies auch in der Psychologie oder ansatzweise in der Linguistik der Fall ist"[4] (Bentele 1984: 11).

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[4] But at least *besides* general semiotics, as we know it today, a general 'developmental semiotics', or better a *general genetic semiotics* as a scientific branch and theoretical field, will be established, in the same way as this has occurred in psychology or for instance in linguistics.

The bioevolutionary topic in semiotics was occasionally analyzed, particularly one should mention the book by G. Bentele (1984), the works of H. M. Müller (1990; 1993), G. Witzany (1993), P. Bouissac (1993), several papers touching on semiotic aspects of evolutionary epistemology (Schult 1989; Hoffmeyer 1996) a.o. A remarkable paper in which a series of statements on the semiotic aspects of biological evolution is formulated, is the collective article by M. Anderson *et al.* (1990); e.g., they stress the importance of coevolution and symbiosis. Also, "communication begins with a decoder, not with the encoder, whether 'intentional' or not: This insight is particularly crucial to the understanding of evolution as a part of semiosis. Similarly, life is a result of one of the most interesting innovations with Gaia, namely, death" (Anderson *et al.* 1990: 762).

S. Salthe (1997) even considers that "semiotics has implicitly been a part of Darwinian concerns more or less from the inception of the discourse. Prominently, we have always interpreted adaptations in organisms as signs of their environment."

Despite several exceptions, it can be concluded that the majority of biosemioticians have been quite critical toward the neo-Darwinian school of thought, appreciating considerably higher the views of the followers of Karl Ernst von Baer (Kull 1998). "Natural selection itself is but one of a number of semiotic processes involved in biological transformation" (Anderson *et al.* 1990: 756). If so, then it might be rather expected that biosemiotics will contribute to the 'new synthesis' (Hoffmeyer 1997; Odling-Smee 1994; Salthe 1993a), or to post-Darwinism (Ho 1989), if it comes about, of course.

A principal issue that makes a divide in the evolutionary approaches is the role assumed for the organisms. Either they are survival-machines automatically selected by the environment, or they are subjects of selection who create their life conditions together with themselves. The latter view has been expressed already by K. E. v. Baer, and by J. M. Baldwin (the concept of organic selection, Baldwin 1896; Belew, Mitchell 1996; Tembrock 1990; Weber, Depew 2003), and in various aspects by L. L. Whyte (the concept of internal selection, Whyte 1965), E. Jablonka (the role of epigenetic inheritance, Jablonka, Lamb 1995; also Ho, Saunders 1979) and F. J. Odling-Smee (the role of niche construction, Odling-Smee *et al.* 2003).

A general mechanism of non-selectional origin of evolutionary adaptation (i.e. a non-darwinian type of adaptive evolution) could briefly described as follows (Hoffmeyer, Kull 2003; Kull 1992; 2000).

Adjustment (or acclimatization, or adaptation) to environment is a process that is taking place as a physiological and behavioural one continuously, in all periods of organism's life. This means certain slight changes in the organisms' structure, including in the pattern of gene expression. In case of a permanent change of life conditions (either due to migration into a new location or a change of conditions in the locus), some of these changes may include almost all specimens of the population. Later, some of these adjustments can become irreversible in result of either processes of genetic drift or stabilizing selection, and thus an adaptation has turned into an evolutionarily fixed characteristic.

This sort of mechanism can be called *semiotic*, because it requires an activity of organisms in acclimatization, in recognizing and selecting their behaviour and their environment. And this is different from, or more general than the mechanism of natural selection that would necessarily require differential reproduction. And this is not a Lamarckian mechanism because it does not assume the inheritance of acquired characters.

Adaptation itself is neither physical nor evolutionary phenomenon — adaptation is a communicative, thus a semiotic phenomenon (of course having certain physical and evolutionary counterparts).

Uexküll's view on evolution[5]

Uexküll retains a very special place in twentieth century biology. He was, in the beginning of the century, one of those who helped to found theoretical biology, and whose contribution was important in establishing it as a separate field of science (Uexküll 1913; 1920; cf. Alt *et al.* 1996). And at the end of the century, he has been the one whose views happened to be in the center of a (new) synthesis which heralds the start of post-Darwinian biology (after the long neo-Darwinian period), in a synthesis which generalizes evolutionary theory, in order to make mental phenomena a natural aspect of it (Hoffmeyer 1997).

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[5] An earlier version of this analysis has been published in Kull 1999.

As a tool of this synthesis, may serve semiotics. It may be interesting, therefore, to look more closely at this 'Uexküllian tradition'.

Uexküll, when studying zoology and evolution at the lectures of Julius Kennel (1854–1939) at the University of Tartu, was initially fond of Darwinian explanations. However, when Kennel claimed that one can build a phylogenetic tree between any given pair of organisms or species, Uexküll saw in this a play and not serious science. Instead of zoology, he started to be interested in physiology (particularly of marine invertebrates), investigating how physiological mechanisms work in the natural conditions of living nature. He also moved away from the views of Ch. Darwin and E. Haeckel (G. v. Uexküll 1964: 35–36).

In his *Theoretische Biologie*, Uexküll did not allocate much space to the problems of evolution — for him, evolutionary theory was not directly needed in order to build up a theory of living systems. According to G. Bentele (1984: 114), "die Konzeption, die von Uexküll entwickelt hat, [ist] nicht genetisch im Sinne von 'entwicklungsgeschichtlich' ausgerichtet"[6]. Below, I will describe Uexküll's evolutionary views in more detail — this is a part of his approach which has usually received less attention, in comparison to his *Umwelt*-theory.

Uexküll's approach to living systems is based (at least since the second edition of *Theoretische Biologie*, 1928) on the notion of *Funktionskreis* — 'functional cycle'. According to this, all behaviour of organisms, all functions of a living body, are expressions of circular acts which include recognition of signs by receptors, actions as induced by these recognitions, and perceptions of the results of these actions.

Instead of H. Driesch's entelechy, Uexküll used the notion of *Plan* (Uexküll 1929: 36; this is an interesting point, since it is similar to the step made by J. Woodger (1929) and J. Needham (1936), which replaced the rational part of entelechy by 'organising relations', or 'biological organisation'). *Plan* represents a spatial whole. "Unter Regel verstehen wir die Verknüpfung beliebiger Faktoren zu einer Einheit. Der Plan ist enger gefaßt und bedeutet bloß die Einheit räumlicher Beziehungen"[7] (Uexküll 1929: 36).

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6 The conception developed by Uexküll is not genetic in the sense of 'developmental history'.

7 Under rule we mean the connection of certain factors into a whole. The plan is more strictly defined and means only the whole of spatial relations.

Uexküll sees the functional cycle as an active *Plan*, the *Lebensfaktor*, or *Mechanisator*, which is responsible for an organism's functions, including its growth and regeneration (Uexküll 1929: 39). "Die Funktionsregel selbst ist, die fähig ist, Gefüge zu formen"[8] (Uexküll 1973: 217).

Functional cycles are also a basis for the functioning of cells in tissues. "Die lebende Zelle ist der Träger eines eigenen Naturgesetzes — sie ist ein Autonom. [...] Die lebende Zelle verhält sich äußeren Objekten gegenüber nicht als Objekt, sondern als *Subjekt*"[9] (Uexküll 1931: 386).

Thus, *Planmäßigkeit* is characteristic to *Bauplans*. "Nicht aus Reflexen, sondern aus *planvollen Funktionskreisen* bestehen die Baupläne der Tiere, die zugleich Tier und Umwelt in einer sinnvollen Zusammenhang zueinander bringen"[10] (Uexküll 1931: 389). "Die Planmäßigkeit des Körpergefüges und der Planmäßigkeit des Umweltgefüges stehen einander gegenüber und scheinen sich zu widersprechen"[11] (Uexküll 1940: 7). Uexküll sees in this, also, a direct continuation of Baer's views: "Das oberste Gesetz des Lebens, das alle Planmäßigkeit in der Zeit planmäßig zusammenfaßt, hat K. E. von Baer die 'Zielstrebigkeit' genannt"[12] (Uexküll 1938: 144). This Baer's term was, much later, replaced by the word 'teleonomy' (in order to make it acceptable for Darwinian school; cf. Mayr 1988).

Uexküll assumes that "jeder Merkplan einen bestimmten Wirkplan induziert"[13] (Uexküll 1931: 389). *Induktion* is the type of interaction which is specific to interactions between subjects (whereas the object-object interaction is 'mechanical', object-to-subject is *Reiz*, and subject-to-object is *Impuls*; Uexküll 1931: 388). The connection between *Merkplan* and *Wirkplan*, as well as between subjects, is

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8 The functional rule itself is that, which is able to form structures.

9 The living cell is the carrier of its own natural law — she is an autonome. [...] The living cell does not behave in relation to external objects as an object, but as a *subject*.

10 The Bauplans of animals do not consist of reflexes, but of designed functional cycles, which bring both animal and Umwelt into a meaningful connection.

11 The plan of the body structure and the plan of the Umwelt structure face against and seem to contradict each other.

12 The highest law of life, which connects all plan in time, has been named 'directedness' by K. E. v. Baer.

13 Every sign plan induces a certain operation plan.

komplementär (Uexküll 1931: 389); the latter means for Uexküll the relationship which is generated by *Induktion*.

Consequently, the form of organisms is not static, but generative. "Die Morphologie kann man kurz die Wissenschaft der Entstehungszeichen nennen, denn ihre Aufgabe ist es, die Lebewesen nicht in funktionelle, sondern in genetische Bausteine zu zerlegen"[14] (Uexküll 1973: 226).

It is important to realize that *Planmäßigkeit* concerns not only spatial, but also temporal aspects of organization. "[...] die Planmäßigkeit nicht bloß das Nebeneinander der Organe im Raum, sondern auch ihr Nacheinander in der Zeit beherrscht"[15] (Uexküll 1925: 7).

Uexküll follows Caspar Friedrich Wolff's epigenetics, and sees the creation of new structures as a result of induction both in ontogeny and phylogeny. Consequently, he accepts the possibility of saltatory evolution, without the existence of all intermediate forms. These are similar to transitions from one motif to another in a musical score. "Obgleich auch bei Raupe und Schmetterling sowie bei Libellenlarve und Libelle die Motive grundverschieden sind, fällt es keinem Menschen ein nach Zwischengliedern zu suchen"[16] (Uexküll 1943: 2).

Thure von Uexküll (1980: 59) described his father's evolutionary views with the following words: "[...] Evolution [kann] nicht der Weg des Zufalls sein, der in einer linearen Zeit durch Versuch und Irrtum von unvollkommenen zu besser angepaßten Formen führt, sondern nur die Komposition einer großen Symphonie oder eines umfassenden Code, einer übergreifenden Planmäßigkeit, welche in den verschiedenen Umwelten die gleichen Themata in wechselnder Differenzierung — aber immer gleicher Vollkommenheit — variiert."[17]

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14 Morphology can be shortly defined as a science of developmental signs, whose task is to deconstruct living beings, not into functional, but into genetic [generative, generic] elements.

15 The plan rules not only the arrangement of organs in space, but also their arrangement in time.

16 In the same way that the motives basically differ for caterpillar and butterfly, and for dragonfly larva and dragonfly, so it is for human intermediate forms.

17 Evolution cannot be a path of chance, leading in a linear time through trial and error from imperfect to better adapted forms, but rather the composition of a great symphony or an extensive code, a far-reaching plan, which varies the same themes in different Umwelten — in different degrees of complexity, but always to the same perfection.

The terms from music, which appear here, are not random examples for Uexküll. He saw in them a possibility to express the holistic features of living systems. "Alles Körperliche läßt sich mit dem Messer zerschneiden — eine Melodie aber nicht"[18] (Uexküll 1940: 51). Over the years, the frequency of music metaphors grew in Uexküll's texts.

Uexküll distinguished between *Anpassung* (fitting) and *Einpassung* (matching), preferring the latter in the description of adaptations. He criticized the term *Anpassung*, which has been used to denote the adaptation of organisms to the environment (*Umgebung*) (Uexküll 1973: 318). "An ihrer Stelle hat die Lehre von der überall gleich vollkommenen Einpassung zu treten, die dreifacher Art ist: 1. besteht eine Einpassung der Organe und Organteile, die den Körper bilden, in- und untereinander; 2. besteht eine Einpassung zwischen Körper und Umwelt; 3. besteht eine Einpassung der Umwelten untereinander"[19] (Uexküll 1927: 696). "Wohin wir schauen, erblicken wir [...] komplementäre Einpassungen paarweise aufeinander abgestimmter Umwelten"[20] (Uexküll 1931: 391). According to Uexküll (1973: 319), "es gibt kein Mehr oder Weniger bei der Einpassung. Die Einpassung ist immer vollkommen, soweit die dem Tier zur verfügung stehenden Mittel reichen."[21]

This emphasis on the reciprocity of interactions in living systems is an important aspect in understanding Uexküll's views. This concerns, for instance, his approach to the role of symbiosis: "man kann sagen, daß grundsätzlich alle Lebewesen zugleich selbstdienlich und fremddienlich sind"[22] (Uexküll 1973: 322).

Uexküll highly appreciated the works of Gregor Mendel and August Weismann (Uexküll 1927: 694), but remarked that "so ist die theoretische Bedeutung der Mendelschen Entdeckung bis zum

18 All corporeal can be separated with a knife — but not a melody.

19 Instead, a theory on the accomplished matching (complementarity) is developed, which includes three types: 1. the matching of organs and their parts, which within and between each other make up the body; 2. the matching of bodies and their environment; 3. the matching of Umwelten.

20 Wherever we look, we see [...] the complementary matching of pairwise mutually harmonised (co-ordinated) Umwelten.

21 There is no more or less in matching. An adaptation is always accomplished, as far as it provides a tool for an animal.

22 It can be said that all living beings are at the same time both self-serving and else-serving.

heutigen Tage noch nicht in ihrem vollen Umfange erkannt worden"[23] (Uexküll 1973: 221), and, noted particularly, that Mendel did not analyze the development of organisms (Uexküll 1927: 694). In the views of Ewald Hering and Richard Semon, Uexküll saw a certain support for Ernst Haeckel's biogenetic law, the former, however, being unacceptable to Darwinists due to the vitalistic inclination of Semon's approach (Uexküll 1927: 695).

Understanding the role of genes, he gives the following example. "Die Tatsache, daß sowohl kurzhalsige wie langhalsige Säugetiere sieben Halswirbel besitzen, beweist, daß die Mutation erst eingesetzt hat, nachdem die sieben Sprossen für die Halswirbel bereits fest angelegt waren. Eine von solchen Gesichtspunkten ausgehende Stammesgeschichte wird aber erst dann möglich sein, wenn die Lehre von der sprungweisen Einpassung die Lehre von der allmählichen Anpassung verdrängt haben wird"[24] (Uexküll 1973: 259).

It can be added that Uexküll's view on species may be interpreted as quite close to the contemporary recognition concept of species (Paterson 1993; Kull 1992). "Ist die Grenze einer Art gegen die andere nur dadurch festgelegt, daß beim Aufeinandertreffen einer allzu großen Zahl von abweichenden Genen aus äußeren physiologischen Gründen bei der Kreuzung ein lebensfähiges Individuum nicht mehr erzeugt werden kann?"[25] (Uexküll 1973: 265).

Uexküll leaves his evolutionary views unfinished. As H. Driesch (1921: 203) put it: "Warum ändert sich die Melodie? Wir wissen das nicht."[26] For a biosemiotician, this would give an insight to analyse the processes of evolutionary change in a way similar to the way one would analyse the development of music, *sensu lato*.

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[23] The theoretical meaning of Mendel's discovery is not yet fully understood.

[24] The fact that both short-necked and long-necked mammals have seven cervical vertebrae, shows that the mutation first appeared, after the seven primordia for cervical vertebrae had already appeared. A phylogeny based on this view can be possible after a theory of saltatory matching has replaced the theory of gradual fitting.

[25] Is a species boundary in relation to some other species drawn only by the fact that the interaction of a large number of genes due to external physiological reasons does not produce a living individual?

[26] Why does the melody change? We do not know.

Concluding remarks

In a typology of views, both synchronic and diachronic divisions should be considered.

As synchronic, for instance, A. Lyubischev's (2000) two great lines in the history of philosophy, the line of Democritos and the line of Plato, have been described. Similarly, the Darwinian and von Baerian biology. Or, why not, a physical versus semiotic biology.

As diachronic, the four ages in the history of philosophical thinking according to J. Deely, or the periodization A. Lovejoy introduced for interpretation of nature in the ladder-tree-web series. Or, the epistemes as described by M. Foucault.

One and the same opposition can also create both — the opposing views of contemporaries, and the periods of dominant view — like the epigenetic–preformist opposition in biology of many centuries.

Moreover, the typology would be deficient if we would not take into account the continualist views to science. This also has both synchronic and diachronic dimension. According to the 'diachronic continualism', the science, e.g., biology, or evolutionism, is either a cumulative or just ever-changing set (or system) of knowledge, where the revolutions hardly occur. And according to a 'synchronic continualism', we just have many versions of understanding simultaneously co-existing that do not possess a real hiatus required for different types to really exist.

All this considered, it would be attractive to make a more thorough inquiry of the fundamental turn in biological understandings that can be called 'an end of modern biology', or 'a start of post-modern'.

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Юкскюлл и постмодернистский эволюционизм

Взгляды на эволюцию Якоба фон Юкскюлла рассматриваются на фоне тех изменений, которые имели место в семиотическом и биологическом мышлении с переходом от модернизма к постмодернизму. Одной из особенностей постмодернистских интерпретаций живых систем является второстепенность эволюционистских объяснений, в отличии от модернистской биологии, которая считала эволюционистское объяснение основным в объяснении биологии. Все же эволюционистское объяснение не является обязательным при объяснении, например, явления адаптации, так как в этом случае мы имеем дело с коммуникативным соответствием (между организмом и средой), т.е. с семиотическим явлением.

Uexküll ja uusajajärgne evolutsionism

Jakob von Uexkülli evolutsioonialaseid vaateid analüüsitakse nende muutuste taustal, mis on leidnud aset semiootilistes ja bioloogilistes arusaamades seoses üleminekuga modernismilt postmodernismile. Elussüsteemide postmodernsete tõlgenduste üheks iseäraks on evolutsiooniliste seletuste teisejärgulisus, erinevalt hilismodernistlikust bioloogiast, mis pidas evolutsioonilist seletust bioloogia peamiseks seletusviisiks. Ometi pole evolutsiooniline seletus esmatarvilik näiteks adaptatsiooni seletamisel, kuivõrd adaptatsiooni puhul on tegu kommunikatiivse vastavusega (organismi ja keskkonna vahel), seega semiootilise nähtusega.

Semiotician or hermeneutician? Jakob von Uexküll revisited

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Abstract. Like other sciences, biosemiotics also has its time-honoured archive, consisting, among other things, of writings by those who have been invented and revered as ancestors of the discipline. One such example is Jakob von Uexküll who has been hailed as a precursor of semiotics, developing his theory of "sign" and "meaning" independently of Saussure and Peirce. The juxtaposition of "sign" and "meaning" is revelatory because one can equally legitimately claim Uexküll as a hermeneutician in the same way as others having claimed him as a semiotician. Such a novel temptation can be justified by Uexküll's prolonged obsession with *Sinn* and *Bedeutung* since his first book in 1909. This paper attempts to reconstruct the immediate intellectual horizon of Uexküll's historicity, a discursive space traversed by his contemporaries Frege and Husserl, in order to see how Uexküll's discussions of *Zeichen* and *Gegenstand*, *Sinn* and *Bedeutung*, were informed by other philosophers of language, and to establish Uexküll as a phenomenological hermeneutician in the tradition of Husserl, Heidegger and Gadamer. To forestall and counter possible criticism that hermeneutics is primarily concerned with textual interpretation, while Uexküll is at most an interpreter of animal life, the paper will discuss his unfinished parody of the Platonic dialogue *Meno*, which is entitled *Die ewige Frage: Biologische Variationen über einen platonischen Dialog* (1943). It is through such textual practice that one witnesses the emergence of an Uexküll who embodies at once the addressee exercising his *understanding* of ancient texts as well as the second addresser recoding his *explanation* to another group of targeted addressees. This textual practice already goes beyond the confines of biology and in fact involves the linguistic pragmatics of rhetoric and speech act.

Like other sciences, biosemiotics also has its time-honoured archive, consisting, among other things, of writings by those who have been invented and revered as ancestors of the discipline. One such example is Jakob von Uexküll. As to the people who "invent" him, they are either mediators of semiotic globalisation, like the late Professor Thomas A. Sebeok, or *de facto* progenitor like Professor Thure von Uexküll. Since Sebeok's seminal promulgation in *Semiotica* and his enthusiastic promotion, the legacy of Uexküll as another precursor of semiotics, who had worked independently of Charles Sanders Peirce and Ferdinand de Saussure, has become generally known to us. What is not known to us, as is the reality of human knowledge, is the fact that other people, each from her persuasion, and in her own way, may also legitimately claim Jakob von Uexküll. This not only shows the wide scope of Jakob's knowledge, but also raises the thorny issue of conflict in interpretations. What I have in mind is hermeneutics, whose primary concern is the processing of meaning.

However, one does not invent her ancestor randomly because she is always already situated in her disciplinary tradition and can make claim only from within that context. Therefore, it is quite natural for a historian of biology like Erik Nordenskiöld to label Uexküll as a vitalist; Ernst Cassirer to stick to him the sobriquet of Neo-Kantian; Hans-Georg Gadamer to summon him to the camp of fellow phenomenologists; and Sebeok to honour him as a founder of semiotics. Much as a biosemiotician claims Uexküll, a biohermeneutician like Sergey V. Chebanov can lay equally legitimate claim.

To label Uexküll as a hermeneutician, rather than the more accepted semiotician, is no easy task. There are several difficulties confronting us, but let me point out just two. First, hermeneutics deals with the theory and method of understanding, traditionally of text, and through the latter, the thought behind it or prior to it. Therefore, it involves the proper decipherment of meaning, supposedly emitted from a source, and thus presupposes continuity between addresser, encoded message, and addressee. The procedure of decipherment for what is behind the sign is quite different from the heuristics of semiotics, which is more concerned with system-specific functionality of sign, e.g., how does the sign process rather than what it means.[1] Second, Uexküll deals, though not exclusively,

[1] It is no accident that I have evoked Paul Ricoeur. The French philosopher contrasts two kinds of human understanding: one is immediate, non-programmatic, and subjective, or "Heideggerian" and "Husserlian"; the other is

with the meaning of animal life rather than text. This categorial shift further raises the questions of validity in applying hermeneutics to nature, in textualising nature, and, above all, in begging the question of "meaning of meaning" to which the biologist addresses himself. Such questions are complicated by Uexküll's obsession with meaning, since his first book in 1909, where he observes "each newly discovered fact [...] gain[s] sense [*Sinn*] and significance [*Bedeutung*]" (Uexküll 1985: 224; Uexküll 1909: 7), all the way to *Bedeutungslehre* in 1940.[2]

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methodical and programmatic and claimingly objective. Ricoeur traces this distinction to Dilthey's distinction between understanding and explanation (in his words, "a German product") and interprets the two procedures as hermeneutics versus semiotics (1974; 1990). Incidentally, Thure von Uexküll alludes to Dilthey's distinction (1987: 153): "If science is understood as the attempt to identify the factors which determine the behavior of phenomena in relation to each other and toward man, then Dilthey's famous distinction is no longer valid for a theory of signs. 'Explaining' (*Erklären*), which according to Dilthey is restricted to the natural sciences, becomes identical with 'understanding' (*Verstehen*), which he reserved for the human sciences."

Uexküll's semiotic project falls into the category of Ricoeurian explanation in his assumption that all animal perception, action, reaction [behaviours] in relation to the external world can be explained in terms of sign processing. The teleological nature of his *Bauplan* is also interpretative. It parallels the Kantian concept of purposiveness of nature (*Zweck*, *Zweckmässig*), which "represents the unique way in which we must proceed in reflection on the object of nature with the aim of a thoroughly interconnected experience, consequently it is a subjective principle (maxim) of the power of judgment" (Kant 2000: 71).

While Manfred D. Laubichler alternates between biosemiotics and biohermeneutics (Laubichler 1997a; 1997b), obviously finding it difficult to reconcile interpretation and description of operational processes, Sergey V. Chebanov (1993) provides a better hermeneutic model of interpretation processes (IP) in biology and life based on linguistic pragmatics. He prefers the discipline of hermeneutics to semiotics in interpreting, for instance, the interactions of sensible beings and living beings, called enlogue or quasi-dialogue (Chebanov 1993: 225). More importantly, he believes biosemiotics is a division of biohermeneutics: "Now, while the hermeneutization of humanitarian disciplines is being developed and some domains of biosemiotics appear to be involved in it, I find sufficient reasons to call this trend 'biohermeneutics'" (Chebanov 1993: 40).

[2] In one of his first published book in 1909, Jakob von Uexküll had already used the two terms *Sinn* and *Bedeutung* together, reminding one of Frege's classic distinction. "If the organization of the construction plan is placed at the focus of research for every species, then each newly discovered fact finds its natural place, and only thus does it gain sense and significance" (Uexküll 1985: 224) ("Wird die Ausgestaltung des Bauplanes für jede Tierart in den Mittelpunkt der Forschung

Our hermeneutic task is then two-fold: on the one hand, we need to reconstruct the conceptual and semantic horizon in which Uexküll's usage of meaning and sign is embedded, and on the other, to carve out of his less read writings an image of textual hermeneutician. Regarding the latter less known aspect of Uexküll, I refer, in particular, to his unfinished parody of the Platonic dialogue *Meno*, which is entitled "Die ewige Frage: Biologische Variationen über einen platonischen Dialog" (1943). It is through such textual practice that one witnesses the emergence of an Uexküll who embodies at once the addressee exercising his understanding of ancient texts as well as the second addresser recoding his explanation to another group of targeted contemporary German addressees. This textual practice already goes beyond the confines of biology and in fact involves the linguistic pragmatics of rhetoric and speech act.

As I have pointed out, it is due to Thomas A. Sebeok's unfailing effort of promotion that Jakob von Uexküll as a forerunner of semiotics has been accepted and rarely questioned. Although Uexküll developed his theory of sign and meaning independently of Saussure and Peirce, quite a few scholars have attempted to negotiate him with these two founders of *sémiologie* and semeiotic. One of the attempts is to draw an analogy between biology and linguistics, using, as model, the dual structure of sign consisting of *signifiant* and *signifié*, and projecting it onto biological phenomena. In this regard, the most notable example is none other than Thure von Uexküll. Since the linguistic model has been challenged from time to time and even made obsolete among certain poststructuralist camps, a few attempts to appropriate Peirce have been made, especially the version to establish the Peircian link to biology.

Since human thinking is essentially model-bound, whether or not the Saussurian and Peircian applications are appropriate is a metatheoretical matter not concerned here, but I am afraid that such applications fail to do justice to Uexküll as a forerunner independent of Saussure and Peirce. Specifically, the more we think of Uexküll in light of the Latinate *sign* and the Greek *semeion*, the less can we appreciate Uexküll in light of his own conceptual context and the tradition to which he belongs. Before addressing myself to the main

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gestellt, so findet jede neuentdeckte Tatsache ihre naturgemässe Stelle, an der sie erst Sinn erhält und Bedeutung") (Uexküll 1909: 7).

issues, let me mention in passing the terminological problem. For instance, the German word *Zeichen* has been translated, without much reflection, into *sign* in the English version of *Theoretical Biology* (1926) and in the long essay, "Theory of Meaning", which constitutes the main body of the 1982 special issue of *Semiotica*. It is in the latter title that the English word *meaning* is used indiscriminately for the ill-defined *Bedeutung*. This probably accurate but misleading translation has not been clarified, as it should have, not least for its unavoidable entanglement, following Gottlob Frege (1848–1925), with *Sinn*, and to a lesser degree, with *Zeichen* and *Vorstellung*. Likewise, a key word in Uexküll's system, *Merk*, which can refer to both *mark* and perceptual *sign*, as in *Merkmal*, has not received due attention by semioticians.

1. *Sinn* or *Bedeutung*: The Frege-Husserl-Uexküll complex

Anyone familiar with the philosophical context will have already detected the ghosts of Gottlob Frege and Edmund Husserl (1859–1938) haunting Uexküll's writings, maybe without his awareness.[3] I am not suggesting influence, a vague concept — indeed a non-issue — that had unfortunately plagued many a comparatist in the 1960s–1970s. Instead of establishing points of contact showing positivistic rigour, we tend to bracket the issue and replace it with a more explanatory, albeit no less vague, intertextual space. A cliché runs like this: Embedded in her cultural *Umwelt*, a poet does not need to read a Petrarchan sonnet to write one. It is under a similar cultural milieu, which witnessed the birth and growth of a scientific discourse through the exchange, debates, and brainstorming of such great minds as Frege, Husserl, and Wilhelm Dilthey that Uexküll developed his theory of sign and meaning at the turn of the twentieth century.

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[3] Witness what the latter has to say: "Each general name is a sign for a general representation, and this, in turn, is a sign for any object that falls under the corresponding abstract concept [...]. Furthermore [...] we take any conceptual mark (*Merkmal*) — so far as it serves, precisely, as a distinguishing mark — to be a sign" ("Jeder allgemeine Name ist ein Zeichen für eine allgemeine Vorstellung, und diese wiederum ist ein Zeichen für jeden der Gegenstände, welche unterden korrespondierenden abstrakten Begriff fallen [...] Des weiteren gilt uns [...] jades begriffliche Merkmal, sofern es eben als Merkmal dient, als Zeichen") (in German, Husserl 1970: 340; in English, Husserl 1994: 20–21).

In the following, I will situate Uexküll in his immediate discursive context by evoking his contemporaries and predecessors Frege and Husserl. It is generally agreed that Uexküll's major contribution to theoretical biology and semiotics lies in his theory of meaning, that is, theory of meaning in life, which can be called, as with his titles *Bedeutungslehre* (1940) and *Der Sinn des Lebens* (1947); it also lies in his reinstatement of the idealistic, subjective paradigm of biology. Now it is due to Frege's renowned "puzzle" on the distinction between *Sinn* and *Bedeutung* that modern theory of meaning, in particular logical semantics, has come into being. And Husserl's discussion of the subjective lived experience (*Erlebnis*) has given rise to the rich phenomenological tradition that includes Martin Heidegger and Hans-Georg Gadamer, all of whom have discussed the concepts of *Dasein* and *Umwelt* to different extent, with Gadamer explicitly evoking Uexküll in his masterpiece.[4] In the pages that follow, I will

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[4] For Husserl's discussion of *Umwelt* and *Vorstellung*, see, for instance, his 1934 essay, "Foundational Investigations of the Phenomenological Origin of the Spatiality of Nature" (Husserl 1982: 222–234). Here *Umwelt* is defined as "the surrounding world" (222). Heidegger devotes lengthy discussion to *Umwelt* in his *Being and Time* (*Sein und Zeit* 1927) (1963: 66ff, English, 1962: 93ff). According to him, "That world of everyday Dasein which is closest to it, is the *environment*" (94). ("Die nächste Welt des alltäglichen Daseins is die *Umwelt*" (66).) For Husserl and Heidegger, the prefix of *um* suggests both "around", as in *Umsicht*, and the more "intentional" preposition "for" as in *Umgang*. The two philosophers used the world *Umwelt* probably after Uexküll, and each with a *Gegenentwurf*, i.e., shifting the focus from animal world to human world. *Kluge: Etymologisches Wörterbuch der deutschen Sprache* (2002: 24) gives the word's 19th-century Danish origin, but identifies its conceptualization by Uexküll in 1909.

In Gadamer's *Truth and Method* the author alludes to Jakob von Uexküll and praises his alternative attitude to scientific study (Gadamer 1994: 451; 1986: 455): "[...] Thus, for example, the environmental studies (*die Umweltforschung*) of the biologist von Uexküll contrasted the world of physics to a universe of life composed of the manifold living worlds of plants, animals, and men. Such biological inquiry claims to overcome the naïve anthropocentricity of the earlier study of animals by investigating the particular structures of the habitats (*Baupläne der Umwelten*) in which living things have their being. Like animal environments (*Umwelten*) the human world is built of elements that are available to human senses (*menschlichen Sinnen*). If 'worlds' are to be thought of as biological plans, however, this not only assumes the existence of the world of being-in-itself that is made available through physics, in that one is working out the selective principles according to which the various creatures construct their worlds out of material that "exists in itself"; it also derives the biological universe briefly discuss Frege's and Husserl's use of *Sinn*, *Bedeutung*, and *Zeichen* to see how such concepts may have either informed or crisscrossed with Uexküll's theory of "meaning" and "sign."

According to Kalevi Kull's bibliography (Kull 2001: 16), Uexküll's first essays were published in 1892.[5] The same year saw the publication of Frege's article on *Sinn* and *Bedeutung* in *Zeitschrift für Philosophie und philosophische Kritik*, and in the previous year, 1891, Frege and Husserl had had correspondence on the semantic issue involving common name or concept word, with particular reference to the terms that concern us here (Frege, "Letter to Husserl, 24.5, 1891," in Frege 1997: 149–150). Most critics have suggested that Husserl's use of similar concept was under Frege's influence, though recent discoveries show that Husserl might have borrowed such terms from other sources. Very probably both Frege and Husserl had drawn upon identical materials, including contemporary logic, and were under the general influence of Kant. In 1890 Husserl published an article entitled "On the Logic of Signs (Semiotic)" ["Zur Logik der Zeichen (Semiotik)"]. The article is of historical importance. For one thing, it might have given birth to an alternative but aborted tradition of semiotics. For another, it anticipated Uexküll's concept of signs. A re-reading of Husserl on sign may put Uexküll in a different perspective from semiotics.

It would be interesting to compare the three philosophers' theories of meaning and sign. Incidentally, the title of one of Uexküll's major writings, *Bedeutungslehre*, can mean both "theory of meaning" in general and "semantics" in particular. For all the profusion of signs throughout his work, Uexküll's contribution to theoretical biology has much to do with his theory of meaning. In fact, it would be negligent not to presuppose some kind of discursive rapport between Uexküll and Frege and Husserl regarding their discussions of meaning. The relationship of the three thinkers can be represented as an inverted

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from the physical universe by a kind of restyling, and it indirectly assumes the existence of the latter. Certainly this constitutes a new kind of inquiry. It is a line of research generally known today as behavioral biology. Logically it would embrace the human species as well." In order to fully appreciate Gadamer's representation of Uexküll and his approach to biology, one needs to situate the statement in the larger context of philosophical hermeneutics.

5 Thure von Uexküll (1980: 403) identifies the two 1892 essays in *Zeitschrift für Biologie* 28 as 1891.

pyramid (Fig. 1). Chronologically, Uexküll appears later on the vertex of this inverted triangle, the other two angles being occupied by the Husserl of "On the Logic of Signs (Semiotic)" dated 1890 (*Husserliana* 12: 340–373), and the Frege of "On *Sinn* and *Bedeutung*" dated 1892 (*Zeitschrift fur Philosophie und philosophische Kritik* 100: 25–50). Both work anticipated Uexküll's discussions of meaning and sign, dating from 1909.

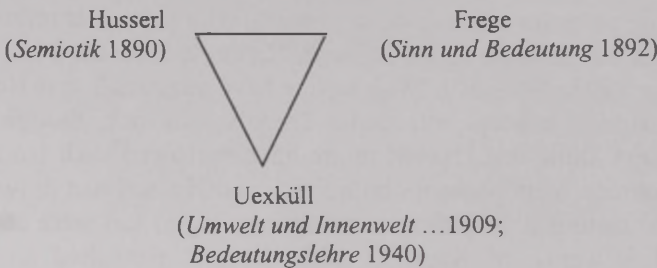

Figure 1. Uexküll, Frege, and Husserl.

In the following I will briefly negotiate the Uexküllian theory of *Bedeutung*, the Fregean distinction of *Sinn* and *Bedeutung*, and the Husserlian concept of noematic *Sinn*. My purpose is to show how Uexküll's use of terms, including the ubiquitous *Zeichen*, is very much concerned with the interpreted sense of hermeneutics. This applies to his interpretation of living organisms as well as his textual hermeneutics. For the latter, I will analyse one relatively obscure text which is a parody of Plato's dialogue *The Meno*, co-authored by Jakob and Thure, and by so doing attempt to show another unknown Uexküll as a hermeneutician of classics.

But let me begin with Frege. The theoretical implication of Frege in modern semiotics is yet to be explored, although his legacy on analytical philosophy cannot be denied. Semioticians in general have avoided him probably because of the bias that semiotics and logic are incompatible. Whereas logic is concerned with truth and the procedure of its acquisition, semiotics is interested in exploring an "alternative" truth, not confined to referentiality. Even Peirce, who equates logic to semeiotic, asserts abduction as a privileged semiotic reasoning rather than induction and deduction.

In his seminal essay on *Sinn* and *Bedeutung*, Frege begins by talking about equivalence as represented by algebraic equation. Following Kant, he argues that $a = a$ is tautological or "analytic," and $a = b$ is more complicated and tricky than it appears. The latter gives rise to the thorny issue of name and reference, concept and object, or in semiotic parlance, *signans* and *signatum*, *signifiant* and *signifié*. In the first analytic equation, a and b as names are not equal but they can be made so because of their identical extension. Furthermore, if the extensions of two terms are identical, then there is no reason why the equation cannot be reversed to suggest that a and b as names are also equivalent. Therefore, in the purely nominal sense, there is an aporia in $a = b$ and $a \neq b$.

Take Frege's own example. The morning star (*Morgenstern*) refers to the planet Venus and the evening star (*Abendstern*) to the same planet. Now one could say that their references are identical, but the reverse is not true because *the morning star ≠ the evening star*. From the point of view of logical semantics, the two *Zeichen*, each with its *Sinn*, share one *Bedeutung*. A naïve conflation of semantics with semiotics would take the morning star as *signifiant 1*, and the evening star as *signifiant 2*, and the two *signifiants* share one *signifié*. But from the semiotic point of view, the morning star as *Zeichen* or *sign* already consists of an inseparable pair *signifiant* / *signifié*, the sensible and the intelligible. Put in Saussurian terms, the acoustic picture, i.e., the *signifiant* [abntʃtərn] points to its semantic content of {*Abendstern*}, or *signifié*. Let us see how Frege defines the relationship of expression and content in his famous puzzle.

> It is natural, now, to think of there being connected with a sign (name, combination of words, written mark), besides that which the sign designates, which may be called the *Bedeutung* of the sign, also what I should like to call the *Sinn* of the sign, wherein the mode of presentation is contained. (Frege 1960: 152)
> (Es liegt nun nahe, mit einem Zeichen [Namen, Wortverbindung, Schriftzeichen] ausser dem Bezeichneten, was die Bedeutung [des Zeichens heissen möge, noch das verbunden zu denken, was ich den Sinn des Zeichens nennen möchte, worin die Art des Gegebenseins enthalten ist.]) (Frege 1892: 27)

Frege here seems to be suggesting a triad consisting of *Zeichen*, *Sinn*, and *Bedeutung*. But in fact, the *Bedeutung* is exterior to the *Zeichen* rather than interior of it, especially when it stands for a referent or object, whether be the *Zeichen* a proper noun or a common noun.

There is no such intrinsic semiotic relationship as among the Saussurian *signifiant* and *signifié* or the Peircian representamen, object, and interpretant. But does Frege grant motivation to the relationship between *Zeichen* and *Sinn* and *Bedeutung*? It is not surprising that he doesn't. Instead, he argues that the relationship between *Zeichen* and *Bedeutung* is arbitrary, and as such one cannot reverse *Bedeutung* to *Zeichen* because of the interference of mode of presentation (*Art des Gegebenseins*) contained in the *Sinn* (Frege 1960: 152). Moreover, a *Sinn* may not point to a *Bedeutung*, insofar as the latter means a referent (*ibid.*153). Here Frege anticipates Saussure's famous argument of the arbitrariness of the sign.

Frege has been much acclaimed by members of literary community because of his assertion that the *Sinne* of morning star and evening star are different, despite their shared *Bedeutung*. The poet, for one, is especially pleased for the license which enables her to relate the Fregean *Sinn* to the affective function of language expression. The same may not yet be true with the semiotician, as I have tried to demonstrate above, before she can clarify satisfactorily the conflation of semiotics and semantics in a statement as follows.

> The regular connection between a sign, its *Sinn* and its *Bedeutung* is of such a kind that to the sign there corresponds a definite *Sinn* and to that in turn a definite *Bedeutung*, while to a given *Bedeutung* (an object [*einem Gegenstande*]) there does not belong only a single sign. The same *Sinn* has different expressions in different languages or even in the same language. (Frege 1892)

The difficulty of the passage, especially the latter part, lies in linguistic and semiotic trespassing. Because of system-specificity, no identical *Sinn* can be shared by different expressions in different languages, nor can a *Bedeutung* as object subsume more than one sign.

We can agree with Frege on the following. Every word, phrase, proposition has a sense (*Sinn*) and its meaning and/or reference (*Bedeutung*). In the case of proper noun, such as *Angela*, it has a sense whether etymological or otherwise. We all know Angela is a female angel, but normally Angela also refers to an individual person. The person referred to is the word's reference or referent and therefore its object. In this case *Bedeutung* refers to designation (*Bezeichnung*) rather than meaning. In the case of a common noun or in Frege's words, "concept word," the word has both a sense and reference (referent) but it does not have an object. Two kinds of relationships are involved here, one is subordination, and the other is subsumption. Since the verbal semantic of a word, namely *Sinn*, may lead to a concept and/or an object, one needs to discuss the intensional and extensional qualities of the concept and/or object. These relationships can be illustrated by Frege's diagram in his letter to Husserl in 1891 (Frege 1997: 149) (Fig. 2).

proposition	proper name	concept word [common name]	
↓	↓	↓	
Sinn of the proposition (thought) [*Gedanken*]	*Sinn* of the proper name	*Sinn* of the concept word	
↓	↓	↓	
Bedeutung of the proposition (truth value)	*Bedeutung* of the proper name (object)	*Bedeutung* of the concept word (concept) →	object [*Gegenstand*] falling under the concept

Figure 2. Sinn and *Bedeutung* in Frege's diagram — in his letter to Husserl in 1891 (Frege 1997: 149).

We can see from the diagram that the heart of the puzzle lies in the possible confusion of object and concept, both being represented by the ambivalent *Bedeutung*. Whereas the proper name "Angela" stands for the woman bearing that name despite its *Sinn*, a common name is seen by Frege as a concept word and stands for a concept rather than an object. I think Frege's answer to Husserl is crucial to our understanding of Uexküll, as I will argue later.

About the same time when Frege coined the distinction, other people were talking about similar concepts in similar terms. Husserl, for one, used these terms in his early writings on arithmetic and logic, and later on his analysis of human experience in the world. To Husserl there is little distinction between *Sinn* and *Bedeutung*, and he had used them interchangeably.[6] It is in the 1913 book *Ideas* that he proposes a

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6 Although Husserl uses both words, he does distinguish *Sinn* and *Bedeutung*, holding the one to be sensory and the other mental and conceptual. Later he

distinction: *Bedeutung* refers to meaning at the conceptual level, and "more particularly in the complex speech-form '*logical*' or '*expressing*' *meaning*" while *Sinn*, in its more embracing breadth of application, refers to sense or "meaning *simpliciter*" (Husserl 1931 [reprint 2002: 346]). Husserl's concept of language is more complicated because of its involvement with human psychical experiences and intersubjectivity. Before talking about Husserl's concepts of noematic *Sinn* and content in relation to Uexküll, I will first allude to his 1890 essay on "semiotik".

Very little about the semantic distinction is discussed here except that while *Sinn* represents the sensual aspect of expression, *Bedeutung* its conceptual aspect. When discussing the composite or indirect signs, Husserl does distinguish *bedeutet* from *bezeichnet*: "In the case of indirect signs it is necessary to distinguish: that which the sign *signifies* (*bedeutet*) and that which it *denotes* (*bezeichnet*). With direct signs the two coincide" (Husserl 2002: 23). In his later writings, however, Husserl retains only the pair of *bedeuten /Bedeutung* and extends *Sinn* to the totality of the noematic experience (Derrida 1982: 162; see footnote 6).

> We restrict our glance exclusively to "meaning" (Bedeutung), and "meaning something" (Bedeuten). Originally these words relate only to the sphere of speech, that of "expression." But it is almost inevitable, and at the same time an important step for knowledge, to extend the meaning of these words, and to modify them suitably so that they may be applied in a certain way to the whole noetico-noematic sphere, to all acts, therefore, whether these are interwoven with expressive acts or not. With this in view we ourselves, when referring to any intentional experiences, have spoken all along of "Sinn" (sense), a word which is generally used as an equivalent for "Bedeutung" (meaning). We propose in the interests of distinctness to favour the word Bedeutung (meaning at the conceptual level) when referring to the old concepts, and more particularly in the complex speech-form "logical" or "expressing" meaning. We use the word Sinn (Sense or Meaning simpliciter) in future, as before, in its more embracing breadth of application. (Husserl 1931 [reprint 2002: 346])

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observes: "Let us start from the familiar distinction between the sensory, the so to speak bodily aspect of expression, and its non-sensory 'mental' aspect. There is no need for us to enter more closely into the discussion of the first aspect, nor upon the way of uniting the two aspects [...]".

As can be seen from the last quotation, the writer's main concern in the "Semiotik" essay is the nature and function of sign. According to Husserl, a *Zeichen* (that is, a symbolic or inauthentic sign) can represent an object (*Objekt* or *Gegenstand*) by virtue of a *Merkmal*, which is an intensional property, a distinguishing mark, a characteristic of the object, and is itself a sign, as the author terms it, a *Merkzeichen*. (Husserl 1994: 20–21; 1970: 30–341). The idea of marking or noticing suggests the sign user's conscious act upon an intended object, wherein lies the quality that catches his attention. Even here one already notices Husserl's emphasis on the role of the perceiving subject — a theme which he develops in his subsequent works and which is congenial to Uexküll's concept of animal's attitude towards its environment, albeit with a qualitative and species leap! But at the same time, Husserl believes that the characteristic which identifies an object for the perceiving subject and hence the sign that represents it is intrinsic to the object. This eclectic stance compromises his sign theory and makes it essentially transitive. One may recall in the opening of the essay his false distinction between authentic concept that does not need the mediation of signs and the inauthentic concept which can be represented only by signs.

Husserl provides a typology of signs to represent inauthentic concepts. It consists of half dozen pairs: (1) Extrinsic versus conceptual signs, where the former is what Frege means by proper noun, such as the name, and the latter is noted for its distinguishing *Merkmal*; (2) univocal versus multivocal signs, an instance of the latter being the general name for a concept; (3) simple versus composite signs; (4) direct versus indirect signs; (5) identical versus non-identical, or equivalent versus non-equivalent signs; (6) conventional versus natural signs; (7) formal versus material signs; (8) natural versus artificial signs. With minor revision, some of these categories actually address the Fregean distinction between proper name and common name. More importantly, they point to a common feature by virtue of which something can stand for, in Husserl's word, "deputize" or act as "surrogate" something else (*aliquid stat pro aliquo*). What is it? Husserl believes there is homogeneity between sign and object in that they share identical property and/or the sign may give rise to psychical processes or activities leading to this property.[7] The concept that sign and what it denotes or designates are homogeneous is a popular concept in traditional semiotics. Likewise, few of us would deny that the observer and the observed are homogeneous.

Husserl's analysis of *Zeichen*, which he refers especially to symbolism in logic, includes no doubt language, and he believes that the linguistic sign as an instrument of inference carries corresponding psychical and symbolic aspects (Husserl 2002: 43). As an inauthentic, conventional, deputizing and surrogate sign system, language has only a secondary and subservient role to play, namely, "to serve as marks for remembering, as sensuous supports for psychical activities, as instruments of communication and conversation, and the like" (*ibid.* 44). Although he concedes that "[b]y far the largest part of symbolic representations and judgment processes rests upon language," nonetheless he observes that "linguistic signs quite certainly were not invented for this purpose, but rather to enable people to interact with one another" (*ibid.* 45). Obviously, Husserl, like Uexküll, is not interested in language, but how does he talk about meaning?

The Husserlian equivocation of *Zeichen* and *Merkmal* parallels Uexküll's later usage in his description of functional circle. He uses *Sinn* as two terms freely and interchangeably. Unlike *Sinn* in Frege, where it stands for meaning and only implicitly thought (*Danken*), for Husserl, *Sinn* is both a linguistic and perceptual entity, whose point of departure and return is human subjectivity. We use language to intend an object. This intentional use of language involves an act and its sense is what Husserl terms "noematic *Sinn*," and the object intended by this consciously linguistic act is *Objekt* (intentional object) or

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[7] In virtue of the fact that the deputizing signs (changing from moment to moment in relation to the same fact) either include in themselves, as a partial content, precisely the property upon which the momentary interest bears, or at least possess the aptitude to serve as the beginning or connecting point for psychical processes or activities which would lead to this property — or even to the full concept involved — and which we can arouse and produce wherever it may be required. If, for example, we are concerned with the concept of a sphere, then, like a flash, there appears with the word the representation of a ball, in which the shape along is specifically attended to. This accompanying representation, whose property crudely approximates to the intended concept and thereby symbolizes it, may then disappear once again, leaving only the word remaining. But its appearance nonetheless suffices in order to secure us in a confident grasp of the subject involved. (Husserl 2002: 31–32)

Gegenstand which actually refers to "objective meaning". The phenomenological problem how to move from the immanent of consciousness to the transcendent external world can be solved, suggests Husserl, by an analysis how an object comes to have meaning for consciousness, and how consciousness relates to the object. This procedure is called intentional analysis, or the analysis of the constitution of meaning.

There is continuity between the subjective consciousness, its use of language on the object in external world, one could say. Compared with Frege, who is interested in logic's semantic procedure, Husserl is interested in the human subject's experience in and relationship to the world in which he lives. This kind of relation of "consciousness to an objectivity" is a phenomenological problem, and the problem has its "noematic aspect". Husserl asserts, "The noema in itself has an objective relation, through its own proper 'meaning'" (Husserl 2002: 360). The double nature of noema, with a nucleus and changing characters, enables the "meaning" of consciousness to transmit itself to the "object", that is, its own object, whilst remaining the same (Husserl 2002: 360). In short, every noema has a "'content,' namely, its 'meaning' (*Sinn*) and is related through it to 'its' *object*" (*Gegenstand*) (Husserl 2002: 361).

This kind of analysis of noematic *Sinn* (i.e., meaning-component of an act), of highlighting the act of meaning-giving, of attributing sense to an object, is what Paul Ricoeur identifies as the subjective paradigm of knowledge, traceable to Dilthey but without the latter's scientistic pretension for objectivity. Whereas in Ricoeur's historiography, the two procedures of understanding and explanation are curiously identified with hermeneutics and semiotics (1990), Uexküll does not separate understanding and explanation, but his interpretive project in terms of sign, Husserlian or otherwise, shows his attempt at blurring the distinction, and maybe that of *Naturwissenschaften* and *Geisteswissenschften*. Ricoeur, though apparently not aware of Uexküll, may find it difficult to attribute Uexküll to either category. The biologist's project may be attributed to the category of explanation in his assumption that all animal perception and action in relation to the external world can be explained in terms of the operational procedure of sign processing. But at the same time, this Husserlian interest in *Erlebnis*, though of animal kingdom, including us *homo sapiens* and *homo signans*, and the teleological nature of his

Bauplan, not short of reminiscence of the Kantian purposiveness of nature (*Zweck*, *Zweckmässig*) (Kant 2000: 71), is hermeneutical and phenomenological.

I am aware this is not the occasion to rehearse Uexküll on sign. Some carping formalists may find his semiotics failing to provide a rigorous theoretical model, an analytical tool as discovery procedure, despite the fact that the functional circle is self-explanatory. It works perfectly well as a top-down hermeneutic perceptual model whilst short of bottom-up analytical instrumentality. Furthermore, his concepts of sign and meaning are elusive and vague. For this reason, he is sometimes criticized for being anthropocentric, in other words, of treating animals as human subjects. I would say it is here that Uexküll sees eye to eye with Husserl although one is concerned with animals, the other with human beings.

Uexküll can be said to have followed Husserl in affirming the subjective paradigm, e.g., living organisms' intentional act on the objects of their environment. However, he does not care much about the Husserlian noematic *Sinn*, and less the Fregean verbal *Sinn*, but takes a cue from Kant and Johannes Müller to refer *Sinn* to the immediately sensational aspect, on both the physiological and psychological levels. As with Husserl, there is continuity between this sensational *Sinn* and the intended object. The articulation of this physio-psychological sense in language, i.e., linguistic *Sinn* and its transposition onto animals, is what he calls *Bedeutung*, as in "*Bedeutung des Gegenstandes*" (1928: 86). Incidentally, the word came to be used rather late: the index to the second edition of *Theoretische Biologie* (1928) shows that the word *Bedeutung* is used only once (twice on the same page), compared with *Zeichen* for seven times, *Sinneszeichen* for eight times, and other *Sinnes-* prefixed words for forty times.

One critic has pointed out the close relationship between the Husserlian concept of intentionality via noematic *Sinn* and the Fregean concept of *Bedeutung* via *Sinn*. (McTintyre: 220). One may wish to extend this analogy by relating the Uexküllian *Bedeutung* to the Husserlian noematic *Sinn*, but before the Husserlian *Sinn*, there is the purely sensational, instinctual, and non-lingual Uexküllian *Sinn*. This transference from the sensational *Sinn* to the intended object constitutes the *Bedeutung* of *Umwelt*. Take a well-known example. The tick waiting for its mammalian prey (food-function), not "knowing" exactly what will appear next illustrates the Hursselian/ Uexküllian "act"'s non-specific "phenomenological content". Further analysis of Uexküll's cognitive and pragmatic universe in terms of the Husserlian *Merkmal*, *Zeichen*, content-qualities, horizon, etc., and the Heideggerian hermeneutic circle is beyond the scope of this paper, but will be provided in a sequel on another occasion. Now let me turn to the Platonic parody.

2. A biological parody: Uexküll as textual hermeneutician

Jakob von Uexküll annotates the title of his adaptation of Plato's *Meno* in a footnote which reads as follows:

> The reinterpretation of Nature by biology, which will prevail in spite of all obstacles, has brought our thinking closer to antiquity, giving us the chance to reinvigorate our perused terminology with the help of the resources to be found in the thoughts of the greatest minds of mankind. The way to Plato thus being cleared, I perceived the idea to seek enlightenment on pressing biological questions from the great Sage. As means to this end, I chose to make Socrates continue one of his dialogues, with the adjustment of giving him the knowledge of our contemporary biological problems. Thus some kind of interaction between the Ancients and ourselves is created, to our considerable benefit. (Uexküll, Uexküll 1943: 126)[8]

This *apologia pro sua* has profound implications for anyone familiar with the hermeneutic tradition of textual interpretation. There is no need to reiterate the commonplace that translation, following explanation, is an integral part of textual hermeneutics. And in the modern tradition of philosophical hermeneutics since Heidegger — rather than Schleiermacher, the fusion of horizons has become a trendy notion, a critical term, that is, first articulated by Husserl but later refined by Gadamer and put to use in literary criticism by Hans Robert Jauss of the next generation.

Jakob von Uexküll's interest in recontextualising classical texts is seen on many occasions. A more familiar case is the motto with which he prefaces the famous *Bedeutungslehre* booklet. The English translation has for mysterious reasons deleted the word "Motto" and the source: "Übersetzt von Karl Kindt, Platon Brevier. Karl Rauch

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[8] The translation was done by Edgar Vögel.

Verlag." Maybe Professor Sebeok, as hermeneutician supervising the translation, did not find the information important for semioticians, but I believe it is indispensable to any serious Uexküll scholar, not only one who is interested in archaeology, and for that matter, a Uexküllian archive, but also for someone trying to establish Uexküll as a rhetorician and polemist. Before returning to the *Meno* variation, let me essay an exegesis of the Motto and the dramatic scene the writer sets for his audience and himself.

The Motto is taken from Plato's late dialogue *The Sophist* which deals, among other things, with the problematic of representing truth, both by language and visual art. In a recent paper, I have discussed the issue of iconicity in the dialogue in relation to Peirce (Chang 2003). In a strong sense, the dialogue is a debate over the pros and cons of iconic sign, but this is not the occasion to rehearse it. The Motto Uexküll quotes is a transition in the dialogue at which point conversation alludes to the myth of the Battle of Giants, which actually is a burlesque of the debate on the ontology of the universe by two camps of natural philosophers, the materialists and the idealists. It should be clear now why Uexküll uses this ancient fable inserted into the dialogue of *The Sophist* as his Motto. There is an analogy between the ancient fabulous debate and the current debate between the vitalists and mechanists. I am not saying Uexküll is a member of either camp, or for that matter, of any one of the four camps, past and present. But one should not fail to notice this dialogic answerability dear to Gadamer.

The interesting thing about the Motto is what immediately follows, that is, Uexküll's dramatic point of attack that opens his discourse on meaning. His discourse opens as a Socratic defense, familiar to anyone who has read the early dialogues of Plato, simply called the Socratic Dialogues, after the protagonist, especially *The Apology*, *Crito*, and *Phaedo*. Jakob's (or in literature we would say his persona's) stance is exactly like that of Socrates who is accused of corrupting Athenian youths by preaching falsehood. I know very little German, but my informants, including a native German-speaking professor of linguistics originally from Humboldt University, have told me the stylistic difference in the original German version and the white-washed English translation. Why Jakob displays this kind of archaic martyr complex when summoned to the law court is beyond my comprehension and I believe any of my biologist colleagues is more competent than myself to hazard an answer. Given the tone, said much harsher in German, there is no denying that Uexküll is a fellow-traveller of ancient rhetors, and in this case, a Socrates-surrogate.

Now back to the "Eternal Question" dialogue. Jakob puts it modestly in the footnote cited above that he has put biology into Socrates' mouth. In the sense of disciplinary history, his observation is accurate, but there is no accident in this world of causality. Let me make and take another excursion. We all know Aristotle is a forerunner of life science, but nothing significant can be said about Plato and still less about Socrates. Let me prove that the historian is wrong.

According to Erik Nordenskiöld — a source for Cassirer, "Nature did not interest him [Socrates] in least; the streets of Athens were his haunt, he said, and neither trees nor stones had anything to teach him" (1935: 31). I think the author simply had not read enough — his ignorance of Chinese botanical science long before Linnaeus' classification is another example. I suspect that Jakob's letting Socrates discuss biology is not groundless. This parody by the Uexküll's is also prefaced by a Motto, taken not from *The Meno*, the dialogue to be parodied, but from *The Phaedo*. I am afraid that not many people know that it is in this farewell dialogue that Socrates makes a confession, not to committing crime of seduction, but to giving up biology in youth. Shortly before his drinking the poison, Socrates tells Cebes:

> When I was young, Cebes, I had an extraordinary passion for that branch of learning which is called natural science. I thought it would be marvelous to know the causes for which each thing comes and ceases and continues to be. I was constantly veering to and fro, puzzling primarily over this sort of question. Is it when heat and cold produce fermentation, as some have said, that living creatures are bred? Is it with the blood that we think, or with the air or the fire that is in us? Or is it none of these, but the brain that supplies our senses of hearing and sight and smell, and from these that memory and opinion arise, and from memory and opinion, when established, that knowledge comes? Then again I would consider how these faculties are lost, and study celestial and terrestrial phenomena, until at last I came to the conclusion that I was uniquely unfitted for this form of inquiry. (Plato, *Phaedo* 96a–c)

Socrates admits to being unable to study natural science, including life science, because, among other things, he cannot solve the mystery of origin, growth (96d) and causality (97d). Out of this Darwinian frustration, he turned from "natural philosophy" to philosophy proper and eventually cost his life.

With this, we turn to the Uexküllian biological variations. The topic that launches the debate in *The Meno* is the Greek virtue of *arete* or excellence in worldly affairs, but, as I have argued elsewhere, Socrates' main concern is the paradox of learning in life (Chang 2002). Socrates' interlocutor is Meno, follower of the famous sophist Gorgias. In the course of refuting Meno with his famous strategy of *elenchos*, Socrates turns to a slave boy of Meno's, engaging him to a series of Q&A. Socrates uses geometry to test the slave boy's immanent intelligence, and succeeds in demonstrating that human intelligence is an in-born ability of inference, and it cannot be taught. Now it is immediately at this turning point to the original Platonic dénouement that Uexküll inserts biology to prolong the torture of that hapless slave boy. Characteristically, Uexküll again makes a qualitative species jump, this time from human immanent intelligence to animal instinct, as he is to develop in the space that follows. This echoes his shift, in theoretical writings, from Husserlian human consciousness to animal cognition, both to him being immanent.

Our hermeneutic exegesis is not completed yet. There remains one final question on that eternal question of life: Why does Uexküll insert biology after geometry? The answer cannot be easier. Why? He is a biologist! But again we need to situate the question in Western disciplinary history. One recalls that Kant in *Critique of the Power of Judgment* opens his "Analytic of the Teleological Power of Judgment" (5: 362, Kant 2000: 235) by geometry, and he praises Plato for the Greek philosopher's knowledge of geometry (Ibid., 236). According to Cassirer, in *Die Lebenslehre* Uexküll juxtaposes geometry and biology. Since I have not been able to locate the original, let me quote indirectly from Cassirer:

> The real analogue to the concept of biological form is not to be found in the world of material things or processes with which physics is concerned, but must be sought elsewhere, in the pure relationships of geometry and stereometry.
>
> Structure is not a material thing: it is the unity of immaterial relationships among the parts of an animal body. Just as plane geometry is the science not of the material triangles drawn on a blackboard with chalk but of the immaterial relationships between the three angles and three sides of material parts united in a body so as to reconstitute the structure in imagination. (Uexküll 1930: 9)

Cassirer adds, "With that view the program of 'idealistic morphology' [proposed by Goethe] was being thoroughly resurrected" (Cassirer 1950: 200).

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Семиотик или герменевтик: Якоб фон Юкскюлл

Подобно другим наукам, биосемиотика также имеет свой исторический архив, в котором содержатся работы основателей дисциплины. Одним из таких является Якоб фон Юкскюлл, которого называли первопроходцем семиотики, так как он, независимо от Соссюра и Пирса, развивал теорию знака и значения. Сопоставление 'знака' и 'значения' при этом весьма существенно, ведь получается, что с равным основанием можно Юкскюлла считать как семиотиком так и герменевтиком. Такой новый подход оправдывается продолжительным интересом Юкскюлла к понятиям 'смысл' (*Sinn)* и 'значение' (*Bedeutung)*, начало которого отражено в одной из его первых книг в 1909 году. Данная статья пытается восстановить непосредственный интеллектуальный "исторический горизонт" Юкскюлла, то дискурсивное пространство, в котором находились его современники Гуссерль и Фреге. В частности, предполагается выяснить, как повлияли другие философы языка на размышления Юкскюлла над знаком (*Zeichen)* и объектом (*Gegenstand)*, смыслом (*Sinn)* и значением (*Bedeutung)*, и как Юкскюлл (в качестве феноменологического герменевтика) вписывается в традицию Гуссерля, Хейдеггера и Гадамера. Чтобы предотвратить возможную критику: мол, герменевтика занимается в основном текстовыми интерпретациями, в то время как Юкскюлл в лучшем случае интерпретирует жизнь животных, — в статье рассматривается неоконченная пародия Юкскюлла на диалог Платона "Менон" под названием *Die ewige Frage: Biologische Variationen über einen platonischen Dialog* (1943). Пример такой работы с текстом свидетельствует, что Юкскюлл одновременно является и адресатом, который занимается *толкованием* древних текстов, и адресантом, который записывает свои объяснения для следующей группы адресатов. Такой подход выступает за границы биологии, вступая в область риторики и лингвистической прагматики речевых актов.

Semiootik või hermeneutik? Jakob von Uexküll, taas

Sarnaselt teiste teadustega on ka biosemiootikal oma ajalooline arhiiv, mis sisaldab distsipliini eelkäijatena avastatud ja austatud inimeste töid. Üheks selliseks on Jakob von Uexküll, keda on nimetatud semiootika teerajajaks, kuna ta arendas Saussure'ist ja Peirce'ist sõltumatult märgi ja tähenduse teooriat. 'Märgi' ja 'tähenduse' kõrvutamine seejuures on tähendusrikas, sest ühtviisi põhjendatult võib Uexkülli pidada nii semiootikuks kui hermeneutikuks. Taolist uudset seisukohta võib õigustada Uexkülli pikaajalise huviga mõistete 'tähendus' (*Sinn)* ja 'osutus' (*Bedeutung)* vastu, mis sai alguse tema ühest esimesest raamatust 1909. aastal. Käesolev artikkel püüab taastada Uexkülli vahetut intellektuaalset ajaloolist horisonti, diskursiivset ruumi, milles viibisid tema kaasaegsed Husserl ja Frege. Nii peaks selguma, kuidas olid Uexkülli arutlused, mille teemadeks märk (*Zeichen)* ja objekt (*Gegenstand)*, tähendus (*Sinn)* ja osutus (*Bedeutung),* mõjutatud teistest keelefilosoofidest, ning kuidas asetub Uexküll fenomenoloogilise hermeneutikuna Husserli, Heideggeri ja Gadameri traditsiooni. Ennetamaks ja tõrjumaks võimalikku kriitikat, et hermeneutika tegeleb peamiselt tekstilise tõlgendusega, samas kui Uexküll on parimal juhul loomade elu tõlgendaja, käsitleb artikkel Uexkülli lõpetamata jäänud Platoni dialoogi *Meno* paroodiat pealkirjaga *Die ewige Frage: Biologische Variationen über einen platonischen Dialog* (1943). Niisugune tekstiga töötamine annab tunnistust Uexküllist, kes kehastab samaaegselt vanade tekstide *mõistmisega* tegelevat vastuvõtjat ning teist saatjat, kes paneb kirja oma selgitused veel ühele vastuvõtjate grupile. Selline tegevus ületab juba bioloogia piirid ning hõlmab retoorika ja kõneaktide lingvistilise pragmaatika.

From protoplasm to Umwelt: Plans and the technique of nature in Jakob von Uexküll's theory of organismic order

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Abstract. For Uexküll, biology is the science of the organization of living beings. In the context of *Entwicklungsmechanik*, he refers to Driesch's and Spemann's experiments on the development of embryonic germ cells to prove that self-differentiating processes constitute organisms as natural objects. Uexküll focuses on the theory of such self-differentiating processes or organizations. The notion of organization implies for him a "technique of nature" that is capable of structuring organic and inorganic material according to plans and rules. These plans and rules are part of the overall order of the world. As preformed sign systems or codes, they determine and regulate the development and existence of individual animal subjects in their specific Umwelten.

The universe is made out of subjects and their Umwelten *that are related to each other through function circles to form a plan-governed whole.*
Uexküll 1928

1. Introduction

After various experiments on the nervous system and the initiation of correlated muscle movements of sea-urchins, jellyfishes, octopods and other invertebrates in Heidelberg and Naples, Uexküll published in 1905 his first book: *Leitfaden in das Studium der experimentellen Biologie der Wassertiere*. The first chapter of the book focuses on "problems". One of the main problems for experimental biologists is, according to Uexküll, to explain the "connection that combines the operations (*Leistungen*) of all organs", that is to say from the stimulus of receptor organs to their "answer" in effector organs (Uexküll 1905: 9). Uexküll calls this connection a "reflex" or a "reflex arch".

A reflex is a "chain of intercalated independent operations (*Einzelleistungen*)" between the receptor and effector organs of a single organism. The reflex "passes" through a certain number of organs, and the reflex arch represents the totality of these organs. The "succession" of organs is always the same: receptor, nerve, center, nerve, effector. Each animal exists thus as a "well-ordered bundle of reflexes" (*geordnetes Bündel von Reflexen*), and experimental biology retraces their mechanisms (Uexküll 1905: 9). However, experimental biology has to explain "more" than these mechanisms because the "effectiveness" and "purposefulness" of reflex arches makes it "necessary" to refer to a "construction plan" (*Bauplan*) (Uexküll 1905: 66–67). Only if biologists provide a theoretical basis for such a "plan", does biology acquire the "foundation" (*Grundlage*) necessary to be a natural science on par with chemical physiology, chemistry and physics. Biological knowledge thus depends on both experimental and theoretical (or "analytical") research (Uexküll 1905: 96).

Experimental biologists refer to explanations through descriptions and proofs, and theoretical biologists through definitions and their logical consequences. However, Uexküll thinks that a good scientist has to work in both ways. Scientific definitions must be in accordance with experimental proofs and descriptions, and experiments are performed according to questions that are themselves related to definitions and their analytic context. But experiments cannot explain the correctness of definitions and their consequences. Rather, theoretical biology has to develop the explanatory framework within which experimental biology can be interpreted. Biology thus needs, after a sufficient set of experimental proofs and descriptions, first of all a theoretical "foundation" to become a natural science (Uexküll 1905: 125–130). In an article of 1903 on the biological *Bauplan* of the worm-like *Sipunculus nudus*, Uexküll defines the general objective of "biological" research:

> Biology is the science[1] of the organization of living beings. Organization is called the conjunction of different elements according to a uniform plan for a common

[1] I translate 'Lehre' as 'science'.

> effect. Biology has thus to search in each living form (*Gebilde*) for the plan of its construction and for the elements of this construction. (Uexküll 1903: 269)

Uexküll's answer to the problem of organismic "organization" is that "plans" can explain organismic order, while "mechanical" causation cannot; biologists have to discover these "plans" in nature, and biology is also "the science of the *Planmäßigkeit* of all living beings" (Uexküll 1928: 292). Explanations that refer to "plans" imply for Uexküll that there is something like a "technique of nature" (*Naturtechnik*) as a general principle for order generating processes in organic bodies.

The next sections reconstruct Uexküll's notions of a "plan" and "technique of nature" (*Naturtechnik*). After some remarks on Uexküll's epistemology in the second section, I will outline the experimental settings of two "proofs" that Uexküll uses as standard references to explain organic order. The difference between technical and mechanical biology is the theme of the fourth section. In the fifth section, I will focus on Uexküll's general scheme of action. Finally, metatheoretical assumptions and analogies of order are discussed in the sixth section.

2. Uexküll's epistemological claims

As for Kant, subjectivity means for Uexküll first of all that there is an agent that constitutes its own ›reality‹. However, Uexküll asks not only for possible forms of judgments, but also for the existential mode of the agent of knowledge. For him, explanations of this mode basically refer to "experimental research" in biology (Uexküll 1928: 130). Such research is always performed by subjects, but biologists might be able to "minimize" and control subjective factors that are involved in the production of scientific knowledge:

> Objective events (*Vorgänge*) are in general regarded as events that occur among objects with no consideration for any subject. But we have to admit that we do not know such events, because it is always our own subject that observes the events, and this subject can never be eliminated (*ausschalten*). It can thus only be a question of reducing the subjective accessories (*Zutaten*) to a minimum. (Uexküll 1926: 179)

Uexküll thinks that scientists not only reduce "subjective accessories" in experiments, but even go one step further. He is convinced that experiments in biology "force" us to reconstruct a reality that we could not have "imagined" before, that is to say to rationalize constitutive "factors" of other organized orders than ours, orders that are at the same time organized and organizing. If scientists reconstruct "plans", they can switch from one "subjective" perspective to another, although they can only sketch very general aspects of these "worlds" and their agents, the "animal subjects". It is thus Uexküll's vision to glimpse into "worlds" that have no windows before biology takes form and to sketch the constitutive principle of natural subjects:

> Kant thought of causality as a part of the constitutive activity of understanding (*Verstand*). However, *Planmäßigkeit* was for him a part of the regulative use of reason (*Vernunft*). One could thus have the impression that a plan could never be an integral part of an object, but just an imagined (*hinzugedachte*), though necessary human rule. Driesch has examined this question in detail. He proved that *Planmäßigkeit* should also be a part of the constitutive properties [of objects]. This problem is thus removed (*beseitigt*). (Uexküll 1928: 293–294)[2]

Uexküll claims that biological research changed the explanatory status of the regulative judgment. Kant could only refer to the facts of "descriptive natural scientists".[3] But experiments can "prove" that something is the "fact" beyond these descriptions. Biologists might be able to find scientifically a model of the natural constitution of knowing subjects and to enlarge this model to a common explanatory scheme for all natural subjects that are capable of "actions" or "acts", although such an explanatory scheme of an organizing "factor of nature" is, in a strict sense, just an adequate scheme for "our" thinking:

> Neither the construction plan nor the formation plan have anything to do with the real factor of nature (*Naturfaktor*) that forces physico-chemical processes to take certain paths. Rule and plan are just the form (*Form*) through which

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2 Cf. Uexküll 1931a: 385: "Epistemologically we can assume that we have two thought forms (*Denkformen*) at our disposal to connect (*verknüpfen*) the phenomena of the world with each other: First, the *causality*, that is to say the relation between cause and effect. Second, the *Planmäßigkeit*, that is to say the relation between the part and the whole." See also Uexküll 1922: 137 and 1923: 60.

3 Cf. Uexküll 1923: 60.

we recognize the effects of this factor of nature. The factor itself is totally unknown to us. (Uexküll 1921: 10)

Uexküll's position between epistemological and ontological claims has thus something to do with "adequate" explanations of experimental settings and descriptions of phenomena.[4] For Uexküll, experimental settings and descriptions of objects that belong to organisms "force us" to refer to a certain model of organismic order. These models are, for Uexküll, somehow out there in nature, but we cannot know for sure if they are ›really‹ that what they seem to be.

Uexküll thus relates the deconstruction of the knowing subject to the "experimental investigation" of the order of organic bodies. For Uexküll, this investigation results first of all in the formulation of a new problem, the one of the regulation of cell development.

3. The regulation of cell development and its two experimental proofs

This section has two main parts. In the first part, I will reconstruct some aspects of the scientific environment that influenced Uexküll's theory of organic development, which focused on two experimental "proofs". In the second part, I will discuss Uexküll's interpretation of these "proofs".

Around 1900, research on the development of embryonic cells and discoveries of chromosome movements changed perspectives on the evolution, morphogenesis and hereditary factors of organic bodies. This change began already in the second half of the 19th century, and one of its main actors in the German context was Wilhelm Roux. Like Hans Driesch, he was a disciple of Ernst Haeckel.

In 1888, Roux killed one of the blastomeres of a two-cell-stage of a frog egg with a hot needle. The uninjured cell formed an abnormal gastrulation and developed into a cluster of cells that was interpreted as a half-embryo. The result of the experiment seemed to prove Roux's theory of "determinants" (*Determinanten*) that are differentiated after the cleavage of the primary germ cell, so that each cleavage changes the developmental potential of cells. This mosaic

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4 See also Thure von Uexküll 1980: 149–151.

theory of determining factors in cleavage cells goes back to Weissman's theory of the differentiation of germ cells.

Roux's experimental setting initiated not only a series of new experiments to prove the mosaic distributions of determinants in cleavage cells. It also represented a shift in general interest from rather descriptive comparative mophogenetic studies to experimental research. Roux called this research program "developmental mechanics" (*Entwickelungsmechanik*).

However, the reiterations of Roux's experiment also resulted in new critiques. The development of the uninjured cleavage cell seemed to depend on the influence of the remaining dead cell. One of the main problems was therefore to separate the two first cleavage cells without killing both of them.

A group of scientists of the *Stazione Zoologica* in Naples focused on this problem. From 1898 to 1903, Jakob von Uexküll was the director of the center's physiology department, but he also worked until 1900 with Wilhelm Friedrich Kühne at the university of Heidelberg. Hans Driesch began his work at the institute in 1891. In the same year, one of his colleagues, Curt Alfred Herbst, developed a new technique to separate the blastomeres of a sea-urchin egg in using calcium-free seawater.[5]

Driesch shook the embryos to separate the blastomeres, but he also used Herbst's method.[6] The isolated blastomeres developed not into Roux's half-embryos, but into completely formed, albeit smaller sea-urchin larvae of *Echinus microtuberculatus*. In 1892, Driesch published the results of his experiments in the *Zeitschrift für wissenschaftliche Zoologie*.[7] He concluded that germ cells contain not a mosaic of determining factors that are separated mechanically during the cleavage, but regulative properties instead. These regulative properties in embryonic cells belong for Driesch to a "harmonious-equipotential system" that is active in cells of the blastula. Its formative or "prospective potential" changes during the cell development. Driesch thus distinguished between the "prospective" and the "actual potential" of cleavage cells. In his *Philosophy of the Organic*, which was published after his Gifford-lectures in 1909, he referred to a non-

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5 A different technique had been used by H. Endres (and later on also by Spemann) in 1895. Endres laced the two cells of the blastula.

6 Cf. Penzlin 2000: 444–446.

7 Driesch 1892.

mechanical, "individualizing causality" that develops as a self-differentiating "entelechy" to explain the theoretical framework of regulative properties in embryonic cells.[8]

Hans Spemann also focused on the regulative properties of early cell developments. Spemann, a disciple of Theodor Boveri, worked first in Würzburg on the development and formation of lens cells. In 1901, he began to use a new technique to transplant cell fragments from one embryo (the donor) into another embryo (the host) with a micropipette. After he went to Freiburg to take the chair of Franz Dorflein in 1919, Spemann performed various experiments to understand the development of the amphibian nervous system. His main interest was to specify the moment in which embryonic cells loose their totipotent regulative properties. While there are only few visible differences between the cleavage cells of the blastula in amphibian embryos, these cells are slowly rearranged in the late gastrula phase to form three germ layers (ectoderm, mesoderm and endoderm). The determination of the fate of embryonic cells thus seemed to happen between the early and the late gastrula.

One of the first visible organ systems during gastrulation is the nervous system. Spemann and other investigators, such as Johannes Holtfreter, knew that detached or explanted parts of the presumptive neural tube cells from an early gastrula do not develop into neural tissue. However, presumptive neural tube cells of the late gastrula had that potential. Because the neural plate always appeared in a constant position, Spemann suggested that the invaginated cells at the dorsal lip (which form under normal conditions the roof of the achenteron directly beneath the neural tube cells) are able to determine the fate of ectoderm cells.

The crucial experiment to prove that there is something like a "differentiating" or "organizing center" in the gastrula of amphibian eggs was performed by Spemann and his doctoral student Hilde Mangold in 1924.[9] They used two species of salamanders with a different pigmentation (the nearly white *Triturus cristatus* and the brownish *Triturus taeniatus*) to retrace the development of the dorsal lip cells that had been transplanted from the donor's blastopore into

[8] For Driesch's theory of self-differentiation and cell development see Mocek 1998.

[9] For a detailed description of the experiment see Moore 1972: 265–274 and Fässler 1997.

the opposite ventral ectodermis area of the host embryo in an early gastrula. Not only did the host's blastopore invaginate normally, but the donor cells also developed into a small archenteron and later produced neural folds. The neural folds were composed of host cells. Under normal conditions, these host cells would have developed into an epidermis. In addition, the new folds occasionally almost formed an entire embryo.

Spemann interpreted this effect as an "induction" of an organizing center in the dorsal lip, and called this center an "organizer" (*Organisator*). After Spemann's and Mangold's experiment, it seemed that, in the early phase of gastrulation, presumptive ectoderm cells have an equal "prospective potential", and that their fate depends on the influence of an "organizer" situated in the area of the dorsal lip.

Uexküll refers frequently to Driesch's and Spemann's experimental "proofs".[10] However, these "proofs" are part of his own theory of cell development. He distinguishes three phases or "steps" (*Schritte*) during the development of embryonic cells: First, the "cell differentiation" (*Zellteilung*) of germ cells in the "mother cell" (*Mutterzelle*) or the "primary shoot" (*Primärsproß*), second "tissue differentiation" (*Gewebeteilungen*) and third "organ formation" (*Organbildung*).[11]

Cell differentiation, tissue differentiation and organ formation represent, in general, the three basic steps of the organismic "*Gefügebildung*" (structure formation).[12] *Gefügebildung* is the "temporal form" (*Zeitgestalt*) of organic bodies. During *Gefügebildung*, organic bodies develop gradually into a "close mechanism" that characterizes the "spatial form" (*Raumform*) of the adult organism (Uexküll 1922: 129). The temporal form always expresses a directional process or a "path" (*Weg*) that ends in the formation of a spatial form.[13] Uexküll thinks that such a directional process is similar to a "technical process" that operates according to a plan. Each developmental phase that characterizes the "temporal form" of the *Gefügebildung* could thus also be

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[10] For references to Driesch and Spemann, cf. Uexküll 1920: 68–69; 1927: 12–14; 1928: 229–231 and 249–253; 1929a: 150–155; 1929b: 41–43; 1931a: 388; 1937: 197 and 1938: 137.

[11] Cf. Uexküll 1922: 144–156.

[12] '*Gefüge*' could be translated as "form" or "structure".

[13] Cf. Uexküll 1928: 244: " […] each spatial relation in the body results from a specific process (formative process)".

interpreted as a "technical path" (*technischer Weg*).[14] However, only the organismic "plan" is itself "creative" (*bildend*) or "active", while the technical "plans" of human machines are just "passive" representations of mechanical connections.[15]

For Uexküll, each cell differentiation is regulated by "partial plans" that depend on the general plan of the organismic "organization".[16] The *Gefüge* that results from the developmental process finally "inhibits" (*hemmen*) the process: "*Gefüge* inhibits the *Gefügebildung*"(Uexküll 1922: 146–147).[17] At the end of the tissue formation, the *Gefüge* forms a functional unit of organs that interact as a "close mechanism".[18]

The *Gefüge* of the protoplasm and of the growing organism is thus at the same time a material *Gefüge* of visible structures and of "immaterial" plans that "induce" the *Gefügebildung* according to certain "rules". This is the "technique of nature" that appears during organic development.[19]

Uexküll thinks that it is "impossible" for humans to "imagine" how immaterial plans could "act" on matter. However, he points, in a similar way to Kant in his *Third Critique*, to the possibility that phenomena of the *Anschauungsraum* "force" us to refer to plans and their "over-mechanical" faculty to produce temporal forms:

> I wanted to show that [...] the time forms are not problematic any more if I take as a basis the *Anschauungswelt* instead of the *Vorstellungswelt*, because they are a necessary consequence of the *Anschauungswelt* itself. The *Anschauungswelt* encloses (*beherbergen*) a broader manifoldness than the *Vorstellungswelt* [...] (Uexküll 1927: 25)[20]

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14 Cf. ibid., p. 145.

15 Cf. Uexküll 1938: 58. "If the performance (*Arbeitsleistung*) of machines is called 'mechanics' (*Mechanik*), but the construction and form generating process 'technique', we can make a difference between the 'mechanics of nature' and the 'technique of nature'." See also Uexküll 1929b: 39.

16 In some germs, however, specific groups of cells or "secondary shoots" (*Sekundärsprosse*) differentiate very early. Uexküll calls them "mosaic germs" (*Mosaikkeime*). (Cf. Uexküll 1929a: 41.)

17 Uexküll (see also Uexküll 1905: 9) refers to experiments on lens formations and their interpretations by Bernhard Dürken and H. Wachs.

18 Cf. ibid., p. 149.

19 Cf. ibid., p. 155.

20 However, Uexküll does not always make a clear distinction between *Vorstellungswelt* and *Anschauungswelt*.

But the *Anschauungswelt* of modern science is different from the descriptions of Kant's observer. Experimental research, "totally unknown in Kant's epoch" (Uexküll 1923: 60), "proved" that there have to be self-regulative processes in nature. These "proofs" are related to the experiments of Driesch and Spemann. Uexküll needs them for two "facts".

First, Driesch's experiments on the development of sea-urchin embryos "proved" that the regulative factor in the germ is "independent" from its material expression.

> Only the experiment has clarified it. If, as has been assumed, there would be a germ *Gefüge* that is similar to the one of the future body, it must be divided in half when the germ is divided in half, and both halves must produce two half animals. This is not the case: Half a germ always produces an entire animal, although of half height. This insight is due to Driesch who scattered the whole science of development (*Entwicklungslehre*). (Uexküll 1920: 68-69)

There is thus nothing "folded" or "tangled" (*verwickelt*) in the germ that could be seen by a comparative anatomist who searches "corporal forms". Rather, the "lower anatomy of corporal forms" has to be replaced by a "higher anatomy of generating forms (*Bildungsformen*)" (Uexküll 1927: 23). The anatomy of generating forms must define the relation between immaterial plans and cell differentiation. But such an interaction cannot be explained by mechanical laws. Generating forms are temporal forms, and they appear as technical paths that produce order. There is a second experimental "proof" that this dynamic process is regulated through different "organizing plans":

> Spemann could show that an ›organizing center‹ appears in the beginning of the gastrulation of Triton in the upper lip of the blastoporus from which, as he says, emerge ›differentiating currents‹ (*Differenzierungsströme*) that impose on the hitherto undifferentiated cells of the outer germ layer a new direction of formation (*Gestaltungsrichtung*). From cell to cell run new impulses, as I expressed it, to force a new technical path on them. (Uexküll 1929a: 157)[21]

The experiments of Spemann and Driesch thus force us to develop a new imaginative space of regulative processes. To define life cannot mean, as Uexküll highlights in his 1927 paper with the title *Definition*

21 Spemann (Uexküll 1929a: 153) has thus "proved the independency of the impulse from matter in the most convincing way".

des Lebens und des Organismus, "to construct logical notions about the essence of life" (Uexküll 1927: 1). Rather, one has to "refer to" (*darzulegen*) and discuss the "scientifically examined experiences (*wissenschaftlich gesichteten Erfahrungen*) that characterize life".[22] It is "impossible" to reduce temporal to mechanical forms. But scientific modeling can get very far:

> If the ideal that I have in mind, that is to say to confine the formation process (*Formbildung*) in the test tube, is reachable, cannot be said. But it is possible to come much closer to the problem if one has found the right question. (Uexküll 1920a: 179)

The "right question" is for Uexküll the one that investigates the *Planmäßigkeit* of organic order. The answer to the question must be a scientific model that mediates between descriptions, experimental proofs and definitions.

4. From development to existence: the scientific model of organismic self-differentiation

The whole organism, the "cell", for Uexküll is an autonomous unit, or an "*Autonom*" (*Zellautonom*), as he calls it, with different prospective potentials.[23] It is the "elementary organ" (*Elementarorgan*)[24] of the organism, its "living module" or "building block" (*Baustein*)[25] that "acts" according to its own "plan" as a "cell subject" (*Zellsubjekt*)[26]. It cannot "act" in a dead, but only in a "living organism".[27]

Each cell contains a "nucleus" (*Kern*) and "protoplasm". Along with the nucleus, the protoplasm represents the "matter of life" (*Lebenstoff*).[28] No man-made machine uses "protoplasm" to structure

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[22] Uexküll 1927: 1. A similar argumentation can be found in the beginning of 'Technische and mechanische Biologie' (Uexküll 1929a: 129).
[23] Cf. Uexküll 1928: 177.
[24] Cf. Uexküll 1928: 176.
[25] Uexküll 1928: 177.
[26] Cf. Uexküll 1929b: 41.
[27] Cf. Uexküll 1929b: 41.
[28] In the following paragraphs, I will use the word "protoplasm" in brackets if it means protoplasm and nucleus.

its units. Only organisms are self-regulative, and only organisms are made out of "protoplasm".[29]

Research on the relation between the "protoplasm" and the organism is "basic" and necessary for any progress in biological knowledge.[30] "Protoplasm" is for Uexküll "not a substance in the common sense, but a mixture (*Gemenge*) of substances in a state of perpetual metabolism".[31]

Uexküll's answer to the question whether "the physical laws of metabolism" or the "organization" of organisms could explain the "origin" of a "perpetual regeneration" in a self-regulative order is clear: there must be a ruler that "coordinates" (*regelt*) the processes of formation and maintenance, and there must also be a ruler if these processes are in disorder. Without a ruler, processes could not be "harmonized", they would "run out" (*sich tot laufen*) and end in disorder.[32]

There are two different general plans in all organisms: one for "formation processes" (*Gestaltungsvorgänge*) and one for "regeneration processes" (*Regenerationsprozesse*) in the larger sense, that is to say processes that also include metabolism. The first one is the "development plan" (*Entstehungsplan*) or "active edification plan" (*aktiver Erbauungsplan*), and the second one is the "maintenance plan" (*Betriebsplan*) or "active construction plan" (*aktiver Bauplan*).[33] While the development plan is the plan of the temporal path of the organism's formation, the maintenance plan is basically a "performance plan" (*Leistungsplan*)[34] of a "functional unit" (*funktionelle Einheit*)[35] between organs:

> Only if the organism is entirely developed and its performance (*Leistung*) has begun, does the *active construction plan* that rules the regenerative processes take the place of the *active edification plan*. (Uexküll 1927: 22)

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[29] Cf. Uexküll 1927: 18 and 1928: 146.
[30] Cf. ibid.
[31] Ibid.
[32] Cf. Uexküll 1927: 18–21.
[33] Cf. Uexküll 1929a: 42 and 1938: 135. Uexküll (1929: 39) also refers to the "active construction plan" as a "life factor" (*Lebensfaktor*) because "it maintains the corporal mechanism" constantly in its functional order.
[34] Cf. Uexküll 1938: 135.
[35] Uexküll 1922: 156.

Both general plans are "active" because they initiate constructive processes. They are both — as an "edification manager" (*Bauleiter*) or as a "maintenance manager" (*Betriebsleiter*) — rulers of the cell subject. Uexküll calls the first one "organizator" (*Organisator*)[36] and the second one "mechanizator" (*Mechanisator*)[37]. Both plans produce a passive "construction plan" of mechanical structures, but only the *Gegengefüge* of the "mechanizator" is a "functional unit" of organs. Each plan acts "independently" and is "blind" to the other.[38] However, they are "correlative" because the *Gefüge* of the *Bauplan* is the *Gegengefüge* that inhibits the formative processes of the *Erbauungsplan*.[39] They "act" independently and yet in harmony as two plans that are necessary for organismic life. There is no functional unit without formation, and no temporal form exists without its reproduction in functional units. Within the limits of possible structural variations, reproduction is thus just the repetition of the necessary conditions of organic existence, from the *Erbauungsplan* to the *Bauplan*, and from the *Bauplan* to the *Erbauungsplan*.

If the "appropriate material" is available, the perpetual regeneration (metabolism) of the organism and the repetition of its two major plans — the formation plan and the construction plan — can produce "normal" results. However, malformations appear "naturally" because of the blindness of the partial plans to their overall plan. There might not be enough material or space for the proper development and functioning of parts, but other parts do not "adapt" to this situation. If such a problem occurs during the development of the organism, serious malformations can result because the *Gegengefüge* of the *Bauplan* cannot inhibit and "correct" developmental processes (Uexküll 1929a: 40–42).

That life is basically a dynamic and continuously repeated "big cycle" between *Erbauungsplänen* and *Bauplänen*, with short phases of deconstructions or "dissolutions", becomes most visible in unicellular organisms or "protoplasmic animals" (*Protoplasmatiere*).[40] Amoeba, infusoria, and especially paramecium and *Plasmodium vivax*, are for

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[36] Cf. Uexküll 1923: 58–59.

[37] Cf. Uexküll 1929: 29.

[38] Cf. Uexküll 1929a: 40–42. For the "blindness" of plans, Uexküll refers to Curt Alfred Herbst's experiments on the regeneration of crayfishes (cf. Uexküll 1929a: 40).

[39] Cf. Uexküll 1929a: 42.

[40] Cf. Uexküll 1928: 148.

Uexküll standard reference objects.[41] These organisms cannot form a functional unit of different organs. Rather, formative and constructive periods succeed each other constantly during their life. Infusoria "form a vesicle around the nutrient drop and transform it successively into a gullet, a stomach, an intestine and finally into an anus" (Uexküll 1929b: 73).[42]

In pluricellular organisms, and especially in higher animals, a single formative period is followed by a functional unit of various organs. However, in the beginning, there is just "protoplasm" that contains the "primary material" (*Urmaterial*) (Uexküll 1938: 141) of a "seemingly unlimited formative potential (*Bildungsmöglichkeit*)" (Uexküll 1920b: 178).

In this primary material, "ferments" initiate "specific processes" that can express various "properties" (*Eigenschaften*) of the "protoplasm" (Uexküll 1920b: 178). The ferments are released from the nucleus through "impulses", but they "act" also as "stimuli" on the nucleus.[43]

The impulses always appear as "impulse systems". They initiate the release of ferments, and this "act" is a non-mechanical or "immaterial" effect.[44] Impulses thus "act" as "non spatial initiators of spatial processes" (Uexküll 1928: 245). Their influence on the protoplasm is not a physiological, but a "biological event" that expresses the "potential" of the "cell subject" and its "subject rule" (*Subjektregel*) to develop into and exist as an organism.[45] The "animal subject" represents "*the new natural factor* (*Naturfaktor*) *that biology introduces*" (Uexküll 1931a: 389). However, there are other "factors" that are active during the cell development.

"Factors" can be characterized by their "faculty to impose a formative process on a mechanical *Gefüge*" (Uexküll 1928: 245). Uexküll defines the role of genes as dependent "factors" of the cell subject. There are various versions in his texts of how they operate

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41 Cf. Uexküll 1920a: 147–148; 1920b: 73; 1922: 133; 1929b: 39; 1931a: 387 and 1938: 137–140.

42 For Uexküll's analysis of the different life periods of *Plasmodium* see Uexküll 1922: 133.

43 Cf. Uexküll 1920b: 72–73.

44 Cf. Uexküll 1920b: 178.

45 Uexküll (1923: 60) also calls the "subject rule" the "idea of the developing subject". The impulse systems are the "imperatives" of this development. (Cf. Uexküll 1920a: 177.)

during the formation processes. In an article from 1920, Uexküll pointed to the double role of genes to "act" as "corporal properties" and to "obey" impulses that "act" non-mechanically. Genes form "autonomous elementary units" and are "probably situated in the coloured substance of the nucleus in the germ cell". During the cell division, the genes are distributed among the new cells, and the "final cells accommodate (*beherbergen*) only genes that are necessary for the construction of their specific tools" (Uexküll 1920b: 72). Uexküll also identifies genes with specific units or "chromomeres" that "compose" the chromosomes of the nucleus (Uexküll 1922: 140).[46] Each "chromomere" or gene has a specific effect on the protoplasm and represents a "firmly circumscribed property" (*fest umschriebene Eigenschaft*) of the cell.[47] Genes thus operate as developmental, regenerative and hereditary "factors". They release different sequences of ferments according to sequences of impulse series or "act" themselves as ferments:

> It is very instructive to combine the theory of organizators with Mendel's theory. Mendel found that there are developing structures (*Anlagen*) as autonomous factors in the germ of living beings for their future properties. His theory says nothing about the way in which these factors reach their goal (*sich durchsetzen*). We know from recent research, especially from Morgan and his school, where we have to search for these ›genes‹, as these factors are called; they are situated in the chromatin stripes of the nucleus of the germ cell. In general, genes are regarded purely as matter. They are supposed to have the ability to act (*wirken*) as ferments when they enter into the protoplasm of the cell body and to initiate certain processes [...] It is clear that these initiations or ›impulses‹ have to occur in the right combination and in the right succession to prevent all processes from becoming disordered. This is where Spemann's theory of organizators which rule the succession of form generating processes through their law-making interventions comes into play (*gesetzgebendes Eingreifen*). (Uexküll 1923: 59)[48]

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[46] For the role of the chromosomes as hereditary factors and during the mitosis, see Uexküll 1928: 241–247 and 296–301.

[47] Uexküll 1922: 140. Uexküll refers also to Wilhelm Johannsen's definition of the "genotype" to characterize the "members" of a "race". The "genotype" is for Uexküll more characteristic to identify the "race" than the "properties of the developed body". (ibid.)

[48] For references to Morgan and Mendel see Uexküll 1927: 40, 1928: 240–247 and 1938: 140.

After the *Gefüge* of the *Bauplan* has been developed, the "role" of the genes ends. During the construction period, they only serve the regeneration of "destroyed or injured tools".[49] The "role" of the genes is thus very similar to that of the organizers which "dissolve" into partial organizers to control certain "germ areas" (*Keimbezirke*) until the end of the formative period.[50] In a late article of 1938, Uexküll introduced a new organizing element, the "commander genes" (*Obergene*) (Uexküll 1938: 141–143). After the formation of the blastema, the commander genes "determine" the "activity" of the "obeying genes" (*Untergene*) to form specific tissues in certain cells (Uexküll 1938: 143).

When the functional unit of the "cell machine" starts to work, the "nucleus" becomes the "autonomously ruling chemical center of the cell" (*autonom regierendes chemisches Zentrum*) (Uexküll 1928: 183). It releases various ferments that maintain the metabolism of the cell (Uexküll 1928: 183). As during the formative period, "impulse systems" initiate the release of ferments in groups and in certain sequences:

> The autonomous center of the cell is hit by a differentiated impulse, or, more correctly, by a differentiated series of impulses that compel (*veranlaßt*) the nucleus to regulate the metabolism in the protoplasm in such a way that certain products are released into the body of the cell. Together these products form a functioning mechanism. (Uexküll 1928: 183–184)

The "differentiated" or "regulated impulse series" that appears during the construction period results from the activity of the "mechanizator". The mechanizator "makes a certain choice (*Auswahl*) within the bundle of ferments (*Fermentbündel*) [of the nucleus] [...] and forces the chosen ferments to appear in a certain succession" (Uexküll 1928: 184). Missing products for metabolistic processes and products for regenerative processes are available from the "basic tissue" that extends itself through tiny "protoplasmic bridges" over the whole body of the organism (Uexküll 1928: 184–185).

In analogy to Johann Müller's specific energy, Uexküll refers to "biological factors" to describe the "initiation" (*Auslösung*) of move-

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[49] Cf. Uexküll 1920b: 73.

[50] For the relation between partial organizers and "germ areas" Uexküll refers to the experiments of Hermann Braus (1867–1920) who worked with Hans Spemann in Würzburg. (Cf. Uexküll 1938: 141–142.)

ments in cells and organs, especially of muscle contractions.[51] During the construction period, "factors" are, in general, necessary to "start" and maintain the operational mode of the mechanic apparatus of the organism. They "act" through impulses, and Uexküll calls these impulses "performative impulses" (*Leistungsimpuls*) because they function as "signs" that mediate between the ruler and the mechanical movements (Uexküll 1928: 186–187). Uexküll thus integrates performative impulses as "signs" into a general scheme of organismic "action".

5. The general scheme of action: Self-regulation and the function circle

For Uexküll, each "action" (*Handlung*) can be described as a "combined movement"[52] that establishes certain "relations" (*Beziehungen*) between various agents. The relation is itself an "act" or an "effect". One entity "acts" on or "effects" (*wirkt*) the other.[53] Objects "act" on objects mechanically, objects on "subjects" through a "stimulus", "subjects" on objects through an "impulse" and "subjects" on "subjects" through an "induction".[54]

Inductions occur if "two complementary factors" are present, and if one "calls" (*ruft*) the other.[55] Uexküll often refers to the induction of "lens formations" through presumptive retina cells that result in "complete functional units" of eyes.[56] However, how the "call" acts on a "factor" or a "plan", is unknown.

All relations in which "subjects" are involved are "biological". There are three of them: stimuli, impulses and inductions. During the formation and construction period of the organism, stimuli, impulses

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[51] Cf. Uexküll 1928: 185–186.

[52] Cf. Uexküll 1903: 276.

[53] In the context of perception and action, Uexküll (1931a: 389) also describes the relation between "action" and "reaction" as a "question and answer game".

[54] Cf. Uexküll 1931a: 388.

[55] Cf. Uexküll 1931b: 331. Uexküll (1931b: 330) also describes induction as a "strange psychoid act" (*merkwürdiger psychoidaler Vorgang*).

[56] Cf. Uexküll 1929b: 43 and 1931a: 389. In 1901, Spemann published an article on lens formation in the neural stage of *Rana fusca*. He cauterized the presumptive retina cells and observed that the eye and the lens was missing on the operated side of the tadpole.

and inductions are related to each other through a processing scheme. This scheme is a variation of a reflex scheme and dates back to Uexküll's early works on the contraction of muscles in invertebrates.[57] However, the organism is not a "skillful intertwined bundle of reflex arches with perfectly built receptors and effectors in an autonomous machine that responds through its own operations to the influences (*Einwirkungen*) of the outer world" (Uexküll 1928: 147). Rather, Uexküll's scheme involves a threefold relationship between reflex mechanisms, signs and subjects. Such a relationship is "organic" because relations depend on the intervention of the "subject" and are thus "indirect" instead of being "direct" in inorganic relations.[58]

Within an organism, Uexküll describes organic relationships in general as "individual function chains" (*individuelle Funktionsketten*) with three "links" (*Glieder*): "reception — conduction of stimuli — effect" (*Rezeption — Erregungsleitung — Effekt*) or "perception — regulation — action" (*Merken — Steuern — Wirken*).[59]

The relation between organisms is for Uexküll a relation of an animal subject to its *Umwelt* in which other subjects appear as objects.[60] There is only induction between organisms if one organism uses "parts" of the other for its development and existence. Each organism thus always "acts" within its own function chain.

In such a function chain, stimuli can operate as "*Merkzeichen*" (perception clues), and "impulses" as "*Wirkzeichen*" (action clues). Within the "world" that surrounds the subject, *Merkzeichen* become "*Merkmale*" (perception marks), and *Wirkzeichen* (as "products" or "effects") "*Wirkmale*" (action marks).[61] *Merkmale* and *Wirkmale* constitute the "*Umwelt*" of the subject. They are "set out" (*hinausverlegt*) by the subject.[62]

As stimuli and impulses, perception and action clues play a performative "role" for the expression of the subject rule. The *Wirkzeichen* "extinguishes" or "destroys" (*vernichtet*) the *Merkzeichen* that

57 Cf. Uexküll 1903: 270.
58 Cf. Uexküll 1920b: 84.
59 Cf. Uexküll 1920a: 175.
60 For semantic implications of Uexküll's theory see Kull 1998.
61 *Ibid.*
62 Cf. Uexküll 1931a: 389.

comes from the "object" or the *Gegengefüge*.[63] A pattern or a "plan" of the animal subject corresponds to each perception clue, and this "*Merkplan*" (perception plan) with its *Merkzeichen* induces a complementary "*Wirkplan*" (action plan) with its *Wirkzeichen*:

> The perception plans induce in the action organ the action plans that are complementary to them, and the impulses of the action organ carry out the right innervations. (Uexküll 1903: 390)[64]

Merkzeichen thus initiate, as "performative impulses", *Wirkzeichen* through the intervention of a subject.[65] Each organismic subject expresses itself through these relations.

If the subject is regarded as the center of its perceptions, it exists within an "*Umwelttunnel*" in which its "*Umwelt*" is made out of *Merkzeichen* and *Wirkzeichen* of the *Gegengefüge* of the surrounding objects.[66] In this monadic *Umwelttunnel*, other organismic subjects can only "appear" as marks and clues.

Uexküll sketches various schemes of the relationship between *Merkzeichen*, *Wirkzeichen* and the subject. In an article of 1931, he calls this relationship a "function plan" and refers to the example of an ape and an apple (Fig. 1).

In a different version, that is often referred to, the inductive process is not indicated and the clues are generalized to "worlds" that seem to characterize the outside world of the "animal subject". However, the scheme is somehow misleading because it is not clear what the inside of the "inner world" of the subject is. Uexküll calls this scheme a "function circle" (Fig. 2).

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63 In the scheme of the ape and the apple (Fig. 1), the "touch mark" (*Tastmerkmal*) of the apple is "extinguished" (*ausgelöscht*) through the "bite" of the ape. For Uexküll the main problem of "complicated actions" is to find the "right action mark" (*richtige Wirkmal*) that extinguishes the perception mark (Uexküll 1931a: 389).

64 Cf. Uexküll 1931b: 331.

65 Cf. Uexküll 1928: 187.

66 Cf. Uexküll 1920a: 176; and 1928: 108. Instead of *Umwelttunnel*, Uexküll (cf. 1920a: 176) also uses the word "*Lebenstunnel*" (life-tunnel).

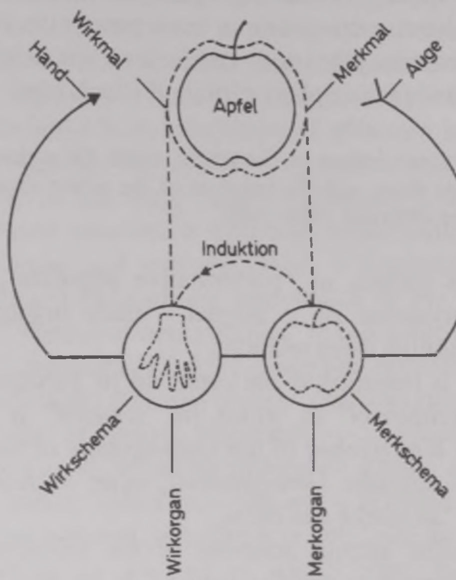

Figure 1. Function plan of an ape that grasps an apple (Uexküll 1931b, reprinted in Uexküll 1980: 329.).

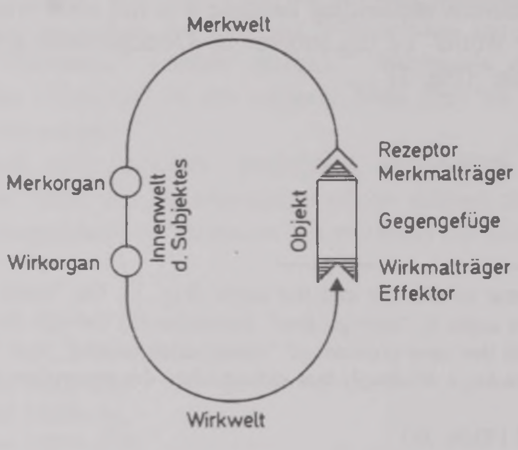

Figure 2. Scheme of a function circle (from Uexküll 1980: 330).

In the organismic world, function circles appear in different, more or less complex "organizations". They extend from simple reflex arches to actions with multiple and interconnected reflex systems, and from unicellular organisms to men. In his *Theoretische Biologie*, Uexküll distinguishes between "instinct actions" (*Instinkthandlungen*), "plastic actions" (*plastische Handlungen*), "experience actions" (*Erfahrungshandlungen*) and "controlled actions" (*kontrollierte Handlungen*) (Uexküll 1928: 305–307). The differences between them depend mainly on the faculty of the subject to initiate the same action with different *Merkmale*. Reflexive capacities (for example memory, experience or analytical skills) can establish new "secondary clues".[67] Uexküll often refers to Pawlow's experiments as a "proof" for the plasticity of the *Merkwelt*.[68]

However, the "complementarity" of the *Merkwelt* and the *Wirkwelt* is a precondition for their regulation through an animal subject In this context. Uexküll often alludes to "life energies" (*Lebensenergien*) that express themselves in harmony.[69] But he uses these terms only to point to an unknown "origin" of biological order. The best analogy to understand the origin of this order is, for Uexküll, the order that is produced through the composition of a melody or a symphony.[70] Music thus comes into play when Uexküll wants to go beyond descriptions and proofs to sketch the "*Planmäßigkeit* of the world power that creates subjects" (Uexküll 1920b: 74).

6. The "composition" of the world and its melody

The *Planmäßigkeit* of the world is a "rule" to create order. Stimuli and impulses are "both expressions of the same self-acting cell dynamic" (Uexküll 1931a: 388), and this cell-dynamic expresses itself like an "I-tone" (*Ich-Ton*). The I-tone is the "self-tone" (*Eigenton*) of the cell, and not a "tone of use" or "usefulness" (*Nutzton*) as in human machines (Uexküll 1931a: 386).

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67 Cf. Uexküll 1903: 390.

68 Cf. Uexküll 1928: 169–171, 305–306; and 1931a: 388.

69 Cf. Uexküll 1920a: 176–177.

70 Uexküll refers to this analogy throughout his *Bedeutungslehre*. Cf. Uexküll [1934] 1956: 105–159.

Various receptor and effector cells are combined in "centers" that "direct" (*leiten*) the excitations in different "ways" (*Bahnen*). This "regulation" (*Steuerung*) is "influenced through the 'mood' (*Stimmung*) of the whole, which can change periodically" (Uexküll 1920a: 175–176). The mood of the whole is "decisive" (*ausschlaggebend*) for the existence of "thresholds" that block excitation: "a low tension lets the stimulus in, a high tension dims it".[71]

The I-tone of an organism that acts in its specific *Umwelt* is not the result of a gradual "adaptation" (*Anpassung*) in time (as "Darwin" thought) or of the influence of the environment on the individual development of an organism (as "Lamarck" thought), but of its "adjustment" (*Einpassung*)[72]:

> We have to accept the fact that there are, on the one hand, the properties of the outer world that have no determining influence [on the development of the germ], and that there is, on the other hand, the living germ that has no organs which could inform it about these properties. However, we can see that the germ produces with complete certitude certain anti-properties that are adjusted to a group of certain properties in the outer world. (Uexküll 1928: 321)[73]

Organisms "fit" into their *Umwelt* through their receptor and effector organs as the "joints" (*Fugen*) and "tenons" (*Zapfen*) of a harmonizing plan.[74] For Uexküll, it is a "wonderful fact" (*wunderbare Tatsache*) that "there are in the outer world certain properties (*Eigenschaften*) in a limited number, for which the animal must, if it is supposed to thrive, form certain anti-properties (*Gegeneigenschaften*) in its corporal construction that fit as joints and tenons into the outer world" (Uexküll 1928: 320). Each anti-property of the animal subject always fits into a "group of properties" in the Umwelt (Uexküll 1928: 321). Conversely, the *Umwelt* represents from the perspective of the subject the "complementary properties" or the "*Gegengefüge*" of its own properties.[75]

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[71] Cf. Uexküll 1920a: 176 and 1931a: 391.

[72] Cf. Uexküll 1928: 317–321.

[73] Cf. Uexküll 1928: 317–321. Uexküll thought that the impulse series can be "excited" (*angeregt*), but not "created" (*gebildet*) from external influences (Uexküll 1928: 313).

[74] Cf. Uexküll 1920a: 176.

[75] Cf. Uexküll 1920b: 76: "Each property of a living being has its complementary property in the *Umwelt* to accomplish the relation (*um die Beziehung voll zu machen*)". See also Uexküll 1927: 20–21.

Each "gene" is "interwoven" (*verflochten*) in the *Planmäßigkeit* of the animal subject, and each property that expresses the "gene" during the development of the animal subject also has a complementary property in the *Umwelt* of that subject. However, in "biological relationships" properties of the subject can be "bound" to multiple complementary properties, and different subjects "use" (*verwerten*) these options individually to create "richer" or "poorer" *Umwelten*.[76] All *Umwelten* "fit" again into each other, although no I-tone "acts" for the expression of other I-tones. Organisms live in their proper "worlds", and yet every "world" is part of a universal harmony in which an individual construction plan can appear as a variation of one of the same "species":

> It can be proved that, on the one hand, each organism has a different *Umwelt* to which it is adjusted with accuracy, and that, on the other hand, its relations to other organisms fit not only into [their] external properties but also into [their] construction plans. (Uexküll 1927: 21)

The unity of each organismic plan that integrates formation and construction plans corresponds to the unique role that the adult organism plays in the universal harmony of all plans, and the universal harmony depends solely on the *Weltplan* and its creator.[77]

Uexküll makes very clear that explanations of "biological relations" refer ultimately to metaphysical and religious assumptions or *Weltanschauungen*.[78] However, a conscious choice of a *Weltanschauung* has to respect scientific descriptions and experimental proofs. For Uexküll, these descriptions and proofs tend rather to vitalistic than to mechanistic positions.[79] In his technical biology, the "adjustment" of the animal subject to the common world of all organisms is the "goal" of its self-differentiation. Such a goal is not a "purpose" that depends on imagination, but the main "natural" property of the subject as an expression of its "plan".[80]

According to this "plan", receptor and effector organs fit into *Umwelten* as "joints" and "tenons". But organic joints and tenons are

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[76] Cf. Uexküll 1920b: 85 and 1928: 320.
[77] Cf. Uexküll 1931a: 391.
[78] Cf. Uexküll 1927: 25, and 1923.
[79] Cf. ibid., pp. 8–12. Uexküll also criticizes vitalistic positions (cf. ibid.).
[80] Cf. Uexküll 1928: 320–321. See also Langthaler 1992: 75–92.

not part of a clockwork with fixed mechanical relations. Rather, the "interweavement" (*Verflechtung*) and relatedness of I-tones depend on the "autonomous center" of the organism, the nucleus, that "acts" like a "piano of ferments" (*Fermentklavier*) on which the impulse series plays for itself the "melody of formation" (*Gestaltungsmelodie*) and the "melody of construction" (*Baumelodie*). Both melodies are part of the same "organismic symphony".[81] This baroque composition "regulates" the opposition between the double bass like "mood" (*Stimmung*) and the partial I-tones of organs and cells, the contrapuntal juxtaposition of *Merkzeichen* and *Wirkzeichen* in *Umwelten* and the complementarity of all organismic plans in inorganic environments.[82]

Uexküll was convinced that the manifold of *Umwelten* had increased during the phylogeny of organic bodies. This increase of new *Umwelten* and their subjects never happens for Uexküll "gradually", but in "leaps" (*Sprüngen*). Changes of "parts" in the construction plan of organisms would destroy their "functioning".[83]

In a similar way, Leibniz thought of the world as the production of a God who searched for the best rational criteria for variety in unity. The solution was a network of "ideal machines" that independently produce and reproduce themselves as "automatons". The effect of their permanent reproduction is a growing variety in time according to a single rule that ›governs‹ the relations between all automatons.

Within the manifold of Uexküll's *Umwelten*, all organisms are, as in Leibniz's monadic system, "equally perfect" as natural subjects that are able to exist, although the "adjustment" of higher organisms is more multifarious.[84] There are thus "poorer" and "richer" *Umwelten*, and their richness depends on individual potentials to perceive and act. This potential is predetermined through the subject's "plan" and does not depend on its reflexive faculties and cultural environments. However, it can only be expressed if the respective framework of the *Gegengefüge* is present.

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[81] Cf. Uexküll 1903: 276; 1920b: 72–73; 1922: 140 and 1928: 172–173, 184, 295–296. Uexküll also refers to a "melody of impulses" (1928: 313) and a "melody of metabolism" (1928: 296).

[82] Cf. Uexküll [1934] 1956: 145–149.

[83] Cf. Uexküll 1928: 290–291.

[84] Cf. Uexküll 1920a: 177. For the role of the double perfection of organismic order in the natural history and philosophy of the 18th and 19th century, see Cheung 2001 and 2000b.

7. Conclusion

Uexküll's technique of nature is a theory of organic order that refers to experimental settings in research fields that focus on reflex mechanisms and cell development. Hans Driesch's experiments on the prospective and actual potential of embryonic cells and Hans Spemann's experiments on the induction of organizing effects represent for Uexküll two "proofs" for the existence of "immaterial factors" that "regulate" organismic development.

The temporal order of such a regulation can only be explained through an "active plan" and its impulse series that initiate the release of ferments. Ferments are stored and bundled in the "genes" of the nucleus that "act" as subordinated natural "factors" with specific "properties" within the cell. Activated through the impulse series, they release ferments which are necessary for the construction and deconstruction of the cells and for their development into a "close functional unit" of correlated organs. However, constructive and deconstructive processes "act" according to the same general scheme of "action". As a "function circle", this scheme can also be applied to the relation between the organism and its *Umwelt* of *Merkzeichen* und *Wirkzeichen*. The "big question of the future" is thus for Uexküll, "if it will be experimentally possible to isolate impulses and to force them to act on other substances than the protoplasm" (Uexküll 1920b: 178).

In his theory of a technique of nature as a necessary condition for the development and existence of organismic subjects, Uexküll also reinterprets evolutionary problems. For Uexküll, neither Darwinian adaptations nor gradual neolamarckian transformations can explain the inductive and functional aspects of plans that regulate individually metabolistic, perceptive and mechanical processes. Rather, the "composition" of plans and their harmony in a *Weltplan* is a necessary, though non-scientific precondition for the existence of organisms. Ultimately, this ordering order or "organization" can only be understood in analogy with the composition of a "melody" that is composed of individual tones or I-tones. Each set of tones needs a complementary set of tones to express its own "melody" within the "symphony" of all.

Uexküll's theory of a technique of nature thus reestablishes the problematic settings of older discursive formations.[85] The relation between partial and general plans that regulate the formation of the "living germ" could be interpreted as a reformulation of Charles Bonnet's theory of germ-fiber-units, and the necessary "leap" from one construction plan to the other refers clearly to Georges Cuvier's comparative anatomy and his organizational types.

The philosophical framework of Uexküll's theory of a technique of nature depends on problems that are related to Leibniz's monadology, rather than to Kant's *Critiques*.[86] Uexküll uses Kant's notion of 'schemes' that mediate between perception and judgment, but the pivotal point of his theory is centered around the "natural" conditions of self-differentiating entities and the harmonic "complementarity" of their "perspectives".

Uexküll pointed clearly to the problem that explanations of regulative processes have to refer to sign theories of mediating material processes and informing "agents". The rule of the subject could thus be interpreted as an active code that produces the conditions of its readability and of its coordinating influence during developmental and metabolistic processes itself. The code aspect of Uexküll's theory is also related to the notion of complementarity and *Gegengefüge*. The expression of the organismic subject, its development and existence, involves an active and reactive exchange with other subjects on multiple organizing levels. Intersubjectivity is thus necessary for the existence of animal and human subjects. However, intersubjective relations are limited through the respective set of rules and their range of possible applications that are predetermined by the overall organismic plan. Uexküll's theory of organic order thus unfolds, in a biological perspective, the Leibnitian problem of monadic worlds. The problem of subjectivity and intersubjectivity, however, is part of a larger and long-lasting discursive transformation in the first half of the twentieth century. Husserl, Cassirer and Heidegger address similar problems to Uexküll, but offer different solutions.

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85 Cf. Cheung 2000, 2004a and 2004b.

86 For a detailed discussion of the philosophical context and framework of Uexküll's theory see Langthaler 1992.

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От протоплазмы до умвельта: планы и природная техника в теории порядка организмов Якоба фон Юкскюлла

Для Якоба фон Юкскюлла биология является наукой об организации живых существ. В контексте механики развития *(Entwicklungsmechanik)* он указывает на опыты X. Дриша и X. Шпеманна над эмбриональными зародышевыми клетками как на доказательство того, что организмы являются природными объектами, формирующимися в процессе самодифференциации. Юкскюлл сосредоточен именно на этой теории самодифференциации или упорядоченности. В понятие упорядоченности он включает и "технику природы", которая способна структурировать органический и анорганический материал в соответствии с планами и правилами. Эти планы и правила являются частью порядка всего универсума. Как предсуществующие системы знаков или коды они определяют и регулируют развитие и существование отдельных животных субъектов в специфических, им присущих Umwelt'ах.

Protoplasmast omailmani: Plaanid ja loodustehnika Jakob von Uexkülli organismilise korra teoorias

Jakob von Uexkülli jaoks on bioloogia teadus elusolendite organiseeritusest. Arengumehhaanika *(Entwicklungsmechanik)* kontekstis viitab ta H. Drieschi ja H. Spemanni katsetele embrüonaalsete idurakkudega, tõestamaks, et organismid on diferentseerumise poolt moodustatavad looduslikud objektid. Uexküll keskendubki just sellisele diferentseerumiste või organiseerituste teooriale. Organiseerituse mõistesse on tema jaoks kaasatud “looduse tehnika”, mis on suuteline struktureerima orgaanilist ja anorgaanilist materjali vastavalt plaanidele ja reeglitele. Need plaanid ja reeglid moodustavad osa kogu maailma korrastusest. Eelnevalt olemasolevate märgisüsteemide või koodidena määravad ja reguleerivad nad üksikute loomsubjektide arengut ja eksistentsi nendele eriomastes omailmades.

Uexküll and contemporary biology: Some methodological reconsiderations

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Abstract. Philosophical anthropology and philosophical biology were both very powerful and influential movements in the German academic discussion of the early 20th century. Starting with a similar conceptual background (particularly with reference to Hans Driesch's bio-Aristotelism) they aimed at a synthetic philosophy of nature, which was supposed to include human nature into the realm of a monist description of nature itself. Within this field of bio-philosophical reasoning, Jakob von Uexküll's theory of organism and his theoretical biology hold a central place. In this paper, Uexküll's theoretical biology is reconsidered as a resumption and reformulation of a theory of knowledge from a "Kantian" provenience. Its specific structure as a generalized theory of knowledge is reconstructed and the pitfalls of a biological interpretation of the condition of the possibility of knowledge are outlined. The theory of organism is reconstructed as a centrepiece of Uexküll's approach. The last section of this paper presents a proposal of engineering morphology which allows the full application of Uexküll's insights into the relativity of organismic constitution. The usefulness of functional modeling for evolutionary reconstructions on the basis of a theory of organism of uexküllian type and its relevance for biological research is evaluated.

Introduction

Jakob von Uexküll is one of the most important representatives of an "organism-centred" biology, which was developed in Germany during first decades of the 20th century. His approach resembles Kant's transcendental philosophical "metaphysics of science" in some relevant aspects. However, it is just one paradigmatic case of a variety of approaches dealing with the very fundamentals of biology, to be found in either "life" or in "organisms", such as H. Driesch's developmental biology, W. Roux's mechanics of development or H. Plessner's philosophical anthropology. But the task of Uexküll's theoretical biology is not only to provide a foundation for biology — at the same time it is supposed to be a fundamental extension and widening of Kant's transcendental program:

> Die Aufgabe der Biologie besteht darin, die Ergebnisse der Forschungen Kants nach zwei Richtungen zu erweitern: 1. Die Rolle unseres Körpers, besonders unserer Sinnesorgane und unseres Zentralnervensystems mit zu berücksichtigen und 2. Die Beziehungen anderer Subjekte (der Tiere) zu den Gegenständen zu erforschen. (Uexküll 1973: 9)

Ironically, it is exactly this biological interpretation of Kant's program which finally leads to the methodological malformation of Uexküll's approach. My paper then attempts to achieve two goals: (1) to provide a critical revaluation of Uexküll's theory of organism, by identifying its methodological shortcomings and insufficiencies, and (2) I wish to give at least a rough sketch of a constructivist reinterpretation of this theory, which we can then fruitfully apply within the realm of biological research.

Uexkülls theory of organism

The biological elaboration of Kant's theory of knowledge refers to organisms, which veritably construct the world they live in. Space, time, meaning etc. are considered to be the products and by-products of this process of construction. So, for example, the orientation of the three canales semicirculares are connected with the three dimensions of Euclidean space (for an methodological criticism of this approach see Janich 1989). The respective senses of an organism produce a specific sense-space, which represents the structure which the organisms impose on the world by the activity of their sense organs on the one hand, and their effector-organs on the other. In accordance with its sensitive and effectorial constitution, the organisms produce *Merkzeichen* — signs of recognition, and *Wirkzeichen* — signs of effect or impact (see Uexküll 1973: 158). The result of this creative activity is an interactive relation between the organism and those aspects of the external world, of its surroundings, which are designated by the organism as its environment. The shift of language (from surroundings to environment) indicates the very nature of this relation. The organism is thought to be implemented into its own creation, i.e. its environment:

> Schon der bloße Augenschein belehrt uns, ob wir es mit einem Luft-, Wasser- oder Landtier zu tun haben. Die Flossen, die Flügel und die Füße tragen unzweideutig den Stempel ihrer Bestimmung. Je mehr der Funktionskreis auf ein eng umschriebenes Medium eingeschränkt ist, um so deutlicher kann man an den Effektoren ihre Fügung erkennen. Wir unterscheiden Saugfüße, Springfüße, Lauffüße und Kletterfüße, die uns einen ganz sicheren Anhalt geben, um das Medium der Landtiere in weitere Unterabteilungen zu zerlegen. Bei den Parasiten entdecken wir Klammerfüße, die ganz genau den Geweben ihrer Wirte, die ihnen das Medium liefern, eingefügt sind. (Uexküll 1973: 201)

This relation depends on the constitutions of the organisms itself (its *Bauplan*) and on the specific type of its (sensitive as well as effectorial) action. The types of these actions are summarised in the *Funktionskreise*, the (closed) functional circuits e.g. of medium, food-supply, predators and reproductivity. The relationship between organisms and their respective environment can be (almost physicotheologically) described in terms of *Gefüge* and *Gegengefüge* i.e. structure and its corresponding counter-structure.

> Die Tiere sind nun derart in die Natur hineingebaut, daß auch die umwelt wie ein planmäßiger Teil des Ganzen arbeitet. (Uexküll 1973: 153)

Consequently, evolution — defined as the transformation of the *Bauplan*, acting within the structure of its functional circuits — becomes a non-gradual, and, at least in its main aspects, non-adaptive process, produced and evoked by the structure and activity of the organisms themselves; to put it in accordance with Lewontin's observation: organisms are not or not only the objects, but the subjects of their evolution as well. The worlds, the respective environments which the organisms inhabit, are specific systems of signs and representations which refer to the organismic activities and not primarily to the existing structures of the world *per se*. This concept, despite its undeniable merits, raises empirical as well as epistemological problems.

Empirical objections

This becomes clear when we take a short look at the evolutionary conception. Uexküll is a prominent anti-Darwinian author, and this anti-Darwinism can be shown to be a direct consequence of his concept of organism. If organisms are well inserted into their respective umwelt (Uexküll emphasises the completeness of this relation by determining organisms as "perfect" entities) they can be considered to be in complex homoeostatic harmony with their umwelt:

> Ein jeder Organismus kann nur er selbst sein. Aber in sich selbst ist er vollkommen, weil er, wie wir wissen, im Gegensatz zu unseren Gegenständen, die aus Struktur und Gefüge bestehen, nur aus Gefüge besteht. Daher darf man die grundsätzliche Behauptung aufstellen: *ein jedes Lebewesen ist prinzipiell absolut vollkommen*. (Uexküll 1973: 204–205)

Consequently, any shift of the inner functional contexture will lead to critical internal-external relations, unless the complete architecture itself is changed in a way that guaranties a new, evenly perfect insertion into the umwelt. From this point of view, gradual evolutionary shifts become unlikely. Only a saltationist mechanism may provide a basis for "phylogenetic" change. Uexküll borrows a mechanism of this type from developmental biology, namely the organiser-concept of Spemann, combined with Driesch's regulator-hypothesis. The ontogenetic development provides an example for abrupt organisational shifts. According to this approach, the oocytes and the zygotes of all animal phyla start as the same structure, and the differences between the single phyla are produced during development because the oocytes of the "higher" phyla do not stop their development at a special earlier stage. At each single stage of development a new organiser starts its activity. Consequently, the higher forms run through the states of those forms that stand on the lower levels of the systematic hierarchy of phyla. The development of a chick serves as an example of the activity of an organiser that starts to operate when a specific state of differentiation in the respective germ is reached:

> An einem ganz bestimmten Punkt springen neue Organisatoren ein, die die bisherigen Anlagen vernichten und die im Bau begriffenen Zellen als indifferentes Ausgangsmaterial benutzen. Ein zweiter solcher Sprung ist nach der Anlage der Kiemenbögen deutlich zu erkennen. Die Kiemenbögen

> wachsen nicht zu Kiemen aus, sondern werden von mehreren Organisatoren in verschiedener Richtung umgeformt. (Uexküll 1973: 259)

From this point of view, evolution can neither be a series of gradual shifts of organisation, nor a sequence of adaptations. This anti-Darwinian approach is a consequence of the underlying theory of organism. But Uexküll has to pay a high prize for his ontogeny-oriented concept, because evolution inevitably collapses into development (Gutmann, Neumann-Held 2000).

Epistemological objections

In order to identify possible methodological objections, we should go back to the basic anticipations of Uexküll's "empirical Kantianism". When we describe organisms as the central units of environmental formation, we can infer, that within one and the same surroundings differing organisms will live in differing environments. The task of a biologist, then, is to reconstruct and understand the differing environments as the "world-images" of differing *Bauplans*. In order to do so, the biologist undertaking the reconstruction will have to refer to invariants of world-making, of environmental formation. To put it more epistemologically — if the semantics of the *Merk-Wirk-male* refers to the specific functional constitution of organisms, then we'll need at least a common syntax which allows the identification of corresponding world-aspects of differing *Bauplans*. This raises the most serious epistemological problems: the validity of the reconstruction of the organismic world-making and formation must not depend on the validity of this description itself. In order to avoid this type of contradiction, we have to state that the validity of our descriptions of organismic activities as a sign- and meaning-producing process is independent of the description of humans as living entities. In order to allow a self-application, Uexküll refers to a machine analogy, from which the "machine-like character" of all organisms is inferred — including human organisms:

> An der Untersuchung der lebenden Organismen sind drei Wissenschaften beteiligt, die Physiologie, die Psychologie und die Biologie. Alle drei geben eine verscheiden Definition des Organismus. Die Physiologie behandelt ihn als Maschine, die Psychologie als beseelte Maschine und die Biologie als

> autonome Maschine. Alle drei stimmen also darin überein, dem Organismus die Eigenschaften einer Maschine zuzuschreiben. (Uexküll 1973: 156)

Within the class of machines we can distinguish living from non-living machines. Organisms, then, are machines which literally produce meaning by using signs and symbols, constructing representations of their world etc.

So far so good, but the question remains: how do we know? Let us assume that Uexküll's assumption is correct, and the constitution of environmental relationships is tightly connected with their respective *Bauplan*. The knowledge about all aspects of the environment is a relative knowledge about the interference between the *Wirk-Gefüge* of the organism and the physical, chemical or biotic aspects of its surroundings. Other organisms then appear in this constructed environment in the same way, namely as constructed aspects of the environment, created by the respective organisms itself. But all this takes place *within* the framework of our own description. In order to evaluate the validity, i.e. the adequacy of the description, we cannot refer to the biological knowledge we used in order to describe the type-centred, organism-environment relationships. If we did so, an infinite regress or a vicious circle would follow. We would find ourselves in a dilemma:

(1) If we knew the specific types of meanings of other non-human entities just because we reconstructed their behaviour in the environment in reference to *our* self-description as environment-forming entities, the validity of our knowledge about other living entities would entirely depend on the validity of our self-description. In this case we would be instantiating exactly an "as if relationship" of a Kantian style which is ruled out by premise.
(2) If, on the other hand, we presupposed that our knowledge from non-human entities refers to our own animal nature, we would either have to state that this assumption is true, because we can describe our self "as if we were" a non-human-being, or we would have to state the truth of the description referring to the type of environment formation, following Uexküll's approach. In the first case it is again an "as if relationship"; in the second we would again run into a circle or a regress.

However, in both cases, the status of our knowledge about organisms must be based upon an "as if relationship", which contradicts our premise. As a consequence we have to state, that Uexküll provides a classical Kantian framework of "as if" descriptions of living entities in terms of organism-environment relations in the form of *ontological* reasoning. We can use this insight most fruitfully by radicalising exactly this Kantian point of view. In doing so we could avoid the fallacy of category which Uexküll commits by, for example, instituting his machine analogy in the way we reconstructed above. We have to transform the identity between organisms and machines into an analogy. This shift has some dramatic consequences, because now the production of meaning, the application of signs, the use of language, the creation of environment become a metaphorical description in reference to human (and not to animal) activities. Organisms have to be considered to be acting *as if they were* producing meaning, using language, applying signs or creating their environment. Accordingly, the reference to human action as the methodological starting-point grants the methodological validity of our descriptions of living entities behaving as if they were acting. This reconsideration of the analogy has already been used in order to provide a sound basis for the constructional-morphological reconstruction of evolutionary pathways (for a direct application see Gutmann, Gutmann 1995).

Perspective of a constuctivist morphology

Following the constructivist approach the objects of the sciences cannot be found in nature — determined and structured per se independent of our description. Considering the sciences (and a fortiori natural sciences) to be the product of human action, the objects of the sciences are the result of a "construction process". The construction of scientific objects starts within common everyday practices (*Lebenswelt*). This starting point is methodological, in contrast to a merely historical starting point, because it refers exclusively to practices and actions that are not constitutively based upon scientific knowledge or know-how. In order to create the very primary scientific objects we must observe a "principle of methodological order", insofar as only those concepts or notions can be used which themselves have already been introduced. The language we need in order to describe the resulting objects refers prescriptively towards the underlying methodological starting point; i.e. a standardized language is constructed in reference to the instructions that are creative for the underlying practice (for further reading see Janich 1997). The creative considerations that are necessary in order to construct primary scientific objects are themselves the subject matter of so called "proto" disciplines. The most important common everyday practice, which has been proven to be particularly useful for protobiological purposes, is the practice of breeding (especially of animal breeding, plant cultivation etc.). In respect to this practice we can talk about singular or collective actions, movements or qualities of animals or plants (living beings, "*Lebewesen*") as well-known objects, which can be described, used, manipulated and varied according to the aims of the breeder (described using the intended characteristics to be improved during breeding) and without referring to a biological theory. Those qualities, including animal action or movement, e.g. the non-scientifically described behaviour, such as the mode of motion, food-gathering etc., can include aspects of the "gestalt" of an animal, as well as the propagation of characteristics. The descriptions of these collective or singular qualities referring to cultural practices build the methodological starting point for the reconstruction of biological theories and the objects they are referring to; this reconstruction allows the determination of their respective methodological structure and status.

The resulting abstract notions are restricted to an explicable context of argument. Two languages will result: a standardized language containing all the abstractors, ideators etc. to be introduced into the *scientific language* (*S*) and a language that refers to *everyday language* (*L*) (see Janich 1989); *S* and *L* are connected by a third language that is represented by technical, physical or other kinds of non-biological knowledge. According to the purposes of protobiology, we must refer to the common everyday practices as breeding or cultivating, the keeping and utilization of living entities. In addition, for the individual steps of theory-building, several specified everyday practices, such as engineering and technical knowledge, on the one hand, and non-biological knowledge, such as physics and chemistry on the other hand, are applied as models to construct and structuralize biotic entities as objects for biological theories. The term 'structuralize' is used here to emphasize the operational definition of structures. Consequently, animals or plants don't "have" structures but they become "structuralized" through having models applied to them (for further reading see Gutmann 2002).

The constitution of morphological objects

The methodological starting point for the application of models, for the construction of biological objects, can be identified within the numerous cultural practices, such as using animals to carry, pull or move loads. Traditionally, horses or cattle are bred to optimize such characteristics which support the tasks required. Accordingly, these animals can be described *as* being used to produce force. In an abstract way, they can be described *as* force-generating units (*Kraftaggregate*). Consequently, their limbs can be described to provide optimal working conditions in order to use these forces most effectively. The fore- and hind-limbs are described *as* working structures, the tendons *as* force-transmitting structures etc.

The next step is the construction of primary morphological terms. The description of animals will invariably begin with a movement or motion of the animal (Table 1). We call the descriptions of the motions of an animal, such as "swimming", "running" "digging" etc., the bionomal options of that animal. Bionomy (a term in *S*) covers all descriptions of motion and movement (in *L*) of living beings and must not be confused with their respective description, for example, "as" locomotion (a term in *S*). Bionomy has to be constructed as an open list of such descriptions to avoid the problems of (mis)understanding the quantifiers "all" or "sum total" ontologically.

Bionomic descriptions of animals result, for example, in the description of animals as constructions in terms of biomechanics. The terms used to describe an animal as a construction are gained by applying the machine model. As the parts of a machine will have to work together in terms of "force closure" to ensure the mechanical continuum during work, the structures of a construction (the parts of an animal denoted "as" structures which refer to the description of the animal as a bionomal construction) will have to fit in terms of coherence. These operations, which describe an animal as a "force-generating unit" and its parts as "working structures" indicate a shift of language from an ordinary language (animal, working, part etc. in *L*) to a standardized biomechanic language (structure, function, force, transmission etc. in *S*). Consequently, coherence and bionomy do not describe the characteristics of an animal in *L* but of a construction in *S*.

Table 1. Descriptions in *everyday language* (*L*) and terms in *scientific language* (*S*).

L	*S*
list of descriptions of movement	bionomy
force-closure	coherence
animal	construction
utilization	function
swimming, running etc.	motion, locomotion

The constructive modelling procedure, which in fact shares the logical structure with constitutive metaphors (see Gutmann, Hertler 1999), can be adequately understood as the construction of a relationship between three different languages. On the one hand, there are the two languages (*S* and *L*) that designate the starting point and the result of the construction. Additionally, we use knowledge and know-how of, for example, technical, physical or chemical origin during the modelling. This third language can be applied without the risk of a vicious circle because no biological knowledge (in terms of valid biological theory) is needed for the construction of the primary objects of the respective sciences and techniques.

From part to structure

Usually, an analogy is assumed to be a two-termed relation of immediate representation between a model and its intended object. In contrast to this point of view, within the constructivist approach the analogy is transformed into a three-termed "model-relation" applying non-biological, physical or technical knowledge to structuralize parts of an animal as morphological structures: e.g. the mammalian leg serving as a working structure is structuralized according to a technical lever construction. The *tertium comparationis*, then, is the functional rule governing the function of an idealized lever construction, for example in regard to its optimal geometry, the relation between the lever arm of a force and the leverage of the load, i.e. their relation to the supporting point. In general, it is possible to structuralize the "gestalt" of an animal under the given conditions as its respective bionomal construction, referring to the practice of preparation (anatomical sectioning) by applying the functional principles that are gained by modelling in the first step. The result of this model-based sectioning is the functional description of parts of the animal as the structures of the animal's construction. Applying functional models to structuralize a part of an animal, the resulting structures are the product of human operations using, for example, anatomical or histological methods. Of course, the "function" of a structure is not a "natural property" of this structure. We can call the operation, by which a part of an animal becomes functionally structuralized, the "ascription of function". When we refer to the different options of utilization, different functions of a structure and, consequently, differing structures might result, and this is an important point if they refer to the same part of the animal.

In addition, it is possible to describe even the mechanical interaction of several functionally defined structures, referring to a particular mode of their action. If muscles are described as "tension-fibres-force-generating structures" (*Zugfaserelemente* = TFGS), referring to the performance of the two TFGS on a single "force-transmitting-structure" (e.g., bones described "as" FTS, which may be biomechanically characterized by their flexural stiffness), an agonist and an antagonist can be distinguished. In the case of the applied models, several types of antagonism can be defined mechanically, which differ according to their geometrical arrangement, the mechanical properties of the constituting materials, their efficiency etc. By applying the hydraulic model other types of antagonism can be constructed (see W. F. Gutmann 1972; 1995). The (ant)agonist arrangements, for example, of TFGS working within a hydraulic (i.e. a fluid-filled) construction, thereby using the fluid itself as a "working substance" to generate indirect antagonism, cannot be reduced to classical lever constructions, applied as models above.

From gestalt to form

One of the most prominent problems of traditional morphology, namely whether the "form" may be an intelligible scientific object at all, can be solved by applying the method of rational morphology I have proposed here. After the description of animals in terms of structure, function, construction, coherence, bionomy etc., the term "form" can be introduced. "Form" then is a character of the construction of two animals, structuralized successfully in reference to the same criteria of a mechanical description. If two animals are identical in reference to their construction, they share the same "form". The "identity of form" is an abstractor, introduced invariantly to the "identity of construction". To summarize, all those terms, such as structure, function etc., are gained by using, for example, engines or other machines as models to structuralize animals. Following this constructivist approach, scientific objects, constituting the "universe of discourse" of rational morphology aren't natural entities but products of human operations. Morphology itself will result as one of the numerous disciplines of biology, irreducible to any other discipline. We can summarize these operations that allow the transition from an ordinary everyday description of living entities to a *construction* as follows:

$$Lw \overset{KP}{\Rightarrow} K_{Lw}$$

The meaning of the arrow is the instruction to shift from the description of living entities towards the structuralization of constructions; Lw — living entity; K — construction; KP — principles of constructions.

Referring to the knowledge which is needed for the modelling procedure and which represents a third language in addition to the two language levels we already discerned, we can summarize the procedure as follows:

$$\left|\begin{array}{ccc} T^1_{Lw} & \overset{Mod_{F_1}}{\Rightarrow} & S^1_{Lw} \\ T^2_{Lw} & \overset{Mod_{F_2}}{\Rightarrow} & S^2_{Lw} \\ & \cdots & \\ & \cdots & \\ & \cdots & \\ T^n_{Lw} & \overset{Mod_{F_n}}{\Rightarrow} & S^n_{Lw} \end{array}\right| \Rightarrow K_{Lw}$$

Here T is the specific part of the animal (*Lw*, living entity) we start with; *Mod* is the knowledge that is applied in terms of the specific model (e.g., the know-how of construction and the use of the lever), F is the function that is modelled; S is the structures resulting from the process of model-guided functional ascription (e.g., the TFGS), and K is construction.

As a result of this standardization we finally gain the level of standardized scientific languages, which refers to methodologically ordered and regulated practices. The notions of constructional ("rational") morphology belong to this language level. There are several asymmetries governing the systematic relations between these language levels and the languages that belong to them respectively. The construction of biological (e.g., morphological) objects is only possible if we can refer to technical or physical knowledge. But the reverse is obviously absurd, as we do not need any biological knowledge in order to create physical objects. The same asymmetric relation can be identified between common everyday descriptions of animals and morphological descriptions or structuralizations. The result of the structuralization process is a "construction" — the rational version of the classical "bauplan" we were looking for. The structures we are dealing with now are introduced without the danger of "evolutionary implication". With the structuralization of living entities as constructions we can provide the bases of rational comparison, which we assumed to be a necessary prerequisite of systematic considerations (see Webster, Goodwin 1996).

Towards reconstructional morphology

After the introduction of the constructions and their classification as different constructional types, the next step of our procedure is the reconstruction of possible predecessors. A reconstruction starts with the comparison of at least two constructions. We apply an explicated "transformation rule" as the tertium of the comparison. By applying such a transformation rule we are able to transform one of our constructions into the second construction with which it was to be compared. In order to provide a transformation rule of the type that is appropriate for our task here, one should bear in mind that the constructions are biomechanical structuralizations of living animals. Consequently, the transformation that shall be reconstructed must be considered as a transformation sequence that is based on biomechanical principles (presenting the transformation line of echinoderms s. fig. 1). These principles can again be borrowed from engineering. When describing animals as if they were mechanical constructions, the transformation of these constructions can be described by either optimizing them or by differentiating a given construction for different working conditions. But because animals are only treated *as if they were* mechanical constructions, some fundamental differences to the engineering of machines or engines must be appreciated:

In contrast to the optimization or differentiation of engines, we start the evolutionary reconstruction with the constructions of actual, existing forms and go back to those constructions that can be regarded as predecessors.

In contrast to the optimization or differentiation of engines, all the individual transformational intermediates that build a transformation line must be regarded as being "fit for work". In terms of engineering processes, the force-, form- and material-closure of the intermediates of a transformation line must be maintained during the transformation process. Additionally, the construction of a field of this type provides the abilitiy to reconstruct more than one predecessor for one given starting construction.

The antecedent constructions of a given construction must be "re-interpreted" as the biomechanic "conditions of possibility" of (formerly) living entities. This procedure, i.e. the "imagination" of living entities on the basis of the constructional description within a transformation line, can be called "reverse engineering".

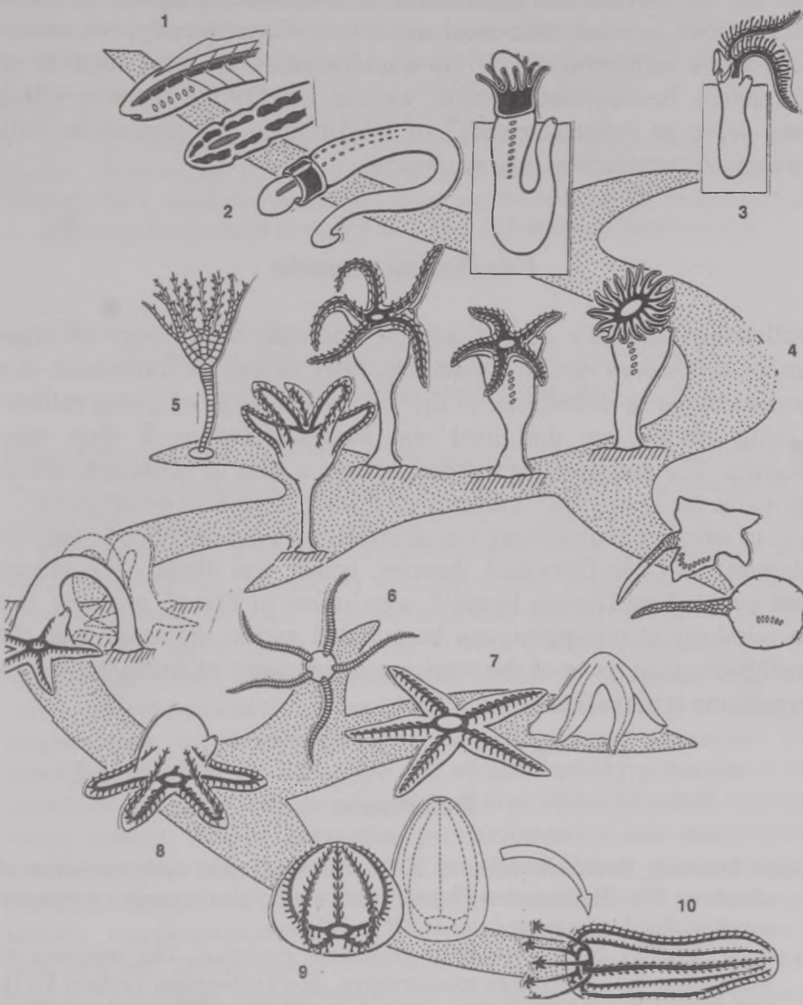

Figure 1. This drawing represents the transformation line of some fundamental echinoid bodyplans, starting with a metameric annelid-like basic-construction; 1 ancestral *Chordata*, 2 ancestral *Enteropneusta*-like worm, 3 *Pterobranchia*, 4 transformation into *Echinodermata* construction form, 5 *Crinoidea*, 6 *Ophiuroidea*, 7 *Asteroidea*, 8 *Eleutherozoa* constructions, 9 *Echinoidea*, 10 *Holothuria* (see Gudo, Grasshoff 2002).

For the elaboration of a reconstruction, the entire construction has to be regarded as a coherent mechanical unit. Consequently, we cannot reduce the reconstruction to the transformation of some features or characters. In complete contrast, we can identify the features which may serve as "characteristics" of evolutionary transformation only after the reconstruction was successful.

Concluding remarks

Following Uexküll's insight into the necessity of a theory of organisms, this theory can be applied fruitfully within the framework of a constructivist re-description of the machine analogy of living entities. Living entities are described and structuralized as if they were engines. The term organism then becomes a term of reflection, which provides the systematic reference of further biological descriptions — e.g. in terms of evolutionary transformation. A structural deficiency of classical and neo-Darwinist theories, which was already recognised and avoided by Darwin himself, who refers to French anatomy and morphology at this point, can be avoided and at the same time the methodological locus of the resulting descriptions of living entities as organisms is identified.

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Юкскюлл и современная биология: некоторые методологические соображения

Философская антропология и философская биология были обе мощными и значительными движениями в немецких академических дискуссиях начала XX века. Имея похожую концептуальную основу (в том числе имея в виду биоаристотелизм Ганса Дриша), они ставили своей целью разработку синтетической философии природы, которая должна была бы включить человеческую природу в монистическое описание самой природы. В этой биофилософской дискуссии теория Якоба фон Юкскюлла занимала центральное место. В статье теоретическая биология Юкскюлла рассматривается как продолжение и переосмысление кантовской теории познания. Реконструируется ее структура как общая структура знания и выделяются ловушки биологической интерпретации условий возможности знания. Теория организма рассматривается как центральная часть юкскюлловского подхода. В последней части статьи предлагается инженерная морфология, которая позволила бы полнее применить юкскюлловский подход к релятивности органистической конституции. Обосновывется полезность функционального моделирования на основе теории организма Юкскюлла и изучается ее связь с современными исследованиями в биологии.

Uexküll ja kaasaegne bioloogia: Mõned metodoloogilised kaalutlused

Nii filosoofiline antropoloogia kui filosoofiline bioloogia olid võimsad ja mõjukad liikumised saksa akadeemilistes diskussioonides 20. sajandi alul.

Lähtudes sarnaselt kontseptuaalselt aluselt (sealhulgas silmas pidades Hans Drieschi bio-aristotelismi) seadsid nad oma eesmärgiks sünteetilise loodusfilosoofia, mis pidanuks haarama inimloomuse looduse monistlikku kirjeldusse. Selles biofilosoofilises arutelus on Jakob von Uexkülli teoorial keskne koht. Käesolevas artiklis vaadeldakse Uexkülli teoreetilist bioloogiat kui kantiliku teadmiseteooria jätku ja ümbersõnastust. Rekonstrueeritakse ta eristruktuur kui teadmise üldine teooria ja tuuakse esile teadmise võimalikkuse tingimuste bioloogilise interpretatsiooni lõksud. Organismi teooriat käsitletakse kui Uexkülli lähenemise keset. Artikli viimane osa esitab insenermorfoogilise käsitluse, mis võimaldaks täielikumalt rakendada Uexkülli lähenemist organismilise konstitutsiooni relatiivsusele. Vaadeldakse funktsionaalse modelleerimise kasulikkust evolutsioonilistele rekonstruktsioonidele uexküllliku organismiteooria alusel ja selle seotust praegusaegse bioloogilise uurimistööga.

Schema as both the key to and the puzzle of life: Reflections on the Uexküllian crux

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Abstract. Jakob von Uexküll's problematic is manifested in his paradoxical portraiture of form within the plan of nature: the one a sensual schema and the other a transsensual ideal form. At first sight, Uexküll's belief in the Platonic and the Reformational notions of the immobile becoming of form seems to be a resignation from the heated debates among his contemporary materialists, vitalists, dynamists, and evolutionists. However, in terms of the Kantian subjective teleology, Uexküll's appropriation of the ancient philosophy reinstates the invisible, static, but repetitive cycle as his regulating principle in the observation of the activity of animals. This regulating principle distinguishes itself from the rule of resemblance established by the appearances and fossil remains of animals, which is linear, incomplete, and digressive. In the light of Michel Foucault, the transition from the visible to the invisible recoups the study of nature from the living beings (*les êtres vivants*) to the life itself (*la vie*), from natural philosophy to biology. My study suggests that we recast Uexküll's sign theory from his observations on the crux that models and triggers an animal to action in its *Umwelt*. Bracketing Uexküll's transcendental configuration of form and image, we still find that schema, in its sensual and functional context, evolves from a reflection of the objects to a summary of their features plus an ignorance of their proper names. Uexküll's erasure of proper names (in different languages) that directs our attention to the presentation in its pure form (*Gestalt*) not only constitutes an important step in epistemology, but also in a life science that meticulously delves into the genotypes.

1. The changing shape as a problematic

In his observations of the phenomenon of life, Uexküll bridges two seemingly irreconcilable but necessary states — constancy and change. He attributes constancy to the structure of the organism and change to its protoplasm. Sometimes he describes the organism as a well-built machine, but, more often than not, the organism appears to us as an intelligent being, which knows how to lead its life. From the Uexküllian perspective, an amoeba under the microscope and the clouds floating in the sky are not very different. Uexküll projects the functional circle to them both, in which the sensitive and reactive organisms take different shapes during their incessant interactions (*die Wechselwirkung*) with the food and the wind. The changing shapes (*die wechselnd Formen, die Formbilden, die Gestalten*) offer an index to life; however, each change is not random but already invested with a command, a purpose, and a meaning.[1] Both a machine and an organism are constrained by their innate commands during the course of their lives *(Zeichenprozesse*). One of the essential tasks of *Umwelt-forschung* is to explore the centralizing command within an organism that attracts only the desired objects, but ignores the undesired ones in its outer world.

Regarding the human subjects' understanding and judgment of nature, it is Kant who devises schema as mediation between the innate a priori categories and the phenomenon. Without the schemata and the sensations, one can see the objects with his given categories, but there will be no understanding and no judgment of them. The schemata coated with sensibility (*Sinnlichkeit*), sensations (*Empfindung, Sinnesempfindung*), and the feelings of pleasure (*Lust*) and displeasure (*Unlust*) realize, but at the same time restrict, the human subject's representation of the world.[2] Uexküll closely follows Kantian doctrine in order to replace the stereotyped conceptualizations of living beings.

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[1] Uexküll reinstates the meaningful shape in *Bedeutungslehre*: "The meaningful shape is constant; it is always the product of a subject, and never the product of random influences on an object. […] The meaning of all plant and animal organs as utilizers of the meaning-factors external to them determines their shape and the distribution of their constituent matter. […] Until now, we had no reason to infer a meaning-command separate from the form-shaping command" (Uexküll 1982: 37).

[2] Kant 1996: 276–277.

In his rebuke against the mechanists and the dynamists, he excludes the possibility of unplanned machines from his planned biology:

> One might just as well imagine that a simple mechanism came into existence through pure coincidence and remains completely without plan. The same is true with dynamisms. A wellspring, which arises somewhere from beneath the earth's surface, is certainly a dynamic system but completely without plan, while a fountain in a French park is meticulously planned. Thus the question should not be: are living beings dynamisms or mechanisms? One should rather ask: *are they a planned work or a piece work, which is unconnected to any plan* (such as the raindrops in a cloud)? (Uexküll 1980: 128; italics mine — *J. C.*)[3]

In addition to the construction plans, which are assumed to be universal in all living organisms, Uexküll distinguishes the unrelated object (*beziehungsloser Gegenstand*)[4] from the meaning carrier (*Bedeutungsträger*). An organism without a plan is analogous to a human subject without schemata. However, Kant's anthropocentric speculation of schema is rather metaphysical, which is not identical with a structure or even something substantial in the human mind. Aiming to pick up the tradition developed by Plato and Kant, Uexküll has transferred and located this enabling but restricting magic of schema in animals. How did he make the breakthrough to prove his teleology that all animals, regardless of their levels in the man-made classificatory system, are equipped with schemata?[5]

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[3] Uexküll highlights the idea of blueprints in all living organisms when he refines the borderline between physiology and his biology: "Mechanismus irgendwo durch Zufall entstanden ist und völlig planlos bleibt. Das gleiche gilt von den Dynamisen. Ein Springell, der irgendwo dem Erdboden entsteigt, ist gewiß eine dynamisches System und dabei planlos, während die Springbrunnen eines französischen Parks planvoll abgestimmt sind. Die Frage muß daher nicht so gestellt werden: Sind die Lebewesen Dynamismen oder Mechanismen?, sodern sind sie Planwerk oder Stückwerk, die durch keinen Plan verbunden sind (wie die Nebeltropfen in einer Wolke)?"

[4] The 1982 translation of *Bedeutungslehre* says: "The stone lies in the objective observer's hand as a neutral object, but it is transformed into a meaning-carrier as soon as it enters into a relationship with a subject" (Uexküll 1982: 27). Regarding the object, Uexküll actually holds a completely negative tone in the German text; he says "Der Stein, der als beziehungsloser Gegenstand". I therefore translate the key term as "unrelated object".

[5] For the 4th volume of *Symbolic Forms*, Cassirer keeps some notes about his discontent with Uexküll's use of schema in animals. He says: "[Uexküll's

2. The theoretical evolutions of *Schema* and *Umwelt*

Before Uexküll had his book on *Umwelt und Innenwelt der Tiere* published in 1909, he spent at least seventeen years observing the muscular contractions of invertebrates and marine animals, the so-called model organisms. Uexküll's illustration of Schema in this work is much more controversial than his use of Umwelt; the former promptly caused disagreements among the empirical scientists at the time, while the latter still stays within the ordinary notion of the outer world or the environment of an animal. In his 1911 reply to a letter from Ernst Mach, Uexküll says:

> I cannot get over one point, which is about your rejection of Kant. For me personally, I do not understand the theory of things in itself as much as you do. I think it is a purely marginal concept, with which certain things would be dismissed and it does not help us understand anything. On the contrary, Kant seems to me, as correctly as you do, to observe the sensations as the materials, from which the world constructs itself. I particularly have a high regard for the chapter on the Schematism of Pure Understanding, which shows how the materials of sensation [*dies Empfindungsmaterial*] can be formed as enactive objects [*Gegenstände*] through the schemata. *I think many of your research results can also be developed with this process.* (Uexküll 1978: 135; italics mine, J. C.)

Mach, as a follower of Fechner and the pioneer of the Vienna Circle, presented a series of psycho-physical analysis of human sensations between 1900 and 1911 (Thiele 1978: 124; Mach 1998). His project adopted "the principle of the complete parallelism of the psychical and physical," in which the reduced amounts of psychological elements are equal to the expected amounts in the nerve-processes (Mach 1998: 30). Except for Mach's rejection of the metaphysics, Uexküll, in this letter, is not strongly against Mach's physical approach because he suggests that schematism and parallelism can enlighten each other. He even conveys his admiration to Mach by complementing Mach's original detour from the traditional approach of atomism, which, he

'Gegenwelt'] conceives the schema all too narrowly as an image, as a spatial schema"; "Animals do not possess such a view as nonperceptual representation." He believes that the human beings become animal-like only under pathological conditions, like agnosia [the inability to name objects] and apraxia [the inability to move] (Cassirer 1996: 214–215).

criticizes, has led biology to a completely dead end.[6] At the early stage of Uexküll's research, the schema in the philosophical domain was intended as a higher term to bring metaphysics and the empirical sciences together. The schema was also given an anatomical configuration as the "mirror" (*der Spiegel*) that faithfully and completely reflects the objects in an animal's environment (Uexküll 1985: 234). Uexküll believed that an animal reacts to the mirrored image of an object that has already been formed in the animal's eyes. A further centralization of the peculiar mirrors from the retina to the brain forms the counter world (*Gegenwelt*), in which he found the number and types of objects to be correspondent with the given schemata:

> I call this central pathway complex, formed in correspondence with the images of the objects on the retina, a schema and assert that the exact number of types of objects in the surroundings is distinguished by the animal as there are schemata present in its counter world. (Uexküll 1985: 240; 1909: 241–242)

The counter world constitutes the fundamental organization (*Ausgestaltung*) or the construction plan of an animal. Uexküll takes it as the focus, from which derives the sense and signification (*Sinn und Bedeutung*) of every species. In contrast to the Darwinian interest in the outer worlds, Uexküll plans to narrow down his scope within the inner worlds and the counter worlds that constitute a minimal source but generate the broadest implications (Uexküll 1985: 224–225). It is the *Innenwelt* and the *Gegenwelt* rather than the *Umwelt* or the *Umgebung* that are charged with high voltage to shift the attentions of the scientific communities:

> The comparison of inner worlds [*Innenwelten*] is just as instructive as the comparison of environments [*Umwelten*]. Whereas our own environment

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[6] In the final paragraph of the letter, Uexküll says: "Ich habe es immer sehr bewundert, dass Sie im Gegensatz zur herrschenden Physik nicht aus dem Atom die Weltseele gemacht haben, sodern einen Weg gegan[g]en sind, der eigentlich ein biologischer ist und das in einer Zeit, da die Biologie völlig todtgeschlagen war" (Uexküll 1978: 135). My gratitude goes to Dr. Torsten Rüting for discovering this letter during my two-week stay in Hamburg in July 2003. We didn't find the letter from Mach to Uexküll in the Hamburg archive center. Neither did I find any letters between Uexküll and Mach catalogued in the Tartu archive centre when I visited it in mid January 2004, with the kind assistance of its chairperson Riin Magnus and Prof. Kalevi Kull.

> [*Umwelt*], which constitutes the surroundings [*Umgebung*; geographical environment] for all animals, is full of colorful, resounding, scented objects, our counterworld [*Gegenwelt*] is limited to the succession of excitations in the prestructured nervous tissue schemata [*nervösen Fasergebilden (Schema)*] of our brain. In their form they resemble those objects. (Uexküll 1985: 242; 1909: 250)

Later manifestations of schema after 1909 still reveal his emphasis on the collaboration between the receiving ends and the commanding center inside an organism. Uexküll's renewed definition of the nervous schemata can be formally traced in his *Theoretische Biologie* (1920), in which he invalidates the theory of psycho-physical parallelism, but embraces the theory of sufficient determinateness or differentiation by Johannes Müller (Uexküll 1926: 146–147; Mach 1998: 28):

> Wheresoever qualitatively different stimuli effect an entry, we find that their specific peculiarity is taken from them. Whether an airwave strikes the ear, or an etheric wave the retina, the same transformation is set going in both cases…The various stimuli are not distinguished through different excitations in the nervous system, but by the "person" of the nerves through which they flow…it was discovered by Johannes Müller, who made of it, along with all its corollaries, the basis of comparative physiology of the nervous system. (Uexküll 1926: 147)

Assisted by the metaphors of a scale (*eine Skala*, 1920), some lines (*die Linienführungen*, 1920), and a sieve (*ein Sieb*, 1940)[7], Uexküll conceptualizes the schemata as several people, who serve to quantify the number of excitations and to control their effects. However, the number of schemata definitely does not correspond to the number of excitations, nor do the schemata reflect the objects in the outer world. The schemata are a "summary" of the features of the objects that are most proper and important to the person:

> As soon as outlines serve the body as indications, differentiation of the sensory part of the nervous system speeds off. For now it is useful so to combine quite definite sensory nerves of the eye, that their common or

[7] The 1982 translation of *Bedeutungslehre* mistranslates "das Sieb" (the sieve, the screen) as a gutter (the underground tunnel), which renders Uexküll's idea bizarre: "At the outer boundary, they [sense organs] serve as a gutter for the physico-chemical effects of the outside world" (48).

> successive excitations are linked up into a whole, which makes its way into the guiding mechanism as a new unity. I have called these nervous unities 'anatomical schemata,' because they do not give a complete reflection of the outline in the external world, but merely a summary combination of its most important parts, and this with a degree of exactness suitable for the particular animal. (Uexküll 1926: 149)

The Kantian schema is also coined with the reflex arch and the functional circle to illustrate the sufficient content qualities inside the sense organs. Uexküll's use of *Umwelt* still oscillates between the subjective world and the physical world. Nevertheless, he gives *Umwelt* a greater prominence than his previous work; the *Gegenstand* is refined as the "*Umweltding*" in his elaboration on "*Welt und Umwelt*," supplemented at the end of the 1928 version of *Theoretische Biologie*:

> Now I mark all the surrounding objective realities as the world and all the surrounding subjective realities as *Umwelt*. So it will gradually reveal that the two worlds contradict each other...One had best always start from an individual object and look for it in the different *Umwelten*, [that is,] to have a sense of impression, how he [the impression] dresses himself in hundreds of colors and forms and how he [the impression] becomes first one thing and then the other in the *Umwelt*. (Uexküll 1928: 232)[8]

Umwelt as a theoretical tool gradually outshines the anatomical *Schema* when Uexküll in the 1934 *Streifzüge durch die Umwelten von Tieren und Menschen* distinguishes *Umwelt* from *Umgebung*, the former is constituted by an organism's reactions to the geometrical shapes while the latter is the objective physical world. On the other hand, he presents some case studies about the fallacy of schemata:

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[8] Uexküll came to Hamburg in 1925, and the *Institut für Umweltforschung* was established in 1926. His specification of Umwelt may be attributed to the rise of the new discipline: "Bezeichne ich nun sämtliche mich umgebenden objektiven Wirklichkeiten als Welt und sämtliche mich umgebenden subjektiven Wirklichkeiten als Umwelt, so wird sich Schritt für Schritt zeigen lassen, worin diese beiden Welten sich widersprechen" (Uexküll 1928: 228); "Am besten wird man immer von einem einzelnen Gegenstand ausgehen und ihn in den verschiedenen Umwelten aufsuchen, um einem Eindruck zu gewinnen, wie er sich in hunderterlei Farben und Formen kleidet und bald zu diesem bald zu jenem Umweltding wird…in der Umwelt eines Singvogels, der in ihren Ästen nistet — eines Fuchses, der unter ihren Wurzeln seinen Bau hat — eines Spechtes, der auf Jagd nach die Holzwürmer in ihrer Rinde macht — in der Umwelt eines solchen Holzwurmes selbst."

they may be broken, dissolved or become incomplete in life situations, due to the lack of established pathways or the traumas inside the animals. The completeness and the sophistication of the nervous systems become an index to differentiate the animals into two types:

> It is enough to assume that the receptor cells for local signs in the receptor organ are segregated into two groups, those in one, according to the schema, broken [*aufgelöst*], those in the other, according to the schema, compact [*geschlossen*]. There are no further differentiations. (Uexküll 1957a: 40; 1934: 47)

A dissolved schema is not able to organize the protoplasm or to control the muscles, much less to form an enclosed system. An organism or an animal without the continuous and systematic network is open (*eröffnet*) to the outer world. Its shape of body is subject to constant but blind changes, like the amoeba, the sea urchin, the scallop and the earthworm. The schemata dominate the formation of the counter world (*Gegenwelt*) and the perceptual world (*Merkwelt*). However, the function of the schemata will not be completed without the operational world (*Wirkwelt*). The constant oscillations between triggering and extinguishing (*Das Wirkmal löscht das Merkmal aus*, 1980: 124), selecting and imprinting (*Merkmale, die ihnen vom der Subjekt aufgeprägt werden*, 1940: 57) strengthen an animal subject's "surrounding world" (*Umwelt*; or "rebuilt world" in the sense of *Umbau*), which is a composite of the transformed and abstracted properties of the objects. *Umwelt* as an abstract and theoretical tool achieves its sufficiency in the 1940 *Bedeutungslehre*:

> Everything that falls under the spell of a Umwelt (subjective universe) is altered [*umgestimmt*] and reshaped [*umgeformt*] until it has become a useful meaning-carrier; otherwise it is totally neglected. In this way the original components are torn apart without any regard to the building-plan that governed them until that moment. (Uexküll 1982: 31; 1940: 7–8)

When Uexküll appropriates *Umwelt* in the sense of ego quality (*Ich-Ton*) rather than the outer world, the Kantian schema becomes merged with the nervous system, the functional circle and the intended sense of *Umwelt* itself. Unlike the multiple properties of an object, the *Ich-Ton* of a subject is much restricted to its time, space and sensations. The problematic lies in how the subject uses his phenomenal world to differentiate his body parts and his perceived world, following a purpose, a meaning and a melody. The distinctions or gaps between human beings and animals are replaced by a seamless cooperation between the meaning user (*Bedeutungsverwender*) and the meaning carrier (*Bedeutungsträger*).[9]

3. The *Urbild* and the *Gestalt* against evolution: the Uexküll-Darwin controversy

Uexküll as a scientist sounds rational and artistic enough, but he dramatically negates the schemata when he becomes intoxicated over the meaning of life. The metaphysical Uexküll backbites the constructive Uexküll when he adopts the tone of Socratic irony:

> But stop! That is not what the spider does at all. It weaves its web before it is ever confronted with an actual fly. The web, therefore, cannot represent the physical image of a fly, but rather it is a representation of the archetype of a fly [*eine Ausschnitt des Urbildes der Fliege*, a clipping of the ideal image of a fly],[10] which does not exist in the physical world. Hark! I hear the mechanists calling: they will say that by this example Umwelt-theory is revealed to be metaphysics; because he who seeks effective factors beyond the physical world is a metaphysician. (Uexküll 1982: 42; 1940: 20)

Instead of using schema to illustrate the *Umwelt* of the spider, Uexküll shifts to other terms, like the *Urbild*, *Urform*, *Urfasson*, and *Urpartitur* to indicate the ideal form (*eidos*) as a higher power over schema. This higher power prescribes an animal's developmental stages from its embryo to its death; the beginning has foretold the end. The program enacted in the cycle of the ideal form goes beyond human acquisition, but embodies Nature as an eternal composer, which is not constrained by time, space, and sensations:

> There is no human knowledge that can be obtained through experience. The tunnel-boring actions of pea-beetle larvae prove to us that they are condi-

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9 See Han-liang Chang's paper in this volume.

10 The 1982 translation literally translates Ausschnitt as representation, Urbild as archetype. The translator may not have paid much attention to the controversy that Uexküll evokes in this paragraph. From the position of an austere metaphysician, Uexküll makes a complete distinction from the Darwinian theory of defining the species as modifications (or representations) of the archetypes. Uexküll reminds his readers that the object of contemplation here is far from the physical types.

> tioned by a transsensual knowledge that is timeless [*durch ein übersinnliches nicht an die Zeit gebundenes Wissen*]. Thanks to this knowledge, the composer can shape the future life-requirements of an unborn beetle [*noch nicht vorhandenen Käfer*] and program the actions of the beetle larva. (Uexküll 1982: 59; 1940: 40)

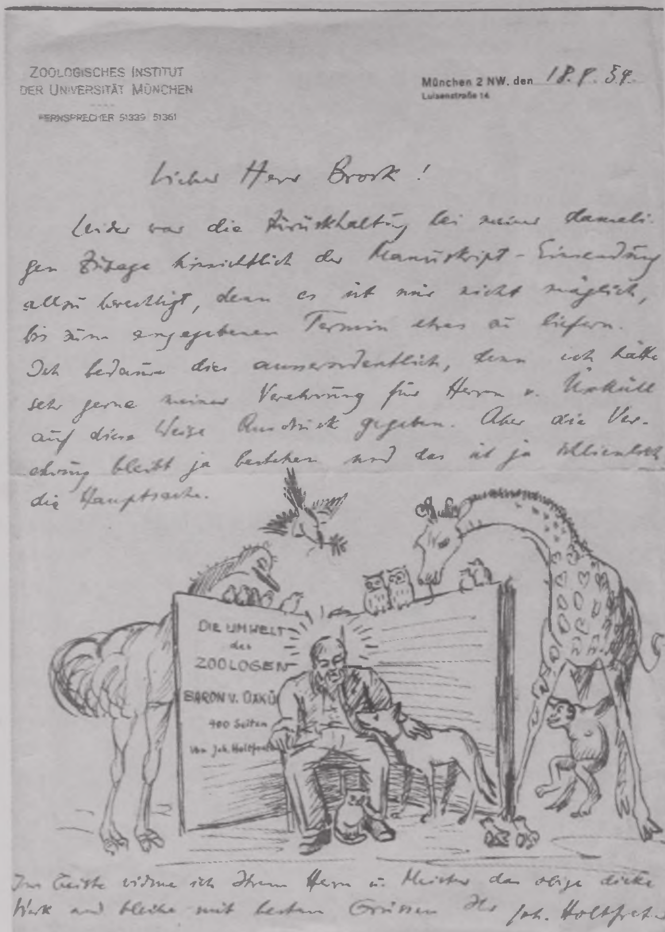
Despite the fact that Uexküll has rooted schemata in both human beings and animals, from an anatomical point of view, his idea of timeless transsensual knowledge in Nature debases human beings and the perceptions mediated by schemata. A beetle larva is far more superior to a human being in the way that it is always faithful to the higher command, but the human being does not have any capacity to realize the way it works (Fig. 1; Fig. 2). The gap between human beings and nature, which is bridged by Kant, becomes a gulf again when Uexküll allies with the animals:

> Once this cardinal principle of nature's technique is understood, we can state that no progression occurs from the less to the more perfect. Because if a variety of theme of meaning extraneous to the animal influence its development [*Denn wenn fremde Bedeutungsmotive allseitig eingreifend den Aufbau der Tiere gestalten*], it is impossible to see how successive generations could alter this situation. [...] The triumphs of nature's techniques are readily apparent, but the manner in which its melodies are created cannot be investigated. Nature's techniques share common features with the creation of a work of art. We can, of course, see the painter's hand apply one color after the other to the canvas until he has completed the painting, but the creative melody [*Gestaltungsmelodie*] that moves his hand is wholly hidden [*unerkennbar*] from us. (Uexküll 1982: 75; 1940: 58)[11]

[11] We can also find the metaphor of a painter at work in the first chapter of Michel Foucault's *Les mots et les choses* (1966). I hold the hypothesis that Foucault was inspired by Uexküll's idea either through his master, Georges Canguilhem, who formally gave three lectures about Uexküll at Collège Philosophique during 1946 and 1947, or during his one-year stay in Hamburg in 1959. As a daring explorer of knowledge, Foucault has the habit to prove what he hears or studies when he travels to the place that incubates the knowledge.

Figure 1. The magical tunnel made by peabeetle larvae (Uexküll 1934: 87).

Figure 2. The personified Umwelt of ladybirds by an Estonian artist, exhibited in Tartu University Library during January 2004.



ZOOLOGISCHES INSTITUT
DER UNIVERSITÄT MÜNCHEN
FERNSPRECHER 51339 51361

München 2 NW, den 18.8.34.
Luisenstraße 14

Lieber Herr Brock!

Leider war die Zurückhaltung bei meiner damaligen Zusage hinsichtlich der Manuskript-Einsendung allzu berechtigt, denn es ist mir nicht möglich, bis zum angegebenen Termin etwas zu liefern. Ich bedaure dies ausserordentlich, denn ich hätte sehr gerne meiner Verehrung für Herrn v. Uexküll auf diese Weise Ausdruck gegeben. Aber die Verehrung bleibt ja bestehen und das ist ja schliesslich die Hauptsache.

Im Geiste widme ich Ihnen Herr u. Meister das obige dicke Werk und bleibe mit besten Grüssen Ihr Joh. Holtfreter

Figure 3. A cartoon drawing made by Johannes Holtfreter in München, included in a letter from him to Friedrich Brock, dated Aug. 18, 1934. Holtfreter was invited to contribute a paper for Uexküll's 70th birthday Festschrift. He did not send the paper but the letter and the drawing instead. The bulky book that he drew is dedicated to both Brock and Uexküll but the aura around Uexküll's head looks ironic. (Permission of Jakob von Uexküll Centre, Tartu.)

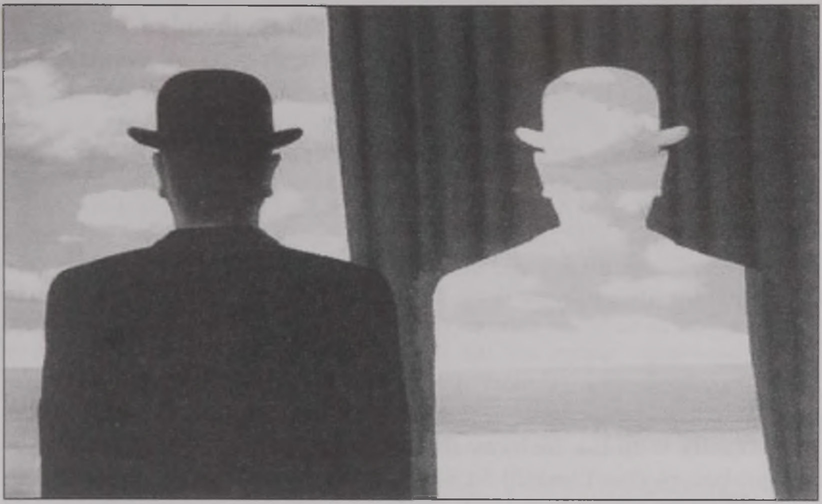


Figure 4. Décalcomanie (1966, René Magritte, 1898–1967).

Uexküll's endorsement of the animals within the invisible *Gestaltungsmelodie* conveys a religious overtone that regards the shapes of animals as a sign of the divine Nature. The presentation of the ideal form in *Gestalten* is a well-defined and meaningful theme shared by both an animal subject and its species, which is incongruous with the human rule of representation [*Vorstellung*]. The *Gestaltungsmelodie* repeats itself in a cycle that guides an animal subject in its former, present, and future existences; on the contrary, the rule of representation develops over time and creates differences for the human subject within his limited present life.[12] In his variation on the

[12] Some readers may wonder if Uexküll is influenced by Gestalt psychology, the trace of which can also be found in his *Theoretische Biologie* (1920), where he discusses the importance of apperception and the displacement (rather than the disappearance) of organic functions. However, Uexküll himself denies this link: "The results of studies of the building of forms (*Gestaltbildung*) are interesting but of limited theoretical interest for the knowledge of the problems of life. And this will not change even when we go deeper into the process of form-building (*Gestaltbildung*). But we have in every case, where an animal builds articles for its own use, a possibility of observing the process of form-building first hand. We can follow the weaving of a spider's web as accurately as we can follow the manufacture of an article for use by human [beings], say the shaping and firing of a coffee cup. In both cases the building of the form is bound to strict rules,

Platonic dialogue about Meno, Uexküll construes the ideal form as "a memory of former existence," which is universal in animals but lacking in human beings. Uexküll has Meno and Socrates say:

> Meno: Men always observe the models of their present lives only. They do not possess *an unforgotten knowledge* stemming from a previous existence, which could serve them as a rule for the actions of their present existence.
> Socrates: You would find the disadvantage to be even greater if you made clear to yourself that man's imitations of the objects he has seen during his present life never are the equals of their originals, whereas the objects which animals are capable of producing by drawing from their inner knowledge always are *the equals of their originals, sometimes even surpassing them*. (Uexküll 2004; 1943: 140; italics mine — *J. C.*)

It is exactly with the memory that is persistent in animals but lost in human beings that Uexküll fictionalizes the unknown. Uexküll levels himself to the same plane as the animals, and the spiritual meaning is thus comprehensive only between the animal subject and its objects, the privileged observer and his target animals, but excluded from other human beings. In establishing his extreme cult, Uexküll cleans away sensuality, digressions, and irregularity of shape from the holy Umwelts by embracing the Platonic and the Reformation paradox of immobile becoming, which is achieved in the unity of time (memory) but does not change over time (Fig. 3).[13]

[which] we can compare to tunes" (2001a: 121). The founder of gestalt theory, Christian von Ehrenfels, acknowledges the attainment of a pure and higher gestalt quality when one excludes the variations of time, space, and sensations *a posteriori*. This does not fully match Uexküll's *Gestalt a priori*, either. The only concept of gestalt that matches Uexküll's can be traced back to the Reformation text in the 17th century, in which the *Gestalten* are construed as the holy signs of Christ, materialized in the bread and the wine. Ernst Cassirer indicates that Kant in the 18th century purposefully dropped the Germanic *Gestalt* but picked up the Greek *Skema* when he illustrated the *Critique of Pure Reason* (Cassirer 1945: 118–120). Uexküll may have regressed to the religious connotation of *Gestalt* that was avoided by Kant. This is another example that reveals Uexküll's resistance to his contemporary theories or concepts.

[13] Uexküll in his autobiography describes his mother's explication about the differences between the Catholic and the Protestant churches: "Die Bedeutung der evangelische Kirche liegt in ganz anderer Richtung. Sie dient als Versammlungsort für die christliche Gemeinde. In ihr ist jades Glied vor Gott gleich. Das Wesentliche, was wir hieraus lernen sollen, ist, daß, so verschieden wir im weltlichen Leben nicht bloß an Rang, sodern auch an Charakter sein mögen, wir im geistlichen Leben alle schuldbeladene Geschöpfe sind. Alles Menschliche ist

Does Uexküll become incurably insane in his late years when he justifies the Platonic ideal form and memory for animals, but debases human beings' lack of them? In the second part of the dialogue, even his son, Thure, reminds his father that his belief is simply an illusion. However, Uexküll was very much aware of using the given, immobile and complete form (or memory) as a demarcation from his contemporary mechanist, vitalist and evolutionist views of life. Above the dominating factors of energy and matter, Uexküll acknowledges that he chose the third factor to imagine the immaterial relationships of the material structures:

> When the whole complex of natural phenomenon was traced to only two factors, energy and matter [...] the third factor, form, was simply overlooked. [...]
>
> Structure is not a material thing: it is the unity of immaterial relationships among the parts of an animal body. Just as plane geometry is the science not of the material triangles drawn on a blackboard with chalk but of the immaterial relationships between the three angles and three sides of a closed figure [...] so biology treats the immaterial relationships of material parts united in a body so as to reconstitute the structure in imagination. (Uexküll 1930: 19 and 9; quoted in Cassirer 1950: 200)

Uexküll's concept of geometry as an innate and immaterial relationship within an organism is given a purpose in the 1930s, both in *Die Lebenslehre* and *Streifzüge* (1934), before he dramatizes this principle again in the dialogue between a Greek master and a slave boy in 1943.[14] Parallel to his identification of schema as the nervous system, Uexküll also takes the given but invisible relationship as his guiding principle in observing the autonomous actions of animals. In addition to the disagreement between the father and the son, the ideal form is also the main divergence between Uexküll and Darwin, though they both value the "hidden bond" in the species. For Uexküll, the hidden bond is persistent; it can be proved and not proved, both anatomized

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im geistlichen Leben alle schuldbeladene Geschöpfe sind. Alles Menschliche ist verschieden — alles Göttliche ist gleich" (1957b: 25). This may explain Uexküll's belief that animals are better creations than human beings: men are laden with sins, differences, or rather inequalities.

[14] When Cassirer stayed in Sweden during 1940, he recognized the importance of geometry in Uexküll's theory and justified his work as one of those that follow the tradition of ideal morphology established by Cuvier and Goethe (1950: 199–203).

in the sense organs and imagined in the transcendental *a priori*. For Darwin, it takes time to find it out, and will be revealed in the unpleasant and rudimentary organs in an animal (1964: 450-58). The ideal form for Darwin is simply a creation myth, which may occasionally survive as the archetype in the species that leave a small number of eggs. For most species with a big population over a long historical period, in which the new forms constantly supplant the old ones, the archetype or the prototype has already been terminated. Even if it survives in an irregular shape, it is not functional any longer. What kind of truth about nature is revealed in their diverse explanations over the structures and actions of animals?

4. Michel Foucault versus Ernst Cassirer, two perspectives of history

In evaluating the gaps between Uexküll and Darwin, Cassirer subsumes them both under the Kantian definition of teleology, which only makes differences in the maxims that the reflecting subjects propagate but are not constituent as a real end in nature (Cassirer 1950).[15] The following Kantian paragraphs echo Cassirer's interpretation:

> Strictly speaking, one must call this legislation *heautonomy*, since the power of judgment does not give the law to nature nor to freedom, but *solely to itself,* and it is not a faculty for producing concepts of objects, but only for comparing present cases to others that have been given to it and thereby indicating the subjective conditions of the possibility of this combination a priori. [...] The concept of a real end of nature therefore lies entirely outside the field of the power of judgment if that is considered by itself. [...] Hence whatever may be found in experience to belong to teleology contains merely the relation of its objects to the power of judgment and indeed to *a principle of it by means of which it is legislative for itself (not for nature)*, namely as *a reflecting power of judgment.* (Kant 2000: 28, 34, 35; italics mine — *J. C.*)

[15] Thanks to Prof. Frederik Stjernfelt in Copenhagen University, I came to read the 4th volume of Cassirer's *Erkenntnisproblem*. After listening to my presentation in the 3rd Gathering in Biosemiotics in July 2003, he suggested that I find a mediation between Uexküll and Gombrich from Cassirer. Nevertheless, I find Foucault more beneficial than Cassirer in rationalizing the paradox in Uexküll. Cassirer's bias of ethology and zoology overshadows his willingness to explore the mutation in Uexküll's theory.

By returning to the Kantian notion of an enquiring and regulating subject, which cares more about integrating different thoughts than arguing over absolute truth in nature, Cassirer allies with the rational and contingent proponents of truth to point out the shared dogmatisms among the late 19th century scientists. However, if we treat each scientist as a consistent and congenial agent in propagating his own theory, the history of ideas would be strangely continuous and quiet. Foucault reminds us of the fallacy in Cassirer's historical perspective:

> Cassirer exerts himself to find out *the intrinsic necessities* of the thought discourses; he lets the thought think all by itself but not to continue the veins of them better and to show the branches, the divisions, the intersections, and the contradictions which outline the visible figures in them. He isolates all the other histories (of the individuals, as much as of the societies) as *autonomous rather than theoretical space*: [and] under his eyes, he discovers *a history, which simply stayed quiet at the time.* (Foucault 1966: 3; italics mine — *J. C.*)[16]

We have gathered that Uexküll actually creates some noises in his theory by bringing Plato, Kant, and his religious belief into an arena of confrontations; he resurrects the Platonic ideal form at the expense of his solid study of Kantian schematism; he acknowledges and denies sensations interchangeably; he is both a theoretical biologist and an austere metaphysician, preaching absolute harmony in nature and in arts. His beloved paintings, music, and architecture even become condescending products when he follows Plato's reasoning. Nevertheless, the noises that we find in his paradoxical portraiture of form (*Schema, Urform, Gestalt*) differentiate the subjective Umwelts into two kinds: the one which follows the rule of resemblance but

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[16] In his critique on Cassirer's book, which had been newly translated into French, Foucault says: "Cassirer s'efforce d'en [discours-pensee] retrouver les nécéssités intrinsèques; il laisse la pensée penser toute seule, mais pour mieux en suivre les nervures et faire apparaître les embranchements, les divisions, les croisements, les contradictions qui en dessinent les figures visibles. Il isole de toutes les autres histories (celle des individus, comme celle des sociétés) l'espace autonome du <theorique>: et sous ses yeux se decouvre une histoire jusque là restée muette. Ce découpage paradoxal, cette abstraction qui rompt les parentés les plus familières n'est pas sans rappeler les gestes iconoclastes, par lesquels se sont toujours fondées les grandes disciplines: l'économie politique, lorsqu'elle a isolé la production de tout le domaine concrete des richesses, la linguistique, lorsqu'elle a isolé le système de la langue des tous les actes concrets de la parole."

pathetically produces variations, degradations, and illusions; the other obeys the rule of similitude and cleverly follows the same original circuit. Schema as a mediation between the inner world and the outer world acquire its pleasant life within the rule of similitude, but will definitely become a dead end (*todtgeschlagen zu werden*), if it is designed to distinguish the outer world point by point, sound by sound, and color by color (as Uexküll criticizes atomism in his letter to Mach).

According to Foucault, the interplay between resemblance and similitude helps one recognize the epistemological breaks in history. There are two major breaks, the one between the 16th and 17th centuries and the other between the 19th and 20th centuries, in which the rule of similitude takes the upper hand over that of resemblance.

The rule of similitude transforms the history of science from natural philosophy to biology; the former is based on an observer's naked eyes and his classification of the different features among animals and plants, whereas the latter highlights the hidden bind inside the organisms. The transition from the appearances to the invisible relationship recoups the study of nature from the living beings (*les êtres vivants*) to life itself (*la vie*) (Foucault 1994: 160). From the Foucauldian perspective, both Darwin and Uexküll participate in this break with their enquiries over something inside an animal that determines its changes in appearance and action, but Uexküll practices the rule of similitude more straightly by drawing our attentions to the constant, restrictive, and repetitive cycle inside a cell, a neuron and an organ. The Uexküllian confident life only follows the rule of similitude, a clipping and a circulation of the ideal Gestalt (Fig. 4).

5. Structural linguistics and theoretical biology

Bracketing Uexküll's transcendental configuration of form and image, we still find that the schema, in its sensual and nervous context, serves as a crux of life. It brings a typical relationship to the materials of sensation (*Empfindungsmaterial*) and triggers an animal's reaction to the outer world. As we can tell from Uexküll's alienation from "reflection" to his affiliation with "the centralized pathways" in defining the schemata, the typical inner relationships generate their own speech-acts (*énonciations*), but do not resemble the proper name (*énoncé*) of an object outside the animal subject. Uexküll distinguishes his functional circle from Pavlov's reflex in his letter to Heinrich Junker in 1937:

> Pavlov called this a 'conditioned reflex'. The same effect can be obtained by saying the word 'meat'. Still, from this one cannot conclude that the dog understands the word meat. [...] The experiments carried out by Dr. Sarris at the *Institut für Umweltforschung* are a different matter. [...] The word 'chair' for the dog is not the name of a thing [*einen bestimmten Gegegenstand*] but of a performance [*eine Leistung*]: to sit. To me this seems a fundamental feature of language as a means of communication between human beings as well. The spoken word, a certain sequence of sounds as carrier of sense and meaning, relates primarily to performances and not to things [*nicht auf einen bestimmten Gegenstand*]. (Uexküll 2001b: 446; 1980: 297–298)

Uexküll's insight about the speech-act reminds us that the arbitrariness of sign cannot be found between the inner world and the physical objects; it simply stays within the inner world, or rather in the schema, the nervous system and the subjective universe. This arbitrariness is located in the causal relationship between "to notice" (*merken*) and "to act" (*wirken*), the emergence of attention ideally refers to an action. The outer world is thus only an imprint of this arbitrary biological relationship in the nervous system. It is within the schema that we can find the convergence of sign and design in Uexküll. Uexküll's erasure of the proper names and his interest in the synchronic changing shapes situate his theory more in the paradigm of structural linguistics than in philology.[17]

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[17] Saussure invests his energy to find out the law that governs the linguistic forms across time and space. Uexküll's experiments based on the philosophical, anatomical, and transcendental form reveal the law that governs the performances of animals across species.

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Схема как ключ и загадка жизни: размышления над проблемой Юкскюлла

Проблематика Якоба фон Юкскюлла проявляется в его парадоксальном описании формы как части плана природы — в качестве как схемы восприятия так и идеальной формы. На первый взгляд вера Юкскюлла в описания неподвижно проявляющейся формы (наподобие Платона и мыслителей времен Реформации) кажется уступкой в остром споре среди его современников: материалистов, виталистов, динамистов и эволюционистов. Тем не менее, в смысле кантовской субъективной телеологии принятие Юкскюллом античной философии воссоздает невидимый, статичный, но повторяющийся цикл как регуляционный принцип в активности животных. Этот регуляционный принцип отличается от правила подобия, например, между внешностью животных и их окаменевшими останками, которое линеарно, неполно, дигрессивно. По Мишелю Фуко переход от видимого к невидимому сопутствует переходу от исследования живых существ к исследованию самой жизни, от философии природы к биологии. Теория знаков Юкскюлла зарождается из его наблюдений над проблемой выяснения того, что моделирует действия животного в его умвельте. Оказывается, что схема в ее чувственном и функциональном контексте развивается из отражения объектов в совокупности их свойств. Удаление Юкскюллом имен собственных, которое направляет наше внимание на презентацию в ее чистом виде (*Gestalt*), представляет собой важный шаг не только в эпистемологии, но и в “науке жизни”, которая с ненужной тщательностью углубилась в генотипы.

Skeem kui elu võti ja mõistatus:
peegeldusi Uexkülli probleemile

Jakob von Uexkülli probleemistik avaldub ta paradoksaalses vormikirjelduses looduse plaani osana — nii tajuskeemina kui tajuülese ideaalse vormina. Esmapilgul tundub Uexkülli usk Platoni (ja reformatsiooniaegsetesse) mõistetesse liikumatuna ilmuvast vormist resignatsioonina ta kaasaegsele teravale dispuudile materialistide, vitalistide, dünamistide ja evolutsionistide vahel. Siiski, Kanti subjektiivse teleoloogia mõttes, antiikfilosoofia vastuvõtt Uexkülli poolt taasloob nähtamatu, staatilise, kuid korduva tsükli nagu ka regulatsiooniprintsiibi loomade aktiivsuses. See regulatsiooniprintsiip eristub sarnasusereeglist, näiteks loomade välimuse ja fossiilsete jäänuste vahel, mis on lineaarne, mittetäielik, digressiivne. Michel Foucault mõttes, üleminek nähtavalt nähtamatule käib kaasas üleminekuga elusolendite (*les êtres vivants*) uurimiselt elu enese (*la vie*) uurimisele, loodusfilosoofialt bioloogiale. Uexkülli märgiteooria sünnib ta tähelepanekuist probleemi üle, mis modelleerib ja käivitab looma toimimist ta omailmas. Osutub, et skeem, oma meelelises ja funktsionaalses kontekstis, kujuneb objektide peegeldustest nende omaduste kogumisse, kus pärisnimesid ei tunta. Pärisnimede eemaldamine, nagu Uexküll seda teeb, juhib tähelepanu esitusele puhtal kujul (*Gestalt*) ning kujutab endast mitte üksnes tähtsat sammu epistemoloogias, vaid ka eluteaduses, mis mõttetu peensusega on kaevunud genotüüpidesse.

Symbol formation

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Abstract. Symbol formation is a term used to unify the view on the interdependencies in the research of the Hamburg University before 1933: the Philosophical Institute (William Stern, Ernst Cassirer), the Psychological Institute (Stern) with its laboratory (Heinz Werner) in cooperation with the later joining Umwelt Institut (Jakob von Uexküll). The term, definitely used by Cassirer and Werner, is associated with the personalistic approach: "Keine Gestalt ohne Gestalter" (Stern), but also covers related terms like "melody of motion" (Uexküll), and "relational content" (Cassirer), discussing the term "empirical scheme" (Kant). All this scientific interest addressed personal forces to structure thresholds in equivalent stimuli. This view on intermodal formation allowed research in common aspects in the environments of animals, of children and adults to meet there the symbol formation of artists (Weimar Bauhaus) and poets like R. M. Rilke, a friend of Uexküll.

Motion and emotion

"'Movement in response to an optical impression,' says Jakob von Uexküll, 'is an integrating factor in the melody of the environment, by means of which the forms of objects are brought to inner realisation'" (Werner 1948: 67). With reference to Uexküll, Heinz Werner (1890-1964) in his *Comparative Psychology of Mental Development* outlines the formative motor processes of realisation:

> The high degree of unity between subject and object mediated by the motor-affective reactivity of the organism results in a dynamic, rather than static, apprehension of things. Things as constituent elements of a dynamic event must necessarily be dynamic in nature. (Werner 1948: 67)

Anticipatory tonal forces[1] behind the dynamic interrelation of motion and emotion formed both the environmental and internal worlds. Changing thresholds of equivalent stimuli shaped the dynamic interrelations in the things-of-action and their signal-qualities. The interrelation could be varied dynamically by experimental attitude change from "Sachlichkeit" to "Leiblichkeit" (Stern 1950: 156; Wohlwill 1930: 39). Far from distanced object perception, then a zig-zag of lines could become an equivalent stimulus to match the emotional content of a metal quality (Werner 1948: fig. 12), and a specific motion could match a tone or colour. This was the language of abstract expressionism in the arts. The emotional equivalence in expression and perception, explored by Heinz Werner in the Hamburg Psychological Laboratory until 1933, was called "physiognomic perception" (Werner 1926: 45), while William Stern (1871–1938), head of the Hamburg Psychological Institute (Psychologisches Seminar; Stern 1931) used the term "Synkinesie" to label expressive motor activity (Stern 1950: 218). Furthermore Stern focused what he called vicarious functioning (Stern 1950: 219; Werner 1945: 317). What on one hand looked like synesthetic (Stern 1950: 215), on the other hand allowed the blind to read a word by touch.

Finished in 1934, Sterns Allgemeine Psychologie auf personalistischer Grundlage reflected the collaborate scientific aims at the former "Hamburgische Universität" 1919–1933. The more this became visible in the second edition (Stern 1950). Ernst Cassirer (1874–1945), together with Stern, there had been head of the Hamburg Philosophical Institute (Philosophisches Seminar), while the Psychological Institute of Stern had Heinz Werner as the head of its psychological laboratory (Psychologisches Laboratorium). This research focused the biology of the person, distinguishing in contact with Jakob von Uexküll and his Hamburg Umwelt Institute (Institut für Umweltforschung) biological and transbiological aspects (Stern 1950: 35). This also is preserved in Cassirer's *Philosophie der symbolischen Formen* (1990 [1929]) and the later editions of Werner's *Comparative Psychology of Mental Development* (1940).

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[1] Symbol formation (Werner and Kaplan 1963) also is known as the "Tonustheorie der Wahrnehmung": perceptual neurogenic muscle tonus modulation meets environmental forces. These are neuronal mechanisms in behavioral aspects of sensation.

The related research focused organic symbol formation to act across the environment. Symbol formation was seen an inter-individual functional circle and personal binding process, driven by the dynamics of motivation, motion and emotion. Cassirer, like Uexküll, distinguished action-space and symbol-space (Cassirer 1994: 179), while Werner spoke of "things-of-action" and of "signal-things" (Werner 1948: 59). The man–animal interrelation in the related cross-world symbol formation was focused in collaboration with Uexküll's Hamburg *Umwelt Institut*, the exploration of the environments of children, embedded in the environment of the adult, was focused by Martha Muchow (1892–1933). She was the assistant of William Stern, who himself pronounced the personal characteristics in symbol formation in his "critical personalistics" (Werner 1938). Accordingly Cassirer focused the relational binding in communicative and explorative symbol formation in his "theory of symbol formation", while Werner looked at the dynamics of symbol formation in culture (Werner 1948; Werner, Kaplan 1963), which brought him together with art and art education. This guided Werner to understand motor tonality in the formative forces of modern art and its motivating interrelation with the environment: "De même, l'osieau au fond de l'azur représente d'abord l'immortelle envie de planer au dessus des choses humaines, mais déjà vous êtes l'oiseau lui-même" (Charles Baudelaire, Les paradis artificiels, 1860; Werner 1958: 56; but not 1948: 82). The interest in the formation of the artist's worlds Uexküll joined with the poet Rainer Maria Rilke. Though, there was an empirical basis of these interests.

Threshold in equivalent stimuli

In 1948, when the second revised edition of his "tonal theory of perception" was published, Heinz Werner had become professor of psychology at Clark University, Worcester, MA, still recalling several former experiments at the Hamburg Psychological Laboratory, which had been closed in 1933. Until then the Hamburg Psychological Institute shared many experiments with the *Umwelt Institut* (Werner 1948: 65, 115). Many terms and concepts Werner had to transform to communicate the ideas of the Hamburg organic approach to his new audience. The catching realisation (*be-merken*) now was described as a signal-property (*Merkzeichen*) to drive (*be-wirken*) of things-of-action (*Wirkzeichen*), performing equivalent stimuli for the tonality of the related receptors and effectors. This were the terms Heinz Werner used to describe the functional circle forming an environment by perception and action. The new audience learned more about the related collaboration of the Hamburg institutes: "one of the most promising experiments inquiring into a world built up of things-of-action and signal-qualities has been carried out by E. G. Sarris in Uexküll's 'Umwelt Institut' in cooperation with our Hamburg Psychological Laboratory" (Werner 1948: 61). These equivalent stimuli then were used to explore the dog's environment, to understand the action related communication of dog and man across their different biological environments. William Stern as the head of the Hamburg Psychological Institute intended to communicate the Hamburg biological approach to his colleagues and invited Uexküll to talk in April 1931 to the Hamburg Congress of Psychology about "Das Duftfeld des Hundes". This speech and the following discussion was a critical point for the political acceptance of the biological view of the Hamburg Institutes (G. v. Uexküll 1964: 168). Nevertheless, the methodical background of the biological approach Uexküll brought to the audience. In short he described the motivation to focus the threshold in equivalent stimuli, directly addressing the joined research of his Umwelt Institut with the psychological laboratory of the Hamburg University:

> Die Umweltlehre sucht die Schwierigkeit, die die Unerkennbarkeit der Empfindung tierischer Subjekte der Forschung bietet, dadurch auszugleichen, daß sie nach Merkmalen sucht, auf die die Subjekte reagieren. [...] Die Umweltforschung vermeidet die unkontrollierbaren Analogieschlüsse aus der menschlichen Psyche auf die Tierseele, indem sie nicht die Empfindungen und Gefühle der Tiere untersucht, sondern ihre Objektivationen in der Umwelt. Sie faßt alle Objekte als Merkmalträger des Tiersubjektes auf. Ist in der 'Umgebung' des Tieres ein roter, eckiger Gegenstand gegeben, der dem Tiersubjekt als Reizspender dient, so fragt sie, ob die Form oder die Farbe, oder beide in der 'Umwelt' des Tieres zu Merkmalen werden, und kümmert sich nicht darum, welcher Art die Empfindungen sind, die dabei im Tiere wachgerufen werden. Statt der Empfindungen erforscht sie die Eigenarten der speziellen Tierdinge in der Welt des gegebenen Subjektes. [...] Sie berücksichtigt dabei seinen momentanen Schwellenwert, denn der gleiche Gegenstand kann bald eine Hauptrolle auf der Umweltbühne des Subjektes spielen, bald völlig in der Versenkung verschwinden. (Uexküll 1932: 432)

Werner presented his recent research in sensation (Werner 1932: 190), and the discussion touched the related research by Wolfgang Metzger and Erich Moritz von Hornbostel. In 1931 Karlfried von Dürckheim

(Leipzig) had presented his related studies in personal space to the Hamburg Congress (Dürckheim 1932: 318), in 1933 he pronounced his ideas about personal time (Dürckheim 1934: 129), while Stern presented his paper "Raum und Zeit als personale Dimensionen" (Stern 1933) to this last free conference. Both these conferences of 1931 and 1933 had unveiled not just an interrelation, but a common basis in the organic approach.

The common basis of the organic approach

In 1931 a common methodical basis in the interest in the organic relation of the Umwelt and the Innenwelt of the subjects became visible, leading to the question of their common basis. Something common was in the signal-quality of a chair, inviting the tired to sit on, its "sitting-tone" for dog and man (Werner 1932: 61), and in the motor qualities of the acoustic tone, which not just exists as a perception coming then and there from the environment, but also as a signal arising and affecting the human bodies internal tonality in general. There were reasons, to use trumpets instead of harps, to signal the appropriate melody of movement.

Motor dynamics to cause object constancies over time, later Alfred Prinz Auersperg discussed with reference to Uexküll in 1937 (Auersperg 1937: 129), at a time, Stern already had left Europe.

The symbol formation, composing a communicative motor melody across time, Uexküll in his *Theoretical Biology* had illustrated by a movie sequence of a jumping ball. The piled slides of this sequence represent the signal qualities, the human organism needs to access, to perceive the given object constancy in space-time. This organic formation of a movement across time, Stern had discussed in 1894 in his article "Die Wahrnehmung von Bewegungen vermittelst des Auges" (Stern 1894), getting the key for his personalistic theory, to which Heinz Werner later introduced the readers of *Character and Personality* in 1938 (Werner 1938). In short, this was an introduction to the idea of the organic "personal world", generated and dependend on the characteristics of the individual: "... each individual has but one character emerging from the interaction of internally conditioned striving with the 'actionalizing' factors of the personal world. Expressed otherwise, character is both (and equally) 'intelligible' and 'empirical'" (Werner 1938: 122). The words used by Werner referred to terms used earlier by Kant, to describe an aspect also Uexküll had brought to debate in 1907.

Function and substance

When Uexküll had published his "Umrisse einer kommenden Weltanschauung" in 1907, Constantin Gutberlet, the editor of the *Philosophisches Jahrbuch* in his article "Die Substanz als Bewegungsmelodie" (Gutberlet 1907) had picked out the critical point, where Uexküll had linked his term "Bewegungsmelodie" with the "empirische Schema der Gegenstände", an expression used by Kant in his "Kritik der reinen Vernunft" (2nd ed, 1787, book 2: "Von dem Schematismus der reinen Verstandesbegriffe"; Cassirer, Das Erkenntnisproblem, 2, 1922 [1907]: 716). Gutberlet rejected the Kantian position in general, just the moment Ernst Cassirer, later together with Stern head of the Hamburg Philosophical Institute, prepared his "Substanzbegriff und Funktionsbegriff: Untersuchungen über die Grundfragen der Erkenntniskritik" (Cassirer 1910). There Cassirer proposed a psychology of relations (Cassirer 1910: 433) to catch the "Relationsgehalt", binding the subject and the object to each other as complementary motor events: "wie zwei aufeinander bezogene und abgestimmte Bewegungsformen, die wir jedoch niemals rein und selbständig zu isolieren, sondern nur in ihrer wechselseitigen Bestimmung durch einander zu bestimmen vermögen" (Cassirer 1910: 435).

In the misinterpretation of this stream of consciousness, William James had detected "the psychologist's fallacy" (Cassirer 1910: 441). The relational content, the formation of structures in the dynamial interrelational processes became the focus of the future Hamburg philosopy and psychology (Werner 1922: 241) in cooperation with Uexküll. "Keine Gestalt ohne Gestalter", William Stern pronounced to express the specific Hamburg personalistic position, to address the communicational aspect of the "Relationsgehalt", which in 1910 took Cassirer from the mathematical subject of motion (Cassirer 1910: 158) and the numerical substance (Cassirer 1910: 206) to a theory of signs (Cassirer 1910: 402): "We do not realize objects, but we cognize objectively": "... wir erkennen gegenständlich, indem wir innerhalb des gleichförmigen Ablaufs der Erfahrungsinhalte bestimmte Abgrenzungen schaffen und bestimmte dauernde Elemente und Verknüpfungszusammenhänge fixieren". This functional binding (Cassirer 1910: 122) allows to catch and to communicate the relational scheme across space and time.

The renewed idea of the scheme allowed to understand constancies in personal dynamical processes, which generated the substance of the object and made the sign:

> In der Tat liegen unseren reinen sinnlichen Begriffen nicht Bilder der Gegenstände, sondern Schemata zugrunde... Der Begriff vom Hunde bedeutet eine Regel, nach welcher meine Einbildungskraft die Gestalt eines vierfüßigen Tieres allgemein verzeichnen kann, ohne auf irgendeine einzige besondere Gestalt, die mir die Erfahrung darbietet, oder auch ein jedes mögliche Bild, was ich in concreto darstellen kann, eingeschränkt zu sein. (I. Kant, Kritik der reinen Vernunft, 2nd ed., 1787, book 2)

Uexküll's *Theoretical Biology* has chapter on the scheme (Uexküll 1920: 36) has examples of the formation of motor melodies, to distinguish further thing and object, object and substance, and object and "Gegenstand", like a ladder, remaining meaningless unless the knowledge of its melody allows to serve motion. The personal performance producing and communicating these relational rules later made the motto of the Hamburg institutes: "Keine Gestalt ohne Gestalter!" The related personalistic chapters on interpersonal perception of space and time (Stern 1950: 206; 211) focus the same object constancies, as touched by Uexküll. In this personalism, in Werners "symbol formation" and in Cassirers philosophy of symbolic forms remain the outlines of the "psychology of relations", proposed by Cassirer in *Substanzbegriff und Funktionsbegriff* (Cassirer 1910: 433). To illustrate this, Cassirer there pointed to the relational binding of a melody across a variety of transpositions, leading from the author via the orchestra to the audience in the theatre. This "Tongestalt" across time, consequently lead Cassirer to the "Raumgestalt" across space (Cassirer 1910: 442). These relational compounds were the same, his Hamburg colleagues addressed as "compositions" or "melodies".

In this organic view, the object constancies formed by artists, all are manifestations of personal worlds. Equivalent stimuli Uexküll had in mind, when he shared his interest in the empirical scheme of objects with the poet Rainer Maria Rilke, when in 1905 they both discussed the idea of the scheme, as proposed by Kant in his "Kritik der reinen Vernunft". An edition of this book Uexküll once dedicated to Rilke, remaining still in the Rilke-Archive.

When Uexküll communicated his ideas to the public, the new Cassirer edition became the standard (Immanuel Kant, *Werke*, vol. 1–11, Berlin 1911–1921, ed. E. Cassirer). The term "melody of motion" for the empirical scheme of the objects became a perfect expression to serve Uexküll and Rilke. Gudrun v. Uexküll in her biography of Jakob v. Uexküll 1964 prints the facsimile of Rilke's poem "The Panther", handwritten by Rilke himself for Uexküll in April 1905. The rhythm of the words there represents by its rhythm the specific melody of motion (*Bewegungsmelodie*) of the panther in his cage. There are different translations of this poem, more or less keeping the rhythm of movement as a melody of recognition, which allows to realize the panther:

> Sein Blick ist vom Vorübergehn der Stäbe
> so müd geworden, daß er nicht mehr fühlt;
> ihm ist, als ob es tausend Stäbe gäbe
> und hinter tausend Stäben keine Welt.

Though Gutberlet in 1907 had rejected the idea to bind recognition by melodies of motion, motor rhythm in 1900 definitely was in the focus of the sciences and the arts. Ernst Meumann in Hamburg surveyed in his *Einführung in die Ästhetik der Gegenwart* (3rd ed. 1919) the related research in the productive processes to generate and perceive works of arts. There he mentions research by H. Münsterberg and A. Pierce, by Ethel D. Puffer (*Psychology of Beauty*, 1905) and George Malcom Stratton (*Psychology and Culture*, 1903) to understand vision related spatial "rhythmical equivalents", research to be continued by William Stern and Heinz Werner as followers of Meumann. Without knowledge of these psychological experiments, in his 1907 article on the future biological world view, Uexküll also had addressed the melodies of the environment by the fact, that landscape painting is the representation of a specific melody to guide the recognition of the landscape itself. Quoting from Uexküll, to these melodies and the proposed psychology of relations also Heinz *Werners Comparative Psychology of mental development* refers. It is not that surprising, because the mental development itself for him is a structured spatio-temporal differentiation, a "geistiger Bauplan", a dynamical process to generate the "Gefüge der Gegenstände". Werner there is referencing Uexküll's *Theoretische Biologie* (1928), *Umwelt und Innenwelt der Tiere* (1921) and *Streifzüge* (1934). Nevertheless, even the adult still has access to earlier processes of formation.

To keep the dynamics of the binding processes in mind, Uexküll had used symphonic terms, while Werner explored the organic formation of micromelodies in his related series of studies (Das Problem der motorischen Gestaltung, 1924; Über Mikromelodik und Mikroharmonik, 1925; Über die Ausprägung von Tongestalten, 1926). And like Uexküll, Werner addressed the bipolar functional dynamics of the signal and ten related action by biological examples. While Werner also quotes Buytendijk (Werner 1948: 59. 63), Uexküll has the equivalent observations from Fabre to illustrate his "psychoidal laws" (Uexküll, Kriszat 1934: 85, fig. 39; Uexküll 1930: 94, fig. 2), to point at the fact, that an acting organism will not realise the signal at its receptors border here in the ear or the eye, related to the internal world, but at a localisation of the moving and sounding source there outside in the environment. The same personal spatio-temporal dimensions were subject of the psychological research (Stern 1936; Muchow 1935).

The preservation of pre-Nazi scientific tradition

In 1919 the term *Umwelt* first was used by Werner (Werner 1919: 217). The first edition of his *Einführung in die Entwicklungspsychologie* in 1926 in book 2 follows the bipolar concept of the *Aussenwelt* and the *Innenwelt* with its specific physiognomic perception (Werner 1926: 45). His second edition in 1933 has the final distinction of the things-of-action and the signal-things. To continue, it is interesting to realise, where Werner refers to Uexküll in his *Comparative Psychology of Mental Development* when he addresses his American audience. Though there are differences in the 2nd (1948) American edition and the 4th (1958) German edition (which incorporates the 1948 addenda), this German edition had a specific purpose: to preserve the pre-Nazi scientific tradition. But the three books of the American edition reveal much better the organic approach. Book 2 ("Primitive mental activities"[2]) is combining human psychology and animal psychology in its bifocal interest in the inner world of internal signal processing, while the outer world of action and personality is discussed in book 3 ("The

[2] Book 2 includes five parts: I Sensori-motor, perceptual and affective organization; II Primitive imagery; III Primitive notions of space and time; IV Primitive action; V Primitive thought processes.

world and personality"). This bifocal layout mirrors the functional circle in environmental access.

Clearly Werner even in the structure of his book presents the twofold organic model of the internal *Merkwelt* and the external *Wirkwelt*. Accordingly, Werner twice refers to Uexküll (Werner 1948: 61 [Book 2], and 379, 382 [Book 3]) to address the animal's environment, and to Martha Muchow to address the human personalistic environment by her mainly unpublished research (Werner 1948: 19, 72, 122, 227, 385), the research Werner himself tried to continue (Werner 1948: 122).

The children's worlds

In an article published in *Character and Personality* Werner has an elaborated view the personalistic approach, which also throws some light on the focus the Hamburg Psychological Institute once had:

> The notion of a personal world provided the basis for the Hamburg Institute's program of investigation of the different types of such personal worlds. [...] But in the actual procedure of analysis not only the developmental stage, but the whole cultural setting as well must be taken in account. Hence, Martha Muchow's program for such an analysis seeks to establish a typology of the child-world and the adolescent-world, one that is definitely cognizant of specific cultural patterns in space and time. Miss Muchow, in strict conformity with this program, has made a study of the life-space of the city world. In this study she demonstrated for the first time the typical characteristics of the world of the child as thus conditioned. In her posthumous, most admirably written book, she has shown how life-space emerges from the interaction of external, nonpersonal factors and the child-like dispositions, how the child selects and interprets the outer stimuli, and molds them into a world of his own that is typically at different developmental stages.
>
> These novel and productive approaches to the problems of child-psychology were tragically interrupted by M. Muchow's premature death [1933]. She was undoubtedly Stern's most brilliant pupil. Her studies realize the synthesis of personalistic theory and empiric investigation in perhaps its most fruitful form. (Werner 1938: 124)

While this exploration of the children's life-space as their action-world, illustrated by the Muchow experiments in mental activity (Werner 1948: 72–75) had much to do with the studies in the territories of the dog at this time, the words "things-of-action" and "signal-quality" (Werner 1948: 61), the later action related chapters on "primitive worlds" (Werner 1948: 379) refer again to a paper written by Sarris on common aspects in the environment of the blind man and his guiding dog (Sarris 1931), there to introduce Martha Muchow's study of the environment of children in opposition to the world of the adult and the building bureaucracy (Werner 1948: 384–385). To illustrate the differences in the child's world of action compared to the view of the adult, Werner there also published some drawings. This brought ideas to the American public, which years later were renewed by Kevin Lynch in his *The Image of the City* (Lynch 1960), who then mentioned the metal worlds of Marcel Proust and Mark Twain, but apparently had no knowledge of the personalistic approach to the organic worlds, represented by the two mentioned chapters on personal worlds at both ends of the book *Comparative Psychology*.

The Artist's worlds

The children's worlds Werner linked with the artist's worlds. Already in 1913 Werner had published an article on melody driven symbol formation in poetry (Werner 1913: 432):

> Klanglos schläft der Sommergarten.
> Durch die Nacht, erschöpfte Tiere
> Schleppen sich die großen Wolken
> In die neuen Rastquartiere.

Quoting a poem of Detlef von Liliencron (1844–1909), he discussed emotional symbol formation, reflecting the operational world, in contrast to emotional driven symbol formation, reflecting the inner world. Later in this Hamburg personalistic respect, as mentioned, he quoted Baudelaire (Werner 1958: 56). Perhaps also this personalistic view has to be taken in account, reading Uexküll's *Niegeschaute Welten* (1936). There in chapter xiv, Uexküll describes his friendship with the poet Rilke:

> 'Was ist wirklich schön?' Es war eine Autorität, an die sie die Frage richtete, denn der Befragte war niemand Geringeres als der Dichter Rainer Maria Rilke. 'Die Schönheit gleicht einem Schmetterling, der gewisse Dinge bevorzugt, auf die setzt er sich, und sie werden schön', war die Antwort des Dichters. [...] '... Stil ist ein Maß, das wir an die Dinge herantragen und, wenn wir Dichter sind, in sie hineintragen, um sie zu formen, und das tun Sie, lieber Meister, in erster Linie.' 'Dann wäre ich selbst der Schmetterling', lächelte Rilke. (Uexküll 1936: 257, 258)

Accordingly, the last entry of Oskar Schlemmer, the painter and master at the Bauhaus, in his diary in 1.4.1943 quotes from a published letter of Rilke to Uexküll: "Die Kunst nicht für eine Auswahl aus der Welt halten, sondern für die restlose Verwandlung ins Herrliche hinein". In Heinz Werners *Comparative Psychology of Mental Development* children and artists become these butterflies, generating their specific worlds, to which still the distant (*sachlich*) man has access to.

The art-related research of Hamburg Philosophical and Psychological Institutes Werner tried to preserve, because only some of the pre-Nazi experiments could be published (Werner 1948, 70; Krauss 1930). Emphasising remarks of the painter Wassily Kandinsky (Werner 1926: 47; 1948: 71), Werner manifests his touch with the formation of modern art, which, as declared in the German edition, based on *discoveries* by the music-teacher and vocalist Gertrud Grunow (1870–1944) (Werner 1926: 68; 1958: 28, 66, 68, 72), who, like Kandinsky, earlier had been a master at the Bauhaus (entry in the 1921 Weimar directory). Later both lived in Berlin, but so far just a postcard by Gertrud Grunow, mentioning a Berlin meeting with Kandinsky in 1932, proves subsequent contact in the field of primary symbol formation. There are some further traces of research in primary colour form abstraction in the collaborate Hamburg animal psychology (Uexküll 1932: 432), and in research continued by Martin Scheerer, who also had left Germany to Columbia University (Goldstein, Scheerer 1941). Some further hints again are found in Werner's *Comparative Psychology* (Werner 1948: 235).

Werner throughout there refers to facts which otherwise are associated with the productive pedagogical training at the Weimar Bauhaus (Werner 1958: 46, 81, 92, 162, 175). This relies to the personally bound functional circle of the productive artist to generate his objects and worlds. This training had to guide intuition. This organic approach is the common aspect in the original Weimar writings published in 1923. But this common aspect is not an obscure common sense in European cultural dynamics, but a specific concept (Uexküll 1973: 49), which then was targeted by those, who still believed in the existence of an absolute objective world. Gertrud Grunow is known to have handed copies of the articles published by Uexküll in the *Deutsche Rundschau* to her Weimar students.

An article by Werner on rhythm (Werner 1919) clearly unveils, that his later research together with Gertrud Grunow touched her field as a profound teacher of rhythmical education by exactly the facts

Uexküll had described as motor melodies. While a kind of autobiographic article: "Was ist Jaques-Dalcroze dem Sänger?", printed in the *Rheinische- Musik und Theaterzeitung* in 1911, presents herself as a follower of rhythmical education, in 1919 Werner in his "Rhythmik, eine mehrwertige Gestaltenverkettung" distinguishes rhythmical polyfigurations and a-rhythmical monofigurations. In this view objects as well as melodies (*Tongestalten*) are understood as arhythmic monofigurations: "Die Dinge der Umwelt sind einwertige, eindeutige Figurationen" (Werner 1919: 217). These monofigurations, like columns or steps, are the elements to compose motor related rhythmic environments; the related research in the environmental effects on motor activity was continued later by Paul von Schiller (Schiller 1934). The there mentioned artificial environment is known as architecture. Architecture in this view is a polyfiguration, like the compositon of a dance, a picture, a concert. This in mind, it is interesting to trace the figurative aspects even in the writings of the architect Walter Gropius. So far and without knowledge of Werner's publications, it was only the Italian art historian Carlo Guilio Argan, to understand her central position in the Weimar circle to train individually constructive motor activity (Argan 1962: 22).

While Stern had the term "Synkinesie" (Stern 1950: 218) to address her methods to train environmental access, the audience today unfortunately is confronted with the limitations of the English edition of Hans M. Winglers *The Bauhaus* (1969), which does not contain a full translation of the main writing of Gropius, "Idee und Aufbau des Staatlichen Bauhauses", but just parts of an early 1922 version of the Gropius text in translation, without reference to the printed full version of 1923. And just one the related illustrations of the volume *Staatliches Bauhaus 1919–1923* was reproduced by Wingler, perhaps by copyright reasons: The full translation with all illustrations already had been published by the Museum of Modern Art (Bayer *et al.* 1938: 21), but published there without the related texts by Grunow and Kandinsky. Furthermore, Wingler did not print the layout of the 1923 exhibition, when a sequence of rooms presented the educational work of Grunow, Kandinsky and Klee together to the public. Consequently, all the references linking the Gropius text with the article written by Gertrud Grunow ("The creation of Living Form through Color, Form, and Sound") are lost.

Gertrud Grunow and Walter Gropius were both in contact with scientific research. Together with Gropius she had visited the first Berlin conference of the Association in Aesthetic and Art Research in

1913, and since early 1920 to 1924 she and her Weimar assistant Hildegard Heitmeyer (with a Hellerau diploma in rhythmical education) were the only professionals in art education at Weimar. Their training there was called "Harmonisierungslehre", to show their aim to enforce the environment directed productive interrelation of signal-things and things-of-action.

There was a common sense in the Weimar education referring to the productive dynamics in physical signal and physical action qualities: "Das bildnerische Werk entstand aus der Bewegung, ist selber festgelegte Bewegung und wird aufgenommen in der Bewegung (Augenmuskeln)", accordingly explained Klee in his "Schöpferische Konfession" (printed in 1920). These related writings by Kandinsky and Klee still are available and in print, while there are just rare traces on Grunows homogeneous methods, as Werner classified them. There remain some articles printed in the Journal *Kunst und Jugend* 1935 to 1938 about her preliminary education in sensation and expression. For this she used a spatial circle on the ground. This circle of about 2 m in diameter had twelve clock-face like locations, to place a tone or a colour on these places. The training of the interdependency of tone and colour then used the external location to feed back sensation in the internal world. Beyond this Froebel- or Montessori-like education in sensation and expression, her main interest was symbol and artefact formation by motor activity. At Clark University, Worchester, the Werner papers give no further hint on this *Innenwelt*-driven *Aussenwelt* formation in perception and creation. And the manuscript of her final summarizing work definitely is destroyed. Few is known of the content of her the volumes, which apparently intended to fit the three volumes of the *Philosophy of Symbolic Forms* of Cassirer, which he had presented her when he left Hamburg in 1933, while she moved in contact with Gertrud Bing and the Warburg Institute to London. But Bing later destroyed all her letters even in the London Institute, and no traces remained there about the "Pathosformel" related motor formation, which was another aspect of higher order symbol formation.

Uexküll in his "Theoretical biology" has a chapter "Das Schauen" (Uexküll 1973: 46) where he exactly addresses the biological view of tone and colour, Grunow already discussed in her 1923 article "Der Aufbau der lebendigen Form durch Farbe, Form, Ton" — with reference to the biological view. The same view is found also in the contribution of Walter Gropius: "Idee und Aufbau des Staatlichen Bauhauses". Even this title pronounced the bipolar environment paradigm: “Nichts besteht mehr an sich, jedes Gebilde wird zum Gleichnis eines Gedankens, der aus uns zur Gestaltung drängt ... ” In fact, this personal bipolarity is the basis of the concept to handle the personal unification in environment directed motor activity. The secret of the world is not behind the object, but behind the subject, as Uexküll proposed in his theoretical biology, to ask “denn warum sollten zwei räumliche Eindrücke im gleichen Subjekt sich nicht beeinflussen?” (Uexküll 1973: 50). Consequently there was a training to perceive and handle the primary classes of matter and shape, to shape the “Werkwelt”, at term associated with the term “Wirkwelt”, while the formative dynamics of the personal world occur as “bewegter lebendiger künstlerischer Raum” (Gropius 1923: 9).

Though the contact of Gropius to the publications of Uexküll nowhere seem to be realized, he had provable knowledge since 1919, when in a letter dated Weimar, December 29, he wrote to Adolf Behne, that for the Bauhaus students he, Gropius, had bought 30 prints of his “Wiederkehr der Kunst” (Leipzig 1919). There p. 109 Behne summarised the view of Uexküll (*Bausteine einer biologischen Weltanschauung*, 1913) and referred to his own article “Biologie und Kubismus” (1917/1918: 694–705).

Conclusion

“Unsere Empfindungen und Vorstellungen sind Zeichen, nicht Abbilder der Gegenstände” Cassirer concluded in his “Substanzbegriff und Funktionsbegriff” in 1910. The Hamburg scientists Cassirer, Stern, Uexküll and Werner in the pre-Nazi time renewed the idea of the “empirical scheme of the objects”, which at their time synchronized European philosophy with American Philosophy, emphasising their relation with ideas pronounced by William James (Teuber 1982). The “stream of consciousness” in the organic view of personalistics receives a new biological platform (Cassirer 1994: 210; Stern 1950: 715). While there is a formative interrelation of Henry and William James, the formative interrelation of the Hamburg scientist’s organic view is leading to the Weimar Bauhaus. This contact to the artists of their time was mirrored by their life and work. In touch with this productive world of signs, cooperating with Gertrud Grunow and Wassily Kandinsky, Werner is said to have lived with his wife, the dancer Jo Gervai, in Hamburg in a Bauhaus environment (Marianne

Teuber). And Fritz Heider, who had left Stern's Hamburg Institute before 1933, focused aspects of this Hamburg view in his description of the psychological environment in the world of Proust (Heider 1941). While the Hamburg institutes had focused formative dynamic motor aspects in the bipolarity of the internal and external worlds until 1933, looking at equivalent signals and intermodal aspects in animal, child and adult psychology, a more psycho-physical approach to measure the facts in environmental access followed G. A. Brecher (Brecher 1932) and E. v. Skramlik (Skramlik 1937), when Viktor v. Weizsäcker developed a new personal concept (*Gestaltkreis*) of psychophysical dynamics in environmental interrelation (Weizsäcker 1939), while J. H. Schultz, with his "autogenic training", allowed the mental access of internal thresholds, mentioning Uexküll's early articles on sea urchins (Schultz 1950: 33).

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Формирование символа

Понятие *формирование символа* объединяет повлиявшие друг на друга исследовательские работы в Гамбургском университете до 1933 года: в Институте философии (Вильям Штерн, Эрнст Кассирер), в Институте психологии (Штерн) и в его лаборатории (Хайнц Вернер) и в Институте Umwelt'а (Якоб фон Юкскюлл). Это понятие, в том смысле, как его использовали Кассирер и Вернер, связано с персоналистским подходом (Штерн), но охватывает и близкие термины как 'мелодия движения' (Юкскюлл) и 'реляционное содержание' (Кассирер), развивая понятие 'эмпирической схемы' (Кант). Одновременно все они связаны с проблемой структурирования порога при равных стимулах. Этот взгляд интермодального формирования позволяет исследовать общие стороны в Umwelt'ах животных, детей и взрослых и производство символа у художников (Weimar Bauhaus) и поэтов (Р. М. Рильке).

Sümboliloome

Sümboliloome on mõiste, mille kaudu ühenduvad vastastikku teineteist mõjustanud uurimistööd Hamburgi ülikoolis enne 1933. aastat: Filosoofia Instituudis (William Stern, Ernst Cassirer), Psühholoogia Instituudis (Stern) ja selle Laboratooriumis (Heinz Werner), ning Keskkonna Instituudis (Jakob von Uexküll). See mõiste, nagu teda kasutasid Cassirer ja Werner, seondub personalistliku lähenemisega (Stern), kuid haarab ka seotud termineid nagu 'liikumise meloodia' (Uexküll) ja 'relatsiooniline sisu' (Cassirer), arendades 'empiirilise skeemi' (Kant) mõistet. Ühtaegu on kõik need seotud läve struktureerimise probleemiga võrdsete stiimulite puhul. Intermodaalne arusaam võimaldas uurida ühiseid tahke loomade, laste ja täiskasvanute omailmas ning sümboliloomet kunstnikel (Weimar Bauhaus) ja luuletajail (R. M. Rilke).

The musical circle: The umwelt theory, as applied to zoomusicology

Dario Martinelli

Abstract. The purpose of the present article is to illustrate the crucial role played by the Umwelt theory in zoomusicological (and, more generally, zoosemiotic) studies. Too much, in fact too little, has been written on the relationship between non-human animals and music. Most of these writings do not explicitly aim at contributing to the actual problem (a good example being the reflections on birdsong contained in John Locke's *Essay Concerning Human Understanding*). Some are, so to speak, a little folkloristic, quite a few broach the problem in strictly scientific terms, and very few take a clearly zoomusicological approach. In an attempt to understand all the possible ways in which the problem can be analysed, it turns out that all these contributions — in spite of their reciprocal diversity — have points in common, leading to three main categories of approach: discontinuity, gradualism, and pluralism (or Umwelt theory). The discontinuist attitude is by definition opposed to the intent of a zoomusicological research, which in fact defends the thesis that music is not specific only to humans. On the other hand, one might share the gradualist assumption that musicality departs from a basis common to many animal species (at least, all those provided with vocal apparatuses). However, such a basis cannot be interpreted as monolithic (i.e., as having developed in a unique and indivisible way), carrying, as a result, qualitative differences in music between species. For the above-mentioned reasons, and for others to be illustrated in the present paper, it becomes clear that the approach to zoomusicology must necessarily be pluralistic. The most suitable framework seems to be that postulated by Jakob von Uexküll, and known as the theory of Umwelt.

A brief definition of zoomusicology

The idea of zoomusicology, in the modern sense of the term, originated with François Bernard Mâche, in his *Music, Myth, Nature*. He announces that zoomusicology is "not yet born", thus establishing in actual fact its birth. Briefly put, the aim of Mâche's essay is to "begin to speak of animal musics other than with the quotation marks" (Mâche 1992: 114). His book first came out in 1983[1], thus one can understand how little has been said until now about the subject, and how much remains to be said.

First of all, there is the problem of defining the discipline. If I was asked to define zoomusicology in a few words, in order to include this term in a dictionary, I would probably say that this discipline studies the "aesthetic use of sound communication among animals". This definition would have the following consequences:

1. I would avoid the use of that really dangerous word, "music". This is because such a concept must be handled with extreme care, even when related to human music only. If one approaches a not-yet-defined sound phenomenon and claims that such a phenomenon is musical, then one really must prove it.
2. I would include another dangerous word, "aesthetic". That is because a) although non-experts would hardly extend this concept to non-human animals, in actual fact, ethology, especially recently, tends to acknowledge the existence of an aesthetic sense in animals; b) most of all, at this very generic stage, the use of this word, as preferred to "music", is motivated by the fact that this expression represents a methodological presupposition, whereas the expression "music" constitutes the real theoretical goal. Indeed, concepts like musicality and musical culture still have too strong an anthropological connotation to be applied to the rest of the animal kingdom as well; c) the concept of "aesthetics", within my theoretical framework, is a fundamental presupposition for defining music.
3. By simply saying "animals", and not "non-human" ones, I leave open the possibility of including *Homo sapiens* in zoomusicological research. That is because a) as I already stated in the introduction, we should not forget that humans are animals, thus it is important to make

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[1] The excerpts quoted in this book are taken from the English edition of Mâche's work, published in 1992; the original version was issued in 1983.

clear that zoomusicology is not "opposed" to anthropomusicology, but actually includes it; and b) if the analysis of human behaviour can also fall into the ethological domain, then human music can fall into the domain of zoomusicology. I am not envisioning a zoomusicological version of Desmond Morris's controversial *The Naked Ape*, but still I feel that a change of perspective can be scientifically healthy.
4. By saying "sound communication", I am explicitly declaring a semiotic approach to music. In this essay, I consider music as both a semantic and syntactic system. I will clarify this approach shortly.

Secondly, one might wonder about the *raison d'être* of zoomusicology; i.e., what consequences are implied in zoomusicological study? What is zoomusicology really putting up for discussion? Mâche provides an answer when he says that "if it turns out that music is a widespread phenomenon in several living species apart from man, this will very much call into question the definition of music, and more widely that of man and his culture, as well as the idea we have of the animal itself" (Mâche 1992: 95). In my opinion, such a statement implies a few interesting reflections. Zoomusicology approaches non-human animals from the direction of human sciences, and music from the direction of biological sciences. As I have already pointed out, certain changes of perspective can be quite helpful for a more complete overview of the phenomena analysed.

Moreover, the basic innovation provided by zoomusicology is the assertion that music is not an exclusively human phenomenon, but rather an emotion and instinct-based one.

> If we had at our disposal sufficient studies of the neuro-physiological links between biological rhythms and musical rhythms, I would probably have been able to draw up arguments which reinforce the conception I am defending, that of music as a cultural construct based on instinctive foundations [...]. But if the animal world reveals to us precisely this emergence of music from the innate, this should enable us to compare it with what happens in man. (Mâche 1992: 95).

Hence, to adopt the zoomusicological paradigm means to put seriously into discussion the present definitions of music, starting from its strongly anthropocentric connotation.

At the same time, the whole conception of the nature-culture dichotomy is to be revised. Mostly, one should wonder — as Peirce already did in speaking of synechism — if we really have to consider it as a dichotomy.

Finally, on a more ethical level, zoomusicology, together with zoosemiotics, cognitive ethology and other studies, testifies to the encouraging progress of human knowledge in studying other animals. Hopefully, the disturbing ghosts of hardcore mechanism, behaviourism and evolutionism, will soon disappear, allowing humans to perceive and interpret other living beings in a more appropriate and realistic way.

Gradualism, discontinuity and pluralism

In an attempt to understand and classify all the possible ways in which the zoomusicological problem has been and can be analysed, it turns out that all the contributions — despite their reciprocal diversity in typology and reliability — have points in common, and lead to three main categories of approach: *gradualism*, *discontinuity* and *pluralism* (or *Umwelt theory*).

By *gradualism* is meant a generically Darwinian approach[2]. The idea is that of an evolutionary continuum in which the human being occupies the highest position, and in which, position after position, the characteristics of the diverse species are less and less complex and refined, although adequate for ensuring the survival of the species in question. In this sense, music, like language, intelligence and so on, is a unique and gradual structure, which finds its maximum development in human beings. This means that sounds uttered by other animals may easily be considered musical, but their apparently lower complexity, the lack of elements present in human music (musical instruments, written musical notation, etc.) and other such differences, are considered to be manifestations of a comparatively inferior development. Typical gradualistic attitudes are recognisable in those who consider birdsong as proto-musical, and who more generally maintain that the origins and rudiments of art can be traced to several animal species. For instance, Hamilton and Marler take a gradualistic approach when they declare: “we must also bear in mind the

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2 Many of the references to Darwin in this essay are deliberately approximate, for they intend to recall a common idea on Darwininan theories, more than the real theoretical principles postulated by the British naturalist.

possibility that some aspects of song variation [in birds] are a manifestation of some kind of primordial exercise in aesthetics" (Hamilton, Marler 1966: 446).

Discontinuity refers to an attitude that is generally sceptical, if not hostile, of the hypothesis that other animals possess an idea of music. The typical approach here is to emphasise a "discontinuity" in the evolution of human beings, in comparison with all other living beings. In other words, a sort of autonomous and peculiar development started at some point in the human evolutionary course, in a way that every behavioural element articulated from then on constituted an exclusively human characteristic. An example of discontinuity is the opinion that music is a typically human phenomenon, which has nothing to do with sound manifestations made by other animals. Such manifestations may *sound like*, but definitely cannot *be* music.

The discontinuist attitude is by definition opposed to the intent of the zoomusicological research, which in fact defends the thesis that music is not specific to humans only. In addition, I will explore the hypothesis of the Transpecific character of many musical elements, and the species-specificness of many others. In other words, I will share the gradualist assumption that musicality departs from a basis common to many animal species (at least, all those provided with vocal apparatuses). At the same time, however, such a basis is not interpreted as monolithic nor as having developed in a unique and indivisible way, carrying, as a result, qualitative differences in music between species.

For these reasons, and for others to be considered later, it becomes clear that the approach to zoomusicology must necessarily be pluralistic. The most suitable framework seems to be that postulated by the theoretical biologist Jakob von Uexküll, and known as the theory of Umwelt.

The theory of umwelt

Ask a human being to name a piece of furniture consisting of a smooth flat wooden slab fixed on legs. Most probably, the human subject will call such an entity a *table*. Now imagine posing the same question to a wood-worm. Possibly, the latter will describe this object as a big, wide, immense food area. The human subject and the wood-worm are facing the same entity, apparently sharing the same environment, are in the same area of the planet Earth, breathe the same air, and are surrounded by the same quantity and quality of matter and molecules.

Nevertheless, the human being and the wood-worm do not share the same Umwelt, i.e., the same subjective phenomenological environment. The wood-worm, because of its physical constitution, its modes of perception, its experience, and in relation to what is 'necessary', 'interesting' to its existence, interprets and (metaphorically) describes the surrounding environment in a totally different way than a human does. The human, in turn, has a given physical constitution, given perceptual possibilities, etc. In other words, although living in the same environment, human beings and wood-worms establish a different relation with it (a relation that is evidently semiotic). Humans and wood-worms see the same things as different objects. John Deely has explained very clearly the difference between an object and a thing:

> [...] there is a great difference between an object and a thing. For while the notion of thing is the notion of what is what it is regardless of whether it be known or not, the notion of object is hardly that. An object, to be an object, requires a relation to a knower, in and through which relation the object as apprehended exists as terminus. A sign warning of 'bridge out' may be a lie, but the thing in question, even in such a case, is no less objective than in the case where the sign warns of a 'true situation' (Deely 2001: 129)

Cimatti (2001, personal communication) indicates the three basic implications of the Umwelt theory as follows:

1. What we might consider a stupid behaviour in another species, depends in reality on the fact that the animal in question values the same situation according to very different perceptual criteria. Literally, it sees different things than we do.
2. In order to understand non-human animal communication, we first need to investigate how they organise their own experience, i.e., what is pertinent to them and what is not.
3. Something interesting or pertinent for a non-human animal may not be perceived by humans at all.

Rather erroneously, the term "Umwelt" has often been confused with that of "environmental niche", or in other cases with "habitat", and in the most inattentive cases, with "environment". It is evident, though, that Umwelt does not designate a touchable and tangible category, but rather an array of phenomenological elements. As John Deely emphasises,

> We see then how different and richer is the concept of Umwelt than the subalternate concept of 'environmental niche'. The concept of environmental niche simply identifies that part of the environment as physical upon which a given biological form mainly depends in deriving the physical aspects of its sustenance. The concept of Umwelt, by contrast, shows us how a given 'environmental niche' is merely the physical part of a larger, objective, not purely physical whole which is, as it were, fully comprehensible only from the perspective of the particular lifeform whose world it is, whose 'environment' is meaningful in the specific way that it is thanks only to an irreducible combination of relations many of which have no being apart from the lifeworld and all of which contribute to the contrast between the physical environment as neutral or common respecting all organisms, on the one hand, and parts of that same physical environment interpreted and incorporated within a meaningful sphere of existence shared by all the members of a species, on the other hand. Only things which are objects make up part of these species-specific worlds, but within these worlds are many objects which also are not things apart from the worlds. (Deely 2001: 129–130).

More specifically, Uexküll considers Umwelt as the result of two main elements: the *Merkwelt*, i.e., the specific perceptive field of a given organism, and the *Wirkwelt*, i.e., the field of actual interaction, the operational dimension of the same organism. Perceptual and operational factors contribute to form a specific Umwelt, which is exclusive for each species, and — proceeding by levels, and establishing adequate proportions[3] — for each community, individual, class, family and so forth. To make the concept clearer, consider Fig. 1. On one side, an organism (e.g., a frog) takes part in a semiosis process, in which it plays the role of "receiver of meaning". On the other side, the environment that surrounds the frog functions as a counter structure, and the frog is related to it both from a perceptual and from an operational point of view. In the first case, receptors (senses) are important; in the second case, organs 'affecting' the

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[3] Uexküll conceives the idea of Umwelt in a biological framework, thus his reflections have much to do with specific differences. In practice, however, one may re-interpret, as many have already done — the whole concept under different lights: cultural, psychological, sociological, and so forth.

environment — such as legs — become preeminent. The environment thus works as a "carrier of meaning", for it addresses receptive and operative messages to the frog.

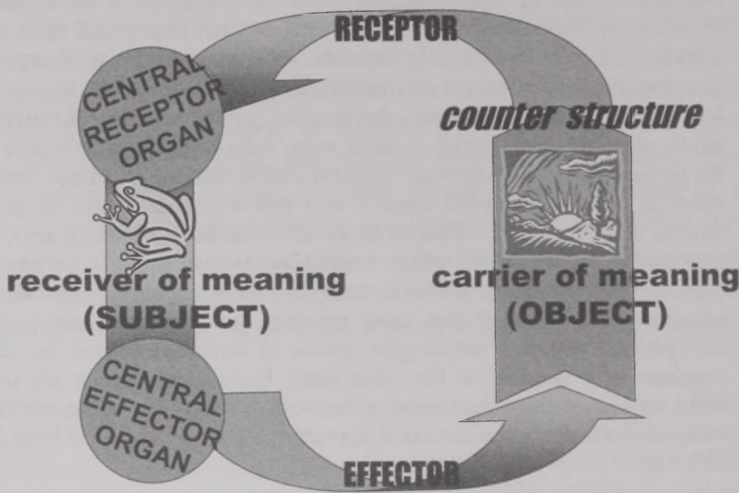

Figure 1. The Umwelt circle.

Transpecific and species-specific traits

How does the adoption of the Umwelt paradigm affect zoomusicology? Many aspects are to be considered here. First of all, to conceive the animal kingdom in the light of the Umwelt theory means at the same time to acknowledge transpecific and species-specific traits in the various species. The word "transpecific" refers to the musical elements that can be found in more than one species, even when among just a few. This level is important in order to show the common biological bases of musicality, and is definitely less problematic than the second level, since in most cases the analysis reveals great similarity between the species observed and human musical culture. The most banal example is of course singing, but other, more particularised aspects could be cited — such as non-human animals arranging sounds into a graduated scale (Mâche 1992; Schafer 1985; Martinelli 1999; 2001; 2002).

Elements are called "species-specific" when they present characteristics that are typical of the species observed. This level shows how musicality, despite the above-mentioned biological basis, has taken quite varied courses, according to the evolution of each species, and — most of all — to the articulation of the respective Umwelts. Of course, the less a species exhibits human musical traits, the more difficult musicological analysis becomes. This is because zoomusicology is just taking its first steps: it is natural that human musicality, for the moment, represents the only complete point of reference. When musical cultures of other animals will have been studied more closely, we will probably be able, through abduction, to create new musical parameters to apply to the most peculiar cases. A typical example of a species-specific trait is the number and quality of pertinent sounds and intervals that occur during a performance. The perception and use of these pertinences vary from species to species, so that — quite trivially — a sound that is catchy and pleasant to a dolphin's ear might sound totally out of tune to a seagull.

Such a distinction should also be considered useful in the area of rules and principles and not only in defining specific traits. For instance, the fact that wolves utter an arch-shaped melody (i.e., a prolonged sound that starts low in intensity — and quite often in frequency, too, then increases to a certain peak, and finally decreases again) is surely not a species-specific trait of that species (humans, to mention one species, occasionally perform in that fashion). Rather, the fact that that type of melodic pattern occurs so often as to make it a distinctive mark of howling can be considered species-specific.

Of course, one shall not deny how problematic the picture is in this case. To deal with the species-specific traits issue means to take a whole responsibility to tell what, in animal sound manifestations, distinguishes one species from all other existing on Earth. This is predictably a hopeless task. Even if it was not, the presence of millions of animal species on this planet would make this the thickest book ever. Thus, any attempt in this direction is doomed to failure anyway. What is more realistic, is to propose some methodological indication and — very cautiously — some hypothetical example.

As already mentioned, by species-specific we mean an element (behavioural, physical or else) that must be considered exclusive of the species examined. The concept itself of exclusivity is however to be put into discussion, for matters of principle:
1. How to deal with the same element emerging in two different species, which presents the characteristics of a simple analogy rather than homology[4] (in a few words, such an element fulfils a given function for one species and a totally different one for the other)?;

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[4] I have already pointed out that the aim of zoomusicology is to demonstrate that a concept of music (or aesthetics, more generally) exists in non-human animals as well as in human ones. In other words, my claim is that sound manifestations in non-human animals are *homologous* to musical manifestations in humans. They are not simply *analogous*. As Sebeok points out, "These parallels immediately raise several problems, the most obvious being whether the animal's behaviour is 'merely' analogous to man's, whether, that is, shifting to a more familiar parlance, [for instance] the label 'dance' is 'just' a colourful and suggestive metaphor — as it must surely be in Frisch's designation of the kinetic component of the communication system of the honeybee as a 'dance' — or whether something deeper is implied, perhaps indeed a remote phyletic homology[4]" (Sebeok 1981: 218).

Let us consider three men holding up their hands. The first stands on a basketball court and has just scored a point. The second stands before the TV watching that basketball match and supporting the team which the first guy plays for. The third guy is somewhere else and has a gun pointed at his back, and to be sure, is not interested in basketball at all. The behavioural pattern (hands up) of the first guy is homologous to that of the second, and analogous to that of the third, since the first two cases are clearly a display of agonistic euphoria, while the third is just obedience to a robber's command.

The homologies-analogies issue, very typical in animal-related studies, applies also to ethnomusicological contexts. "[…] the facts inventoried in the sound material and considered identical by the musicologist do not necessarily have the same meaning for each of the autochthonous people who have played them […]. It is very interesting to find analogies between a work by Messiaen and a Tibetan piece from the point of view of sound material perceived, but one must note that such a comparison — which might end up, why not, by finding universals — retains a necessarily etic character" (Nattiez 1977: 99).

The problem of homologies is widely studied also in ethology, especially as concerns acoustic communication. According to Tembrock (1963: 777), there are three criteria by which to define homologies:
1. The criterion of position, understood as "the situation that exists at the time when the sound is made. This concept of 'position' would have to include all available external and internal factors" (Tembrock 1963: 777);
2. The criterion of the special quality of the structures;

2. Is it acceptable to take into consideration elements that are actually exclusive of a given species, but emerging in totally isolated and sporadic situations, without any significant statistic continuity?; and finally
3. Is species-specificity the sole parameter to consider as opposed to universals, or order-specificity, class-specificity, individual-specificity etc. should be also considered?

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3. The criterion of interconnection by intermediate forms.

These criteria refer directly to sound forms, and, in Tembrock's view, could be used in principle, if comprehensive data on acoustic communication in non-human animals were available.

Tembrock indicates further, auxiliary criteria that can be used for simple structures: "a) simple structures can be regarded as homologous if they occur in a large number of nearly-similar pieces; b) the probability of a homology in simple structures increases with the existence of further similarities of equal distribution in nearly-similar pieces; and c) the probability of homology of a characteristic decreases with the frequency of occurrence of this characteristic in species which are definitely not related" (ibid.).

Unfortunately, the fact that certain types of non-human animal behaviour may be considered either analogous or homologous to human behaviour does not only depend on the factors listed above. In some cases, the exclusive human-ness or non-human-ness of certain behavioural traits is simply taken for granted - e.g., music is claimed to be exclusively human - so that attempts to detect homologous characteristics in such patterns is a priori accused of anthropomorphism or zoomorphism.

Significantly, scholars supporting the aesthetic hypothesis in non-human animals must systematically stress that their researches are not affected by anthropomorphism. "[…] a natural recognition of the remarkable similarities which actually exist between the dances of birds and men and the identity of the emotional sources from which both take their origin. The resemblances between avian and human dancing are the outcome of emotional drives which underlie the behaviour of all the higher animals; and the natural corollary is that we can use the terpsichorean activities of men to interpret those of birds, and vice versa. Let us not be scared by the bogey of anthropomorphism into the arms of the spectre of Cartesian mechanism. It is not anthropomorphism to believe that man and the higher animals have much in common so far as instinct and emotion are concerned, but an acknowledgement of truth scientifically demonstrated" (Armstrong: 1963: 195). Provided that the analogies-homologies phenomenon can be demonstrated in the zoomusicological field (which is one aim of the present essay), I look forward to the time when one will not have to "justify" his/her own anthropomorphic tendencies, especially when they are not at all anthropomorphic in the common sense.

On the first point, Sebeok seems to have quite clear ideas, even without explicitly dealing with the problem:

> Although 'flehmen', or lip-curl, which involves the closure of nasal openings when the head is jerked back, is a widely distributed behavioural trait in mammals, this facial expression has evolved into a particular sign in horses which elicits particular responses on the part of other horses. A fearful rhesus monkey carries its tail stuck stiffly out behind, while a baboon will convey the same emotion to its fellows by holding its tail vertically. In brief, each kind of animal has at its command a repertoire of signs that forms a system unique to it or is, in biological parlance, species-specific. (Sebeok 1986b: 76–77)

In other words, if given patterns are displayed by more than one species with different functions, than they should be considered species-specific. In zoomusicological terms, this implies the transposition of musical traits from their structure to their function, which is quite an interesting point.

As for the second point, I will propose my personal reflections. When a musical characteristic is detected with more frequency than another, it does not necessarily mean that the former is more relevant than the latter. It is surely important to detect the recurrence of a trait, in order to understand how essential and distinctive this trait is to a species (or a community, or an individual). The very large number of solo piano pieces written by Chopin is a clear clue of how relevant that instrument was for the compositional process of the Polish composer.

On the other hand, the sporadic emergence of a given trait should not lead to the conclusion that such a trait is less or not significant at all. There is only one Queen song in which the classic drum kit is replaced by plenty of hand-clapping and foot-stomping, i.e., "We Will Rock You", but it takes a bit of courage to affirm that this song — a Queen standard — is not typical of or significant to the repertoire of the English rock-band. At the same time, an arched-shaped melodic howling is undoubtedly a frequent and characteristic trait in canidae, but from that we should not necessarily deduce that other, quasi-arch shaped forms of howling are melodic mistakes[5]. There are several

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[5] In fact they can be, if there is a way to demonstrate that precise arches are an aesthetic goal in canidae's howling, and thus "almost-arches" are a sort of pre-song, as occurs in birds. My claim here is that neither one nor the other conclusion can be made on a simply statistical basis.

analytical levels to take into account: one is the transpecific, and another is the species-specific, but within the latter there are numerous cultural (i.e., related to the habits of a given community instead of one another) and individual nuances. The amazing variety of humpback whale songs is paradigmatic in this sense.

In addition, just the existence of a wide range of individual variations and styles makes zoomusicology an inexact science.

> Obviously, the study of an animal species cannot be exhaustive. Just as the best singers are at the same time those in whom one finds the greatest individual variations, one must have access to numerous hours of recordings of a great number of different individuals, throughout their entire habitat, in different seasons and over many years. It is not surprising that the number of species for which this kind of work has been done remains minuscule. Generalisations still depend largely on the familiarity of the describer with the species described. (Mâche 1992: 98)

More to the point, the emerging of a trait, even when sporadic, shows that the species in question is in fact able to produce it (even through a single specimen). When a sportsman establishes a world record in a given discipline, he not only demonstrated that he is able to break that boundary in space or in time, but he also demonstrated that human beings are. Then, if that record happens to be undefeated for a very long time, it would be quite paradoxical to consider it as little significant just because it is isolated and episodic. As a consequence, my answer to the second question is yes: it is acceptable to take into consideration rarely-emerging elements.

Finally, although quite crucial, the third question must be temporarily left apart. It is very probable — sure, in fact — that other types of specificity (by order, by individuals etc.) must be taken into consideration, and that the simple species-specific/transpecific dichotomy is in fact inadequate. However, at present, zoomusicology is too young and this essay too limited to transcend human music as a point of reference. And Homo sapiens is notoriously a species, rather than an order, a class or else. At present, zoomusicological research is pushing the musical boundaries from the anthropological (i.e., species-specific) level to the generally zoological (i.e., transpecific) one. At the moment, these are the levels in questions.

Analytical levels

Although much more similar to gradualism than to discontinuity, the Umwelt theory is undoubtedly a third way for zoomusicology. Music cannot be conceived as a unique continuum, simply divided by grades. To locate music on one level instead of another, implies the understanding of *where* exactly a sound utterance should be considered musical (human beings? great apes? primates? mammals? animals? living beings?) and also *where* (i.e., at which point) certain traits can be analysed in their specific autonomy.

If one interprets the musical process at the same level of any other process of semiosis between organism and environment, a fundamental principle of musical activity becomes quite clear: music is the result of an interaction between a subject and an object, between a structure and a counter-structure, between a receptor and a carrier of meaning. These two parts are in constant and reciprocal informational exchange. In fact, the exchange itself is the real generator of the musical phenomenon, since the latter would simply not exist if the subject was not affected by it and did not affect it. Any zoomusicological (and generally musicological) research should take into account such a conception, otherwise it risks perverting the essence of the musical phenomenon.

An excellent exemplification of this close structure-counter-structure bound in music is the theory of bio-acoustic relations. According to Dane Harwood, "human beings construct *meaningful* patterns from information in their environment, and [...] these patterns form the basis of complex bodies of knowledge represented in memory. Categories — names for classes of patterns which are useful in coding, and operating in, the real world — have meaning to the extent that they specify one concept rather than others which are viable alternatives" (Harwood 1976: 529). Philip Tagg refers to such categories as *bio-acoustic relations*. They occur between a subject and a musical object. These relations are detectable between the following:

1. (a) musical tempo (pulse) and (b) heartbeat (pulse) or the speed of breathing, walking, running and other bodily movements. This means that no one can musically sleep in a hurry, stand still while running, etc.;

2. (a) musical loudness and timbre (attack, envelope, decay, transients) and (b) certain types of physical activity. This means, for example, that no one can make gentle or "caressing" kinds of musical statements by striking hard objects sharply, by singing jerky lullabies at breakneck speed, or using legato phrasing and soft, rounded timbres for hunting or war situations;
3. (a) speed and loudness of articulating tones and (b) the acoustic setting. This means that quick, quiet tone beats are indiscernible if there is a lot of reverberation and that slow, long, loud ones are difficult to produce and sustain acoustically if there is little or no reverberation. This is why a dance or pub rock band is well advised to carry its own "sound-space" with it, in the form of echo effects, to overcome all the carpets and clothes that would otherwise dampen the sounds the band produces;
4. (a) musical phrase lengths and (b) the capacity of the human lungs. This means that few people can sing or blow and breathe in at the same time. It also implies that musical phrases tend to last between two and ten seconds.[6]

If we accept such a theoretical framework — and Tagg's application of it to human musical experience is very convincing — it could be interesting to interpret animals' musical cultures as consequences of each species' musical-biological Umwelt. The articulation and the modalities of the sounds produced by humpback whales is a perfect illustration:

1. *Velocity*: If modern human life is characterised by numerous *social rhythms*, the movements of whales' life are much more regular. "The tempo is largo and maestoso, and it seems to proceed at the same pace of the waves. Maybe this is the rhythm the whales are most familiar with, since they live with it" (Payne 1996: 153, my translation).

2. *Echo*: It is apparent that whales are aware of deep underwater feedback. Several recordings catch them amusing themselves by uttering a peremptory sound and letting the echo do the rest. In human music, such effects are artificial, as in popular music one hears flangers, phasers, and wah-wahs. Among other things, it would be interesting to know if the boom in the use of these effects in the 1970s is somehow related with McVay and Payne's discovery of whale songs

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6 From http:// www.tagg.org/texts.html.

(1971). According to Murray Schafer, a relation of this kind actually exists (see Murray Schafer 1985: 60).

3. *Cyclic nature of singing*. One session may be composed by many, manipulated repetitions of the same song. A similar characteristic is hardly found among humans, who seem to be more interested in thematic repetition. Payne maintains that whales' songs are cyclic because almost everything in their life is cyclic: "The life of most cetaceans is cyclic. A whale calf, as soon as it is born, perceives the circular movement of waves. The bigger the wave, the bigger (and slower) is the circular trajectory passively followed by the whale. [...] Migration routes, in many species [...], are circular instead of straight back-and-forth [...]. Whales, as all animals, experience the daily rhythm of light and darkness, and the seasonal rhythm of cold and warm. They experience the changing of tides, as affected by the cycles of the moon's phases [...]" (Payne 1996: 19, my translation). I would add that the above-mentioned underwater acoustic effects shape the sound wave in a roundish fashion. A rock guitarist who uses a flanger on his electric guitar is usually seeking a rounder, more water-like sound.

4. *Length of song sessions*, or, more generally, the time devoted to singing. To my knowledge, there is no human society that sings non-stop for 22 hours;

5. *Sounds and intervals*. The number of sounds employed in a whale song is much greater than those used in the songs of humans, since the former sounds make use of intervals smaller than a semitone. As illustrated earlier, all of these microtonal sounds are likely to be significant for a humpback.

6. *Manipulation of sound material*. The tendency to transform and "play" with sound material is widespread among non-human animals. Such a tendency can be found in humans, but definitely not on a regular basis.

Umwelt theory and biocentric approach

Given such remarks, the question we now wonder about is whether a discipline like zoomusicology (or zoosemiotics in general), which practically deals with animal sound communication through (and thus accepting the idea of) the functioning of their cognitive process, should make do with anthropocentric methodological models[7]. One should say no, of course, but at the same time, is there any efficient

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[7] According to usual definitions, anthropocentrism interprets Nature as (a) an entity existing *apart from* and *for the benefit of* humans, so that (b) nothing in Nature can be considered in itself, autonomously from humans; and (c) it is ethically acceptable for humans and non-humans to be treated in different ways. In other words, Nature is not of interest (e.g., to conservationists and preservationists) because of its hypothetically *intrinsic value*, but just because of its *instrumental value*, i.e., the values it has for and to humans.

Most criticism against animal-related studies tends to emphasise that a totally impartial interpretation of animal behaviour is not possible, for observations are external to the subject of study and cannot avoid frames of reference that are typical of human interpretation of reality. In this sense, the approach is anthropocentric, i.e., concentrated on and mediated by the fact of being human. Such a statement deserves, however, specific reflections.

First, such forms of criticism are a little simplistic, and merely constitute a comfortable and socially shared (thus, stereotypical) way out of facing a problem that is in fact quite complex. It may be easy to speak of anthropocentrism as an apparently unavoidable form of interpretation of reality that affects scientific research; however, to mix all its nuances in the same big pot reveals a lack of knowledge on the topic. It is more proper to dissect the question into all its components in order to re-interpret anthropocentrism more accurately.

Secondly, I have the feeling that those who doubt the scientific validity of animal-related studies, because of the difficulty of avoiding anthropocentrism, often seem to be sceptical only about part of the story, while in a few other cases, animal-related studies seem to enjoy everyone's confidence. Very well known is the scepticism that surrounded and partially still surrounds Darwin's theories, but where are the sceptics when it comes to evaluate the very probable anthropocentrism of pharmacological research? Should they not be at least suspicious about transferring given data from non-human species to the human one so easily?

Lastly, these types of criticism are a little too defeatist. It is true that there is no way to avoid some elements of anthropocentricity, but is this an absolutely unbridgeable gap between scientific research and a correct interpretation of reality? Things are never all black or white: the impossibility of being totally objective and impartial towards a topic is not really a good reason to give up scientific research in general. Different degrees of impartiality, according to specific cases, can be achieved. The challenge is to *tend* towards absolute impartiality. Otherwise, not only animal-related studies but also 99% of scientific fields would not be scientifically believable.

The above considerations appear rather simple, if not banal. Yet when animal studies are involved, scholars tend to forget them quite often.

Hence, the very first question, Is there just one type of anthropocentrism, or are there more? In other words, How many ways exist to observe reality according to the criteria of interpretation and classification proper to the human being? My alternative, an Umwelt-based model, which I call *biocentrism* for reasons I am about to illustrate, which works on both theoretical and concrete levels? I believe there is, and in fact I believe that — unconsciously or not — part or most of such a model is already used in scientific research (possibly, under different labels), the main problem thus being just that of systematising the different parts into a coherent and realistically applicable theoretical model.

An issue such as biocentrism deserves more than the general scrutiny I give it in this article. First, because concepts that are complex and crucial, in order to understand and regulate the human role in the ecosystem, could be made to seem a bit generic and banal.

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research suggests me that such criteria should be distributed on at least two layers: *default anthropocentrism* and *binary anthropocentrism*. The latter, in its turn, can be divided into *quantitative* and *qualitative* types.

The first elementary level, *default anthropocentrism*, consists in the banal consideration that the subject who observes a given animal species is evidently a human being, with all its resources, limits and modes of categorisation. What we understand about a dog, for instance, is what we are able to understand, given the means that allow us to do. Technology does not (yet?) allow us to understand a dog the way, say, a pigeon would understand it. Such a consideration is not very different from statements like "Alvar Aalto is a great architect". Quite evidently, in pronouncing such statements, we are reporting one of our forms of interpretation of reality, founded on personal experience, education, culture, perceptive sources and so on. Now, this looks to me obvious, inevitable, and not dangerous. The other way round, however, could be dangerous, for it could mean the expressing of opinion without any point of reference or any code, resulting in a sort of perceptive anarchy. As long as an anthropocentric attitude is reduced to this very basic expression, no kind of scientific research runs the risk of being taken little seriously.

The second type is *binary anthropocentrism*. Here, the fact of being a different entity from the object observed (human, rather than another animal) produces a dualistic interpretation of reality, based on criteria of *difference* (*qualitative anthropomorphism*) and/or a strongly *hierarchical identity* (*quantitative anthropomorphism*), which puts the observer, and the group s/he belongs to, in a superior position in relation to the group observed. In the case of qualitative anthropocentrism, the observer-human being tends to distinguish him/herself from the non-human animal by means of either/or qualities, which is almost a causal relation (i.e., "humans do, *ergo* animals don't"). In the case of quantitative anthropocentrism (which is a post-Darwinian anthropocentrism in a way), the difference between human beings and other animals is expressed by means of quantities (more/less). Within this framework, a statement like "Unlike Gropius, Alvar Aalto *is* a great architect" is of qualitative type, while the statement "Walter Gropius is a good architect, but Aalto is definitely better" is quantitative.

Second, because I also run the risk of using the wrong terminology. In particular, if zoosemiotics pertains to animals, why should I use a word like *biocentrism*, which actually refers to all living beings, including plants, and not the more appropriate term *zoocentrism*? And why not even ecocentrism, referring thus to the whole ecosystem? There are three possible explanations for my choice:

1. Very simply: there is not room enough to develop every single issue and to provide adequate terminological and conceptual explanations. Among the above-mentioned options, *biocentrism* is the most familiar and, theoretically speaking, the best defined. For my purposes, that should be enough.
2. One of my main theoretical sources for this section is the Finnish philosopher Leena Vilkka, who has exhaustively illustrated the three concepts (Vilkka, 1997: 37–83). According to her definitions, zoocentrism "covers the discussions in which the notions of higher animals and their value are central. Zoocentrism is the animal-centered, especially vertebrate-centered philosophy" (ibid.: 37). In zoosemiotics, invertebrates have a definite and important role (see the importance of zoosemiotic studies on bees' communication). If one accepts Vilkka's definition (which she argues quite convincingly), the concept of zoocentrism is too limited in this context.
3. Any scientific theory should always take into consideration its own possible developments. If a phytosemiotics exists (and it does), nobody can exclude, a priori, the application of certain zoosemiotic principle to plants, as well. I am not saying that we should, but simply stating that, in looking forward to further developments, it is wise not to take too solid a position.

Having accepted that, other considerations can be proposed. As a first step, the concept of anthropocentrism must be reconsidered. Indeed, the real core of the biocentrism-anthropocentrism problem is not, as one might expect, the dichotomy between instrumental and intrinsic value. Anthropocentrism is certainly an interpretation of Nature on the basis of its instrumental value, but this conception is not necessarily opposed to the idea of intrinsic value.

> The concept of intrinsic value can be interpreted at least in three ways: a) as a quality or property that human conscience attributes to something, and that characterises this object as possessing a value in itself, not related solely to human interests, or solely to the value of the conscience that gives birth to it;

> b) as a property that emerges from the relation between an event and a conscience, in a relational-phenomenological fashion; c) in Platonic terms, as a totally objective value, inscribed in the objects themselves and independent of human evaluation (e.g., Nature's value existed before human conscience and will keep on existing when the latter disappears"). (Bartolommei 1995: 42; my translation, D.M.)

In environmental philosophy, these three interpretations may be separated or combined. If kept separate, mostly excluding the third, ontological interpretation, there is little contradiction with a default anthropocentric attitude. It is not problematic for an anthropocentrist to accept that Nature, in whatever form or manifestation, may have value in itself, if a distinction is made between humans as *source* and as *centre* of values (Bartolommei 1995: 43). In a way, default anthropocentrism is nothing other than anthropogenesis: what is said or thought by humans starts from the human interpretation of reality, but — and this is the point — does not necessarily have to be confined to humans. What is said and thought by — say — a supporter of Juventus Football Club is not a priori "Juventus-centric".

> In other words, the condition of the subject who speaks must not be confused with the contents of his/her statements: anthropocentrists should easily acknowledge that if it is true that there is no value without someone valuing, it is also true that the value of the object is not reduced to the sole value it has for the one who values, nor to the value of this latter him/herself. In short, it is one thing if anthropocentrism is meant as negation of values independent and separated from human acts of evaluation; anthropocentric prejudice is another thing (i.e., the idea that everything on Earth is only a function of human values). (Bartolommei 1995: 43–44; my translation, D.M.).

It is evident that the *value* I am discussing here is the musical one. The thesis I defend is that just because human beings create and theoretically develop the concept of music does not constitute a sufficient reason to think that music is an exclusively human peculiarity. I illustrate this concept further on. What matters now is to point out the four basic implications of a biocentric musicology:

1. Hermeneutically speaking, Nature is to be divided into levels, organised as follows. Beyond a general common basis, here called *ecological*, whose constraints — such as being subject to gravity — are shared by everything on Earth, there is a second, *biological* level, in which every living being is included. Eating and reproducing, for

instance, typify humans and birds, insects and flowers, and so on. Things become more interesting on the third level, called the *zoological* or the *transpecific*, which concerns aspects held in common among the whole animal kingdom. At this point, more than one human conception is to be revised. This book, for instance, proposes that music is not an exclusively human domain. In a way, it is only a matter of complexity. In turn, complexity is a relative concept, since it should be proportioned to the respective needs of each species, or to their respective Umwelts. Fourthly, there is the level of characteristics that concern a single species (*species-specific*). An activity such as making a presentation with the use of transparencies must be considered an exclusively human skill, just as giving the exact position of a flower by a figure-eight dance is a skill-specific to bees. From the next level on, the course is quite clear for humans, but is yet to be well defined for other species. This is because the categories are now species-specific, and each species has developed a unique process. For most animals, including humans, this level is mainly social, but many species are not organised into societies at all. Thus, one should stop here.

2. In this research, the transpecific level must be considered the first meaningful category. Zoomusicology is concerned with all those musical features that are not exclusive to humans, but are shared among at least some other species, specifically, among those provided with vocal apparatuses. It can now be said that as a zoological phenomenon, music can no longer be analysed from an anthropocentric point of view, just as decades ago ethnomusicologists said that, as an anthropological phenomenon, music should not be analysed from a strictly Eurocentric point of view.

3. The species-specific level is so capacious that nobody should take this kind of research as being too zoomorphic. *Homo sapiens* retains its incredibly large number of exclusive aspects. The problem here is to arrange categories in the right position and proportions, and to create a more appropriate "cosmology". As Cimatti comments, "centripetal" tendencies must be balanced with "centrifugal" ones: "On the one hand, this centripetal tendency is positive, for it finally reminds us that we are animals, that our behaviour does originate from an immaterial entity, and — as a consequence — that we have clear responsibilities towards Nature. Of course, this tendency is good as long as we do not neglect differences, falling once again into an

excess of anthropomorphism (a typical attitude of TV programmes). Non-human animals are very different from us, and I would also say that it is ethically wrong to say that we should preserve them since they are *good*, they take care of the children, and things like that. Animals are not *good* from *our* point of view, but definitely this is not the point. We should preserve the animals' world as itself, precisely because it is so different from us. I would rather say that biology reminds us that we all are similar — we all descend from other living forms — and different at the same time, just because every animal species is different from all the other, otherwise it would not be a *species*. So, this centripetal movement is not wrong, but it must be accompanied by an analogous centrifugal movement that reminds us of the biological differences of each species" (Cimatti 2001: personal communication, my translation).

4. As biomusicologists like Nils Wallin (1991) maintain, the study of music in its biological dimension can be very useful for understanding its real essence and development.

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Музыкальный круг: теория умвельта применительно к зоомузыкологии

Цель настоящей статьи — иллюстрировать существенное значение теории умвельта для зоомузыкологических (и шире — зоосемиотических) исследований. Много писалось о связи музыки и различных животных, но при этом мало внимания обращали на саму суть проблемы. Некоторые исследования относятся скорее к фольклористике, только немногие исследуют проблему научными методами и лишь одиночки используют зоомузыкологию. Несмотря на многообразие разных подходов, при ближайшем рассмотрении выясняется, что у них имеются общие точки соприкосновения, что позволяет выделить три главных подхода: градуализм, дискретность и плюрализм (или теория умвельта). Исходящий из идеи дискретности взгляд уже по своему определению противоречит принципам зоомузыкологии, так как последняя придерживается мнения, что музыка присуща не только людям. Градуалисткая точка зрения предполагает, что музыкальность базируется на основе, являющейся общей для многих видов животных (по крайней мере для всех тех, которые имеют голосовой аппарат). Все же такую основу нельзя считать монолитной (т.е. развитой единственным и неделимым способом), такой, которая бы могла быть основанием качественных различий в музыке разных видов. Самой подходящей кажется созданная Якобом фон Юкскюллом теория умвельта.

Muusikaline ring:
Omailma teooria, rakendatuna zoomusikoloogias

Käesoleva artikli eesmärgiks on illustreerida omailma teooria olulist tähtsust zoomusikoloogilistes (ja laiemalt — zoosemiootilistes) uuringutes. Muusika ja erinevate loomade seostest on küll palju kirjutatud, kuid väga vähe on puudutatud selle sisulist probleemi (nagu ka John Locke'i käsitlus linnulaulust ta teoses *Essay Concerning Human Understanding*). Mõned käsitlused on pigem folkloristlikud, üksikud uurivad probleemi teaduslikus plaanis, ja vaid väga üksikud kasutavad otseselt zoomusikoloogilist lähenemist. Erinevaid vaateid ja lähenemisviise mõista püüdes selgub, et neil on — mitmekesisusele vaatamata — ühiseid punkte, mis viib kolme peamise vaateviisi eristamisele: gradualism, mittepidevus, ja pluralism (ehk omailmateooria). Mittepidevusest lähtuv vaade on määratluse kohaselt vastuolus zoomusikoloogiaga, kuna viimase püüdeks on kaitsta seisukohta, et muusika ei ole üksnes inimomane. Gradualistliku vaate järgi eeldatakse, et musikaalsus lähtub alusest, mis on ühine paljudele loomaliikidele (vähemalt kõigile neile kel on hääleaparaat). Ometi ei saa sellist alust pidada monoliitseks (s.t. ainsal ja jaotumatul viisil arenenuks), mis annaks aluse kvalitatiivsetele erinevustele erinevate liikide muusikas. Sobivaim raam tundub olevat Jakob von Uexkülli poolt sõnastatu, mis on tuntud kui omailma teooria.

Race and breathing therapy: The career of Lothar Gottlieb Tirala (1886–1974)

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Abstract. The historiography of life, work and visions of Jakob von Uexküll (1864–1944) has grew up during the last years. But up to now lifes of his important followers in science are still unknown. This article ist devoted to life and work of Lothar Gottlieb Tirala (1886–1974), who studied psychology and medicine in Vienna and started cooperation with Uexküll in 1914. They stayed in contact during the following decades, although Tirala began a career in race hygiene and neo-darwinistic scientific thought. He organised the contact between Uexküll and Houston Stewart Chamberlain and got support from the Wagner-family in 1933 to become professor for race biology in Munich. After his booting out in 1936 because of massive faults in teaching Tirala changed his scientific interests and began to stretch Uexkülls "Reflexlehre" into healing of blood pressure diseases in men. He became a favourite researcher in German natural cure community after 1945. Even today his studies are integrated in efforts to fight hypertonia.

In a death notice in the *Wiesbadener Kurier* newspaper on Feb. 23, 1974, relatives mourned Dr.med. Dr.phil. Lothar Gottlieb Tirala, o.ö. Universitätsprofessor a.D., "He was a person of unusual intellectual gifts and tireless creative work".[1] This formulation is a masterly circumlocution for one of the strangest medical careers that ever played out on German territory. The protagonist thereby managed in extraordinary manner to blur almost all the tracks of his various activities, so that the historian's work must resemble that of a

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[1] Death notice Lothar G. Tirala. *Wiesbadener Kurier* Feb. 23, 1974.

detective.[2] In the standard work "Rasse, Blut und Gene" ("Race, Blood, and Genes"), Tirala appears almost in a series with Karl Saller as a "victim of occupational reprisals," in the Third Reich (Weingart *et al.* 1988: 536). Like Saller, the authors assert, Tirala was fired in the 1930s; and the reason he was dismissed from his teaching tasks were his weak efforts to conform to the National Socialists (Weingart *et al.* 1988: 541). The authors illuminate neither Tirala's career before 1933 nor his work after his dismissal in 1936. Paul Weindling has researched the first, along with the network of influential persons who furthered Tirala (Weindling 1989: 510). But Weindling's information on the time between 1936 and 1945 is unclear, and after 1945 Tirala seems not to have existed at all. Weindling, as well as Weingart, Bayertz, and Kroll, overlooked Tirala's unique research approach to homosexuality. Manfred Herzer was the first to describe this, but in complete isolation from Tirala's other oeuvre and person (Herzer 1992: 116).

The following essay examines Tirala's career, his approaches to research, and the long path of his career from 1908 to 1974, thus closing a gap in research.

Lothar Gottlieb Tirala came from a respected Austrian family of civil servants. His grandfather Johann Gottlieb Tirala was a member of the Imperial Academy of Sciences and a Professor of Chemistry in Graz. Johann Gottlieb's son Theodor had made his career in law, and had been transferred as an Imperial Councilor to Brünn. Here, Lothar Gottlieb Tirala was born on Oct. 17, 1886. Like his forefathers, he went to Vienna to study and completed his Dr. phil. in Psychology in 1908 and his Dr. med. in 1913.[3] His scientific teachers in this period were Otto Weininger's companion[4] (Tirala 1969: 119), the private lecturer Hermann Swoboda (Tirala 1930: 165), and the pharmacologist Ernst Meier. For a while he had to do with the Psychoanalytical Society. He also felt drawn to the ideas of the biologist

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2 For example the University Archive in Vienna has no files on Tirala in his capacity as university employee. The Bayerisches Hauptstaatsarchiv (Bavarian Main State Archive) and the Archive of the University of Munich do not have the files on Tirala's appointment. Nor are any files found in the Hessian ministries on any measures relating to Tirala.

3 Vienna a: File Tirala.

4 Tirala seems not to have had any contact with Weininger. But he later proudly underscored that he had lived next to the room in which Weininger died.

Jakob von Uexküll (1864–1944), whose concept of a neo-vitalist-like doctrine of existence ("Umweltlehre", or "theory of environment") would lastingly shape Tirala's thinking. Among these ideas were the radical rejection of leading protagonists of the idea of racial hygiene and the glorification of "Mendelism" at the expense of Darwinism, which was condemned as unnatural and scientifically untenable (Uexküll 1912/1913: 1089). In accordance with the tenets of his mentor, Tirala, too, believed in a supra-individual guiding principle in nature that influenced people (Tirala 1969: 57). But in contrast to Uexküll, he was open to the idea of the neo-Darwinists. This did not alter the long-lasting friendship between Tirala and Uexküll, but it often led to long scientific debates between them, as Tirala underscored with great plasticity in a "fictional discussion" about Uexküll between himself and a colleague that Tirala wrote on the occasion of Uexküll's 70th birthday (Tirala 1934d). Thus, Tirala argued to his antagonist that Uexküll's actions were based on Kant, that Uexküll rejected Lamarckism as well as Darwinism, and that he made biology scientific again, in opposition to Ernst Haeckel, who, in connection with Darwinism, had raised it to the level of a religion (Tirala 1934d: 274). At the same time, he argued, Uexküll's ideas were extremely modern, due to their orientation toward Mendel's laws, which had only recently been rediscovered. Beyond that, claimed Tirala, Uexküll was also able to judge and analyze the situation of living beings in their living worlds (Tirala 1934d: 279). In this way, he was not only able to support the neo-vitalistic teaching of adjustment, but also to surpass the Darwinists in explaining the world (Tirala 1934d: 282). In Tirala's explication, the completely overwhelmed adherent of Darwinism has no choice but to follow Uexküll's argumentation. At the end of the discussion, Tirala points to the valuable remarks of Houston Stewart Chamberlain, who probably also arranged the cooperation between Uexküll and Tirala.[5] In Bayreuth in the summer of 1914, Tirala encountered Siegfried Wagner, the heir and epigone of Richard Wagner (Tirala 1935a: i). This contact to Bayreuth would later have favorable consequences for Tirala's further career. Tirala's publications permit the deduction that, after completing his medical training, he worked for Uexküll as an Assistant and was permitted to ac-

[5] Bayreuth Archive: Uexküll-Chamberlain April 10, 1911; G. v. Uexküll 1964: 97; ASZN A1931 T Tirala-Dohrn.

company him to France in 1914 on field studies (Tirala, Uexküll 1914; G. v. Uexküll 1964: 97). Earlier, in the academic year 1913–14, Tirala had worked as an Assistant at the Pharmacological Institute of the University of Vienna under Prof. Meier.[6] In the following years, as well, he continued his career as a biologist, transferring to the Physiological Institute of the University of Vienna as a regular member of the staff with the position of Assistant (Tirala 1917).

In World War I, Tirala, whose initial rank was that of a Lieutenant of the Reserve, was assigned to a front hospital and rose to the position of Senior Physician of the Reserve.[7] In 1915, he married Auguste Victoria Wenzlitzke, who bore him two sons and three daughters in the course of a long marriage. Also in 1915, Tirala assumed the direction of the Surgical Ward at Levico Army Hospital, which he headed until Spring 1918.[8] Then he was appointed Head Physician at the Army Gas School in Vienna and was permitted to devote himself to the ideological schooling of officers (Tirala 1934c: 355). He compiled his lectures in a small book that contained all the ideas of racial hygiene that would be discussed in the German-speaking world in the 1920s (Tirala 1918). Tirala was in favor of both positive and negative eugenics, warned against letting "inferior people" breed out of control now that the nation's most capable had died on the battlefields, and underscored the dangers of syphilis and tuberculosis (Tirala 1918: 6–18).

After the lost war, Tirala initially continued to work in or near Vienna, but already left university employment before the beginning of the 1919–20 academic year. In the period that followed, he gained recognition for lectures on racial hygiene at schools (Tirala 1934c: 356) and for the continuation of his zoological studies (Tirala 1923). He gave lectures at the University of Vienna on "Problems of the General Theory of Inheritance" and spoke on the topic of the "Decline of the West or the Ascent of the German People?"[9] In mid-1920, he set up a practice as a general practitioner and railroad doctor in Wilhelmsburg, Lower Austria (Weinrich 1990: 345). There he

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6 1913. Übersicht der akademischen Behörden Professoren, Privatdocenten, Lehrer, Beamten, etc. an der k.k. Universität zu Vienna für das Studienjahr 1913–14, Wien: Universitätsverlag, p. 49.

7 Weinrich 1990: 345; Vienna b.

8 Berlin, Bundesarchiv W1 A 537.

9 BDC PK 12678.

assembled a circle of adherents and advocated the sterilization of "inferior" people — and National Socialism, as a companion later recalled.[10] From 1922 to 1924 he studied again to become a gynecologist at the Viennese Women's Clinic (Degener 1935: 1613). At the same time, he interned for a short time at the medical department of the German University in Prague (Hlavackova, Svobodny 1998: 212). He maintained contact with Houston Stewart Chamberlain and Jakob v. Uexküll, whom he informed about the course of Chamberlain's illness.[11]

In 1925, he moved to his home city of Brünn, which now lay in the Czechoslovakian republic, and took over a local gynecology practice.[12] In 1926, he completed his Habilitation in Physiology at the German University in Prague, but was not hired to instruct.[13] A year later, he applied for a Lectureship in Racial Hygiene at the Prague University, but was not accepted (Weindling 1989: 510). By returning to the city of his birth, Tirala also opted for Czechoslovakian citizenship. Uexküll occasionally visited Tirala in the latter's new home.

In the years up to his failed application in Prague, Tirala did not publish anything else. But he held a lecture at the Technical College in Brünn on experiments with the housefly, on labor physiology, and on the seemingly ineluctable "decline of the civilized nations".[14] In 1927, he held a funeral eulogy for Houston Stewart Chamberlain. A year later, Tirala had his first appearance abroad when he gave a short lecture to the Medical Section of the Society of German Natural Scientists and Physicians at their meeting in Hamburg; another year later, he expanded this lecture into an essay (Tirala 1929a). He regarded himself as a student of Uexküll and thought about applying to humans Uexküll's teachings on the nerve and tonus centers of animals (Tirala 1929a: 139). Tirala hypothesized that using a special breathing technique that eases the nerves would make it possible to heal all blood pressure diseases. He referred in particular to the publications that Uexküll had written in 1903 and 1907 and had

10 REMA A 106/I.

11 Bayreuth Archive: Uexküll-Chamberlain Oct. 29, 1920, Uexküll-Eva Wagner Aug. 3, 1924.

12 Vienna a.

13 Munich b: MF 68256.

14 BDC PK 12678.

reformulated with his companion Albrecht Bethe in 1929 (Uexküll 1903; 1904 a–c; 1907; 1929 a–b).

Tirala was also increasingly politically active for the German Nationalists (until 1928) and National Socialists. His radicalism found expression in a series of essays in the magazine *Volk und Rasse* ("Folk and Race"). Along with special instructors for racial hygiene at schools for continuing education (Tirala 1931). He called for the establishment of state-run eugenic marriage counseling offices (Tirala 1932) and for child rearing to be oriented toward "breeding, selection, reproduction, and enhancement" (Tirala 1930: 169). He also advocated a kind of tax on bachelorhood to prevent the extinction of the German people (Tirala 1929b: 87), whereby a few years later he himself denied the sense of such a punitive tax (Tirala 1932: 111). Nothing more is known about further contacts with National Socialist party leaders or persons standing close to them. But Tirala's relations with important members of the Nazi party must have been substantial. Otherwise it is difficult to explain why the until then almost unknown gynecologist from Brünn should be appointed to the chair for racial hygiene at the University of Munich in Summer 1933. Fritz Lenz, he previous holder of this chair, unique in Germany until 1933, had been called to the Kaiser Wilhelm Institute for Anthropology in the field of human genetics and eugenics.

Tirala had neither made his mark in renowned specialized journals nor held lectures at a college or university. But with the support of the new National Socialist government, he managed to have his teaching position turned into a tenured professorship.[15] The appointment procedure was a farce. While the medical faculty and the founder of the German racial hygiene field, Alfred Ploetz, spoke against Tirala and Ernst Rüdin also maintained neutrality, Tirala received decisive support from the external "evaluators" Eva Wagner (the wife of the deceased Houston Stewart Chamberlain), Julius Lehmann (a publisher), and Philipp Lenard (the founder of "German physics").[16]

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15 Munich b: MF 68256.

16 Philipp Lenard (1862–1947) is regarded as the founder of "German physics", as opposed to Albert Einstein and his theory of relativity. For his research on the possibility of the ionization of the air, Lenard received the Nobel Prize in Physics in 1905 and was a Professor at Heidelberg University until he was pensioned in 1931.

Tirala's co-applicant Ernst Rodenwaldt found no acceptance from the responsible Bavarian State Ministry of Education and the Arts, although — or perhaps precisely because — the established faculty in Munich had backed him (Weindling 1989: 510). At the end of 1933, Tirala had been appointed to the chair in Munich. His training or academic upbringing by Swoboda and Uexküll had made him critical of Rüdin's stance on racial hygiene. Additionally, he had not even made a name for himself with scientific publications. Fritz Lenz commented upon this development with the words: "To sum up, the following can be said about Mister Tirala: His publications show that he has not been instructed in the elementary foundations of racial hygiene. The information he provides is unreliable, his presentations unconcentrated and unclear".[17]

Tirala began his career in Munich with two mistakes. First, he claimed that the law to prevent the birth of children with hereditary diseases, which was designed for the long term, would have positive results immediately — an affront to the protagonists of the draft law, Ernst Rüdin and Hans Luxenburger, who headed the "German Research Institute for Psychiatry" (*Deutsche Forschungsanstalt für Psychiatrie*) in Munich (Tirala 1933). A little later, Tirala also denigrated the grand master of German heredity research, Eugen Fischer, and his main work as useless in terms of racial hygiene (Tirala 1934a). He slapped down Fischer's protest (Fischer 1934) by pointing out his own achievements in the field of racial hygiene (Tirala 1934b).

This performance led to a subtly planned counter-measure on the part of the medical faculty, which included several professors who felt snubbed by the performance of the newcomer from Bohemia. For example, Ignaz Kaup, one of the forerunners of the racial hygienic seminars at the University of Munich, had to relinquish his own courses after the Ordinariat (tenured professorship) for racial hygiene was set up (Böhm 1995: 249).

Increasingly, Tirala's lectures were disturbed (Böhm 1995: 349) — and the Assistants of the head of the university psychiatric clinic,

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Later, in the Foreword to his book *Rasse, Geist und Seele*, Tirala called Lenard his "fatherly friend". Tirala worked on the Festschrift for the dedication of the "Philipp-Lenard-Instituts" at Heidelberg University. See Tirala 1936b.

[17] Munich b: MF 68256.

Oswald Bumke, whom Tirala had also snubbed, immediately reported this to the rector's office.

> The moment that Tirala entered the auditorium, he was received with listeners' seemingly endless foot stamping, so that Tirala could not make himself understood for a long time. The unrest continued throughout the entire lecture. The lecture was very frequently interrupted by trampling, laughing, and catcalls. Tirala's attempts to re-establish order were answered with laughter and noise [...]. Professor Tirala often speaks quietly, sometimes almost as if talking to himself. Sentences are often not finished. Several times long-lasting lulls developed... It was often difficult for me to follow the sense of what was said, even when I understood it acoustically; in part it seemed to me that the unusual succession of ideas was to blame. (Bavarian Main State Archive: MF 68256)

Seemingly well-meaning members of the medical faculty immediately recommended examining Tirala for nervousness.[18] Tirala suspected a broad intrigue against him, but his request for a disciplinary hearing petered out and he had to accept the presence of his antagonists' Assistants as "customary". To rid himself of them, Tirala suddenly had the scheduled lectures for jurists and pre-internship heredobiologists dropped from the 1935 summer semester.

Even thought Tirala had to expend much energy defending himself, he came to the fore with numerous lectures in Munich.[19] As Director of the Institute for Racial Hygiene, by 1935 he had authorized about 70 dissertation topics that show his interest in expanding Kretschmer's theory of body types beyond the differential diagnosis between schizophrenia and manic depression (e.g. Hermann 1934; Kreutzer 1934; Mayr 1935; Pichler 1935; Raff 1935; Riese 1935). Together with Ernst Rüdin, he also represented the German Empire at the conference of the "International Federation of Eugenic Organizations" (IFEO) in 1934 in Zurich, where he embarrassed himself with unqualified remarks on the topic of homosexuality (Schlaginhaufen 1995: 182). But he asked Rüdin to provide him material about test persons for a study of his own on homosexuality.[20] A short time later, Tirala invited his former academic mentor Hermann Swoboda to the Munich branch of the German Society for Racial Hygiene (*Deutsche*

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18 Bavarian Main State Archive: MF 68256.

19 Munich c: MPIP-HA GDA 134.

20 Munich c: MPIP-HA GDA 134.

Gesellschaft für Rassenhygiene), where Swoboda was permitted to present his theory of cycles, which Rüdin regarded as unscientific ("calculating in the algebraic kitchen of alchemy", Swoboda 1917; Weber 1993: 208.). Tirala expressed his ideas on homosexuality in a lecture before the *Gesellschaft deutscher Naturforscher und Ärzte* (Society of German Naturalists and Physicians, Tirala 1935b). Referring to the alleged degeneration of the Hellenes, Tirala declared that homosexuality was caused by racial miscegenation. This "true homosexuality" comprised the genotype, and its carriers were active as seducers (Tirala 1935b). This hypothesis was included in Tirala's main racial-hygiene work, "Rasse, Geist und Seele", in which he also construed a connection between Asiatic races (Jewry) and homosexuality (Tirala 1935a: 66/67, 80). The connection between intersexuality of secondary sex traits and homosexuality, as well as the alleged tie between racial degeneration and homosexuality, reveals that Tirala took inspiration from Otto Weininger (Weininger 1904: 52, 81). But Tirala did not go quite as far as other physicians in the Third Reich, who declared sexual research, homosexuality, and Jewry to be a single conglomerate (Rodenfels 1939; Thiele 1939; Trurnit 1939, see also Braun 2001). Outside of medicine, the only similar oppositional stance toward homosexuality and homosexuals was in the oeuvre of the jurist Rudolf Klare (Klare 1937: 27, 35, 45).

In 1935, Tirala's position in Munich seemed to have stabilized. Along with his racial hygiene writings, he wrote the book *Heilung der Blutdruckkrankheit durch Atemübungen* ("Healing Blood Pressure Disease with Breathing Exercises"), in which he concretized the studies on breathing therapy he had been conducting since 1929 (Tirala 1935c). In this book, he maintained that breathing therapy relaxed all tensed nerves in the body, thus enabling an alternative cure not only for high blood pressure, but also for all cardiac and circulatory diseases (Tirala 1935c: 66–69). This view is based primarily on the theory of reflexes developed by Jakob v. Uexküll, with whom Tirala continued to maintain contact.[21]

Tirala was also a convinced opponent of the use of alcohol and nicotine (Tirala 1935c: 71–73).

But at this time another intrigue against him was spreading, one he had himself provoked. Soon after his appointment in Munich, he had

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[21] Tartu, Uexküll Centre: Correspondences 1934.

already complained to the Bavarian State Ministry of Education and the Arts about hostility that his family, which initially remained in Brünn, was exposed to. The Foreign Ministry thereupon assigned its local consul to look into the matter.[22] But by the beginning of 1936, it turned out that, in contrast to what he had said earlier, Tirala had a very bad reputation as a doctor and that, on the other hand, he had not, after all, always been a strong supporter of the National Socialist cause.[23] In addition, accusations, to this day unproven, were accumulating that Tirala had performed abortions. Tirala himself denied all the charges and accused the responsible Foreign Office agents of intellectual corruption. To secure himself against every form of attack from state authorities, at the beginning of November 1935 Tirala applied for "Selbstreinigung" ("Self-purification"), a party trial before the party court of the NSDAP (National Socialist German Workers Party) in the Gau ("province", in Nazi parlance) of Munich.[24] Before this court could begin its work, events accelerated. Because of quarrels about alleged behavior unfitted to his profession, Tirala was expelled from the Nazi physicians association in early December 1935.[25] Critics had judged his new book *Sport und Rasse* ("Sport and Race", Tirala 1936a) to be ridiculous or insignificant (Jaensch 1936; Schultz 1936). It also turned out that Tirala had accepted lecture fees without holding the corresponding lectures and that, in seminars, he had falsified the number of attendees.[26] This was especially problematic because at this time Lothar Gottlieb Tirala was not yet tenured; as a result, he was discharged without notice in Spring 1936. The State of Bavaria and the University of Munich also sued him for reimbursement of about 5,000 Reichsmarks in lecture fees and advances.[27]

Tirala's dismissal was an important turning point in the Third Reich's policy of filling university chairs. The offended established medical faculties had been victorious in the middle term over the outsiders supported by Party offices. Even the head of the NSDAP Racial Policy Office, Walther Gross, had to concede at this time that

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[22] The files on this matter unfortunately no longer exist in the Archive of the Foreign Ministry.
[23] Munich b: MF 68256.
[24] Berlin, BDC OPG 1696.
[25] Munich b: MF 68256.
[26] Munich b: MF 68256.
[27] *Ibid.*

the politicization of higher education since 1933 had failed because of unknowledgeable party members (Uhle 1999: 280). The further direction of the Institute for Racial Hygiene was entrusted to Ernst Rüdin and Hans Luxenburger, while the rooms were acquired by the Institute of Hygiene.[28]

Tirala responded to his termination immediately, filing an objection. In the time that followed, he repeatedly tried to get an appointment to a chair for racial hygiene, at the same time expanding his expertise to the field of alternative medicine. Thus, he declared that breathing therapy could cure liver damage and cardiac dilation (Tirala 1936 c–d), as well as occupationally induced heart damage (Tirala 1937), once again underscoring that these studies were based on preliminary work by Uexküll.

Until 1943, however, Tirala focused his attention on the possibility of being reinstated as a Professor of Racial Hygiene. In the dispute over the State of Bavaria's demand for money, he claimed that the ministry's staff had grossly deceived him about his tenure status and answered them with a counter suit).[29] But the leaders of the Munich branch of the Nazi party also felt offended and launched against Tirala a campaign of vituperation that culminated in his dishonorable dismissal from the party.[30] Winifred Wagner — one of the Bayreuth friends of Bavarian State Interior Minister Adolf Wagner and of the head of the Personnel Office of the Reich Labor Leader, Freiherr v. Loeffelholz — supported the former Professor of Racial Hygiene by filing complaints with Reich Minister Rust.[31] Winifred Wagner also invited Tirala to Bayreuth in the summer of 1936 and personally introduced him — and his work — to Adolf Hitler.[32] This indicates that the contact between Tirala and this representative of the Villa Wahnfried must have been close, yet no correspondence is extant in the Archive of the Richard Wagner Memorial Site of the City of Bayreuth. Nor did Brigitte Hamann write a single syllable about Tirala in her monumental study "Hitlers Bayreuth" (Hamann 2002). At about the time when Winifred Wagner brought to Hitler's attention the fate of her friend, the former university professor Lothar Gottlieb Tirala,

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28 Berlin, BDC W1 508.
29 Munich b, MF 68256.
30 Berlin, REMA A 106/I.
31 *Ibid.*
32 Berlin, REMA 106/II.

we note a suspension of Tirala's opponents' efforts. In March 1937, Tirala even went on the offensive. He won a court victory against Hans Luxenburger, who had to make a formal apology retracting all assertions that Tirala was pedagogically incompetent.[33] In late March/early April of the same year, the Führer's Chancellery under Philipp Bouhler ordered a complete audit of the proceedings against Tirala. But the first concrete results were not forthcoming for almost a year. Then the highest party court of the NSDAP resolved to rescind Tirala's expulsion and declared all the accusations against him null and void.[34] The primary reason the court gave was the points of accusation against "Prof. Tirala's" activities as a physician in Brünn could not be investigated. So this was a dismissal of charges, rather than a finding of innocence. On May 4, 1938, the Gauleiter of Franconia, Julius Streicher, turned to Education Minister Rust, appealing to his "National Socialist conscience", and demanded Tirala's reinstatement.[35] Not long afterward, Tirala self-confidently approached the minister to make it clear that, after the end of the "baseless campaign of slander" against his person, there was no longer any reason not to confer the venia legendi on him again.[36] At the same time, with the support of Julius Streicher, Tirala tried to get an appointment to an as yet unfounded School of Racial Hygiene in Nuremberg (Weindling 1989: 511). The Führer's Chancellery apparently saw in this the chance for a compromise and issued a directive that Tirala be paid 1,000 Reichsmarks from the support funds of the *Deutschen Forschungsgemeinschaft* (DFG — German Research Association) until the appointment to the Munich chair was settled.[37] This subsidy was preceded by a debate within the DFG, because Ferdinand Sauerbruch initially spoke against such support; but he was outvoted after Walter Groß, Julius Streicher, and Gerhard Wagner intervened with Reich Education Minister Rust (Klee 2001: 179). Tirala had long-term plans to create an "Institute for Racial Physiology" that would address the "physiology of sexuality" and pregnancy testing, among other things.[38] In this, Tirala showed himself to be an

33 Berlin, REMA A 106/II.

34 *Ibid.*

35 *Ibid.* Streicher-Rust May 4, 1938.

36 *Ibid.* Tirala-Rust June 17, 1938.

37 Berlin, REMA A 106/II Bouhler-Streicher March 28, 1939.

38 Berlin, REMA A106/II Tirala-DFG June 24, 1938.

adherent of the writings of Arthur Dinter ("Die Sünde wider das Blut" — "The Sin Against the Blood"). This research intention was backed especially by Julius Streicher, who in March 1939 reported the provision of rooms to this end in Nuremberg.[39] But the outbreak of war seems to have prevented the development of such an institute in the "Stadt der Reichsparteitage" ("City of the Reich Party Conventions"), so that in June 1940 Tirala resumed his efforts for an appointment to the chair in Munich.[40] These efforts at reinstatement, along with the possibilities given since 1938 through the occupation of the Sudetenland and the construction of the protectorate of "Bohemia and Moravia", led in 1940 to a comprehensive police reinvestigation of the charges pressed against him in 1936. Several witnesses thereby gave testimony under oath that Tirala had accepted tremendous fees to carry out illegal abortions[41] and that he had maintained business contacts with local Jews. The result of these charges was that, in Spring 1943, the Bavarian State Ministry of Education and the Arts and the Security Service of the SS declared Tirala to be unworthy of appointment to a chair. The Ministry also insisted on reimbursement of a total of 6,635.79 Reichsmarks and once and for all forbid Tirala to bear the title of University Professor (Ibid.). Weindling's arguments thus seem unpersuasive that Tirala's chances to be reappointed in Munich had improved in 1944 because Rüdin's position was weakened (Weindling 1989: 511). It is indeed true that at this time Rüdin had long ceased to play the role he had still had in the 1930s (Weber 1993: 253/254, 259–261), but Tirala had already been taken completely out of the running for the chair in Munich. It is true that the plenipotentiary for the Sanitation/Health Department, Paul Rostock, as well as the Squadron Physician Armin of Tschermak-Seysenegg made some efforts on behalf of the "causa Tirala" in Fall 1944.[42] But in January 1945, the Reich Education Minister briefly informed the petitioners that "Reich Leader Bormann has rejected further support for Tirala".[43]

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39 *Ibid.* Streicher-Rust March 29, 1939.
40 *Ibid.* Tirala-Rust June 28, 1940.
41 Munich b: MF 68256.
42 Berlin, REMA A 106/II Rostock-Rust Oct. 18, 1944; Tschermak-Rust Nov. 3, 1944.
43 *Ibid.* Rust-Rostock Jan. 8, 1945.

Tirala had eluded further criminal prosecution by following his family to Kitzbühel in secure Tyrolia at the end of 1944. Here he ran a small practice — without official permission — until 1946.[44] He earned additional money by publishing an extremely successful small book with Reclam publishing house (Tirala 1943)[45].

By fleeing to the Tyrolian mountains, Tirala not only shed his investigators from the police and the educational bureaucracy, he also escaped denazification in Munich. In Austria, where denazification consisted merely of a short questionnaire, Tirala claimed he had been dismissed from state service "for political reasons" in 1936 and also expelled from the NSDAP, which he had been forced to join.[46] When the Munich physicians' association wrote to the Tyrolian Chamber of Physicians that Tirala had been a convinced National Socialist, he rebutted this with various witness testimonies to the opposite effect from clergymen and earlier acquaintances.[47] Thus, Othmar Spann also confirmed Tirala's role as an antifascist who had even hidden Spann's son Adalbert from the Gestapo in 1936. Tirala and Spann may have known each other for a long time, since the latter had been a Professor at the Technical College in Tirala's home city, Brünn, in 1909.

Tirala immediately received registration as a physician and moved to Graz, where he lived from 1948 to 1950. There he briefly headed the sanatorium Himmelhof before opening a private practice.[48] Undisturbed by the Bavarian ministerial bureaucracy, he called himself "Univ-Prof. für Erbpathologie a.D. [University Prof. for Heredopathology, ret.], Dr.med. et Dr.phil. Tirala, Facharzt für Gynäkologie [Specialist for Gynecology], Internist". But in 1949, the physicians' association in Graz denied him the right to use the last title. After Tirala had once again entangled himself in disputes about demands for payment, he moved to Vienna in Summer 1950. But the Chamber of Physicians there demanded a comprehensive résumé from Tirala prior to any registration. In his list of publications, he left out all his essays in *Volk und Rasse* ("Folk and Race") and renamed his main work as "Bios, Geist und Seele" ("Bios, Mind, and Soul").[49] He

44 Vienna a.

45 By the end of the war, Tirala had sold about 30,000 copies of this 70-page book.

46 Vienna a.

47 *Ibid.*

48 Vienna a, report of the Styrian physicians's chamber.

49 See Vienna a, Tirala's résumé.

also listed a number of studies that had never been published[50]. Tirala was permitted to open a practice as a general practitioner, but was denied the right to carry the title of a specialist or the term "Univ-Prof". But this did not stop Tirala from continuing to promote himself with these academic titles. The Chamber of Physicians responded to this in 1952 with criminal proceedings, and Tirala also stood once again under suspicion of behavior unworthy of the profession, due to advertising measures.[51] In the same year, the press termed him a racial hygienist who administered lethal injections.[52] The matter in question was an apparently fateful treatment of a diabetes patient[53].

At this time, the Bavarian bureaucracy had already taken up Tirala's trail again, since he had complained about the confiscation of his property in an indignant 1950 letter to the University of Munich.[54] The new — and apparently completely clueless — university management displayed willingness to give him his skull collection, his X-rays, his microscope, a manuscript ("Der Erbgang des Genius" — "The Heredity of Genius"), and autographs from Richard and Winifred Wagner, but first sent an inquiry to the Bavarian State Ministry of Education and the Arts. The Ministry immediately remembered its claims for monies owed and demanded that Tirala transfer 663.58 DM (in place of 6,635.79 RM)[55]. In various letters to Austrian addresses (the Vienna Chamber of Physicians, Vienna University), the Ministry and the University underscored that Tirala was not entitled to bear the title of Professor.[56]

Overtaken by his own past, in February 1952 Lothar Gottlieb Tirala left Vienna for Wiesbaden in a hurry. Here he was entrusted to head a sanatorium operated by the married couple Wilke at Bierstädter Straße 1. This workplace seems to have left him enough time to engage in research again. At the 59th Congress of the "Deutsche Gesell-

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50 Die Erbgrundlage und Entstehung der Homosexualität, Munich 1935. Konstitutionspathologie und Zwillingsforschung, 1947 "in press". Zur Theorie der Heilatmung, 1947 "in press". Grundlagen und Erfolge einer neuen Diabetesbehandlung, 1949, (manuscript).

51 Vienna a.

52 *Ibid.*

53 This may be the reason why the book Tirala planned in 1949, "Grundlagen und Erfolge einer neuen Diabetesbehandlung", never appeared.

54 Munich a.

55 The currency reform pegged the exchange rate at 1:10.

56 Munich a.

schaft für innere Medizin" (German Society of Internal Medicine), in the presence of other prominent researchers (including Thure von Uexküll), he explained the significance of breathing therapy (Tirala 1953). He emphasized the importance of "dextrose therapy" (Tirala 1954: 105) and "oxygen treatment", which were highly thought of in the 1950s (Tirala 1956/1957). As supportive measures for the breathing therapy he continued to propound, he discovered the use of leeches, hormones, and novocaine shots (Tirala 1954: 89, 130, 131). He also engaged in cancer research (Tirala 1954/1955).

But Tirala continued to use the title of Professor, which repeatedly led mistrustful contemporaries to make inquiries to the University of Munich.[57] His adverse experiences with state agencies — in particular in relation to his activity under National Socialism — did not stop Tirala from demanding in 1957 that the Hessian State Interior Ministry pay him compensation for damages suffered during the Nazi period.[58] Thereupon, the Vienna Chamber of Physicians, the Bavarian State Ministry of Education and the Arts, and the University of Munich sent file material on Tirala's activity to Hesse, with the result that the original files went missing in the mills of the Hessian bureaucracy, but Tirala still did not receive any compensation. In 1958, he also lost his position as senior physician when Franziska Wilke closed the sanatorium after her husband's death.[59] Tirala thereupon opened his own practice in internal medicine. In 1960, he briefly cooperated with the pharmaceutical company Cesra (Tirala 1960).

He continued to work as a propagandist for breathing therapy. In the early 1960s, he had already sold more than 100,000 copies of his book *Heilatmung bei Blutdruck-, Herz- und Kreislaufkrankheiten* ("Breathing Therapy in Blood Pressure, Cardiac, and Circulatory Diseases"). As an author, he called himself "Dr.med.et.phil. Lothar Gottlieb Tirala, o.ö. Univ-Professor a.D". Also in the early 1960s, he "discovered" the perniciousness of rock music as a trigger of hypertonia (Tirala 1961). But he claimed he noticed a positive side effect of breathing therapy in the curing of eye diseases (Tirala 1966). In 1967, Tirala founded a private "breathing school" in his medical practice in Wiesbaden.[60] In the same year, he found a forum for his research in

57 Munich a.
58 Vienna a, letter from the Hessian State Interior Ministry.
59 Wiesbaden: Business file card Wilke.
60 Wiesbaden, business file card Tirala.

the *Weltunion für prophylaktische Medizin und Sozialhygiene* ("World Union for Prophylactic Medicine and Social Hygiene"), located in Vienna since the early 1950s. Here, in the second half of the 1960s, he presented not only new ideas to expand breathing therapy, but also his revisionist hypotheses on the Nazi period. He summarized the latter in 1969 in his last book (Tirala 1969), *Massenpsychosen in der Wissenschaft* ("Mass Psychoses in Science"), which was published by the Grabert-Verlag and declared an auxiliary issue of the rightwing-conservative *Deutschen Hochschullehrer-Zeitung* ("German College Instructor Newspaper"). Along with Einstein's theory of relativity and Freud's psychoanalysis ("psychological placebo"), Tirala also rejected Darwin's teaching and the Nazi doctrine of racial hygiene (Tirala 1969: 12–13, 93). Instead, he asserted, biology as pursued by Jakob von Uexküll was suited to explore the origins and effects of the human race (Tirala 1969: 8). The succession of this neo-vitalistically anchored theory, he said, included the studies by Hermann Swoboda, whose theory of cycles had scientifically demonstrated the inheritance of character traits (Tirala 1969: 112–113). Finally, he once again wrote on the inheritance of homosexuality (Tirala 1969: 114) which he sought to explain with Richard Goldschmidt's chromosome theory, which had been refuted by 1956 at the latest (Goldschmidt 1916; Bleuler, Wiedemann 1956). Tirala may have seen his last book as revenge, fixed in writing, against his opponents, who had long since been branded as forerunners of National Socialism. Unlike many contemporaneous colleagues, he did not thereafter write any memoirs, but continued to run his medical practice and the attached "breathing school" in Wiesbaden. But his 1933–1936 interlude in Munich was mentioned in the recollections of former antagonists:

> The dilettantism was terrible — we had a racial hygienist who had not even mastered the fundamentals of genetics, but who "healed" diseases, from brain tumors through dental granuloma to flat feet, by means of breathing exercises [...]. (Bumke 1952: 144)

After his death on Feb. 20, 1974, his oldest son Siegfried (born in 1917) did not continue the "breathing school". But this did not lead to Tirala's disappearance from the parascientific discussion. His supposed victim's role in the Third Reich benefited him again. First, his bestseller *Heilatmung bei Blutdruck-, Herz- und Kreislauferkrankungen* was republished in 1997 under the title *Heilatmung:*

Gesundheit ohne Medikamente ("Breathing Therapy: Health without Medications", see Tirala 1997) and second, his breathing therapy teachings experienced further development in the digital age. Although Tirala himself had rejected confronting a weakened organism with modern musical sounds as dangerous (Tirala 1961), at the beginning of the new millennium, the Israeli dance teacher and therapist Benjamin Gavisch propounded the combination of meditation music and breathing therapy.[61] Melodies, said Gavisch, stimulated the body directly and improved breathing technique. Gavisch thereby referred directly to Tirala's earlier works. Tirala's work had unfortunately been forgotten, lamented Gavisch, who, with his CD player and breathing therapy, is pushing onto the pharmaceutical industry's ca. 26-billion-dollar hypertonia treatment market. After preliminary clinical tests in Europe, in 2001 the U.S. Federal Drug Administration granted permission for this product resulting from racial physiological ideas to be sold on the U.S. market (*ibid.*). Since the product is already found on German-language homepages,[62] it cannot be ruled out that, via the detour through the U.S.A., Tirala will manage a brilliant comeback in the German-speaking world. That would pave the way for his rise to the Olympus of (para-)science and his final laundering of all suspicion of National Socialist contacts.

But at the same time, his importance in the history of biological schools of thought in Germany between 1900 and 1945 would remain unconsidered. For the close, decades-long contact between the neo-vitalist-like Jakob von Uexküll and the mostly neo-Darwinistically oriented Lothar Gottlieb Tirala raises doubts whether the strict separation or even enmity between mechanists/Darwinists and neo-vitalists, as presumed until now in the history of science, ever existed in reality. Might there also have been other personal and ideological intersections? And what effects did the exchange of ideas have on the development of both research directions? These are questions that could shatter our image of the history of the natural sciences in 20th-century Central Europe. Tirala is not thereby the key to the gates of wisdom, but he may be a previously unperceived glimmer pointing in the right direction.

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61 Musik hören gegen zu hohen Blutdruck. *Handelsblatt* 22. 08. 2002.

62 See for example www.musikmagieundmedizin.com/aktuell (as of Summer 2003).

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Раса и дыхательная терапия: жизнь Лотара Готтлиба Тиралы (1866–1974)

В историографии жизни, трудов и взглядов Якоба фон Юкскюлла за последние годы многое прибавилось, но в то же время биографии его последователей почти неисследованы. Лотар Готтлиб Тирала, чья жизнь и деятельность рассматривается в статье, учился психологии и медицине в Вене и начал научную деятельность в сотрудничестве с Юкскюллом в 1914 году. Их связь продолжалась и в последующие десятилетия, хотя научная карьера Тиралы пошла вверх в области расовой гигиены и неодарвинистской науки. Он установил контакт между Юкскюллом и Х. С. Чемберленом. После увольнения

с места профессора по расовой биологии из университета Мюнхена в 1936 году он поменял свою научную ориентацию и начал применять “учение о рефлексах” Юкскюлла в лечении гипертонии.

Tõug ja hingamisteraapia:
Lothar Gottlieb Tirala (1886–1974) elukäik

Jakob von Uexkülli elu, töö ja vaadete historiograafiale on viimastel aastatel palju lisandunud, kuid samal ajal on ta teaduslike järgijate elud peaaegu uurimata. Lothar Gottlieb Tirala (1886–1974), kelle elu ja tööd artikkel vaatleb, õppis psühholoogiat ja arstiteadust Viinis ning alustas koostööd Uexkülliga 1914. a. Nende side jätkus ka järgnevail kümnendeil, kuigi Tirala karjäär oli seotud rassihügieeni ning neodarwinliku teadusega. Tema korraldatud oli kontakt H. S. Chamberlaini ja Uexkülli vahel. Pärast vallandamist rassibioloogia professori kohalt Müncheni Ülikoolist 1936. aastal vahetas Tirala oma huviala ning asus rakendama Uexkülli “refleksiõpetust” vererõhuhaiguste ravis.

Ernst Cassirer's philosophy of biology

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Abstract. The first part of this essay outlines Cassirer's philosophy of biology in the context of philosophy of science in the 20th century, giving an overview of Cassirer's different writings on the philosophy of biology. The second part outlines his treatment of what he took to be the chief philosophical problem in the philosophy of biology: the conflict between mechanism and vitalism. Cassirer interpreted this conflict as a methodological debate, not a metaphysical problem. In Cassirer's eyes, each point of view is justified within specifics limits. The third part explicates Cassirer's critique of Darwinism. Although Cassirer was critical of particular conceptions of Darwinian evolution, he did not reject evolution and, in fact, asserted that the concept of emergence was also of far-reaching importance in other fields besides biology. Part four offers concluding remarks about the importance of the philosophy of biology for Cassirer's general philosophical orientation and for his conception of the tasks of philosophical theory.

1. Background

Ernst Cassirer's *Philosophy of Symbolic Forms* is one of the largest twentieth-century works of philosophy — three volumes and over a thousand pages — but despite its size it was unfinished. Cassirer intended to publish a further, concluding volume. He actually completed part of the book: a first chapter dealing with the problem of life and a second, more sizeable, one entitled "The Problem of the Symbol as the Basic Problem of Philosophical Anthropology". In these texts, which he dated "April 1928", Cassirer gives great prominence to Jakob von Uexküll's theoretical biology. Two years before — in 1926 — Uexküll became the director of the Institute for Umweltforschung in Hamburg, and Cassirer became a frequent visitor to the institute and Uexküll's friend. Cassirer's 1928 text was published in 1995, in the first volume of the German Nachlass edition (ECN 1: 1–109), and soon thereafter in an English translation (Cassirer 1996: 3–111). Previously, Cassirer's debt to Uexküll was primarily known through his 1944 book *An Essay on Man*. The other source was Cassirer's treatment of biology in the fourth volume of his *The Problem of Knowledge*. That work was written in Sweden in 1940 but first appeared in an English translation in 1957. The text from 1928 was Cassirer's earliest treatment of Uexküll, but it is by no means the only example of a previously unpublished application of Uexküll's thought. The second volume of the Nachlass edition, a book Cassirer finished in 1937 called *Ziele und Wege der Wirklichkeitser-kenntnis* (ECN 2), includes frequent references to Uexküll. More is still to appear. The following unpublished texts deal importantly with Uexküll: a lecture course (*Probleme der Kulturphilosophie*) from the Winter semester of 1939 in Göteborg, a manuscript entitled *Zur 'Objektivität der Ausdrucksfunktion'*, a year long lecture course in Göteborg 1939–40 on *philosophische Anthropologie*, and 1941 book manuscript in English entitled "Philosophical Anthropology" (not to be confused with the more popular *An Essay on Man*). Uexküll plays an important role in all these texts, which will be published in volumes 5 and 6 of the Cassirer Nachlass edition.

A briefer text that will also appear in the Nachlass edition (ECN 17) is historically significant. In March 1929 Cassirer gave a lecture at Davos entitled "The Basic Problems of Philosophical Anthropology".[1] In this lecture Cassirer linked concepts from Uexküll's thought and similar notions in Heidegger's *Being and Time*. Heidegger attended this lecture of Cassirer's in Davos. That October, Heidegger explicitly took up Uexküll's conceptions in his lecture course at Freiburg (Heidegger 1983), focussing upon the distinction between the 'worldlessness' of things, the 'world poverty' of animals, and the fact

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[1] After the title, Cassirer wrote in round brackets "(from the standpoint of Martin Heidegger's existential analysis)". This manuscript, "Grundprobleme der philosophischen Anthropologie (unter dem Gesichtspunkt der Existenzanalyse Martin Heideggers) ", will be included in Ernst Cassirer, *Nachgelassene Manuskripte und Texte* (henceforth cited as: ECN), vol. 17.

that humans are able to fashion worlds.[2] As far as I have been able to determine, it was Cassirer who introduced Heidegger to Uexküll.

By the time all of these texts relating to Uexküll are available it will be clear that Cassirer's late work was deeply indebted to Jakob von Uexküll and it will be obvious that Cassirer was himself a pioneer in biosemiotics.[3] In his text on the "Objectivity of the expresssive function" of symbolism and his philosophical anthropology Cassirer treats semiotic processes in biological and not just in cultural terms.

Here, I am not going to enter into these new, and as yet unpublished writings, rather my focus will be more general: Cassirer's placement of biology in philosophy.

Cassirer is best-known as an interpreter of modern physics, but he also developed a theoretical interpretation of biology. Biology was of great significance for his philosophy of symbolic forms[4] and especially for its explication as a philosophical anthropology. Cassirer's teachers at Marburg — Hermann Cohen and Paul Natorp — interpreted Kantianism as a philosophy of natural science and especially of mathematical physics.[5] Cohen and Natorp were not alone in attributing to physics favored status as a science, indeed, this was typical among philosophers throughout most of the twentieth century. In the 1920s and 30s, the philosophers in the "Vienna Circle of Logical Positivism" (centered around Moritz Schlick, Otto Neurath, and Rudolf Carnap) and the "Berlin Group" (led by Hans Reichenbach), all treated physics as the prototype of genuine scientific knowledge. This elevation of physics went together with their conception of the "unity of science" expressed in the doctrine of "physicalism". Physicalism is the doctrine that all descriptions are "subjective" unless they are expressed in physicalistic language. Hence, in order to be scientific, psychological, sociological, and biological terminology all needed ultimately to be rephased in the language of physics. The

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2 See Heidegger, 1983: 263: "1. der Stein (das Materielle) ist weltlos; 2. das Tier ist weltarm; 3. der Mensch ist weltbildend".

3 Biosemiotics has been defined as "the study of signs, of communication, and of information in living organisms" (Oxford Dictionary of Biochemistry and Molecular Biology 1997: 72; cf. Hoffmeyer 1998.

4 References to the philosophy — and not just the book of that name — are given in lower case spelling.

5 Cohen (Cohen 1918: 94) contended that Kant's transcendental method arose from his reflection on Newton's Philosophiae naturalis principia mathematica.

"unity of science" in the philosophy of science meant: unity based upon the supremacy of physics.

Cassirer knew the Vienna circle philosophers and Reichenbach personally, and he followed their work, often with approval — except for their physicalism. For Cassirer, the unity of science could neither be interpreted to mean the supremacy of one science above all the others nor the natural sciences over the cultural sciences (by which he meant both the social sciences and the humanities) or vice versa. The unity of the sciences is functional, not substantial as phyicalism proposed.[6] As Cassirer explained in the preface and introduction to the first volume of his *Philosophy of Symbolic Forms* (Cassirer 1953), different ways of having a world can be understood as distinct symbolic forms, which have a functional, rather than a substantial unity. Cassirer's criticisms of physicalistic philosophy of science enabled him to give biology far greater importance than it was granted in the Vienna or Berlin schools. Cassirer's well-known books on the theory of relativity (Cassirer 1953a) and on the problem of causality in quantum physics (Cassirer 1956) are his most extended writings on the philosophy of science. This is not surprising considering the philosophical problems raised in these fields in the early part of the twentieth century for traditional conceptions of space, time, and causality, or for such particular notions as that of a material point. Nonetheless, it would be a mistake to assume that Cassirer's lesser-known writings on the philosophy of biology only were of marginal importance for him.

Cassirer began his academic career in 1892 as a student of German literature, but he switched to philosophy after four years of study due to disappointment with the anti-theoretical and biographical approaches prevalent then in German studies. Cassirer's earliest theoretical orientation stemmed from this first stage of his academic career. As a student of German literature, long before he read Kant or took up philosophy, Cassirer was already an avid admirer of Goethe. His admiration, which bordered on fascination, continued his life long; indeed, he once remarked that he had read in Goethe's works almost

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[6] Many of Cassirer's writings on these subjects were never published. Some with be appearing soon in ECN, vol. 8. For a discussion of his unpublished writings about the Vienna Circle and the prevalent forms of philosophy of science, see Krois 2000.

daily for 50 years — from age 16 on.[7] Goethe, of course, was not only a dramatist and poet, but a scientific thinker whose chief concern was the study of life.

When Cassirer switched his field of study from German to philosophy in the Winter semester of 1896/97 his outlook was already deeply influenced by his reception of Goethe's work. Cassirer's interpretation of biology needs to understood against the background of his work on Goethe, and this is also true of the growing importance he attributed to biological theory in his later years when he developed his philosophical anthropology.

While philosophers have always raised questions about the nature of humanity, "philosophical anthropology" was a distinct development in German philosophy in the 1920s, arising from dissatisfaction with purely empirical, quantitative approaches to the human sciences. Philosophical Anthropology sought to avoid treating human beings in physicalistic terms, yet some writers, such as Helmut Plessner, preserved an almost positivistic, purely descriptive approach, while Max Scheler, assumed a kind of religious perspective. Cassirer's best-known work on the subject, *An Essay on Man* (Cassirer 1944), focused upon human creativity, which he traced to the use of symbolism, hence his definition of human beings as "animal symbolicum". Kant had introduced the study of anthropology into philosophy, but for Kant the concept of reason (*Vernunft*) defined mankind, and reason was universal. Symbolism was not reason. Mythologies and many other forms of communal symbolism have only local validity. Yet, Cassirer contended, it was symbolism which also made reason possible. That much of Kant remained in Cassirer's philosophical anthropology.

Kant, of course, also wrote about the problem of teleological judgement in biology in his *Critique of Judgement*, but this side of Kant's work was not what interested Cassirer's philosophical mentors. Paul Natorp's well-known book on Plato (Natorp 1903) showed that modern mathematical physics could be interpreted as a new form of

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[7] The depth of Goethe's influence on Cassirer has been greatly underestimated. His fascination with Goethe is most evident in his Swedish lectures on Goethe, which are now in press as vol. 11 of ECN. A check of the membership roster of the Goethe Gesellschaft (published annually in the "Jahresberichten der Goethe-Gesellschaft" in the *Goethe-Jahrbuch*) lists Cassirer from 1895 (vol. 16: 22) until he left Germany in 1933.

Platonism. Cassirer too saw mathematics as the bond between Galileo and Plato, but he did not relegate the theory of life to a minor position in his interpretation of science. Unlike Cohen — who is said to have referred to Aristotle as "the apothecary" — Cassirer seems to have shown increasing interest in Aristotelianism as time went by, because of the latter's work on biology. An indication of Cassirer's perspective can be found in a series of lectures on Greek philosophy which he gave at Yale in 1941 and 1942. There for the first time he gave a systematic interpretation of Aristotle's philosophy (120 pages).[8] Rather than focusing upon Aristotles' metaphysics or logic, Cassirer saw the "centre of gravity" in Aristotle's philosophy in his theory of organic growth. Cassirer wrote at the beginning of the lectures: "Within the limits of these lectures I cannot give you a description of the Aristotelian system and of all its ramifications. I only wish to find, as it were, the centre of gravity of this system. To my mind this centre of gravity is to be sought in the biology of Aristotle, in his theory of organic life". In the next paragraph Cassirer stated: "Mathematics is the clue that serves us as guide in our study of Platonic philosophy; organic life and the laws of organic development are the clue that we have to follow in our study of Aristotle".[9]

Cassirer's most extensive publication on biology was the 100-page section on the history of biological theory in volume 4 of his *The Problem of Knowledge*.[10] Goethe is clearly the central figure in this history. Cassirer's primary concern was to trace the conflict between supporters of Mechanism and Vitalism and to show the importance of this debate in transforming the conception of scientific knowledge. He covered much the same ground in a large unpublished study written about the same time (between 1936 and 1940) on the *Objectivität der Ausdrucksfunktion* (objectivity of the expressive function) and in the recently published (ECN 1: 3–109; Cassirer 1996: 3–111) first statement of his philosophical anthropology (from 1928). Cassirer also

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[8] This text will appear in ECN 13.

[9] Cassirer, "Aristotle", second paragraph (Yale Beinecke Mss 98, box 36, folder 690).

[10] Cassirer wrote the manuscript of this book between July 9 and November 26, 1940. See Charles W. Hendel: Preface (Cassirer 1950: ix). The original German text was not published until 1957. The new edition (Cassirer 2000) of this volume in Cassirer's works (ECW) includes a complete bibliography of the large literature on biology cited in the book.

discussed biology in various published essays as well.[11] To understand Cassirer's position it is best to begin with the theoretical problems to which he reacted.

2. The vitalist controversy

Cassirer conceived the conflict between mechanists and vitalists as a methodological debate, not a metaphysical problem. In Cassirer's eyes, each point of view is justified within specifics limits. Cassirer was ready to side with a strict mechanist like Jacques Loeb when he explained the growth of plants towards the light by means of a system of "tropisms" or involuntary changes due to physical processes, just as he was critical of Fechner's view that this turning of plants towards the light was a sign of a "*höhere Sehnsucht*" ("higher longing", ECN 2, 144). In the same way, Cassirer also rejected Driesch's return to the Aristotelian notion of "entelechy" and, indeed, all speculative notions of life, which, as Cassirer said, went "beyond anything that *science* could establish or prove" (Cassirer 1950: 196). Yet Cassirer agreed with the vitalists' contention that life is a phenomenon *sui generis* that could not be subsumed under mechanism. Cassirer developed his own version of organicism, i.e., he believed that biology deals with wholes.

A particularly telling comment of Cassirer's about biology can be found in an essay where one would hardly expect it: his posthumously published lecture "Structuralism in Modern Linguistics". Cassirer argued there that biology and modern linguistics both employ comparable methodological conceptions, for neither can be modeled upon mechanistic conceptions. Rather, the principles of knowledge in biology are akin to those of linguistics in that both are "structural". That is, each deals with systems in which the relationships between the elements produce a complex whole, and both study structural changes morphologically, rather than causally. Cassirer found his view best illustrated in L. v. Bertalanffy's *Theoretische Biologie*, about which he said: "It puts in place of the idea of purpose the concept of organization and characterizes life by ascribing to it the

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[11] Cassirer also dealt with these issues in unpublished manuscripts such as the text of his Yale Seminar on Symbolism and the Philosophy of Language from 1941–1942, the fourth chapter was which is devoted to "The biological aspect". This material is closely related to Cassirer 1944.

property of a system" (Cassirer 1950: 216). In addition to Bertalanffy, Cassirer cites Haldane's conception of holism and Uexküll's theoretical biology as illustrations of this conception of biology, which he traces back to Goethe.

While Goethe is the chief figure in Cassirer's historical treatment and conception of biology, he does not regard his work without considerable reservations. Cassirer did not agree with Goethe's rejection of mathematics nor his denigration of interventional experiments, or his preference of imaginative vision over historical, phylogenetic study. Goethe relied upon observation alone, yet his observations led him to discoveries of fundamental importance, in particular they convinced him of the untenability of the supposed immutability of botanical classifications. To Goethe, Linné's strict divisions according to the number of stamen and pistils in a plant and the assumption of fixity in the botanical world misrepresented nature. Cassirer notes that in the 19th century, Goethe was given the highest praise possible: he was called a "Darwinian before Darwin" (Cassirer 1950: 137). However, Cassirer is anxious to point out that Goethe was a morphologist, not an evolutionist.

Goethe's notion of 'morphology' — a word he invented — derived from his empirical observation of the fact that the same plants grew differently in different environments. Goethe no longer regarded botanical form as fixed; he discovered the variability and changing nature of species. But he did not, like Darwin, concern himself with their genealogy. As Cassirer put it, "Goethe's concept of 'genesis' is dynamic, not historical" (Cassirer 1950: 149). Instead of facing the empirical question of the descent of species, Goethe gave an ideal outline of the process of transformation. To Cassirer's mind this was a virtue, not a fault, because Goethe did not confound the concept of structure with that of mechanical causation. Goethe's Morphology offered a way to conceive of changing biological forms without reference to mechanistic views or returning to teleological conceptions of nature.

Cassirer cites approvingly Bertallanfy's criticism that Darwin made improper use of the notions of "survival" and "adaptation" by treating them as purposive conceptions. Goethe's conception of the organism regarded species as changing, temporal identities without resorting to *any* kind of teleology. As Cassirer put it, Goethe no longer thought in terms of "spatial forms" (*Raumgestalten*) but rather in "temporal forms" (*Zeitgestalten*) (Cassirer 1950: 147). On Cassirer's view, the notion of a biological species was a whole with temporal limits. The unity of a species was the history of its development. Cassirer argued that while the idea of purpose had no place in modern science, this could not be said of the notion of a "whole". (He argued that the concept of an organized whole is needed in other sciences as well, including field physics and Gestalt psychology (see Cassirer 1945; cf. Cassirer 1950: 212). Cassirer wrote in the *Problem of Knowledge*: "In contrast to the idea of purpose, the concept of organization characterizes life by ascribing to it the property of a system" (Cassirer 1950: 216). This view undercuts the battle between mechanists and vitalists, for it offers no barrier to physicochemical explanations yet maintains that not all biological phenomena can be so explained, namely, the structures of living things as wholes. Anatomy, or rather comparative anatomy, therefore assumed fundamental importance for zoology on Cassirer's view, just as it was the empirical basis for Darwinianism as well.

According to Cassirer, biology became an autonomous field of study with the publication in 1543 of Vesalius' *De Humani Corporis Fabrica* (On the Fabric of the Human Body) (see Cassirer 1943). In that work Vesalius created empirical descriptive anatomy, breaking with the ancient authority of Galen and explanatory theories taken from ancient physics (such as the four elements) or astrological "correspondences". This emphasis on the importance of anatonomy for biology also explains why Cassirer took such an intense interest in the theoretical biology of Jakob von Uexküll, for, as Cassirer once wrote: "Uexküll was above all an anatomist" (Cassirer 1950: 199; cf. ECN 1 40–43 and Cassirer 1996: 43–45).

Jakob von Uexküll (1864–1944) was Cassirer's colleague and friend in Hamburg in the 1920s. Cassirer was drawn to Uexküll because the latter's view of anatomy resurrected Goethe's program of morphology (Cassirer 1950: 200). Goethe's approach to biology, Cassirer thought, was the source of Uexküll's definition of the study of life. Cassirer was so taken with Uexküll's definition of biololgy he quoted it twice in full in his study of the history of biology in *The Problem of Knowledge* (Cassirer 1950: 129, 199). Uexküll said: "The science of living beings is a purely natural science and has but one goal: investigation of the structure of organisms, their origin, and their functioning" (Cassirer 1950: 199; cf. Uexküll 1930: 9). In an unpublished text Cassirer stated explicitly that Uexküll was the biologist who avoided both extremes in the controversy between Mechanists and Vitalists: "The real *middle* way in biology is taken here by Uexküll, who is a methodical Vitalist, without being a metaphysical Vitalist".[12]

Uexküll's own contribution to biology derived, however, from his expansion of the viewpoint of descriptive anatomy to include a conception of an organism's environment (*Umwelt*). These aspects come together in his concept of the structure of an organism, which he called its "Bauplan" or structural form.[13]

Cassirer emphasized repeatedly the importance of Uexküll's view of the "Bauplan".[14] The following passage is from his 1928 text on "Das Symbolproblem als Grundproblem der philosophischen Anthropologie", but a similar assessment is found sixteen years later in *An Essay on Man* (Cassirer 1944: 23ff).

Cassirer wrote in 1928:[15]

> This organization [Bauplan] creates the environment of living organisms so that this is in no case a constant but rather different for every creature since it varies with their organizations [Bauplan]. Just as environmental factors are

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[12] "Die richtige Mitte in der Biologie hält hier Uexküll, der methodischer Vitalist ist, ohne metaphy.[ischer] Vitalist zu sein" (Cassirer, Objektivität der Ausdrucksfunktion, section VII., in Beinecke Mss. 98, Box 52, Folder 1043). This text will appear in ECN 5.

[13] See Uexküll 1930: 73–75: "Die Baupläne". Cf. Uexküll 1921: 5: "Über der Innenwelt und der Umwelt steht der Bauplan, alles beherrschend. Die Erforschung des Bauplanes kann ... allein die gesunde und gesicherte Grundlage der Biologie abgeben". (Over and above the inner world and the surrounding world stands the bauplan, governing everything. An examination of the bauplan provides the only healthy and secure basis for biology.)

[14] See e.g. Cassirer 2000a: 23–27, where "Bauplan" is translated as "blueprint".

[15] "Der Bauplan schafft selbsttätig die Umwelt eines Lebewesens, sodaß diese keineswegs als konstant, sondern als für jedes Wesen verschieden, als mit dem Bauplan variabel anzusetzen ist. Und ebenso objektiv[,] wie es die Faktoren der Umwelt sind, müssen die von ihnen hervorgerufenen Wirkungen im Nervensystem aufgefasst werden. Auch sie sind nirgends anders als von der körperlichen Struktur her bestimmbar, und sie sind von vornherein durch diese gesichtet und geregelt. Die Gesamtheit dieser Wirkungen nun ist dasjenige, was wir als die "Innenwelt" eines Lebewesens bezeichnen, sodaß — wie Uexküll betont — auch die Feststellung dieser Innenwelt "die unverfälschte Frucht objektiver Forschung" bildet, die "nicht durch psychologische Spekulationen getrübt werden" soll" (ECN 1: 41).

> objective, so too we must take as objective the effects called forth by it [the Bauplan] in the nervous system. These effects too can only be determined by reference to the body's structure, and from the outset they must be seen as regulated through it. Now the totality of these effects is what we designate as the 'inner world' of a living creature, so that — as Uexküll emphasizes — even establishing the existence of this inner world is 'the unspoiled fruit of objective research', which 'should not be clouded by psychological speculation'. (Cassirer 1996: 42f)

The Bauplan embraces not only the brain and nervous system, as well as the skeleton but the total anatomy of the organism. The primacy of the Bauplan brought with it Uexküll's characteristic approach to the distinct "worlds" of animals. According to the anatomical structure (*Bauplan*) of the animal, with its particular receptor and effecter systems (*Merknetze* and *Wirknetze*), the animal lives and moves in specific functional circles (*Funktionskreise*): circles of nutrition, defense, and reproduction. As Uexküll colorfully puts it: "In the world of a fly, we find only fly things, in the world of a sea urchin only sea urchin things" (Cassirer 1944: 23). Cassirer concludes: "The experiences — and therefore the realities — of two different organisms are incommensurable with one another" (Cassirer 1944: 23).

This kind of pluralism was for Cassirer a modern version of Goethe's conception of the uniqueness of each biological form (Cassirer 1950: 204). Each has its own center within itself, which cannot be measured by any kind of external purposiveness.

3. Cassirer's critique of Darwinism

Cassirer did not reject evolution, but he criticized Darwin's interpretation of it. In his text on "Darwinism as a Dogma and as a Principle of Knowledge" (Cassirer 1950: 160–175) he offered a balanced critique of both dogmatic adherence and dogmatic opposition to Darwin's ideas. Cassirer's own criticism was quite specific. Darwinism has been variously extrapolated to social theory. Darwin cannot be blamed for the interpretations which have been placed upon his notion of "the fittest," but much of Cassirer's general disinclination towards the theory of evolution relates to the socio-political interpretation of Darwinism, although it does not derive from this alone. When Cassirer wrote his study of biology in Swedish exile in

1940, the notion of a master race was having its political heyday, and it is noteworthy that Cassirer took pains to show a further point of agreement between Uexküll's biology and another basic aspect of Goethean morphology: namely, the elimination from biology of the ranking of species.

For Goethe, the biosphere is not ordered such that the various kinds of animals exist for each other, or form a series which finds its end — in either the sense of a terminus or a purpose — in any species, including mankind (Cassirer 1950: 203). Cassirer emphasized that for Goethe "it would be impossible to select any single race, human or otherwise, from the totality of life and set it up as the goal, the measure, the canon" (Cassirer 1950: 204). Cassirer cites the following passage from Goethe's comparative anatomy to illustrate this: "An individual cannot serve as a standard for the whole, and so we must not seek the model for all in any one. Classes, orders, species, and individuals are related as cases are to a law; they are included under it, but do not constitute it" (Cassirer 1950: 144). The "law" in question is the principle of morphology.

Goethean morphology abandons both "the invariability of the species" and the view that any species of life is superior to any another. This conception is fundamentally pluralistic, and on this point in particular, Cassirer says: "Uexküll's biology conformed in every particular with this view of Goethe" (Cassirer 1950: 205). The social and political undercurrent in this line of argument is unmistakable, but it would be wrong to conclude that Cassirer was attracted to such a theoretical position for political reasons. Rather, Cassirer's entire approach to science and culture was conceived from the outset in reference to his criticisms of traditional logic, with its hierarchy of classes based upon the concept of substantial forms or essences. Beginning with his first systematic work, *Substance and Function* in 1910, Cassirer denied any scientific value to traditional logic. The subsumption of things under higher classes is typical of language, but the resulting classifications are just that: linguistic classifications. This capacity to make binary divisions led early biology into the realm of mere names which Cassirer says even became "a veritable mania for classification" in Linnaeus (Cassirer 1950: 127). In *Substance and Function* he showed how in numerous sciences the logic of relations and functional thinking had replaced traditional logic. Later, in *The Philosophy of Symbolic Forms*, he argued for contextualisation against panlogism and developed a pluralistic conception in which different symbolic forms were regarded as autonomous ways of having a world. It is no wonder that he found Uexküll's notion of irreducibly different surrounding worlds (Umwelten) congenial.

Cassirer approved of Goethe's abandonment of the invariability of species, but he still had to address the problem of how to explain their origin. Cassirer's most explicit statements on this question are found in his study "The Problem of Form and the Problem of Causality" in his late (1942) book *Zur Logik der Kulturwissenschaften* (*The Logic of the Cultural Sciences*). This study explicates a fundamental conception in Cassirer's general philosophy of science: the indispensability of discontinuity for development. Cassirer distinguishes the concepts of form and causality radically, and suggests that the emergence of new structures demands abandoning the ancient notion of *natura non facit saltus*, for, he contends, Nature does make jumps. He quotes approvingly from Hugo de Vries' characterization of mutations (Cassirer 2000a: 102), where he claims that the origin of a species "constitutes a break which sharply and completely distinguishes the new form as a species from which it came. The new species comes into being immediately; it arises from the earlier one without detectable preparation and without transition". Cassirer says that such a "metabasis eis allo genos" is found again and again in both natural and cultural developments. This notion of going over into a new genus or category is recurrent throughout all of Cassirer's writings, not only in his philosophy of biology.

Cassirer claims that empirical research and philosophy are here on the same footing: they can exhibit the emergence of new forms but they cannot give any causal explanation of them.[16] Here he sees himself as following Goethe, whose notion of the *Urphänomen*, Cassirer explains, entails admitting that such developments are "irreducible facts" (Cassirer 2000a: 99). Yet these are processes, and processes emerge from other processes. Cassirer affirmed a concept of

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16 Cassirer claims that the shift from language as a vent for expressing feelings to language as a tool for attaining practical ends and to language as a means for asserting propositions is always a jump, never a gradual change. Cf. Box 52, folder 1041: "Aber weder der Empfindungslaut, noch der Wirk- und Werklaut (Noiré) kann die dritte Stufe der Sprache, die rein symbolische Darstellung erfassen und erklären. Hier bedarf es immer eines "Sprunges", einer "Mutation", nicht Evolution."

emergence which demanded more theoretical explication than he ever provided.[17]

4. Concluding remarks

Cassirer's interpretation of biology was not an isolated part of his philosophy, rather it can be found incorporated into and further developed within his philosophical anthropology. An illustration of this can be seen in his reception of the work of the neurologist Kurt Goldstein. Goldstein was most noted for his work on aphasia, which concentrated upon the effects of brain damage on the use of language. Goldstein did not think that neurology should focus upon the activity of the brain or neural paths independently of the rest of the organism. For example, he did not think that language abilities were localized in a fixed place in the brain but could be transferred. Rather than viewing the symptoms of aphasia as negative signs of a loss, Goldstein regarded them positively as the attempts of the organism to find a new way to preserve a function. In Goldstein's book, *The Organism*, (Goldstein 1995, first published in German in 1934) he regarded the organism and its environment in terms comparable with Uexküll. Cassirer visited Goldstein's clinic in Frankfurt to observe the behavior and speech of patients suffering from aphasia.[18] These observations provided the background for the chapter on the pathology of the symbolic function in the third volume of *The Philosophy of Symbolic Forms*, one of the most important texts for Cassirer's philosophical anthropology. Cassirer conceived of this chapter as a kind of negative proof of his theory of symbolism: "the process of the world's 'symbolization' discloses its value and meaning where it no longer operates free and unhindered, but must struggle and make its way against obstacles" (Cassirer 1957: 277). These words, echoing Goldstein's model of the organism, show that Cassirer's philosophical anthropology is closely linked to his theoretical interest in biology. Cassirer's *An Essay on Man* did not appear until 1944 but the ideas in

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[17] For a recent study of Goethe dealing with the close affiliation of his conception of science and process philosophy, see Stephenson 1995.

[18] On Cassirer's contacts with Goldstein in Frankfurt, see Cassirer 1957: 210, n7 and 217, n19. Cf. esp. Cassirer 1999.

that book derived ultimately from his contacts with Goldstein and Uexküll in the 1920's.

Cassirer upheld what we might best be called a medical model of biology, for he regarded life in terms of concrete, particular, even individual forms. The organism in its environment could only be understood in terms of this particular unique whole taken as an individual case. While chemistry may supply the answers to questions linking botanical and zoological processes with the physical world, this in no way eliminates the validity of a medical "case" model for the study of life processes. Anatomy, on Cassirer's view, becomes the focal point for zoology because the interaction of the organism with its environment is an ultimate phenomenon for biology.

The individual has a similar central place in Cassirer's philosophical anthropology. Cassirer defined humanity by reference to the use of symbols, reinterpreting the traditional notion of *animal rationale* as *animal symbolicum*. He conceived his view as a supplement to Uexküll's theory of the animal's *Bauplan*. Human beings have a symbolic world that cannot be compared with animals' reactions to signs (Uexküll's *Merknetz*). Humans develop "symbolic worlds" which acquire an objective status of their own. While language can be used to give oral signals, there is a difference of kind between such behavior and the use of written, propositional language, just as there is between the use of stick as a tool and the creation of a technology, i.e., a system of instruments. With the development of such systems, individual actions and documents can have long-lasting and wide-ranging effects over generations. Cassirer contended that there can be no transition between an animal's *Merknetz* of signals and such "symbolic systems",[19] but only a metabasis eis allo genus — a jump to a new species.

But even Cassirer's philosophical follower, Susanne Langer, did not want to leave the jump from the animal to the human unbridged. In her late work (Langer 1967; 1972; 1982) she sought to understand this shift by investigating the nature of feelings. Empirical researchers have not been satisfied with this purely descriptive outlook either. The "symbolic species" (Deacon 1997) has a history, which can be reconstructed, and research on the co-evolution of symbolism and the

[19] Cassirer 1944: 24. Cassirer also refers there to symbolism as a medium (Cassirer 1944: 25) and to different symbolic forms as media.

brain may show that Cassirer's biosemiotic perspective is better as a program for research than as a "final interpretation" of the question of the "nature of man" than Cassirer seemed to think.

On the other hand, Cassirer's attempt to show the limits of causal explanation is clearly valid in the area of symbolic systems. Popper rejected the possibility that so-called "laws of history" could predict historical developments, for they would also have to predict the course of future scientific knowledge. Cassirer proposed a comparable view in his essay on the "Naturalistic and Humanistic Philosophies of Culture" (Cassirer 1961), which he first gave as a lecture in Vienna in 1937 at the *Kulturbund*. History, Cassirer argued, is dependent upon symbolic meanings, but we cannot predict the way the different symbolic forms of culture will develop. Unlike Popper, however, Cassirer did not adopt evolution, even in a reinterpreted form, as a model for the theory of knowledge, even though Cassirer recognized that symbolisms were the means to problem solving. Cassirer's view of evolution, if he would have accepted that name for it, would have been more like Peirce's, who distinguished between evolution due to some causal principle and cases requiring the assumption of absolute chance (tychism), i.e., of developments "without detectable preparation and without transition".

Cassirer granted teleological conceptions a place in social and psychological theory, but not in biology. For all his interest in anthropology, Cassirer was critical of anthropomorphism. On this point he liked to quote Goethe, who said, "Nature and Art are too great to be directed to ends".[20]

Cassirer erected a high wall between causal explanation and the concept of structure in his theoretical interpretation of biology so as to avoid teleological assumptions about natural processes. This wall was permeable in the last analysis because the notion of morphology

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[20] See ECN 11, Goethes geistige Leistung, Erste Vorlesung. The passage reads: "Natur und Kunst sind zu groß, um auf Zwecke auszugehen". Cassirer's source is Goethe (1830: 223): "es ist ein gränzenloses Verdienst unsres alten Kant um die Welt, und ich darf auch sagen um mich, daß er, in seiner Kritik der Urtheilskraft, Kunst und Natur kräftig nebeneinander stellt und beiden das Recht zugesteht: aus großen Principien zwecklos zu handeln. So hatte mich Spinoza früher schon in dem Haß gegen die absurden Endursachen gegläubiget. Natur und Kunst sind zu groß, um auf Zwecke auszugehen, und haben's auch nicht nöthig, denn Bezüge gibt es überall und Bezüge sind das Leben."

permitted Cassirer to conceive the rise of new forms by non-mechanical explanations, relying ultimately upon the notion of chance. The recent dissemination of self-organization theories seems to indicate that Cassirer was perhaps on the right track. In any case, his theoretical interpretation of biology was not just of incidental importance to him, but an integral part of his own philosophy.

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Философия биологии Эрнста Кассирера

Первая часть статьи описывает философию биологии Эрнста Кассирера на фоне философии науки XX века, давая заодно обзор важнейших работ Кассирера о философии биологии. Вторая часть посвящена проблеме, которая, по мнению Кассирера, является главным философским вопросом биологии, — конфликту механицизма и витализма. Кассирер показал, что в этом конфликте мы имеем дело с методологическим спором, а не с метафизической проблемой. Обе точки зрения — как механицизм так и витализм — по мнению Кассирера в определенной мере оправданы. В третьей части статьи рассматривается критика дарвинизма Кассирером. Хотя в целом Кассирер относился критически к дарвинисткой эволюционной концепции, он не отрицал эволюцию и считал, что понятие эмергенции имеет значение и за пределами биологии. В заключении показывается значение философии биологии в философской ориентации Кассирера в целом и в его взгляде на задачи теории философии.

Bioloogia filosoofia Ernst Cassireril

Artikli esimene osa kirjeldab Ernst Cassireri bioloogiafilosoofiat 20. sajandi teadusfilosoofia taustal, andes ühtlasi ülevaate Cassireri erinevatest kirjutistest bioloogia filosoofia kohta. Artikli teises osas vaadeldakse probleemi, mis on Cassireri vaate kohaselt bioloogia peamine filosoofiline küsimus — mehhanitsismi ja vitalismi konflikti. Cassirer näitas, et selle konflikti puhul on tegu metodoloogilise vaidluse, mitte metafüüsilise probleemiga. Mõlemad seisukohad — nii mehhanitsistlik kui vitalistlik — on Cassireri meelest oma teatavais piirides õigustatud. Kolmandas osas käsitletakse Cassireri darwinismikriitikat. Olles kriitiline Darwini evolutsioonikontseptsiooni suhtes, ei eita Cassirer evolutsiooni, ning nägi emergentsuse mõistel bioloogiast kaugemale ulatuvat tähtsust. Neljandas osas tehakse kokkuvõte bioloogia filosoofia tähtsusest Cassireri filosoofililisele orientatsioonile tervikuna ja tema vaatele filosoofiateooria ülesannetest.

Mimesis and Metaphor: The biosemiotic generation of meaning in Cassirer and Uexküll

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Abstract. In this paper I pursue the influences of Jakob von Uexküll's biosemiotics on the anthropology of Ernst Cassirer. I propose that Cassirer in his *Philosophy of the Symbolic Forms* has written a cultural semiotics which in certain core ideas is grounded on biosemiotic presuppositions, some explicit (as the "emotive basic ground" of experience), some more implicit. I try to trace the connecting lines to a biosemiotic approach with the goal of formulating a comprehensive semiotic anthropology which understands man as embodied being and culture as a phenomenon of general semioses.

1. Introduction

Together with Jakob von Uexküll there was another important semiotician teaching in Hamburg in the twenties and thirties of the past century: Ernst Cassirer. Like Uexküll's, Ernst Cassirer's role as a major contributor to semiotics has only recently been understood in all its breadth. Cassirer's work has been influential in the theory of art and aesthetics (Langer 1953; 1979; 1967–1983; Goodman 1997), in ethnology (Geertz 1997), in cultural philosophy and epistemology (Schwemmer 1997) and other areas.

Uexküll had argued that organisms perceive their worlds as *signs*; their realities are constructed from meanings. Cassirer, however, had proposed that humans perceive their worlds through *symbols* — there is no experience possible outside the various symbolic forms, as there are myth, religion, art, science. I want to analyze some of the philosophical relationships between Uexküll and Cassirer. Both thinkers knew each other and also repeatedly met in academic circles. Some statements of great mutual respect have been recorded (Heusden 2002). But there is first of all a marked influence which Uexküll's thinking left on Cassirer's late works, particularly in the *Essay on Man* (1944).

I will concentrate on one topic in the relationship between the two thinkers which can be considered important for both of them: the connection between a cultural semiotics, which is Cassirer's *Philosophy of Symbolic Forms*, and a biosemiotic theory. The major problem for such a synthesis, which lies at the core of the two-cultures-problem, is to show how culture emerges from or anchors in the body. Cassirer's reception of Uexküll can be said to be an attempt to solve this, to overcome the arbitrariness of an approach to man which is limited only to cultural phenomena. Cassirer takes even a kind of protobiosemiotic position when he explains how symbols are generated from human experience. Cassirer is not very explicit about this process, apart from in certain core passages of his *Philosophy of Symbolic Forms*. It is particularly these arguments which need biosemiotic analysis. To provide this is the aim of the present paper.

Cassirer's main interest was not biological meaning generation. He adopts biological findings because he needs what he thinks of as a "vitalist" scheme of the living to justify his cultural semiotics (Heusden 2002; Cassirer 1944). Cassirer had to legitimize the fact that he took culture to be the defining character of man. "Vitalism" hence is the prerequisite to Cassirer's culturalism, because the former is an emergentist paradigm: if the living system can be described as emerging from matter arranged in a particular way, it could mean that the symbolic universe emerges from a specifically fitted animal, *Homo sapiens*.

But even here Cassirer's understanding of Uexküll, though decisive for a new framing of his cultural philosophy, does not fathom out the real depth of semiotic possibilities which a biological explanation of meaning can provide. Paradoxically, Cassirer has become relatively famous *because* the references to body and organism are so scarce in his work. He seemed to have written an anticipation of contemporary semiotics, the symbolic forms being somewhat similar to the much more recent argument that everything is "discourse".

But, as certain crucial passages in his works show, the body — or the basic emotive ground of experience, as Cassirer expresses himself — plays a major, though hidden, role in the making of the symbol. Cassirer tries to anchor his philosophy in the world of the living, even if he is not very explicit about it. It is for *this* reason that his philosophy is important today, at a time when the poststructuralist semiotic approach showing major methodological difficulties (Falck 1994; Latour 1995).

To strengthen this hypothesis we have to look for a deep relation between the concept of symbolic forms and a biosemiotic viewpoint. Here I will concentrate on Cassirer's idea of the process of how symbols are produced. This has always been the most critical and enigmatic part of the *Philosophy of Symbolic Forms*. But at the same time it is the key to it — and here Uexküll's work does enter.

2. Kant's bold heirs

The most striking similarity in Cassirer and Uexküll is their determination to continue the "critical business" of Immanuel Kant. It is interesting that this has also been the aim of the semiotician Charles Sanders Peirce — to complete what Kant had left open. To go over Kant's constructionism apparently leads to semiotics.

Cassirer and Uexküll start their projects on different levels of Kant's heritage. Uexküll tries to further analyze the biological functions as the source of the Kantian "conditions of possibility" of any perception. What is transcendental for Kant, for Uexküll is provided by the biological building plan of an organism. Uexküll thus creates a biological constructivism *avant la lettre*. Consequently, there is no longer a rational subject which maps its categories on an outside world. Any perceptional categories are related to the anatomy of the respective organism. They are the embodied process of cognition. Uexküll's new rationality is one of the building plan — hence a rationality which can not leave the body.

Cassirer, however, argues that Kant's faculties of human reason have to be completed by the symbolic forms of culture. Thus, similar to Uexküll, he introduces a stance of uncertainty, of contingency into the Kantian clarity. Culture is not purely rational, but, as we know, it is always entangled with situations; it is manifold, dense, even "dirty".

In thus writing forth Kant, Cassirer already uses Uexküll's development of Kant's philosophy. In his anthropological summa, the *Essay on Man*, Cassirer introduces a "symbolic network", enlarging Uexküll's effector and receptor cycle, whereas Uexküll had also placed culture inside the biological functional circle. Cassirer opens the circle to encompass the symbolic faculty of man as a part of his biological layout — indeed, as a feature of his building plan.

Obviously, both semiotic approaches overcome problems that in the Kantian framework had remained difficult. Both stress the relativity of knowledge — one referring to cognition, the other to culture. But both approaches also contain their own gaps: for Uexküll, as for all constructivists, it is difficult to avoid a solipsistic stance. Why is any communication possible in the first place, if each individual is locked in its own "bubble" of perception, its own "Umwelt" (Uexküll 1980)? As we know, Uexküll had to introduce the rather cryptic "Naturplan" to explain the harmony of the living world.

Cassirer, on the other hand, has no problem with intersubjectivity. He can simply elucidate it as a central feature of symbolic forms. The semiosphere is the symbolic cosmos shared by all men. His difficulties are nevertheless also related to the problem of the external world. What mediates the entry of certain experiences into the symbolic realm? Why do specific symbols play a pertinent role in nearly all cultures — as do strong metaphors of nature, which are known from the most ancient cultures, but are still today commonly used in poetry? What Cassirer is missing in his theory of man as an "animal symbolicum" precisely is the animal. For this reason he is interested in Uexküll. And it is here where a further biosemiotic deepening can make Cassirer's already acclaimed philosophy still more important. We only have to follow the way he himself indicated: as Cassirer stresses, any critique of culture ultimately must be grounded on a critique of perception.

To meet the problems left open by Kant, we have to go beyond Uexküll and Cassirer. How does fully reflexive semioticity emerge from the organic realm? However, the leap Cassirer takes right into the symbolic universe does not have to be necessary any longer. As we know today, life is no mystery inside matter, but rather a lawful outcome of some of its special arrangements, permitted by them, though not *caused*. Symbolic behavior may then be a lawful stage of the same emergent process in just another magnitude (Weber, Varela

2002). To explain the way in which symbolicity arises from biological meaning, Cassirer himself has contributed a good part of the map. To understand it, let us have a look at his conception of the making of symbolical value.

3. Metaphor: Biosemiotic generation of the symbol in Cassirer

A core term in Cassirer's philosophy is what he calls *symbolische Prägnanz*, "symbolic pregnance" (Innis 2001). It defines the process by which an outside factor or stimulus enters the symbolic universe of culture (Cassirer 1977–1982, vol. 3: 235). Symbolic pregnance is present in all strata of culture, but it is accessible most broadly in the "expressive function", which is the basic form of symbolisation. It can be found in myth, religion, and art: their expressive functions are the fires where living symbols are forged, where sense is extracted from experience.

Symbolic pregnance is possible because any sensual experience already provides its transformation into a symbol which perfectly fits to express the experience. Symbolism is a corporal matter. Things are experienced through sensory perception. Their symbolical value is their value for the experiencing body. So far, Uexküll and Cassirer's thinking is parallel. To understand Cassirer's switch to culture however, we have to look at what might be called "primordial" metaphors or symbols: gestures that arouse the same feeling as is felt in the original experience which they symbolize. Hence, in a primary process of symbol generation, experiences *are what they mean*. For Cassirer the symbolic understanding of the world is grounded on this basic emotional background, "gefühlsmäßiger Urgrund" as he puts it (Cassirer 1977–1982, vol. 2: 118). All experiences are valued as they carry gloomy or serene traits that immediately characterize their symbolic import. Cassirer calls this process an "Urphänomen", in reference to Goethe's holist theory of symbols.

We can see here a strong similarity between Cassirer's ideas and some core theses of Merleau-Ponty's phenomenology of perception: "'Semiosis' is here 'pushed down,' with an explicit reference to Cassirer, to the emergence of meaning in the perceptual field itself" (Innis 2001). The world has a physiognomic appearance before any interpretation takes place. It is coloured by a primary accent of value (Cassirer 1977–1982, vol. 2: 118f).

In the way Cassirer describes the working of this primary value he comes very close to the biosemiotic account of how meaning arises from a grid of signification which the cognising organism lays out onto the world. As Cassirer states:

> Only those sensory experiences are extracted from the fluid stream of perception which somehow are shown to be related to the centres of will and of doing, which prove to be helping or hindering the whole of the living, which thus prove to be important and necessary. (Cassirer 1983: 106; my translation, A. W.)

This quotation shows Uexküll's influence in a much deeper way than Cassirer might have admitted. Cassirer speaks of sensory experiences and of the way they become valued as symbols. Already in his terminology he adopts a biosemiotic way of expression.

Most interestingly, Cassirer touches the question of value which a system exhibits in trying to keep alive (Weber, Varela 2002). The character of an experience is determined by what has been its embodied signification for an organism. The quality of this signification is dependent on whether the embodied interaction is good or bad. For a simple organism, we could even say, any experience is an *Urphänomen*. Any experience melts down to this universal existential coin of lived value, and is then paid back in due amount for the construction of the sign — or rather for that flash of insight, coupling existential value, or of vital import to the gestalt of the original situation. Here we can clearly see, that in the first stage of the symbolic process signs *mean* exactly what they really *are* for the organism.

To understand the process of meaning generation proposed by Cassirer we have to go back to the creation of meaning by the organism as such. Because of the living's incessant need of input to keep up the fragile equilibrium of Autopoiesis (Maturana, Varela 1980), stimuli gain an existential cognitive significance. This significance is represented to the organism as a perspective of existential concern. External influences hence act as signs that have a meaning for the organism's survival (for discussion see Weber 2001; 2002; 2003).

This sounds somewhat trivial, but it may mark also for man, as he is an embodied being, the crucial point where experiences become metaphors, and where the metaphor still has the gestalt of the experience that forged it. Think for example of the symbolic power of darkness, which *really* is a frightening situation for a daylight species like man. Darkness marks a family of metaphors which stand for the uncanny, for the gloomy aspects of the soul. The "Gestaltung", the form which the symbol will take, *is* the efficient form of experience which the human organism is undergoing.

In a manuscript, that has never been published, Cassirer discusses the symbolic worlds of certain animal species. Contrary to his statements in the *Essay on Man,* at least some seem to be fitted with a symbolic system which has a physiognomic character, as the mythic world order of early peoples had (Cassirer 1992). This idea contradicts the more elaborate (and "official") position in his *Essay on man* where he accepts a symbolic faculty solely for humans. But this finding stresses even more how important the relationship between "physiognomy", i.e. embodied experience, and the symbol was for Cassirer.

Following Cassirer, we might postulate a genealogy of meaning generation, starting with early human cultures. Their obsession with the facts of nature seems to indicate a state of "physiognomic character", where embodied experiences still *are* what they *mean*. As recent works (e.g., Morphy 1995) have shown, however, the semiotic universe of ancient peoples is rather complicated and at any rate not simpler than ours. Still (as another work would have to show), we might learn from this intricacy a lot more about the necessary interrelation between the experience of nature and its use to understand human social existence (Descola 1997; Ingold 2000): ancient cultures do not rest in an innocent "physiognomic" condition towards nature, but they show with very little "cultural noise" the interrelation of embodiment and symbolicity. Archaic cosmological systems are not paradigms for the lowest stage of symbolic forms. They nonetheless prove Cassirers link between embodiment and symbol in showing in a very clear way how the body (or nature) and symbol are intertwined.

4. Mimesis: how new meaning arises from old bodies

To understand symbolic pregnance, the body must be comprehended as the condition of the possibility of any expression. As such it lies at the base of any culture. This can be grasped more clearly if we regard how poetic metaphor recalls or even re-enacts primary symbols: it tries to arouse the same feeling by generating vital import (Langer 1953). Metaphorical truth, therefore, is far from being literal, but it has to obey the laws of organic flow and rest, the laws of need, of organic desire. A "warm smile" sends out energy by way of meaning, not as a fire does.

There is one fact central to this re-enactment of vital import: what is expressed in the symbol has real properties that cause its uncoupling from the foregoing situation. The metaphor, as a living one, is partly unchained from its pregnance and starts its own semiotic fecundity. This core phenomenon may account for the independency of culture in reference to its embodied origin. Metaphor entrains all its cultural background framework, but then in its primary core as vital import rolls back onto the subject with existential force. Obviously, an "as if" gesture can have the same import as the "real thing", or even more — living in a family where nobody smiles can chill as much as the lack of heating can. The reason for this analogous effectiveness may be that all impressions enter the cognitive network melted down to a universal existential value, a kind of synaesthetic protostate (Weber 2003), where "real" and "virtual" is not differentiated, and "inside" and "outside" are not really clearly marked.

Here we have to introduce the concept of mimesis. This term can be defined as the interpretative reaction to a stimulus from the surrounding world, which leads to its mirroring with slight variation (cf. Gebauer, Wulf 2003). It is important to note that any gesture has a mimetic relationship to its meaning. Any gesture by living being is an interpretation of a sign and at the same time a new one. Meaning is thus an *event* which construes a new reality by the fact of expressing or enacting its signifying value. It happens on a middle ground, being at the same time new and known, incorporating old, but also calling forth new meanings. Because a symbol is always a gesture in its own right, it always remains at some final point an enigma too.

By this definition, most organic cognition is mimetic, because it is the interpretation of a sign. This inevitably leads to a cascade of related form in the interpretation. The signified is contained in the sign as an analogous form, not as an abstract code. The track is new, but at the same time it is the hollow form which contains the step. To come back to Goethe and his notion of the *Urphänomen* in general poiesis, that of art and that of the living: when Goethe is proposing that the eye is sun-like, “sonnenhaft”, he does not mean that the eye is designed for sunlight — but that in receiving light it somehow mirrors its action by mimetic shape. It interprets the fact that there is light by its own action of shining.

If we look at poetry again, we might retain a glimpse of what is the enigmatic *differentia specifica* of the *animal symbolicum* seen under an embodied-subject view. The deciding moment in the symbolic (or poetic) achievement, the so called “keen metaphor” (Haverkamp 1995), is that it does not only arouse a vital import through the synaesthetic enactement of feeling: it produces something entirely new, something never heard of, which becomes an opaque part of the world itself. Maybe this is the *alter* in the middle of the *idem*. What I propose as human specific difference, then, is not the sole fact that humans use symbols, but their increase in poietic power: reinforced creation.

The symbol jumps over the blind spot of cognition with a flash of unexpected light. It knows more than what it was borrowed for. Its wisdom stems from a double source, always merging body and culture: the symbol is filled with the embodied wisdom of primary metaphor, and at the same time it brings with itself the material of a whole culture, the unfathomed depth of the semiotic system. Following Paul Valéry, the symbol is the *thou* which knows of me what I cannot see, but what, for exactly this reason, brings me to life in the first place.

We have to accept the independency of culture *for the very reason that* it is biologically based. A biological symbol always entrains the newness of the event, the continuing enactment, the absoluteness of interbeing which already presupposes the other in the building of self. From this standpoint we can come back to Cassirer and to his attempt to formulate the genesis of cultural symbols from an emotive base. For Cassirer, the relationship between body and soul — or culture — is symbolic: it is even the paradigmatic example for symbolicity. From here stems the permeability of body for cultural metaphor.

Biosemiotic mimesis in human terms means to be born in a world of both material meanings and of a priori nonmaterial significations. But with every breath both become part of enactive mimesis, of the interpretative re-enactment of the world. The resulting topography is the organism’s own path: twirling lines where the silhouette of mountains and trees and the shaking and shivering of the moving spot become indistinguishable.

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Мимезис и метафора: биосемиотическое производство значения у Кассирера и Юкскюлла

В статье рассматривается влияние юкскюлловской биосемиотики на антропологию Эрнста Кассирера. Утверждается, что “Философия символических форм” Кассирера написана как семиотика культуры, которая в некоторых своих основных идеях основывается на биосемиотических пресуппозициях, в одних случаях эксплицитно (как “эмоциональная основа” опыта), а в других — имплицитно. Выявляются черты, общие с биосемиотическим подходом, с целью сформулировать всеобъемлющую семиотическую антропологию, которая рассматривала бы человека как телесное существо и культуру как феномен всеобщего семиозиса.

Mimees ja metafoor: Biosemiootiline tähendusloome Cassireril ja Uexküllil

Vaatluse all on Jakob von Uexkülli biosemiootika mõjud Ernst Cassireri antropoloogiale. Väidan, et Cassireri “Sümboliliste vormide filosoofia” on kirjutatud kui kultuurisemiootika, mis oma teatud põhiliste ideede osas tugineb biosemiootilistele eeldustele, osalt otsesemalt (kui kogemuse “emotiivne alus”), osalt kaudsemalt. Püüan välja tuua ühendusjooni biosemiootilise lähenemisega, eesmärgiga formuleerida semiootilist antropoloogiat, mis mõistaks inimest kui kehandunud olendit ja kultuuri kui üldsemioosilist fenomeni.

In the quest for novelty: Kauffman's biosphere and Lotman's semiosphere

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Abstract. The emergence of novelty in the realm of the living remains, despite the long tradition of evolutionary biology, unwelcome, calling for explanation by old, established knowledge. The prevailing neodarwinian evolutionary paradigm approaches living beings as passive outcomes of external (and extraneous, hence "blind") formative forces. Many teachings opposing Darwinism also take the existence of eternal, immutable and external laws as a necessary prerequisite. Ironically enough, authors who oppose Darwinian theory, and admit that living beings possess a "self", often accentuate internal, ideal and eternal harmony, which is incompatible with historical changes; moreover such harmony is again imposed by external, atemporal "laws". I describe here a third approach embodied by the names of two unrelated scholars, Stuart Kauffman (biology, physics) and Juri Lotman (semiotics, culturology). Their approach suggests that the evolution of organisms, minds, cultures — is a continuous negotiation (semiosis) of 'laws', driving to ever broader spaces of freedom and constantly larger autonomy of existence.

Es klingt wie eine banale Selbstverständlichkeit, wenn man den Satz aufstellt: Die Kaffeetasse ist kaffeehaft. Doch besagt der Satz mehr, als es den Anschein hat. Er besagt, daß die Leistung der Tasse darin besteht, den Kaffee zu beherbergen, aber darüber hinaus, daß diese Leistung zugleich das Motiv für ihre Herstellung war.
Jakob von Uexküll (1958: 146)[1]

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[1] "It looks like a banal self-evident truth when we say that a coffee cup is of coffee-nature. Yet the sentence explains more than is apparent. It suggests that the performance of the cup is in harboring coffee; before all, however, it suggests that this very performance served as a motive for the making of the cup."

Nous verrons que certaines rêveries poétiques sont des hypothèses de vies qui élargissent notre vie en nous mettant en confiance dans l'universe. [...] Un monde se forme dans notre rêverie, un monde qui est notre monde. Et ce monde rêvé nous enseigne des possibilités d'agrandissement de notre être dans cet univers qui est le nôtre.
Gaston Bachelard. (1960: 7)[2]

Science is conservative: an innovation is rarely welcome. Reality does not change: this is the basis of its objectivity — and of scientific knowledge as well. Any novelty, or unexpected (unpredicted) phenomena, must be explainable (or explained away) within the frames of extant knowledge. Thus, the idea that novelty might appear in the world studied by natural sciences has always been met with the greatest suspicion. The quest of modern (Newtonian) science has focused on the axiom of timeless, eternal "natural laws". In such a world, there is no room for any genuine change: for contingence singularities, inventions, progress, creative acts, free choice etc. Actual history is not allowed, and the task of evolutionism is to merely reduce apparent changes of living forms to combinations and recombinations of chemical elements.

If chaotic, haphazard phenomena are observed in a world allegedly governed by mathematical rules, for science it simply means that the system is too complex (in the number of components or in the terms of computation) or our methods are not sensitive enough to decipher the order reigning in the background. The question *whence the rules themselves came into the picture* is forbidden — they are simply there — whether they originated as prescripts by god, or are implied by geometrical, mathematical and logical principles, or were a result of primeval events (symmetry breaking) following the Big Bang, which then froze forever. Hence the difficulties which great biologists like Hans Driesch, Theodor Eimer, Jakob von Uexküll or, in our times, Anderas Suchantke have had in accepting evolution. These and

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2 "We shall see that some poetical daydreams represent hypotheses of our worldviews that enrich our lives by establishing our intimacy with the universe. From such daydreams will arise a world which is ours. And this dreamt-of world renders a possibility of uplifting our being to this universe which is ours."

other great German scientists tried to maintain the purity of science against haphazard and spontaneous events.[3] Their leading axiom was the existence of harmony in nature, nature as a *glockenspiel*: they saw the task of a biologist as being to write down the score (already existing, but hidden) of the natural symphony (as perfectly as possible).

We should not be misled by the contemporary neodarwinian paradigm concerned with the quest for tricks which allow chance to be introduced into biological science, while remaining in the good old realm of eternal computable rules. Yet uneasiness and perplexity is being felt, leaking through statements from people trying to make a serious attempt to reconcile mechanistic science with blind chance (for a superb illustration of such a vain enterprise see Monod 1970, or Jacob 1970).

On the other hand, in some realms of the humanities, the existence of novelty and creativity is being admitted. Hermeneutics, semiotics, history, poetry etc. teach us how meaning can and *does* arise. The problem is that these fields indeed are "humanities", i.e. they concentrate on *human* affairs. Attempts to broaden their realm into biology are received with suspicion or even contempt — paradoxically from both sides of the trench dividing the realm of human knowledge. Thus, a phenomenologist speaking of the lived world (*Lebenswelt*)

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3 Here are some examples of such a bureaucratic science, which describe a lawful, strictly disciplined world: (1) "Alles in der Natur muß selbstverständlich Gesetzen folgen — kein Vernünftiger wird das bestreiten. Aber das von Darwin angenommene Abändern nach den verschiedensten Richtungen ist ein regellos, zufälliges im Vergleich zu dem gesetzmäßig nach bestimmten Richtungen vor sich gehenden, wie ist es thatsächlich nachweise" (Eimer 1897: xi); (2) "The 'law of nature' is the ideal I am speaking about, an ideal which is nothing less than one of the postulates of the possibility of science at all" (Driesch 1929: 4); (3) "Die verschiedenen Tiere und die Pflanzen eines bestimmten Lebensraumes gleichen Organen oder Zellen eines Einzelorganismus darin, daß sie innerhalb des ihnen übergeordneten lebendigen Ganzen bestimmte festumrissene Funktionen erfüllen und in diesen Aktivitäten mit anderen Mitgliedern dieses Gefüges in Verbindung und Austausch stehen; in seiner Gesamtheit ergibt das ein lebendiges Funktions- und Tätigkeitsgeflecht von unerhörter Komplexität. Das alles hat sich nicht irgendwie zusammengefunden, sondern unterliegt formenden, dirigierenden Kräften übergeordneten Charakters, wie es sich etwa im Zusammenspiel von Feuchte und Trockenheit, Helligkeit und Dunkel, Wärme und Kühle zeigt" (Suchantke 1994: 68).

feels *quite* indignant when a biologist suggests applying his insights on non-human living beings: he simply finds the idea improper.

By the same token, concepts borrowed from humanities soon suffer semantic degradation. Thus, in informatics, *information* became but another calculable magnitude upon such a transfer. A similar fate meets the very concept of *meaning* if somebody dares to use it. "Biological meaning" either has something to do with survival, or it points to the effect of a signal. Other meanings of "meaning" are forbidden — at least in contemporary, orthodox biology. Attempts to introduce it come to, as a rule, the simplistic conclusion that meaning is something that has always been there or at least was produced, and could have been produced at any time, according to (decipherable) rules of "contrapunct" (Neubauer 1991; Markoš *et al.* 2003). This is the case when it comes to otherwise incomparable authors like, e.g., J. von Uexküll (1958) and M. Barbieri (2003). *Meaning* stripped off its hermeneutical dimensions, produced according to rules, will become the simple decoding of signals. This reduction to a stimulus/response scheme is but a pale ghost of how *meaning* is generally understood by common sense — not to speak of hermeneutics or poetry!

What all such activities have in common with "objective" science is their understanding of living beings as passive pieces on the chessboard of nature, pushed and pulled according to rules imposed from outside.

> Since we humans are used to conducting our affairs with effort from one goal to another, we believe that animals live in the same manner. That is a basic error, which so far has misled all research. [...] Therefore our first concern must be to quench the will-o'-the wisp of a goal when observing Umwelten. [...] [Animals] are controlled directly by a plan of Nature, which determines their characteristics (*Merkmale*). (Uexküll 1958 [1934]: 60)

Does this mean making science out of what principally cannot be subordinated to any strict rules?

Contemporary attempts to find a common language for both parties on opposite embankments of the trench are therefore *nihil novi sub sole*. What is new is that such calls for synthesis are usually led by a conviction that objectivist and reductionist natural science (in its current form) is the sole owner of correct knowledge. Such proposals argue in favor of the transformation of all knowledge into a branch of natural sciences, within the lines of the worn out 17th century

Enlightenment ideals (Wilson 1998). Fortunately, they are not usually followed by any practical action.

Meanwhile, in the backyard, a real process of a genuine "consilience" — mutual interpenetration with the aim of synthesis — has taken place. Instead of being an artificial construction of solid beams which should bridge the ditch in a unique and definitive way, it is made of a fabric of multiform tangled brambles. Soon, hopefully, it will cover up the ditch completely; soon it will be strong enough to form a natural bridge... Formally, particular fibers do not lose their identity in the web, but our discrimination ability is limited, and not all fibers, shoots and sprouts can be distinguished at the same time. The basic theme, emerging from the background web is *competence*: we have gained the understanding that the living world (or maybe even the whole world) is *taking care of its own affairs*. The rules and laws are not imposed from outside: they are being negotiated and enacted by a spontaneous, internal effort (as, after all, are *any* laws) through an internal, integrating dialogue. Competence and self-imposed laws (habits, rules), then, raise evolution from its marginal status of a Cinderella malevolently disturbing the ideal circles of our objective science to the basic principle ruling the universe!

Let me illustrate this rather inconspicuous process by following two such "fibers" selected from the fabric (in more detail see Markoš 2002): one is the work of the Russian linguist and culturologist Juri Lotman, the second is the theoretical biology of the American biologist and mathematician Stuart Kauffman. Many parallels can be traced in their language and thus also in their models of the world, called semiosphere by the first author and biosphere by the second.

Semiosphere

In the first part of his *Universe of mind*, Juri Lotman (1996 and 2001) criticizes the attempts to reduce natural languages (and texts) to a code in a way reminiscent of the models of genetic information processing provided by molecular biologists. Such attempts suggest parallels with the reduction of natural phenomena to natural laws in natural sciences: here as there, whatever is beyond the code is ignored. If such an approach is adopted in semiotics, it is assumed that the user of language is interested only in receiving the relevant messages, by specific selection from the plethora of background noise. All other aspects of the text — its multiple and variable relation to the context — is ignored. The recipient is "hardwired" or, to express it within the context of this meeting, "*Umwelt*-bound". A text plays the role of a mere carrier of transmitted messages, and the single goal of a semiotic process is an adequate transmission of the message. It is taken for granted that the meaning of the text remains invariant with regard to the transformations of the text itself. Upon this assumption rests most of the reasoning concerning the relations between text and meaning. The *Umwelt* remains constant and the codes are frozen.

According to Lotman, by accepting such a scheme, we are confronted with a lot of patent paradoxes. First of all, all natural languages are very poorly equipped to fulfill such a role. Problem-free transmission requires that the sender and the receiver of a message have an identical table of codes. This can be achieved, however, only if the sender and the receiver are identical, and new information will change neither the receiver nor the context. A shared natural language is not a prerequisite of code identity — on the contrary, *this* fact especially hinders the achievement of sender–receiver identity! It follows that an identity of codes can be achieved only in special cases, to serve very special, narrow purposes, at the price that the language is no longer natural.

> For a total guarantee of adequacy between the transmitted and received message there has to be an artificial (simplified) language and artificially simplified communicators: these will have a strictly limited memory capacity and all cultural baggage will be removed from the semiotic personality. The mechanisms created in this way will be able to serve only a limited amount of semiotic functions; the universalism inherent to natural language is in principle alien to it. (Lotman 2001: 13)

Thus, artificial languages model not language as such, but only one of its functions: the ability to transmit a message (e.g., Eco 1995; Hofstadter 1979). Language would be deprived of its additional — actually essential — functions, and after some time such functions would even be forgotten: language would turn into a sort of algebra and its function would scarcely differ from a mechanical cause–effect relationship. The creative function of language is the most important factor that would be swept aside: the text works not only as a transmitter of messages, but also as a generator of new ones. In this sense, not only understanding, but also misunderstanding is an important and useful means of communication (remember jokes, metaphors...). It follows that neither unambiguous transmissions nor mathematical solutions can be characterized as *new* messages.

Artificial languages are but a special cause from one extreme of an imaginary continuum, states Lotman (in agreement with many others, of course). On the other pole we find languages in which the creative constituents are emphasized — like poetical language. In such a case, receiving and translating the message are creative acts. In special cases the codes cannot even be translated at all: Lotman provides an example of a canvas showing a scene from the Gospels. The image cannot be translated into the particular text of the Gospel, and, of course, it does not follow that reading the text will bring to mind this very scene.

From the semiotical point of view, it is important that new meaning can originate in the process of extracting meaning from the text. The language precedes the messages transmitted, and is an integral part of them. Great deeds in, for example, the arts, are often followed by boisterous applause or, on the contrary, embarrassment, simply due to fact that the audience does not understand the language of the message — in spite of the common cultural tradition. As time goes by, such a novelty may end up in a kind of machine meta-language (cf. Peircean *habit*). Only then will information be communicated as codes given beforehand — but this does not mean that natural language has been transformed into a machine language. Although transmitted digital messages can be quantified objectively in the machine language, nothing like this is possible in a natural language. Well, of course, a written message can be easily digitized, says Lotman — but this simply means that *it is always on the decision of the receiver of the message whether he accepts the text received as a code or as a message.* This double function of the text enables even petrified truths of religious, cultural, or scientific communities to escape canonical (i.e. coded) interpretation and allow the emergence of novelty. Such truths may breach the narrow hold of previous clichés and start again to circulate in broader contexts. This happens again and again in cultural evolution — but is biological evolution different in this aspect?

Since a live language never excludes a new interpretation of even very canonical codes (habits), it may resist the evaporation of information from texts with time. On the contrary — if the text is active in a culture, it will ceaselessly pick up new meanings. Lotman gives a Hamletian parable:

> Nowadays Hamlet is not just a play by Shakespeare, but it is also the memory of all its interpretations, and what is more, it is also the memory of all those historical events which occurred outside the text but with which Shakespeare's text can evoke associations. We may have forgotten what Shakespeare and his spectators knew, but we cannot forget what we have learned since their time. And this is what gives the text new meanings. (Lotman 2001: 18–19)

The part devoted to autocommunication is also of great interest. Lotman here upbraids semiotics for preferring communication between subjects (I – thou) and neglecting the question of how novelty can emerge in the mind of a single subject (communication I – I). Again and again he returns to examples of how a thinking subject introduces new levels into already established codes — generated endogenously or evoked by the environment. We can even make a generalization about a whole culture:

> The laws of construction of the artistic text are very largely the laws of the construction of culture as a whole. Hence culture itself can be treated both as a sum of messages circulated by various addressers [...] From this point of view human culture is a vast example of autocommunication. (Lotman 2001: 33)

Culture is therefore a function of paired communication systems (I–thou, I–I); what will emerge is a collective personality with a collective memory, mind, and history. Lotman named this entangled web a *semiosphere*, a system integrated across all levels of its organization! (Compare with the Kauffmanian *biosphere* below.)

The importance of this statement is apparent when we compare it with two other outlines which allow us to grasp organization: the atomic and dissipative-structure models. The atomic (or reductionist) system aims to explain organization from a single basic level. Other levels (it is strange that their slavish position is labeled as "higher") only reflect the behavior of elements from the basic level, according to pre-established and immutable "laws". The "communication" between levels (if it can be called *communication* at all) is one-way only: the lower level determines phenomena on the higher one(s). But the very expression — "communication" denotes that which is in common —

commune! I. Prigogine — who developed the theory of dissipative structures — had upset this hierarchy when he showed that each of the particular *domains* of description has its autonomy. Communication between domains is bi-directional, but at the price of non-canonicity: the change of language between domains always brings about losses as well as gains (Havel 1996). Dissipative structures, however, lack memory and anticipation — features that are natural for both the semiosphere and, as we shall see, the biosphere. These systems (and the real biosphere as well) behave as if they contained no domains. Yes, we can distinguish elements — atoms, molecules, words, and sentences — but these are interconnected, not only within a particular domain, but also *across* domains; moreover, the flow of information between the domains is reciprocal. What really takes place at the interface is *communication*, a semiotic process, not simple decoding.

It is, however, very difficult to manage — or even imagine — such entangled hierarchies in the context of our culture. This is why I consider Lotmanian or Kauffmanian spheres to be important. Lotman shows that even if we succeed in distinguishing a "basic element" in a cultural continuum symbol, we cannot avoid paradoxes. It can be demonstrated through the concept of *symbol*.

a. The symbol indeed belongs among the most durable elements of the continuum, however not in the atemporal sense typical of the "atoms" from basic levels of description in science. This is because:
b. The symbol is never synchronous — its memory goes deeper than the memory of its (non-symbolic) context. The symbol exists before the texts; the user literally digs it from the deepest layers of his culture.
c. The sensory and communicative potential of symbols is always broader than what comes up in a particular actualization.
d. Thanks to symbols it is possible that text and topics can be transferred across different layers of the culture, thus preventing fragmentation into different cultural layers.
Lotman compares the function of symbols in a culture to the genetic memory in a body. Such a comparison invites a reciprocal view from the side of biology. Genes — originally the presumptive "atoms" of heredity, have experienced during the last century a strange transformation into strings of signs — codes and even texts. This prompts us to draw a parallel to Lotman's points above:

aa. Genes belong to the most durable elements of the continuum comprised of cells, individuals, species and biosphere.
bb. Genes are not synchronous: the user, i.e. the living being, receives them from the thesaurus, memory of its "culture"; by culture we shall mean species or genealogical lines. Individuals dwelling at the current endpoints of such historical chains thus govern the whole experience of the line, i.e. both the genes and the directions for their usage and interpretation.
cc. The impact of genes cannot be localized to a single concrete realization — most of the genes become engaged in a plethora of topics and their effect cannot be sharply demarcated (Dawkins 1982).
dd. Thanks to genes, topics can percolate across different layers (domains). To elucidate this last point, let me give three examples:

(1) In ontogeny, whole complexes of genes become repeatedly activated in totally different contexts. For example, the products of a gene set may assist in the establishment of body axes in early embryogenesis, later they work in organizing the primordia of appendages or inner organs, and then in patterning marginal features, like the structure of a feather or wing ornaments in butterflies.

(2) The same complexes of universal genes (i.e. symbols in our parable) work within a broad spectrum of species (i.e. cultures). Their impact, however, is determined by the modulation via the "cultural" medium they find themselves in. The forelimb of a human, a horse, or a bird, was induced — evoked into life — by the same group of genes — symbols; yet their final appearance is species- (culture-) specific.

(3) Gene complexes can be transmitted horizontally: such a "transcultural" transfer is especially common in prokaryotes, enabling them to engage in genetic communication throughout the whole biosphere. Dissemination of, for example., resistance towards antibiotics, is a good example of this phenomenon.

How, then, do genes–texts–symbols work? What *laws* determine their different engagement in different contexts — temporal or cultural? Or better, what game do they play?

Let us take seriously Lotman's assertion that language, culture and texts live. All participants of communication enter the game with a certain background of experience and memory. Living beings are participating parts, active creators/builders of their own *Umwelt*, not merely thoroughly tuned into a given one! As we shall see below, Kauffmanian autonomous agents are in a similar situation. Neither biosphere nor semiosphere can originate *de novo* like simple dissipative structures, such as a flame or a vortex. Lotman compares semiosphere to a museum hall, full of visitors: inside it you can find a semantic overlap of dinosaur bones, teachers, clay tables with cuneiform script, school children, old china collection etc. A text, says Lotman, has an internal drive towards becoming a unique long word, thus opening a multidimensional space, influencing, in a feedback, the meanings and morphology of the language. Such transformations from the discrete (digital) into the multi-dimensional (analog) do not take place at a single interface: the same game is played again and again at different levels of organization — domains. Articulation of a topic by means of a language typical for different domains helps to disclose its nature. Semiosphere is indeed a generator of *new* knowledge (see, again, Kauffman below).

Let us return to the game and to its antipode — the law. Lotman states that if a goal is given in advance, there is no room for liberty:

> As the reserve if indeterminacy becomes exhausted, the degree of information drops, falling to zero at the moment when it becomes entirely redundant, i.e. totally predictable. [...] When we can predict the next link in the chain of events then it follows that there was no act of choice between equal alternatives. But consciousness is always a choice. So it follows that if we exclude choice (unpredictability which the outside observer sees as chance) then we exclude consciousness from the historical process. And historical laws are different from all others in that they cannot be understood without taking account of people's conscious activity, including semiotic activity. (Lotman 2001: 227, 234)

In other words: if the trajectory of a thrown stone can be predicted to the tiniest detail, i.e. if nothing unpredictable can happen during its flight, there is no need to throw it. If this holds, then history would be superfluous; God would not play dice. He would be merely watching ready-made videotape — and not even that, since He would be able to see it all at once! But in a culture, the less expected a phenomenon is, the greater impact it has, and the same probably holds true in other areas of human activity, even in science. This is why linguistic topics like interpretation, translation, evolution etc. nowadays enter all sciences; this indicates the end of the belief in timeless laws.

Moreover, opposites like culture — species or evolution — history become blended. We cannot avoid the strange feeling that Lotman himself does not fully allow for such a blending: phrases like "historical laws are different from all others" or "people's conscious activity" suggest that, in spite of all his ambitions, he still remains in the realm of *human* affairs. A more consistent attempt at such a blending comes from the sciences.

Order for free and the expansion into adjacent possible

Stuart Kauffman, mathematician and biologist, has experience with mathematical models, as well as their "incarnation", whereby an ideal mathematical map becomes a mutable and living landscape, when eternal timeless laws give room to *physis*. In the preamble to his book *Origins of Order* (1993) we read:

> Simple and complex systems can exhibit powerful self-organization. [...] Yet no body of thought incorporates self-organization into the weave of evolutionary theory. No research program has sought to determine the implications of adaptive processes that mold systems with their own inherent order. (Kauffman 1993: vii)

The last sentence could serve as the epigraph for Kauffman's lifelong scientific activity. Where does order come from in nature and in living beings? He does not take the neodarwinian explanation rooted in frozen accidents sieved by natural selection and shared in genealogical lines. Organisms come out from such an image as passive, ad hoc contraptions: they represent the outcome of historical contingency, their ontogeny being determined by "blind" genetic programs. Evolution is opportunistic and no room is given to the spontaneous emergence of order. Kauffman, on the other hand, aims to prove that order is for free: it is here not *because* of natural selection, but *in spite* of it. The greater the complexity of the system, the less power selection has to change its properties; order emerges not through a random walk, but as a result of a system's internal dynamics.

Even more advanced in this respect is another treatise by Kauffman (2000), *Investigations*, inspired, as he says, by Wittgenstein's *Philosophical Investigations*. The crucial idea is that the properties of a system cannot be stated in advance, by providing a list of a kind. It follows that deterministic laws of physics enabling the calculation of the behavior of a system (its configuration space) are not general, but *special* cases. They only work if we can state initial and boundary conditions for the system. Newtonian or Einsteinian physics thus cannot be applied to systems with evolution, where this condition cannot be fulfilled. It was demonstrated that general laws for such systems couldn't be stated at all; Kauffman, however, asks whether they couldn't be found at least for a special class of system — the autonomous agents.

The definition of an autonomous agent at first looks quite bizarre. It is a system acting on its own behalf:

> All free-living cells and organisms are autonomous agents. But a bacterium is "just" a physical system. In its Kantian form, my core question became, What must a physical system be such that it can act on its own behalf? The stunning fact is that autonomous agents do, every day, reach out and manipulate the universe on their own behalf. Yet that truth is nowhere in contemporary physics, chemistry or even biology. So, what must a physical system be to be an autonomous agent? (Kauffman 2000: x)

It must embody two features, says Kauffman: autoreproduction and the ability to perform working cycle(s). The last condition is crucial and distinguishes an autonomous agent from the dissipative systems described by Prigogine, such as a flame or a tornado. To perform work in a cycle means to have a contraption — a machine, which is able to return periodically to its initial state. Thus, cyclical processes lie in the heart of the acyclical, historical process of evolution.

To perform work, the autonomous agent must be able to build a machine to lower the degrees of freedom available for the dissipation of energy. Making a machine, however, requires an investment of work. The agents are thus characterized by a cycle (or spiral) of work, and the work extracted may be utilized to reproduce the system or to increase its organization (e.g. by building new machines allowing new kinds of work cycles). It can also be used for mapping the surrounding universe in an active search for resources which can be used to perform work. The author thus leads us towards a kind of hermeneutical circle in nature.

This aspect will become even more accentuated when it comes to communities of autonomous agents — biospheres. By expanding from the actual state into the adjacent possible (defined as a state one time-interval from the actual, time interval being defined deliberately) the biosphere explores the field of possibilities and accomplishes, or chooses, one of them. The two states may differ in the number and/or quality of particles (creating new ones never seen before in the universe) and in creating new, unpredictable structures. Due to this uncertainty, it is not possible to predict the evolution of a biosphere, even in a single time interval separating the present from the adjacent possible.[4]

Biospheres are thus characterized by a ceaseless flow from the actual into the adjacent possible, *en passant* increasing their organization. The problem is, says Kauffman, that expanding organization does not fit into the established set of physical concepts like entropy, matter, information, energy etc., nor can it be derived from them. In spite of this, the biosphere *is* a physical system. We know the molecular structure of living beings, the metabolic pathways, membrane function etc., but we have no idea what causes this assembly to be alive — we lack concepts for self-propagating dynamic systems. Even worse, our ability to generalize is somewhat limited when unique exemplar cases of autonomous agents and biospheres are provided by earthly living beings. Would it be possible to generalize about any possible agents and biospheres? Is it possible to formulate laws valid for such systems? Kauffman takes the challenge and formulates several variants of what he calls "The fourth thermodynamic law". The most general definition is as follows:

> Biospheres, as a secular trend, that is, over the long term, become as diverse as possible, literally expanding the diversity of what can happen next. In other words, biospheres expand their own dimensionality as rapidly, on average, as they can. (Kauffman 2000: xi)

How, then, do the biospheres construct themselves? Autonomous agents are ceaselessly measuring the parameters of the surrounding universe (which is a co-construct of the whole biosphere), they detect the resources utilizable to perform work and canalize it via machines built for this purpose.

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[4] Compare with deterministic systems of statistical physics, which allow such moves both into the future and into the past. The solution is not in shortening the time interval between the actual state and the adjacent possible — we'd only end up in the realm of uncertainty principle.

Curiously, at this very point, semiotics enters the scene. When a system is in a thermodynamic equilibrium, no work can be extracted out of it. Even the trick with Maxwell's demon will not help, because the amount of work necessary to measure and store information about the microstates of the system equals the amount of work subsequently gained. Kauffman, however, notes that if the system is far from equilibrium, it pays off to perform such measurements. Under such a condition, the demon uses up only a small fraction of the energy available. Thus, under ordinary circumstances the problem is not that of the energetic balance but that of knowledge. And knowledge means useful, relevant knowledge — not just information of any kind! To look for the right kind of knowledge, sorting the useful (or at least promising and hopeful) type of data from the "garbage" requires the interpretation of the signs of the surrounding world. In other words, how is the demon (i.e. the autonomous agent), first of all, to *know* which particular properties of the surrounding universe to measure, to *decide* what measurements are likely to provide him with energy resources?

We are already amidst semiotic problems: how does Kauffman's "agent" come to know how to build an appropriate machine, able to canalize that very type of the energy gradient? The universe offers an endless number of qualities that can be distinguished from the background and measured. Only some of them, however, are *relevant* — leading to the recognition of a utilizable energy source that can be coupled to the extraction of work by a machine. The agent is a demon of a world not in equilibrium. It performs natural games based on incessant scanning of the environment, the selection of data and comparison of it with the thesaurus of its (his? her?) experience and memory. It actively breaks symmetries, looks for and discovers new ways of energy canalization (and, of course, puts at stake its own integrity or even existence), extracts meaning, constructs the adjacent possible.

> The heart of mystery concerns a proper understanding of "organization" and "propagating, diversifying organization." [It] concerns the historical coming into existence since the Big Bang of connected structures of matter, energy and processes by which an increasing diversity of kinds of matter, sources of energy, and types of processes come into existence in a biosphere, or the universe itself. (Kauffman 2000: 93)

Thus — by definition — autonomous agents are *endowed with endogenous activity*, they are by no means passive substrates molded by external forces. The co-evolution of autonomous agents then drives them into the adjacent possible along a trajectory, which is non-deterministic, (but determining) i.e. selective. By doing so, they open/create a larger space of possibilities. The definition of the autonomous agent is at the same time the very definition of life, says Kauffman. We — autonomous agents — are co-constructors of our universe.

But how do we perceive our "autonomous activity"? Kauffman provides an answer:

> Story is the natural way how we autonomous agents talk about our raw getting on with it, mucking through, making a living. If story is not the stuff of science yet is about how we get on with making our ever-changing living, then science, not story, must change. Our making our ever-changing livings is part of the unfolding of the physical universe. (Kauffman 2000: 119)

Story is the most adequate, maybe the only way, of storing experience. Problems, situations, tasks never repeat themselves in exactly the same way. But problems successfully solved in the past may be of enormous help when one is confronted with a similar situation again. Not because of what is constant, invariant, equivalent, but because of similarities, analogy, correspondence in dealing with novelties — in how to mutually respond (co-respond!) to new challenges. One must first be "versed" in being able to con-verse, with changing rules of game. Such experience in versatility cannot be provided (or re-presented) by static data. It is the 'tune' — the course of the change that makes one tuned to the changing world according to its past trajectory modifications — both gradual and sudden. Thinking in terms of stories seems to be a type of "information processing", which became most effective in evolution.

The bounty of life around us represents players of winning strategies in natural games. But this is but a story, a narrative. Does it belong to science at all? Can this be formalized as science? Kauffman says yes, and gives the outlines of a general biology leading, to the biologization of physics, as an alternative to several centuries' unsuccessful effort to achieve the physicalization of biology.

This would undoubtedly be a great triumph if a semiotic physics could arise one day — it would be a great satisfaction for people like Peirce. Compare such a concept with the prevailing contemporary worldview which takes reality (the true, ultimate reality — the objective one!) to be hidden: people or living beings do not take care of themselves, they are pulled and pushed by invisible forces governed by the hidden laws of physics, genetics, economy, market, selection... But what if they do, as Kauffman states, take care of themselves? Then science rooted in Newton is doomed...

When read out of context, Kauffman, Lotman, and co. may well evoke an impression of bringing about something completely new. Within a broader cultural and historical horizon this is definitely not the case. Their great merit lies rather in their timely and priceless contribution to cultural memory: their courage and ability to bring back to the contemporary consciousness the half-forgotten truths and narratives as old as humankind. They show our generation that the realm of life, history, symbols and stories is as living and unbound by "objective laws" as ever — still binding themselves with responsibility — binding together science with conscience.[5]

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Поиск новшества: биосфера Кауффмана и семиосфера Лотмана

Появление новшеств в сфере живого осталось, несмотря на долгую традицию эволюционной биологии, нежелательным явлением. Преобладающая неодарвинистская парадигма рассматривает живые существа как пассивный результат внешних (и чужих, следовательно, “слепых”) формирующихся сил. Многие учения, противопоставляющие себя дарвинизму, считают также необходимой предпосылкой существование вечных, неизменных и внешних законов. Часто те, которые противопоставляют себя дарвинизму и признают, что живые существа обладают “самостью” (self), подчеркивают внутреннюю, идеальную и вечную гармонию, которая несовместима с историческими изменениями. Поэтому подобная гармония опять-таки обусловлена внешними, вневременными “законами”. В данной статье описывается третья возможность, которая связывается с двумя отдельно стоявшими исследователями: Стюартом Кауффманом как биологом и физиком и Юрием Лотманом как семиотиком и культурологом. Их сближение выявляет, что эволюция организмов, сознаний, культур — непрерывный диалог (семиозис) между “законами”, что приводит к росту свободы и автономии.

Uudsuseotsing: Kauffmani biosfäär ja Lotmani semiosfäär

Uudsuste ilmumine elusa sfääris on jäänud, vaatamata evolutsioonilise bioloogia pikale traditsioonile, soovimatuks nähtuseks. Valdav neo-darwinlik paradigma vaatleb elusolendeid kui väliste (ja võõraste, järelikult "pimedate") kujundavate jõudude passiivseid tulemeid. Paljud darwinismile vastanduvad õpetused peavad samuti igaveste, muutumatute ja väliste seaduste olemasolu vajalikuks eelduseks. Tihti need, kes vastandavad end Darwini teooriale ja tunnistavad, et elusolendeil on "ise", rõhutavad sisemist, ideaalset ja igavest harmooniat, mis aga on kokkusobimatu ajalooliste muutustega; seega selline harmoonia on jällegi tingitud välistest, ajatutest "seadustest". Kirjeldan käesolevas artiklis aga kolmandat võimalust, mis seostub kahe eraldiseisjaga — Stuart Kauffmani kui bioloogi ja füüsiku ning Juri Lotmani kui semiootiku ja kulturoloogiga. Nende lähenemine toob esile, et organismide, teadvuste, kultuuride evolutsioon on pidev läbirääkimine (semioos) "seaduste" vahel, viies seeläbi vabaduse ja autonoomia kasvule.

The Eternal Question: Biological variations on a Platonic dialogue[1]

Jakob von Uexküll, Thure von Uexküll[2]

Abstract. The reinterpretation of Nature by biology, which will prevail in spite of all obstacles, has brought our thinking closer to antiquity, giving us the chance to reinvigorate our perused terminology with the help of the resources to be found in the thoughts of the greatest minds of mankind. The way to Plato thus being cleared, I perceived the idea to seek enlightenment on pressing biological questions from the great Sage. As means to this end, I chose to make Socrates continue one of his dialogues, with the adjustment of giving him the knowledge of our contemporary biological problems. Thus some kind of interaction between the Ancients and ourselves is created, to our considerable benefit.[3]

> *If death were a release from everything, it would be a boon for the wicked, because by dying they would be released not only from the body but also from their own wickedness together with the soul.*
>
> Plato, *Phaedo* (107c)

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[1] The original: Uexküll, Jakob von; Uexküll, Thure von 1943. Die ewige Frage: Biologische Variationen über einen platonischen Dialog. *Europäische Revue* 19(März): 126–147. It was also published as a booklet: Uexküll, Jakob von; Uexküll, Thure von 1944. *Die ewige Frage: Biologische Variationen über einen platonischen Dialog*. Hamburg: Marion von Schröder Verlag. Translated by Edgar Vögel.

[2] Part One of this text is the work of J. von Uexküll. It is followed by a continuation (Part Two) authored by his son, Thure von Uexküll, based on a letter responding to the father. Insofar, the whole piece represents a dialogue between father and son on Plato's *Meno* dialogue.

[3] This abstract (in German) has appeared as a footnote on the p. 126 of the original.

First Part

On the front of an imposing blue painted half-timbered farmhouse in Upper Hesse one finds an inscription, intended as a serious admonition to passersby. The inscription reads: Where do you want to spend eternity?

This motto could as well have been inscribed on a farmhouse in ancient Athens. For people of all centuries were aroused by the question of man's personal immortality, giving now a positive now a negative answer.

Thus it may not be without interest to take up the evidence, as far as it is of biological interest, that has been brought up for the existence of personal immortality, and to link the different pieces of evidence; this is best done by taking up the one of Plato's dialogues that has until now given the most convincing argument, and by linking it with our biological discoveries, thus reexamining its reliability.

In order to create a vivid picture of the Platonic dialogue, we take ourselves on an imaginary journey back to ancient Athens, the scene of our drama.

The columned court of a large villa opens towards a garden surrounded by a marble balustrade. In the garden grows an abundance of laurel bushes offering shadow, with cypresses standing out here and there. Above the green of the garden shine the distant yellow columns of the Parthenon and above them in steel-like blue the blinding rays of the Greek sky.

In the shadow of the columns, comfortably seated on a chair, sits the Master, who is enthusiastically admired by the Athenian youth. His sophisticated complexion, with its friendly bright eyes, leaves no one unimpressed. His small hands with their agile fingers readily accompany his words.

Next to him, leaning against a column, stands the noble stature of his host, easily recognizable as someone refined in the art of living. His delicately shaped lips seem to be up to some witty remark. Not far from them, on the balustrade, sits a young man with beautiful noble features. In his hand he holds a wax tablet on which he occasionally carves his notes, each time the course of the conversation reaches a climax. Through him it is that posterity received the tidings of this conversation.

Being called by his master, a servant of the household, almost still a boy, with frank and intelligent features, joins these men. Whereas the three free citizens are dressed in long white robes covering the whole body, the slave's bare chest shines in a luxuriant reddish-brown. —

This roughly is what we shall imagine the stage set to be like, which is about to gain brilliance and meaning through the dialogue recorded by Plato.

It is easy to describe the background of this scene for one's body's eye. A wholly different task arises for us in painting the background to be presented to one's mind's eye. But it is absolutely necessary to give account for the intellectual background. We have to know these preconditions which are taken as granted by the characters of the dialogue in such a manner that they will not make mention of them; otherwise we will not be able to fully comprehend their words.

Recently Otto's great works have introduced us to the Greeks' concept of their gods and of Nature. But this concept is miles apart from our contemporary concept of Nature, so that we have to feel our way back to the Greeks' world view step by step. —

As starting point I take a conversation which, although it has come down to us only in way of an anecdote, is full of insight. During the first years of the last century, shortly after ascending the imperial throne, Napoleon paid a visit to the famous astronomer Laplace and his newly erected observatory. The first useful telescopes made it possible to gain a clear image even of distant stars.

Napoleon had himself introduced by Laplace to the wonders of the cosmos. He felt like he was entering an enormous dome, the dimensions of which his searching eyes could not measure. The cosmic dome rose higher and higher. This dome, created from many lights, did not rest, but everything in it was majestically moving. It seemed to the emperor as if he could hear the music of the spheres.

Laplace kept talking on and on, about rotating motions and about numbers, numbers and again numbers. After he had finished the emperor leaned back where he sat, looked at him with his piercing eyes and asked: "And you don't say anything about the Spirit who created this wonderful world?"

"*Sire, nous n'avons pas besoin de cette Hypothèse*" (Sire, we don't have any need for this hypothesis.") was Laplace's answer. The emperor looked at him for a long time and finally said mockingly:

"*Vous finirez par corriger la Nature.*" ("You will end up improving Nature.)

This conversation presents to us an instance of two fundamentally different ways of viewing Nature. Laplace took the position of an uninvolved observer, standing on the outside of the starry vault — whereas Napoleon took his position right in the middle of Nature, standing on this Earth, taking part in the dancing of the constellations.

The emperor's prophetic words should come true soon. Without God's hands holding it together, the universe turned into a mere astronomical machinery. Instead of illuminating the dome of endless space erected to glorify God, the stars were assigned the new role of senselessly rotating around each other as part of a giant cosmic machine.

The cosmic machine, having come into being by accident, indeed turned out to be defective. There literally was a shower of cosmic rubble in space.

After it came to light that the existence of living organisms was at best possible only on a few lonely planets in an endless space, Nature began to lose more and more respect with the general public. As far as the physicists were concerned, the living things were also integrated into the great cosmic machine as tiny mechanisms. Their expressions of life, as thoughts and emotions, were reduced to chemical processes in the brain.

It was Loeb who went the furthest in mechanizing the cosmos by reducing the whole life of animals to a mere reactive turning of the animal bodies away from or towards all external stimuli.

But the decisive attack on Nature was led by Darwin. He declared her to be a blind idiotic being. Having come into existence by chance she could as good perish by chance; because all living creatures are permanently caught up in their mutual annihilation, what Darwin called the struggle for existence, which supposedly gives rise to evolution by survival of the fittest. The world was like a battlefield of automatic tanks, and Nature only a scene of devastation inhabited by soulless freaks. —

In comparison to this, Jennings' doctrine looks more moderate. After observing the behavior of individual animals, which reached a goal through many attempts, he traced the evolution of species back to trial and error. He overlooked that he was putting Nature in the role of a petty-minded small shopkeeper, who after many setbacks in conducting his business learns to be clever through experience. But whereas learning by experience seems to be appropriate for individual creatures, it would be unworthy behavior for Nature as Creator.

Being thus, it takes no wonder why the general public was filled with an ever-more deepening contempt for Nature.

The campaign against the religious view of Nature celebrated one triumph after another. In the lower house of the French parliament, the Deputy Viviani proclaimed under the frenetic applause of the chamber: "*Avec un geste magnifique, nous avons éteint tous les astres du ciel!*" ("By a magnificent gesture we have extinguished all the stars in the sky.") Thus the cosmic dome, which Napoleon not long before had entered reverently, finally collapsed. —

But science itself is the place where the tide turns. The physical scientists are turning away from observing space and time from the outside and are entering space itself. The concept of time as flowing through the universe, passing at the same speed everywhere, has been left behind. The physicist judges the events in time from a point in space, and if the point in space changes, so do the relations in time. From a point of view *A,* two events, let's say two gunshots, may occur simultaneously, given the observer stands halfway between the two gunmen. From a point of view *B,* closer to one of the gunmen, that gunman's shot will move faster in time. This kind of consideration led to the introduction of time ordinates for every system of spatial coordinates and finally to the concept of a four-dimensional space-time continuum.

The cosmic machine was replaced by the world formula, i.e. matter was replaced by an idea. The idea of Nature was lost in the process. From here the way back to Greece cannot be found. —

But now the understanding that we have to observe not from the outside, but from the inside, dawns even on biologists.

I take the example of a fly having a walk on a desk. Nowadays we know that the feet of flies are equipped with organs for tasting, so if the fly steps on some kind of food suitable for flies it immediately sticks it proboscis out for it. Everything that is found on the desk, whatever variety of things it may be, like matches, postage stamps, pencils or sealing wax — to the fly all these things have the same meaning as to us the floor we walk on. The fly is simply surrounded by fly things and does not know human things. The owner of the desk does not exist within the fly's environment, he exists outside the range of its comprehension.

It is impossible for us to enter a fly's soul in order to find out what it feels, but we are able to establish those things or matters that are important to flies, that are appropriate to them. Instead of trying to feel ourselves into the fly's soul we are able to follow the fly's life as observers. Thus we are able to establish those things that are regarded by the fly as appropriate to itself, may it be as its food, or as its enemy, or as an obstacle, or as a mating partner.

The biological study of insect colonies brought forth an abundance of discoveries. Entering an imaginary beehive, anthill or termites' nest, we are not to look for human things, but for bee, ant or termite things, by this means opening to ourselves new wondrous worlds. Laying before our eyes we find great empires, the peoples of which are connected with each other by industrious intercourse; we are enabled to study their work, their building, their care for their brood and the laws of their government.

This actually means to view Nature from inside. Only then Nature reveals her true greatness. Only then we understand Nature's confidence in distributing her gifts to every of her creatures, both physical and spiritual gifts. It assigns, so to speak, to every living subject, be it an animal or a human being, its faculty of sensing (*Merkfähigkeit*) and its faculty of action (*Wirkfähigkeit*). And if anyone feels compelled to complain because he regards the dose of intellect and reason assigned to him as too modest, he is free to do so; but he shall not maintain that Nature, who bestows all those gifts, lacks them herself. The habit of uselessly criticizing Nature must come to an end, it will only make contemporary science look stupid for all time.

Considering the above, we are getting a good step closer to the Greeks. Even in his wildest dreams a Greek would never have ventured to criticize Nature.

Nature is like a solemn symphony, all of the thousands of different voices interwoven into one score of music. Speaking with Bilz,[4] Nature performs for us a cosmic drama consisting of thousands of interwoven dramas. The dramas present a sequence of "living scenes", the scripts of which are predetermined. The actors change, but the play is repeated again and again, generation after generation.

4 Bilz, Rudolf 1940. *Pars pro toto*. Leipzig: Georg Thieme.

Later on we are going to see in what way this concept of Nature approaches the Greek one. First we have to state more precisely what separates Greek religion from the Christian church.

"I believe in one God, the Father, the Almighty, Creator of heaven and earth" — this is the beginning of the Christian creed. Without doubt, God is seen here as standing outside of Nature. Our senses are able to comprehend Nature, but not God. But he is not only the Creator and ruler of Nature, but also of man's destiny. Often Nature is nothing more to him than a means to influence man's destiny. But often it is Nature herself who leads man astray from the path of God. Thus arises a permanent antagony between God and Nature.

This kind of thoughts was far from the Greeks' minds. To them, visible Nature was the divine, without any connection to man's destiny. The visible gods, as heaven, sea and earth, only provided the scenario on which the human dramas took place, written by destiny.

The gods are without destiny, they live in an eternal present, youthful and happy. But man, bound by destiny, leaves the past, passes through the present and enters an uncertain future. The gods, to whom were attributed human souls, would from time to time, assuming human figure, descend on earth to stand by their favorites. But they were always close to man. He just had to open his eyes to see heaven, earth, see, sun and moon, the immutable witnesses of all human events. — Only one god is different from the other immortals; it is Dionysus, the god of human destiny, the ups and downs of which found their shocking expression in the mysteries of Eleusis.

The Greeks knew all that is human. The small group around Socrates in Meno's columned court was in the first place, besides other things, concerned with the question of the past, including the question of death.

The conversation had started with Meno's question: if virtue could be taught or not. Socrates' questions led the conversation to take a surprising turn. Meno himself was not sure anymore what was meant by virtue. He was, in his own words, confused like he had been hit by a stingray. On Socrates' request to ascertain the unknown nature of virtue together with him, he replied: *But how will you look for something when you don't in the least know what it is? How on earth are you going to set up something you don't know as the object of your search? To put it another way, even if you come right up against* *it, how will you know that what you have found is the thing you didn't know?*[5]

Meno's attack is not just aimed at Socrates, but inasmuch against all scientific study. To Meno, study is the same as a mere searching. But one always searches only for an already known object. Unsystematic searching and well-trained research, indissolubly linked to all scientific discovery and insight, get indeed mixed up quite often. Serious research can of course be aimed at an unknown goal, as long as it does not disregard the fundamental context.

Socrates regards Meno's words as a sophistic trap which he uncovers at once.

Socrates: *I know what you mean. Do you realize that what you are bringing up is the trick argument that a man cannot try to discover either what he knows or what he does not know? He would not seek what he knows, for since he knows it there is no need of the inquiry, nor what he does not know, for in that case he does not even know what he is to look for.*

Meno, regarding Socrates' studies as unsystematic experimenting, thinks the sophistic argument to be appropriate and asks: *Well, do you think it a good argument?*

No, replies Socrates, and now he develops his doctrine, which he adopted from those regarded as having inspiration, i.e. the human soul being immortal and having acquired during numerous subsequent forms of existence some amount of knowledge which just rests forgotten inside man. The purpose of all learning is to resurrect this knowledge, learning being nothing else than remembering knowledge from a former existence.

Meno: *Can you explain how it fails?*

Socrates: *I can. I have heard from men and women who understand the truths of religion ...*

Meno: *What did they say?*

Socrates: *Something true, I thought, and fine.*

Meno: *What was it, and who were they?*

Socrates: *Those who tell it are priests and priestesses of the sort who make it their business to account for the functions which they perform. Pindar speaks of it too, and many another of the poets who are divinely inspired. What they say is this — see whether you think they are speaking the truth. They say that the soul of man is immortal.*

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5 Plato, *Meno* (80d).

At one time it comes to an end — that which is called death — and at another is born again, but is never finally exterminated. On these grounds a man must live his days as righteously as possible. As a poet has said: For those from whom Persephone receives requital for ancient doom, in the ninth year she restores again their souls to the sun above. From whom rise noble kings and the swift in strength and greatest in wisdom, and for the rest of time they are called heroes and sanctified by men.

Sokrates continues: *Thus the soul, since it is immortal and has been born many times, and has seen all things both here and in the other world, has learned everything that is. So we need not be surprised if it can recall the knowledge of virtue or anything else which, as we see, it once possessed. All Nature is akin, and the soul has learned everything, so that when a man has recalled a single piece of knowledge —* learned *it, in ordinary language — there is no reason why he should not find out all the rest, if he keeps a stout heart and does not grow weary of the search, for seeking and learning are in fact nothing but recollection. We ought not then to be lead astray by the contentious argument you quoted. It would make us lazy, and is music in the ears of weaklings. The other doctrine produces energetic seekers after knowledge, and being convinced if its truth, I am ready, with your help, to inquire into the nature of virtue.*

Meno has been closely following Socrates' explanations. At once he grasped the essence. If it can be shown that our knowledge is a memory from a former existence, the existence of personal immortality is proven with it. That is why he replies to Socrates: *I see, Socrates. Can you teach me that it is so?*

Socrates: *I just said that you're a rascal, and now you ask me if I can teach you, when I say there is no such thing as teaching, only recollection. Evidently you want to catch me contradicting myself straightaway.*

Meno: *No, honestly, Socrates, I wasn't thinking of that. It was just habit. If you can in any way make clear to me that what you say is true, please do.*

Socrates: *It isn't an easy thing, but I still should like to do what I can since you ask me. I see you have a large number of retainers here. Call one of them, anyone you like, and I will use him to demonstrate it to you.*

Meno: *Certainly.* [To a slave boy.] *Come here.*

S o c r a t e s : *He is a Greek and speaks our language?*

M e n o : *Indeed yes — born and bred in the house.*

S o c r a t e s : *Listen carefully then, and see whether it seems to you that he is learning from me or simply being reminded.*

M e n o : *I will.*

S o c r a t e s : (Socrates begins to draw figures in the sand at his feet. He points to the square.) *Now boy, you know that a square is a figure like this?*

B o y : *Yes.*

S o c r a t e s : *It has all these four sides equal?*

B o y : *Yes.*

S o c r a t e s : *And these lines which go through the middle of it* (Fig. 1, AD–BC) *are also equal?*

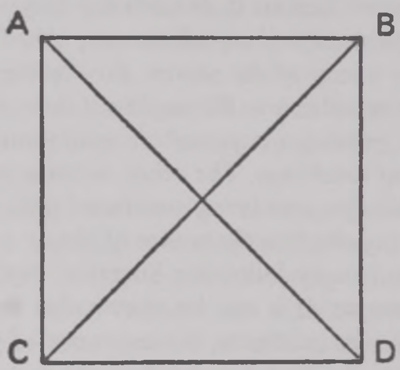

Figure 1.

B o y : *Yes.*

S o c r a t e s : *Such a figure could be either larger or smaller, could it not?*

B o y : *Yes.*

S o c r a t e s : *Now if this side* (AB) *is two feet long, and this side* (BD) *the same, how many feet will the whole be? Put it this way. If it were two feet in this direction and only one on that, must not the area be two feet taken once?*

B o y : *Yes.*

Socrates: *But since it is two feet this way also, does it not become twice two feet?*

Boy: *Yes.*

Socrates: *And how many feet is twice two? Work it out and tell me.*

Boy: *Four.*

Socrates: *Now could one draw another figure double the size of this, but similar, that is, with all sides equal like this one?*

Boy: *Yes.*

Socrates: *How many feet will its area be?*

Boy: *Eight.*

Socrates: *Now then, try to tell how long each of its sides will be. The present figure has a side of two feet. What will be the side of the double-sized one?*

Boy: *It will be double, Socrates, obviously.*

Socrates: *You see, Meno, that I am not teaching him anything, only asking. Now he thinks he knows the length of the side of the eight-foot square.*

Meno: *Yes.*

Socrates: *But does he?*

Meno: *Certainly not.*

Socrates: *He thinks it is twice the length of the other.*

Meno: *Yes.*

Socrates: *Now watch how he recollects things in order — the proper way to recollect.* [To the boy.] *You say that the side of double length produces the double-sized figure? Like this I mean, not long this way and short that. It must be equal on all sides like the first figure, only twice its size, that is, eight feet. Think a moment whether you still expect to get it from doubling the side.*

Boy: *Yes, I do.*

Socrates: *Well now, shall we have a line double the length of this* (CD) *if we add another the same length at this end* (DE)*?*

Boy: *Yes.*

Socrates: *It is on this line then, according to you, that we shall make the eight-foot square, by taking four of the same length?*

Boy: *Yes.*

Socrates: *Let us draw in four equal lines, using the first as a base. Does this not give us what you call the eight-foot figure* (Fig. 2, GFEC)*?*

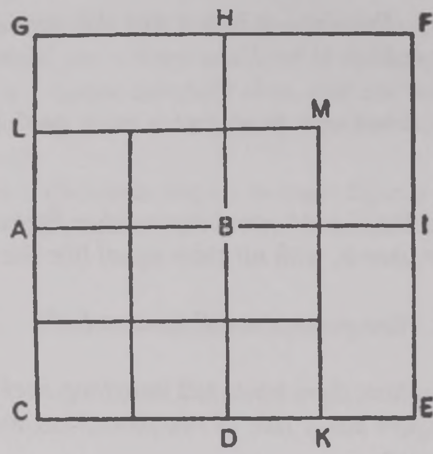

Figure 2.

B o y : *Certainly.*

S o c r a t e s : *But does it contain these four squares, each equal to the original four-foot one?*

B o y : *Yes.*

S o c r a t e s : *How big is it then? Won't it be four times as big?*

B o y : *Of course.*

S o c r a t e s : *And is four times the same as twice?*

B o y : *Of course not.*

S o c r a t e s : *So doubling the side has given us not a double but a fourfold figure?*

B o y : *True.*

S o c r a t e s : *And four times four are sixteen, are they not?*

B o y : *Yes.*

S o c r a t e s : *Then how big is the side of the eight-foot figure? This one has given us four times the original area, hasn't it?*

B o y : *Yes.*

S o c r a t e s : *And a side* (fig. 2, CD) *half the length* (as CE) *gave us a square of four feet?*

B o y : *Yes.*

S o c r a t e s : *Good. And isn't a square of eight feet double this one* (ABDC) *and half that* (GFEC)*?*

B o y : *Yes.*

Socrates: *Will it not have a side greater than this one* (CD) *but less than that* (CE)*?*

Boy: *I think it will.*

Socrates: *Right. Always answer what you think. Now tell me. Was not this side two feet long, and this one four?*

Boy: *It must.*

Socrates: *Try to say how long you think it is.*

Boy: *Three feet.*

Socrates: *If so, shall we add half of this bit* (DK to CD) *and make it three feet* (CK)*? Here are two* (CD), *and this is one* (DK), *and on this side similarly we have two* (CA) *plus one* (AL), *and here is the figure you want.*

Boy: *Yes.*

Socrates: *If it is three feet this way* (CK) *and three that* (CL), *will the whole area* (LMKC) *be three times three feet?*

Boy: *It looks like it.*

Socrates: *And that is how many?*

Boy: *Nine.*

Socrates: *Whereas the square double our first square had to be how many?*

Boy: *Eight.*

Socrates: *But we haven't yet got the square of eight feet even from a three-foot side?*

Boy: *No.*

Socrates: *Then what length will give it? Try to tell us exactly. If you don't want to count it up, just show us on the diagram.*

Boy: *It's no use, Socrates, I just don't know.*

Socrates: *Observe, Meno, the stage he has reached on the path of recollection. At the beginning he did not know the side of the square of eight feet. Nor indeed does he know it now, but then he thought he knew it and answered boldly, as was appropriate — he felt no perplexity. Now however he does feel perplexed. Not only does he not know the answer; he doesn't even think he knows.*

Meno: *Quite true.*

Socrates: *Isn't he in a better position now in relation to what he didn't know?*

Meno: *I admit that too.*

Socrates: *So in perplexing him and numbing him like the stingray, have we done him any harm?*

Meno: *I think not.*

Socrates: *In fact we have helped him to some extent toward finding out the right answer, for now not only is he ignorant of it but he will be quite glad to look for it. Up to now, he thought he could speak well and fluently, on many occasions and before large audiences, on the subject of a square double the size of a given square, maintaining that it must have a side of double the length.*

Meno: *No doubt.*

Socrates: *Do you suppose then that he would have attempted to look for, or learn, what he thought he knew, though he did not, before he was thrown into perplexity, became aware of his ignorance, and felt a desire to know?*

Meno: *No.*

Socrates: *Then the numbing process was good for him?*

Meno: *I agree.*

Socrates: *Now notice what, starting from this state of perplexity, he will discover by seeking the truth in company with me, though I simply ask him questions without teaching him. Be ready to catch me if I give him any instruction or explanation instead of simply interrogating him on his own opinions.* [To the boy:] *Tell me, boy, is not this our square of four feet* (fig. 3, ABDC)*? You understand?*

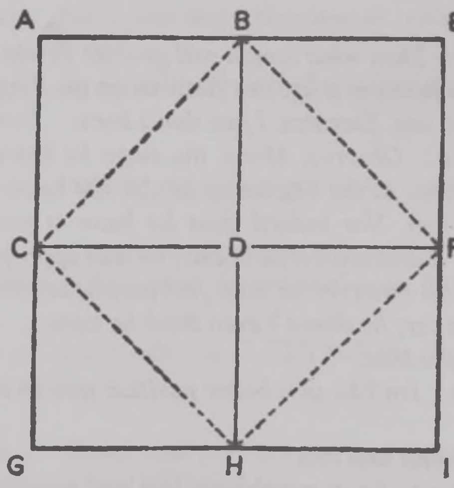

Figure 3.

Boy: *Yes.*

Socrates: *Now we can add another equal to it like this* (BEFD)*?*

Boy: *Yes.*

Socrates: *And a third here* (DCGH), *equal to each of the others?*

Boy: *Yes.*

Socrates: *And then we can fill in this one* (DFIH) *in the corner?*

Boy: *Yes.*

Socrates: *Then here we have four equal squares?*

Boy: *Yes.*

Socrates: *And how many times the size of the first square is the whole?*

Boy: *Four times.*

Socrates: *And we want one double the size. You remember?*

Boy: *Yes.*

Socrates: *Now do these lines going from corner to corner* (CB, BF etc.) *cut each of these squares in half?*

Boy: *Yes.*

Socrates: *And these are four equal lines enclosing this area* (BCHF)*?*

Boy: *They are.*

Socrates: *Now think. How big is this area?*

Boy: *I don't understand.*

Socrates: *Here are four squares. Has not each line cut off the inner half of each of them?*

Boy: *Yes.*

Socrates: *And how many such halves are there in this figure?*

Boy: *Four.*

Socrates: *And how many in this one* (ABDC)*?*

Boy: *Two.*

Socrates: *And what is the relation of four to two?*

Boy: *Double.*

Socrates: *And how big is this figure then?*

Boy: *Eight feet.*

Socrates: *On what base.*

Boy: *This one* (CB).

Socrates: *The line which goes from corner to corner of the square of four feet?*

Boy: *Yes.*

Socrates: *The technical name for it is 'diagonal'; so if we use that name, it is your personal opinion that the square on the diagonal of the original square is double its area.*

Boy: *That is so, Socrates.*

Socrates: *What do you think, Meno? Has he answered with any opinions that were not his own?*

Meno: *No, they were all his.*

Socrates: *Yet he did not know, as we agreed a few minutes ago.*

Meno: *True.*

Socrates: *But these opinions were somewhere in him, were they not?*

Meno: *Yes.*

Socrates: *So a man who does not know has in himself true opinions on a subject without having knowledge.*

Meno: *It would appear so.*

Socrates: *At present these opinions, being newly aroused, have a dreamlike quality. But if the same questions are put to him on many occasions and in different ways, you can see that in the end he will have a knowledge on the subject as accurate as anybody's.*

Meno: *Probably.*

Socrates: *This knowledge will not come from teaching but from questioning. He will recover it for himself.*

Meno: *Yes.*

Socrates: *And the spontaneous recovery of knowledge that is in him is recollection, isn't it?*

Meno: *Yes.*

Socrates: *Either then he has at some time acquired the knowledge which he now has, or he has always possessed it. If he always possessed it, he must always have known; if on the other hand he acquired it at some previous time, it cannot have been in this life, unless somebody has taught him geometry. He will behave in the same way with all geometric knowledge, and every other subject. Has anyone taught him all these? You ought to know, especially as he has been brought up in your household.*

Meno: *Yes, I know that no one ever taught him.*

Socrates: *And has he these opinions, or hasn't he?*

Meno: *It seems we can't deny it.*

Socrates: *Then if he did not acquire them in this life, isn't it immediately clear that he possessed and had learned them during some other period?*

Meno: *It seems so.*

Socrates: *When he was not in human shape?*

Meno: *Yes.*

Socrates: *If then there are going to exist in him, both while he is and while he is not a man, true opinions which can be aroused by questioning and turned into knowledge, may we say that his soul has been* ***forever*** *in a state of knowledge? Clearly he always either is or is not a man.*

Meno: *Clearly.*

Socrates: *And if the truth about reality is always in our soul, the soul must be immortal, and one must take courage and try to discover — that is, to recollect — what one doesn't happen to know, or, more correctly, remember, at the moment.*[6]

At this point we interrupt the scene, and we are going to continue after making no more changes to it than to give Socrates the possession of our contemporary biological knowledge.

Meno: In considering such a serious and important question, as the existence or non-existence of personal immortality is one, I would be grateful to you, Socrates, if you could offer me one more proof for the existence of knowledge from a former life.

Socrates: My dear Meno, does it not seem to you that our existence is similar to the tragedies of Sophocles and Euripides, insofar as it consists of nothing but a sequence of individual scenes?

Meno: Certainly, Socrates, the great poets attempted to make us aware of life itself, and therefore rendered for the stage the scenic sequence of life's events.

Socrates: And did not the poets attempt to clarify through the sequence of scenes destiny's influence on man's soul?

Meno: Certainly. They assign to every actor his detailed part consisting of words and gestures.

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6 Plato, *Meno* (86b).

S o c r a t e s : Now, are the assigned words and gestures announced directly to the actors by the poet or one of his representatives during the performance?

M e n o : Not at all, Socrates. The actors already have to know their parts by heart when they enter the stage.

S o c r a t e s : Did they not, before finally performing, rehearse the whole play, in order to recite it without mistake to the people of Athens?

M e n o : Certainly. Otherwise they would create an awful chaos on stage instead of depicting life.

S o c r a t e s : Therefore we can say, that the drama simply consists of the actors' memories of the rehearsal they lived through earlier.

M e n o : We can say so.

S o c r a t e s : And now, if, Meno, the drama would not be left at being performed once, but if it would be performed over and over again — would it not be possible for us to maintain that the part of life shown to us by the poet in his drama repeats itself over and over?

M e n o : Certainly, Socrates.

S o c r a t e s : Then, Meno, think about it being thus, that in Nature the same play is performed to us over and over again.

M e n o : Can you give me an example for that?

S o c r a t e s : Look into your garden. There you see a tiny songbird collecting stalks to build his nest. Without any reasoning he chooses the right one each time and adds it to the elaborate fabric of his nest, his children's future home. No one taught it how to build a nest. No one told it that it is going to have children.

M e n o : That is indeed astonishing! Could it be that the bird has foresight?

S o c r a t e s : Does it not seem to you to be more probable that it has some knowledge stemming from a former existence, like the actor has it who lived through his rehearsals?

M e n o : Yes, this seems to me to be the truth.

S o c r a t e s : Is it not this knowledge stemming from a former existence, which is called by the trivial name of 'instinct'?

M e n o : Yes, it is as you say, Socrates.

S o c r a t e s : Only as far as the bird has this knowledge it is able to foresee things. Xenocrates had a tamed owl to which he had entrusted two duck eggs for breeding. When the ducklings crept out of their eggs, mother owl tried to feed them with a dead sparrow which she had torn apart as food for her young.

Meno: Indeed, this shows that the owl had no foresight, but some knowledge about something rehearsed earlier.

Socrates: But since it never had had offspring before, this knowledge must have stemmed from a former life.

Meno: Even the nightingales in my garden, when they begin singing their beautiful songs, should they be applying their knowledge of a melody learned in a former life? Is this what you mean, Socrates?

Socrates: Certainly this is what I mean, and does it not appear to you as if the melody of a nightingale's song is a rule of tones, as the act of building a nest is a rule of movements?

Meno: This certainly is the matter.

Socrates: And is not the knowledge of these rules already sufficient to sing the song correctly and to build the nest correctly?

Meno: It seems so.

Socrates: Thus it is the knowledge about these rules which the living things carry in their memories. Thus being, it also were the rules comprising geometry that I brought out of your slave's memory again through my questioning.

Meno: Certainly he carries some knowledge hidden to himself.

Socrates: And this hidden knowledge is comprised by rules.

Meno: Could it be that there are men who know about certain rules unknown to other men?

Socrates: This indeed seems to be the case. For there are people like Xenophon who are unable to sing the simplest song properly, because they do not know the rules of the tones — whereas others, like Alcibiades, are outstanding singers.

Meno: Therefore we distinguish between those men who have a gift for music and those who lack musicality.

Socrates: And we rightly do so. For some master the rules of the tones from the time of their birth onward, whereas some do not.

Meno: Thus you believe that some owe their knowledge to a previous existence, whereas some have not inherited this knowledge, although they no doubt know about the existence of those rules and occasionally search for them, too. Thus some croak like ravens and some sing like nightingales, just like these two species of birds have brought their knowledge about different melodies from their previous lives. But to me such an assumption appears to be unnecessary.

S o c r a t e s : What do you mean by your words, Meno?

M e n o : This is what I mean: Even within a drop of water the rule of turning into an ice crystal is invisibly present, coldness being the only condition for enforcing the rule of crystallization.

S o c r a t e s : What more?

M e n o : Well, the knowledge about this rule is certainly not present within the drop of water, but the water drop is simply playing his role, like an actor.

S o c r a t e s : And now you believe that the nightingale as much as the drop of water is governed by its role like by a rule, sometimes forcing it to sing, sometimes to build its nest?

M e n o : That is exactly what I mean, Socrates. And therefore your assumption of a hidden knowledge stemming from another life would be invalid.

S o c r a t e s : My dear Meno, certainly you would be right, if there were no difference between a drop of water and a nightingale, but both were inanimate. In order to be able to acquire knowledge one needs, before anything else, to have an organ not only possessing the ability of perceiving the events of the outside world, like the ears perceive sound and the eyes color, but also possessing the ability to transform perception into knowledge; that is to say, to recognize its meaning. And now observe the little bird, how it confidently picks only those stalks which are meaningful to its nest-building, but leaves other stalks unpicked. You do not discover any of these qualities in a drop of water. It no doubt loses its shape to reappear in new shape, as ice crystal. Yes, one could say the rain dies as water in winter to be resurrected as ice in the shape of a snow flake, but the water drop does not notice it. It blindly obeys the commandments of Zeus, who hides his countenance one time with rainfall, another time with hailstorm, again another time with snowfall.

M e n o : Thus you, Socrates, believe that Zeus has ordained two roles to the water drop, the one of liquid water and the one of solid ice, replacing each other according to the rhythm of heat and cold, one time turning water into ice, another time turning ice into water.

S o c r a t e s : Certainly this is what I have in mind. Water and ice follow, without any restrictions, the roles Zeus implanted them, but they do not know anything about each other and about the world outside of them, for they do not possess any organ for remembering things and therefore no knowledge. But in bearing the roles appointed to them by Zeus they still are immortal and manifest themselves as soon as they are given the opportunity to do so.

Meno: And how about plants, Socrates?

Socrates: Demeter has bestowed on them, like on all other living things, the succession of generations. The children always succeed their parents, becoming parents themselves. The same souls, having received their roles from Demeter, reappear again and again on life's stage, having to play the same roles over and over, but each time the Fates send them a different fate. At one time an acorn grows to become a great oak, at another time it dies in its youth.

Meno: In the process, the appointed role and the bodily shape fitting this role are of the same kind.

Socrates: Do you not think, Meno, in this case one has to speak about immortality?

Meno: I admit to that — but what distinguishes a plant from an ice crystal, except that the role of the plant includes more complex rules than the role of the crystal?

Socrates: First of all, the role of the crystal is carried through without being influenced by any outside events — except for the cold, whereas the roles of the plants are continuously influenced by their surroundings. All plants always grow upwards and their blooms turn towards the sun, while their leaves serve as gutters in order to supply their roots with water. Yes, after all, the role of the plants consists of adopting themselves to the outside world without having sensory organs, interacting with it in a way truly impossible for a drop of water.

Meno: But you do not want to attribute knowledge to plants?

Socrates: No, as far as plants and small animals are concerned it is sufficient to assume that they merely repeat their roles, which Demeter once and for all assigned to her loved ones.

Meno: At all times defending the same role against the intervention of the Fates after all comprises the nature of the plants' soul.

Socrates: Your words exactly hit the point, Meno!

Meno: Now we are getting to the large animals, which not only master their roles, but also know about their role and clearly see the meaning of their actions. Of course they need their memory of previously having performed the same role to assist them. If the bird would not possess a knowledge about nest-building from a previous life, it would be completely incapable of distinguishing the stalks meaningful to building his nest from those having no meaning to it — as you have already explained, Socrates!

S o c r a t e s : I am glad that you now say the same things as I do.

M e n o : We admire those animals which are not only capable of performing simple tasks, but also are in the position of producing objects for which they lacked, as we thought until now, any model — be it the bird's nest, be it the spider's web, be it the ball which the holy beetles of Egypt are capable of producing from dung. Now you have demonstrated that animals have to take their own actions from a previous existence as models, even if these actions appear to be completely inappropriate within their present lives, as was the case with the owl which tried to treat the ducklings as if they were young owls. That kind of actions is close to unknown within the lives of men. Men always observe the models of their present lives only. They do not possess an unforgotten knowledge stemming from a previous existence which could serve them as a rule for the actions of their present existence. Yes — it even was very difficult to prove that my slave possessed such a knowledge at all, forgotten and resting in him, only pulled back into light by your artful questioning.

S o c r a t e s : This certainly is remarkable.

M e n o : Can you tell for what reason the gods put us at such a disadvantage in comparison to the animals, for they have put man above animal in every other regard?

S o c r a t e s : You would find the disadvantage to be even greater if you made clear to yourself that man's imitations of the objects he has seen during his present life never are the equals of their originals — whereas the objects which animals are capable of producing by drawing from their inner knowledge always are the equals of their originals, sometimes even surpassing them.

M e n o : In this you are right, Socrates. The more justified is my question about the cause of this discrimination against man, for man indeed would never succeed in imitating even the simple nest of a songbird.

S o c r a t e s : Just think about it now, what may be the cause of this apparent disadvantage. The bird building his nest, even in case he repeats his task the following year, always has one choice only, i.e. to build exactly the same nest without any variation, because it always has to be made only according to the one original existing in its memory.

And now imagine yourself to be in the position of a human architect who has been commissioned to build a number of new houses, which are to meet the needs of various clients, the architect possessing only one model of a truly beautiful but all the same stereotypical house from a previous life. And go on to imagine our great Praxiteles had only a single model for every of his likenesses of the gods in his memory — would he then still be in the position to delight our eyes and hearts by ever new, ever more marvelous likenesses?

Meno: In this you are right. For the price of all our mediocre craftsmen and architects being able to produce many different copies of existing things, the memory of the divine originals received from Nature has been taken from everyone. Only the truly inspired, on whom Apollo himself bestows the knowledge of a new image, have the gift to create a true original.

Socrates: But the god who robbed from man the knowledge from his previous existence nevertheless treated him hard, for he robbed from him the confidence pertaining to all actions of the other living beings. Yes, the god took from him the knowledge governing all the rest of the world.

Meno: You do believe that confidence within Nature is based on an all-governing knowledge?

Socrates: I certainly believe so.

Meno: Explain it to me by giving an example.

Socrates: You know the market in Piraeus, where the fishermen put their goods on offer?

Meno: I certainly do.

Socrates: Do you remember those strange crabs living in a snail-shell, the back part of which is regarded as a delicacy by the common people?

Meno: Certainly, these crabs are called hermits, because everyone of them lives in his own house.

Socrates: Now, if we put the origin of the hermit crab's home under scrutiny, we see that it was with great certainty built by a snail to serve for its protection and as a dwelling as long as it lives. After the snail's death, the shell would uselessly lie on the bottom of the sea, unless a crab would have come to know about it through the knowledge common to Nature, and then confidently directed its own body's growth according to the design of the snail's shell. But this would not be sufficient. The crab itself must have been given its own knowledge of the snail's shell to accompany it on its life's journey, for as soon as its house becomes too small for it, it starts searching a new, larger one. If the crab finds a snail shell, many hundreds of which are on offer on the sea bottom to choose from, it examines the shell's size and durability. Then the crab quickly exchanges the shell for its old house by carefully hiding its soft rear part in the protective cover. This clearly demonstrates that the confidence of the body's design and the knowledge about someone else's house stem from the same root, which cannot be anything else than a divine natural knowledge revealing itself on one occasion in the structure of tissue, on another occasion in the actions of animals.

Meno: Your explanations are quite convincing, Socrates. Thus plants as well as animals and men take part in divine Nature's knowledge through the structure of their tissue — but only animals in their actions draw their personal knowledge from this same source, whereas man in his actions has to rely on his own experience and therefore lacks confidence.

Socrates: It seems to me that the difference between human knowledge and Nature's knowledge is to be found in that respect, namely that man has to rely on his deceitful experience, whereas Nature's knowledge constitutes the structure of Nature herself and precedes all experience. That gives animals in their actions an advantage over our actions.

Meno: What shall we do to compensate for this disadvantage?

Socrates: Does it not seem to you that Nature, who uses her knowledge to design the animals' bodies, has also applied it to bestow on them their role in life?

Meno: Certainly.

Socrates: Now, animals know their role directly, but man does not and from this results his lack of confidence. Should it therefore not be our most important task to track down this knowledge about our own role?

Meno: It indeed seems to be so.

Socrates: Only if man realizes the divine knowledge that constructed his body and bestowed his role on him, and if he keeps the purity of his soul, he will at the end of his days, when he gives up his body and with it his role, confidently return home into Nature's divine knowledge.

Meno: I will never forget these words, Socrates!

Second Part

S o c r a t e s : Thus a spirit reveals itself through all the creatures of Nature and their actions, an immortal spirit which is heard through all ages in the same manifold voice, a motherly basis underlying all created things. All living things realize this spirit through their growth as much as through their actions. Obeying an unconscious urge the shapes of the living things rise out of the spirit without becoming conscious of what they are realizing and what is driving them. And the things that were created by the spirit are absorbed back into it without having gained any consciousness of the process other than the unconscious natural knowledge which they take part in. They were never completely separated from the spirit, but they only agitated its surface, like waves agitating an ocean moving by its own harmonies. But human consciousness is knowledge of a different nature, it is so much different from that unconscious participation in the knowledge of the motherly basis that it within the sphere of man's consciousness eternally separates him from the confidence given by unconscious knowledge.

M e n o : That all the living things in their becoming and their actions, 'instinct', as we call it trivially, take part in a knowledge impossibly being acquired by them in their present lives, this idea, Socrates, appears to me to be beautiful and true. But I have to contradict you when you say they acquired it in a previous life which they spent on Earth in a similar shape.

S o c r a t e s : What kind of argument are you bringing up again now, Meno? You claim they have acquired it neither in a previous nor in their present life?

M e n o : That is just what I claim, namely that a memory of previous experience does not explain the knowledge about the laws of Nature.

S o c r a t e s : There you put yourself in a difficult position if you maintain that the living things do have knowledge but did not acquire it, neither now nor previously.

M e n o : You are right, Socrates, I feel like the stingray hit me again; that is why I again make the request to you to assist me.

S o c r a t e s : I will try, but first tell me exactly what you mean.

M e n o : I imagine the bird, which we saw building its nest in my garden, were the first of his species, just having risen to the light from the creating elemental forces of the cosmos; whereupon I begin to feel pity for the unfortunate creature, which lacks the possibility of calling on the experience of previous lives. Not only it will not be able to build its nest, it probably will hardly survive for more than a few days, not even knowing where and how to find its food. And I imagine all living things to be in the same pitiful position, even my slave and myself, even including you, Socrates. Before having been able to make the slightest experience on geometry, we will starve to death, or drown, or fall down a slope. And even if a merciful god would save us from this fate, giving us food and drink, we would be unable to cope with our wildly confused sensory impressions in such a manner as to make the simplest experience.

S o c r a t e s : Thus you are saying that every living thing's existence, be it the simplest or the most complex one, already requires knowledge, thus one cannot imagine it is acquired through experience.

M e n o : Just as it is unimaginable that a man without possessing a non-acquired knowledge of the basic laws of space will make the slightest geometric experience; as it is unimaginable that a fish, thrown upon land by a storm, will then learn to find its way on dry land, for which he lacks every precondition.

S o c r a t e s : Therefore you think scientists should try to understand how hereditary qualities are acquired before studying how acquired qualities are inherited?

M e n o : That is just what I mean, Socrates.

S o c r a t e s : And what do you believe we have to imagine the acquisition of qualities to be like?

M e n o : You said earlier that one has to distinguish between man's conscious knowledge and the unconscious participation in common natural knowledge. And therefore I believe that one cannot imagine the acquisition of this knowledge to be of the same kind as the acquisition of human knowledge, but that it is an original knowledge without beginning, possessed by the first of all living things as much as by the last of them.

S o c r a t e s : By that you claim there can be no progress and no evolution of life, neither of the same living thing in different lives nor of successive generations.

M e n o : I think this idea improperly transfers human concepts onto natural processes, for such progress and evolution can be found only within man's conscious knowledge and its tradition; but transferred onto Nature this idea reduces itself to absurdity. For the whole problem of human experience and its tradition has absolutely nothing to do with our question, which deals with that kind of knowledge which must precede all experience. But a man who would grow up without gaining any knowledge about his ancestor's experience, would not be more wise but more stupid than a wild animal.

Socrates: And in spite of this you believe that one can extract from him by appropriate questioning the hidden knowledge which, so to speak, constitutes the semen of or precondition for all human development.

Meno: You proved this to me earlier on my slave, Socrates. But I still want to believe that there is a difference between my slave's hidden knowledge and that knowledge revealing itself through the actions of animals.

Socrates: What do you mean by that, Meno?

Meno: By this I want to say that both types of knowledge in fact must be without beginning and original in the same way, for they cannot result from experience, but that they differ in the way they reveal themselves.

Socrates: If I understand you the right way, Meno, then you believe in the existence of an original knowledge revealing itself as nightingale knowledge in nightingales, as owl knowledge in owls and also as a knowledge of man as a living being in man, insofar as it concerns that part of his actions and fate that he shares with animals. This knowledge reveals itself directly through the actions of living things, without them becoming conscious of it. But the knowledge that we discovered in your slave also must be an original knowledge, the experience of space being unimaginable without it, but revealing itself only if being raised up into man's consciousness.

Meno: You expressed very well what I have in mind. For we agreed for good reasons to describe as a common natural knowledge the unconscious knowledge of the various animal species as well as of man, insofar as he as a living thing belongs to Nature, because the various species reveal a knowledge about the physical structure and habits of other species, like the spider in building its web reveals a knowledge about the physical structure and habits of flies; therefore we have to describe the other kind of original knowledge as the common original knowledge of man, because we find it only in him, but there in every individual. But experience can be made in both spheres of knowledge, though to a completely different degree in the human sphere. But experience dies with the individual which made it. And the experience of an individual man's life also perishes with him and has to be taught anew to each child through tradition, in speech and writing. Human experience lives only by tradition and therefore language and writing are to be regarded as truly divine gifts, only they make it possible for man to be himself.

Socrates: But the original knowledge about measure, number and spatial relations is reborn with every man, whereas the world built by man through the course of thousands of years, applying his experience based on this knowledge, lives and dies together with tradition. But as far as animals are concerned, their individual experience always dies with the individual, for they have no tradition in the human sense.

Meno: And, as you, Socrates, have shown earlier, the animals of our world do not need something like human tradition at all, for Nature shows herself in all their actions in her original way, and they carry out Nature's knowledge without having to give account for it to themselves.

Socrates: Indeed, Meno, I admit to having found in you an apt student of midwifery, with whom it is worthwhile to examine the hidden interrelations of life. Therefore you believe the world of human experience to be a world of giving self-account, not found anywhere with animals and belonging of living things to man alone. Now let us examine why man attained this special position and what we can conclude from it.

Meno: Yes, Socrates, this seems to me to be one of the great questions, but I admit I cannot see any way of getting us closer to an answer.

Socrates: Did you ever hear the story being told of Prometheus, who, at mankind's dawn, robbed fire from the gods and brought its bright flame to man?

Meno: Surely I heard the myth being told, and also how the gods, angered by the crime, seized Prometheus and forged him onto a rock for eternal torture.

Socrates: Thus hear now what I heard being told by priests and wise men: After Prometheus had brought the light of the eternal flame to man, the gods punished not only Prometheus, but they also turned man's eyes around so that he cannot see fire itself, but only its twitching reflections and the shadows cast by illuminated objects. But since that day man is unable to see the things themselves just as he cannot see fire itself, for his eyes have been turned around. Thus since that day man does not anymore live in the realm of his motherly world, i.e. knowledge unconsciously realizing itself, but also not in the realm of light, but in an intermediate realm of twilight; for man also is only capable of observing of the things and living beings in front of his eyes the flitting shadows emitting from them. But the things and living beings, the shadows of which he perceives, are like man himself expressions of the original motherly natural knowledge, from which stems all that has come to be. But the shadows cast by them are reflections of the divine fire lit by Prometheus behind the things, the blurred shapes of which inhabit man's world since that day. And of themselves, men also realize only the shadowy shapes. The realm of original motherly natural knowledge, giving birth to all living things, men, animals and plants, unconsciously realizes itself and lacks consciousness, in which solely exist shape, form and law. Thus it is the ideas of man, as rays of the divine light, which bestow contours and shape on the motherly natural knowledge. But man, hit by the rays of the divine fire, is excluded from the original confidence bestowed by the motherly knowledge on its creatures. He is forced to construct his own human world, in which both embrace and merge with each other. Thus therefore seems to me to be the position and the purpose of man, as determined by Prometheus' deed: He must spend his life as the being of an intermediate realm between the shadowy forces of eternal Nature and the realm of immortal divine light, belonging to both spheres, but not at home in any of them. But it is this transitory human world where the divine and the demonic spheres meet and merge.

M e n o : And just as it is not given to us to see our own eyes, except by looking in a mirror, you believe it is not given to us to see the light of the spirit and its ideas, except in the mirror of the world where the ideas, reflections of the divine flame in which they have their origin, realize themselves. When I understand you correctly, Socrates, this is what you want to say by your parable about the gods turning around our eyes, so that we may not see fire itself, only its reflections and its silhouette.

S o c r a t e s : I interpret the legend, which I heard being told by priests and wise men, just as you do, Meno. They can speak on the origin and development of human existence, but only by metaphors and parables; for it does not become mortals to inquire into this matter. Although it definitely seems to me to be our duty to inquire and understand if their parables correctly describe the state of our world; for we can in this matter call on our experience, both on the experience which we gain through our own consciousness and our resulting actions and on the experience of other living things and the their actions resulting from it, because we participate in their experience inasmuch as we are living things.

M e n o : In that I agree with you, Socrates. And certainly also in allowing us to trust the priests' stories about a question as far-reaching as man's personal immortality only insofar as they give a true impression of our existence. But we have to remain suspicious in every other respect, for we do not know if they tell the truth or just maintain something in order to please themselves and us. Therefore I now venture to return again to the original question, about which I am so concerned that earlier I already could not be satisfied by your explanations, but had to press you to continue on the path together with me.

S o c r a t e s : Then tell me, what insights on this question can, in your opinion, be gained from our inquiries?

M e n o : I actually had ambiguous feelings earlier, when you, Socrates, said that a man, having found the common natural knowledge which brought forth his body and assigned his role to him, could at the end of his days, after discarding his role together with his body, confidently return into the divine knowledge of Nature. At first, it seemed to me that realizing a common natural knowledge, to which we owe our roles as living things and our bodies, does in no way indicate a previous existence as living beings, for we could never have acquired our part of this knowledge, but carry it with us as knowledge without origin. It rather seemed to me that Nature speaks to us at all times through our bodies' growth and through the roles she makes us play; of course she does not use any of the human languages.

S o c r a t e s : Yes, Meno, as it seems to me, you provided convincing evidence for what you claim.

M e n o : Thus everything seems to point in that direction that we, at the end of our days, do not only discard our bodies and our roles, but also our individual existence which is but the primary condition for what we call personality; for a previous existence cannot be proven and for our memory of hidden knowledge obviously being nothing else than the realization of the words Nature speaks to us at all times. The words from which our bodies and our roles as living beings arose, Nature takes back into herself, while we dissolve into the motherly source which brought us forth, like a drop of water falling into the ocean.

Socrates: Looking on things from this angle, your conclusion seems to be unavoidable.

Meno: Well, this kind of immortality or, as it should rather be called, dissolution seems to be no better than the so called immortality which the materialists comfort themselves with by saying: Not a single atom of all the parts of our body perishes, but is simply returned to the universal cycle of matter. And they comfort themselves with the idea of their body parts continuing to exist in future as dust, rain or whatever else.

Socrates: You make me laugh, Meno, when I see the heavy weaponry you put up against me. But there just seems to me to be a certain difference between the idea of continuing one's existence as dust, ashes or rain and the idea promising one's unification with the omniscient spirit of Nature.

Meno: I would be the last one to deny that, but no one of the two promises personal immortality. And inasmuch as, according to the materialist faith, the wicked man is with his death released of both his body and the wickedness of his soul, the aspirations of the good man and the crime of the wicked man have also been in vain to the same degree; for man's relation towards Nature as a living thing is all that remains, but this relation is absolutely the same for both of them.

Socrates: Meno, because you are pressing me so hard I must admit that realizing one's participation in the common natural knowledge is not sufficient for understanding man's special position and his striving for truth and rightousness. If there were nothing except for this knowledge, man's striving would indeed be in vain, nothing else than deceiving himself.

Meno: But you do not want to maintain that view, do you, Socrates?

Socrates: You are like one of those ferocious hunting dogs not letting go of their game even when their already made the kill. In this dispute, I surrender to you and beg you to show mercy on me.

Please show me how I erred. You are not going to deny that we conducted a zealous and honest inquiry?

M e n o : I do not deny it in any way, Socrates. Just like you, I am convinced that the results of our inquiry are correct.

S o c r a t e s : Therefore personal immortality does not exist and virtue, our initial subject, is a meaningless illusion entertained by man?

M e n o : It would appear to be like that if we forgot that the human world is not limited to realizing the original natural impulse, but a world of giving self-account in every regard. We saw earlier that man only to some degree originates from the unconsciously creating sphere of Nature, and that in his spirit lives a reflection of the divine flame, of which it is said it originated in Prometheus' crime. This ambiguous nature of human knowledge also seems to be of great importance to our question. For we saw everywhere how man impresses the flame of his consciousness on his world, even when he as a little child starts finding his position in the world, man's consciousness definitely being different from Nature's unconscious creating knowledge. And your parable appears to me to be beautiful and convincing: That we live in a world of twilight, observing of the divine light only what is reflected by Nature's creatures, like illusions of a dream, but being denied by the gods to see the flame itself, since they have turned our eye's around

S o c r a t e s : And what effect, in your opinion, has man's double nature on answering our question?

M e n o : For man stems from two different spheres, it seems to me, my dear Socrates, that it will turn out at the end of his days, if he will, following the general gravitation of his physical nature, dissolve into the shadowy source of all natural existence; or if he will, being forged well enough by the divine flame, become light and pure enough to attain a higher spiritual existence.

S o c r a t e s : But how do you imagine this higher existence to be like, Meno? Do you believe man's soul to be torn apart into two pieces, an earthly and a spiritual one, which afterwards part from each other, returning to their respective spheres?

M e n o : No, I do not believe it to be like that. It rather seems to me that Nature herself, insofar as she has been under the spell of the spirit's light, enters a higher existence. I am drawn to the conclusion that man is given one goal in everything he does: To raise Nature up into spiritual consciousness. And I believe that we clearly are 'human' in the true sense of the word only insofar as Nature attains spirit through us; for we may see the light of the divine flame only in the world's mirror, on which it is cast through us. But to a certain degree it seems to be put in our hands, Socrates, in which way the light shines onto the world, clear or blurred, pure or refracted and darkened by instinct. Thus every look a man takes into Nature bears witness on his quality as a human medium, depending on him, if he seeks truth, goodness and beauty or if he looks out for satisfying the desires of his instinct. Thus all our words, looks and actions influence how things around us evolve. The things around us reflect ourselves, they are a mirror which is either lit up by the divine flame or stays what it has always been, a part of Nature's original, shadowy existence. In the second case, man passes his life in vain and the world just remains what it has been without him. But in the first case, man will retain that kind of spiritual shape and personality that corresponds to spiritualized Nature. And thus it seems to me, Socrates: Whoever sees the workings of unconscious Nature in a spiritual light clear enough to make her shine and speak in a way man will understand, he will during his lifetime imprint the clarity of his personal existence on Nature, and he will never loose that clarity.

Вечный вопрос: биологические вариации одного платоновского диалога

Биологическая реинтерпретация природы, которая преобладает несмотря на все препятствия, приблизила наше мышление к античности и дает возможность оживить нашу разработанную терминологию с помощью рессурсов мысли величайших умов человечества. Очищая таким образом путь к Платону, я задумал искать просветления, задавая биологические вопросы этому мыслителю. В этих целях я продолжил диалоги Сократа, давая ему информацию о современных биологических проблемах. Так, принося нам ощутимую пользу, создан мост между нами и античной мыслю. Текст опирается на диалог Платона “Менон”. Первая часть написана Якобом фон Юкскюллом, вторая его сыном Туре фон Юкскюллом. Впервые он был опубликован в 1943 году и здесь мы имеем, видимо первый опубликованный перевод на английский язык.

Igavene küsimus: Bioloogilised variatsioonid ühele Platoni dialoogile

Looduse tõlgendamine bioloogia poolt, mis valitseb kõigile tõketele vaatamata, on toonud meie mõtlemise lähemale antiigile ja annab võimaluse ergastada meie läbitöötatud terminoloogiat inimkonna suurvaimude mõtteressursside kaasabil. Puhastades niiviisi teed Platoni juurde, tulin mõttele otsida valgustust bioloogiliste küsimuste küsimise kaudu mõttetargalt. Selleks panin Sokratese jätkama oma dialooge, andes talle teadmisi tänapäevastest bioloogilistest probleemidest. Nii on loodud teatav kokkupuude antiiksete mõtlejate ja meie vahel, meie märgatavaks kasuks. Tekst tugineb Platoni dialoogile *Menon*; esimese osa on kirjutanud Jakob von Uexküll, teise tema poeg Thure von Uexküll. Esmakordselt avaldati see 1943. aastal, käesolev on arvatavasti esimene avaldatav tõlge inglise keelde.

Jakob von Uexküll and Right Livelihood — the current actuality of his Weltanschauung[1]

Jakob von Uexüll, jr.[2]

I am humbled by your invitation for I can offer neither personal reminiscences — as I never met my grandfather — nor scientific expertise about his work. My school education in the natural sciences was very patchy. The teacher was a failed mining engineer whose chemistry lessons I remember only because he managed to set the classroom on fire. His knowledge of biology was even less impressive. So, while my grandfather stood out — from the descriptions of his widow and children — as a remarkably warm and fascinating human being, my attempts to understand him took much longer. When I first read his *Theoretical Biology* I felt I was entering a new and very complex world.

When the Right Livelihood Awards became well-known, I found myself in the embarrassing situation of people coming up to me and asking me to sign copies of *Theoretical Biology*, assuming me to be the author. I also started getting letters from authors who had written books which they told me had been inspired by my grandfather's work. Two of these were entitled *Understanding Understanding* and *The View from the Oak*. They covered very different fields and made me aware of the width and depth of my grandfather's worldview and influence. So I went back to his writings, hoping that his perspective on life would also help me understand why, despite our material progress, we feel so lost and are doing so badly in meeting the challenges facing us.

I am a generalist interested in practical results. I sold my business and set up the Right Livelihood Awards to identify exemplary individuals and initiatives, "projects of hope" showing us that solutions exist to practically all the current crises and that we have the resources to implement them. But something in the ruling worldview holds us back. And what can be more paralysing than to be told that our lives are meaningless, that we are just

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1 Speech given at the symposium "Signs and the Design of Life — Uexküll's Significance Today", in Hamburg University, on Jan. 9, 2004.

2 Author's address: Jakob von Uexküll, Jr. Right Livelihood Awards, 7 Park Crescent, W1N 3HE London, U.K..

chance creations of "trial-and-error" mutations, alone and disconnected in a hostile, silent universe and dependant on constant struggle to survive?

This terrifying story is the one we are born into. Perhaps no one captured the stark drama of this materialist worldview better than Bertrand Russell, one of the most respected and influential philosophers of our time. I quote a passage from his essay "A free man's worship":

> That man is the product of causes which had no prevision of the end they were achieving; that his origin, his growth, his hopes and fears, his loves and beliefs, are but the outcome of accidental collocations of atoms; that no fire, no heroism, no intensity of thought and feeling, can preserve an individual life beyond the grave; that all the labours of the ages, all the devotion, all the inspiration, all the noonday brightness of human genius, are destined to extinction in the vast death of the solar system, and the whole temple of man's achievement must inevitably be buried beneath the debris of a universe in ruins — all these things, if not quite beyond dispute, are yet so nearly certain, that no philosophy which rejects them can hope to stand. (Russell 1957 [1910]: 107)

If matter is the deepest (or only!) reality, then the only meaningful statement we can make in life is to accumulate as many material possessions as possible and shopping becomes our key cultural activity.

Our ancestors regarded selfishness and greed only as acceptable and natural in extreme situations — otherwise they were condemned, while service to the community, respect for life and the common good were prioritised. If our ancestors had lived as selfishly as we do, we would not be here as the earth would be uninhabitable by now.

But, we are told, modern science has proved that selfish greed is "natural". You may struggle against it but ultimately nature wins. This is the legacy of Darwinism as it is commonly understood and taught. Its power is unprecedented — it rules not just in biology, but determines our economic, educational, social, psychological and other paradigms and policies. Some argue that this is not what Darwin really meant. His writings are contradictory and partly obscure, perhaps because his own thinking was unclear, or because he did not want to offend his followers. Books with titles such as *Darwin's Lost Theory of Love* (David Loye) argue that Darwin saw human evolution not as a struggle for survival but as a struggle for moral growth.

But this is not the Darwinism ruling us and the majority of Darwin's teachings underpin a very different worldview — one which both my grandfather and my uncle Prof. Thure von Uexküll found not only dangerous but deeply scientifically flawed.

In his recent biography of Thure, Rainer Otte writes: "In the teachings of Darwin, Jakob and Thure von Uexküll recognised the forerunners of the catastrophe which showed clearly what happens to the world when the struggle for survival and the survival of the fittest is raised to the status of universal law." My grandfather foresaw that Darwinism helped legitimise the modern institutionalised irresponsibility in science and politics, for the rule of chance destroys all values. He developed his biology and worldview in dispute with Darwinism, to which he provided a deep and broad alternative. He rejected determinism — both scientific and religious — arguing that science has the duty to make sense. Decades of studying the sensitive universes of animals and humans convinced him of the survival of the normal: that life functions according to a natural plan, not chance. He ridiculed the Darwinists' search for elusive "missing links" to prove that all animals are related as "playing games, not science". He was scathing about the narrow perspective of mechanists like the astronomer Eddington who claimed that humanity is "an error in the cosmic machine", describing this view as the "horrific and ridiculous result of an astronomic fly environment". His challenge went even further. Thus, in a letter to his friend Dr. Theiss, he asserted that "the time will come when everyone will be regarded as uneducated who does not believe in immortality".

Was he (mainly) right, ie. has science since his time (mainly) provided evidence for his worldview or for that of his Darwinist opponents?

The "official" position is unambiguous: In 1959, the institute carrying on his work in Hamburg was closed by the university because his type of research was regarded as obsolete. The human cost of this dogmatic shortsightedness has above all been moral. The Darwinists' justification of ruthless selfishness has been described by one critic as "an incitement to crime" (Stove 1995: 74). In Darwin's time it justified chaining children to machines. Hitler found it helpful: "By means of struggle, the elites are continually renewed. The law of selection justifies this incessant struggle by allowing the survival of the fittest" (Midgley 1985: 119[3]).

A few contrarians have tried to link my grandfather's 'holistic' biology (the whole being more than the sum of the individual parts) to the justification of euthanasia etc. But an understanding of the underlying unity of life leads, on the contrary, to a desire to preserve it everywhere. My grandfather was deeply conservative and made his abhorrence of Nazi ideology clear on several occasions. And it was of course Darwin who complained that "excepting in the case of man himself, hardly anyone is so ignorant as to allow his worst animals to breed" (Darwin 1874: 205).

But even if Darwinism is morally inferior, it is claimed to be underpinned by such strong evidence as to be scientifically irrefutable. Thus, Darwinists usually reject the scientific credentials of their critics.

This fundamentalism is doing great damage to the creditability of science. For the scientific case against Darwinism is very strong. (I refer of course to his "General Theory", not to obvious adaptations within the same or closely

[3] Quoted from H. Trevor-Roper (1953), *Hitler's Table Talk: 1941–1944*. London: Weidenfeld & Nicholson.

related species.) The "missing links" are well and truly missing. The more technology enables us to study life on the micro-level, the stronger the evidence for it's irreducible complexity and intelligence becomes.

The way in which most Darwinists ignore, suppress, dismiss and ridicule such evidence — trying to lump it with religious determinism — is one of the greatest scientific scandals of our time. The ramifications are even more important today than in my grandfather's time. For the scientific hubris with which narrow specialists now meddle with the blueprints of life to overcome the genetic barriers between unrelated species would not be acceptable if we understood life as an intelligent plan — about which we still know very little.

Randomness is irreconcilable with the interactive and dynamic structures and functions of living organisms. Genes are not "selfish molecules" acting independently but have many different functions activated in different ways. Genetic engineering not only speeds up genetic changes by about a billion fold — far too fast to ensure safety before release — but also changes their goal from evolutionary success to economic profit. Genetic manipulation, far from being the pinnacle of industrial modernity, is actually industrial primitivism, applying a reductionist and mechanistic mindset to living systems that do not work that way.

Craig Venter, who set up the private company which sequenced the human genome, has since concluded that we simply do not have enough genes for biological determinism to be right. "The wonderful diversity of the human species is not hard-wired in our genetic code. Our environments are critical".[4] The company he created has so far lost almost three quarters of a billion dollars. The fact that one gene can give rise to multiple proteins, depending on the dynamic of the entire organism, has destroyed its theoretical foundation. But the scientific community stubbornly ignores experimental results which contradict the central dogmas of molecular biology, causing the editor of *Science in Society*, Dr. Mae-Wan Ho, to lament "the intellectual decline sympomatic of the degenerate research programme that's neo-Darwinian biology".

Strong words — but justified when celebrated Darwinists like Richard Dawkins "explain" the supposed random evolution of life by the random behaviour of computer programmes. Unable to fit the desire for adopted children into his "selfish gene" theory, Dawkins believes that "mothers deliberately try to deceive naive young women into adopting their children" (Dawkins 1979: 110). With spokespersons like this, no wonder Darwinists shy away from debating their opponents.

For, as Prof. Michael Behe points out in *Darwin's Black Box*, no scientific publication has described how the molecular evolution of a real complex biochemical system occurred or could occur. Irreducibly complex systems

[4] Quoted in "Science in Society", edited by Dr. Mae-Wan Ho (http://www.i-sis.org.uk/HumangenTWN-pr.php).

(e.g. bloodclotting) cannot be put together piecemeal. Every step requires several separate developments. Attempts at gradual evolution are a recipe for extinction. The selective public presentation of the fossil evidence to promote evolutionism is a serious abuse of public trust. The fortuitous accumulation of beneficial mutations via natural selection is as plausible as a tornado blowing through a scrap yard assembling an aeroplane. In the fruit fly experiments of Thomas Hunt Morgan, the mutated flies, when left alone, reverted to normal after a few generations...

The evidence of Darwinist evolutionism dissolves once we evaluate it fairly and avoid the deceptive language of its proponents. For evolutionists have filled the gaping hole in their theory by turning "purposeless evolution" and even "chance" into active agents with godlike powers. Their theory also presupposes that evolution has enough numbers to work on, i.e. it requires a very high percentage of child mortality. Darwin believed that

> every single organic being around us may be said to be striving to the utmost to increase in numbers; [...]; that heavy destruction inevitably falls on the young or old, during each generation or at recurring intervals. Lighten any check, mitigate the destruction ever so little, and the number of the species will almost instantaneously increase to any amount. (Darwin 1966 [1859]: 66–67)

He also believed that "many more individuals of each species are born than can possibly survive" (Darwin 1966 [1859]: 5). But these amazing claims have no basis in reality. (For a detailed discussion, see David Stove's "Darwinian Fairytales", Essay V.)

I very much welcome the opening of the *Jakob von Uexküll Archive* because I hope it will help biology and other sciences, currently trapped by Darwinism, to liberate themselves — as more researchers gain access to my grandfather's writings. I hope that this symposium will be followed by others, debating the many aspects of his work. There would be no lack of distinguished scientific speakers, e.g. — apart from those already mentioned — Dr. Rupert Sheldrake (who acknowledges the influence of Jakob von Uexküll in his work), Dr. Mary Midgley, Prof. Lynn Margulis, etc. The actualité of such a debate is evident. For, to quote my grandfather, "In a world where men are reduced to machines, all sense of allegiance to higher principles is lost. Only the crude mechanism of the market continues to demand obedience".

Jakob von Uexküll speculated that the key discoveries of the coming decades would be made "diesseits" rather than "jenseits" ourselves, ie. in our inner universes. Much has been discovered, but blinded by mechanistic dogmas, we have diminished rather than enhanced ourselves. There is no scientific reason, which forces us to explain our highest achievements in terms of their neurotic perversions. Yet we choose to do so. Similarly there is no science requiring us to turn our genes into our gods, whose adaptation is described as "designed", "organised", "precisely calculated", etc. — i.e.

endowed with intent and purpose. Yet we choose to do so due to our current cultural conditioning.

Science claims to be exempt from such conditioning, yet in my practical experience the opposite is the case. In almost 25 years of highlighting "alternative" thinkers and doers through the Right Livelihood Awards, I have found the scientific establishment to be surprisingly dogmatic and intolerant. In democratic countries today, you are less likely to risk your reputation and your livelihood (or even be physically threatened!) if you disagree with the political mainstream than if you are a scientific dissident.

If you deny that life is "but the outcome of accidental collocations of atoms" (Bertrand Russell), and especially if you do not just deny it but insist that it is unscientific nonsense, as my grandfather did, then your work is likely to end up in the university cellar where his archive has languished for 45 years. It might still be there, if Estonia had not regained its freedom, enabling Prof. Kalevi Kull and his colleagues to create the Tartu Centre ...

One of my grandfather's short stories describes a rich American who found that his focus on making money had destroyed his ability to appreciate beauty. When he achieved his life-long dream of coming to Naples, he could only see stones and water. He became depressed and drank himself to death ... Darwin himself complained bitterly in old age that his churning out natural laws had destroyed (what he called) his higher faculties, including his ability to enjoy poetry...

The consequences for us today are even more serious. Wise men, like former President Vaclav Havel call for a new "ethos, emanating from a rediscovered sense of global responsibility" but how can such an ethos be built on a human story which portrays us, with all the authority of science, as chance products of purposeless mutations?

As the historian Jacob Needleman pointed out, there is a great difference between a Universe which exceeds us in size alone and one which exceeds us in depth of purpose and intelligence. The first excludes and crushes us. The second places us.

It is inconceivable that a society based on the Uexküllian — rather than Darwinian — worldview would have made such a mess of our inner and outer Umwelt, would have created a world in which the survival of most living species is under threat and anti-depressive drugs are increasingly given to children from the age of two.

Working in the World Bank some years ago, the Right Livelihood Award recipient Prof. Herman Daly was asked to comment on a planned publication by a colleague. In it he found an illustration showing the natural environment as a subsystem (box within a box) of the human economy. Daly pointed out that it is of course the other way round but the author disagreed and the book appeared without the illustration.

Now, the belief that our natural environment is a subset of the human economy may strike you as on par with the belief that the earth is flat.

Worryingly, the author holding this belief was Lawrence Summers, President Clinton's economic supreme and later President of Harvard University! I could give many other examples illustrating the extent of to which our decision-makers have lost touch with their Umwelt ...

The semioticians here may know that the US Government called their colleague Prof. Thomas Sebeok for advice on what signs to out on the sealed entrances of nuclear waste depositories, which future generations in 10,000 years and more would still understand to signify "danger". Prof. Sebeok did not think that such signs could be developed and proposed instead the creation of a hereditary priesthood charged with guarding these poisonous wastes, which we have created for a few decades of nuclear-energy-based comfort. I am sure Prof. Sebeok was well aware that no hereditary priesthood has lasted so long...

The priesthood propagating Darwinism will no doubt have a much shorter lifetime. His pioneering work has fossilized into an ideology. It is an ideology which serves the present global elite confirming as "natural" the competitive individualism which underpins their often ill-begotten wealth and power — and as "unnatural" (i.e. inferior) all our higher human values of generosity, solidarity, reciprocity, fairness, kindness, etc.

The ongoing human, social and environmental costs of this ideology are huge. For as Abraham Maslow, the founder of Transpersonal Psychology, noted it is difficult to practise love, generosity and solidarity in a society whose institutions, rules and information streams are geared to promoting lesser human qualities. The immense power of this ideology became apparent when even the Roman Catholic and Greek Orthodox hierarchies felt obliged a few years ago to accept Darwinism as a "fact". When I asked one of the foremost Orthodox intellectuals, Metropolitan John of Pergamon, what had led his church to this conclusion, he replied that it was necessary to be "optimistic" and that his church has accepted evolutionism for ecological reasons, i.e. to remind humans of their links with, and responsibilities for, the animal world! But, he added, his Church accepted evolutionism only in "its serious, rather than its risible aspects" — like the descent of humans from apes ...

One difference between an ideology and a science is that the former is only paid lip service to. Even its most prominent proponents rarely really believe in it. Thus, the high-level Soviet bureaucrats whom I met as an MEP in Moscow in 1989 hastened to emphasise that, while they were members of the Communist Party, this did not mean that they were communists... Similarly, even the most prominent representatives of the ruling global economic order often sound like anti-globalisation activists as soon as they have retired or been fired.

It would be interesting to investigate if the same discrepancy between public and private views can be found among the prominent promoters of "accidental" evolution.

Some years ago I came across the biography of the "Magus of Strovolos", the Cypriot religious mystic and spiritual healer also known as Daskalos. There I found quotes from deeply respectful letters, revealing widespread agreement, to Daskalos from an (unnamed) "famous British philosopher who had the reputation of being an atheist". The biographer confirmed to me that the writer was Bertrand Russell ... (Markides 1990: 64–65).

As anyone familiar with my grandfather's writings knows, his private and "official" worldview coincided. He had no hesitation for example in stating publicly that the survival of the human soul was "beyond any doubt". Today, carefully controlled studies, such as the SCOLE experiments in the UK and the work on Consciousness Survival of Prof. Gary Schwartz at the University of Arizona in Tucson are beginning to provide verifiable evidence for this claim. Naturally, we should be sceptical — but it is also time to become sceptical vis-à-vis the sceptics' increasingly strident but poorly documented rebuttals.

Throwing away the crutches of Darwinism brings more new questions than answers. But admitting ignorance is preferable to propagating false knowledge. My grandfather showed that there is strong evidence that we are much more than machines and that we are parts of a living intelligent plan. The mechanists and evolutionists respond that you cannot have a plan without a planner — forgetting that you cannot have a machine without a builder. And, of course, machines do not recreate themselves.

Let me say in conclusion that, as a generalist, I do not claim the knowledge to provide specific answers on these issues. But I do understand enough about the state of our inner and outer worlds to know that we must start to ask different questions, guided by our highest values.

I warmly thank the University of Hamburg and especially its President, Dr. Lüthje, for the timely and courageous initiative of re-opening the Jakob von Uexküll archive.

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Eye witnessing Jakob von Uexküll's Umwelttheory

Thure von Uexküll [1]

For people interested in the work and the theory of Jakob von Uexküll it may be charming to learn, how I have experienced his way of observing nature when I was a child and also to hear which consequences have arisen from this for me in my profession as a doctor.

I remember that when I was about six years old and we spent a time in the countryside my father asked us: "What does the world look like for the earthworm? The earthworm doesn't have any ears. He can hear nothing. He doesn't have any eyes either and can see nothing. He nevertheless finds the way in the nature surrounding him".

At that time fairytales about animals and their world, like the book by Bonsel about the Bee Maja,[2] were popular. Instead of relying on these books, my father suggested to go into the garden and to watch earthworms orienting themselves in the surrounding nature.

In the garden he showed us, how earthworms grasp leaves — their food — at their tip and pull them into their holes. In order to do this, earthworms must be able to distinguish the taste of the tips from that of the leaves basis; because the basis would block the attempt to draw the leave into the hole. Experiments with leaves cut into pieces have proved that

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[1] This article, "Jakob von Uexküll's Umwelt-Theorie miterlebt" (read at the International symposium Signs and The design of Life — Uexküll Significance Today, Jan. 9, 2004, in the University of Hamburg), has been accompanied by the following letter (dated Freiburg, 1st January 2004): "Dear Mr. Rüting, I am sorry to tell you that the condition of my health has not improved as I had hoped it would in order to be able to stand the stress of a journey. So to my dismay I have to give up my plan to come to your celebration in Hamburg. As a substitute for my personal talk I send to you the following small sketch about my father and the significance of his theory for medicine. With my best regards, Yours Thure von Uexküll." The article is translated by Torsten Rüting.

[2] Bonsel, Waldemar [1912], *Die Biene Maja und ihre Abenteuer*.

earthworms do indeed orientate themselves this way. The world of the earthworm is the world of a gourmet.

This observation gives us an answer to the central question of biology about the relation of living organisms to the surrounding world: Living systems are not related to their Umwelt by causes and effects in a causal-mechanical way, but connected by signs that have meaning for them. Instead of by the two parameters 'cause' and 'effect', this relation can only be described by three parameters: by 'signs' which are grasped by the organism and which designate certain phenomena as 'objects', and as the third parameter the 'interpretant' which creates the relation of meaning between 'sign' and 'object' — and — which controlles the appropriateness [*Zutreffen*] of this relation.

Jakob of Uexküll recognized that this act of relating is a circular event for which he invented the formula "function circle", which is described as a 'cybernetic model' today. In this function circle a 'noticing sign' [*Merkzeichen*] induces a behaviour which sets a 'working sign' [*Wirkzeichen*]. If the meaning is appropriate, the effect sign deletes the noticing sign — and with that the experience ends (the circle is closed and a new cycle starts).

Epistemologically this is of a threefold meaning:

(1) Living beings do not discover their Umwelten. They have to construct it out of the signs found. Philosophically this position and its consequences have been described by 'constructivism'.

(2) Living beings are not related to the surrounding world mechanically by 'effects' and 'causes'. They grasp "signs" and interpret them due to the meaning these signs have for them. Philosophically this leads us to the teaching of the signs, to semiotics.

(3) Constructivism and semiotics presuppose the concept of "system", the concept of the ordered whole, in which the parts have a significance for the whole and for each other. System theory is therefore the third limb of a biological description of nature.

The significance of these insights for medicine reveals itself at medicine's psycho-physical problem or — in other words — in the difficulty of having to relate either to soulless bodies in physiology or to bodiless souls in psychology, but never to inspired bodies.

This deficiency can only be overcome by completing the indispensable mechanistic view on the sick person's body and organs — by a view that is interested in the 'reality' in which the patient lives himself. This complement is also the prerequisite for communicating with the sick person which fails without the construction of a common reality.

The significance of these considerations shows up in the dangerous fact that in the context of modern rationalising efforts and related pressure for economical measures, medicine stops to be "humane medicine". "DRG" (diagnostic related groups) and "DMP" (disease management programs) can just as well be introduced to veterinary medicine.

Jakob von Uexküll Centre, since 1993

***Riin Magnus* [1], *Timo Maran* [2], *Kalevi Kull* [3]**

No doubt, great intellectual heritage serves to be studied, repeatedly. Estonian local traditions in valuation of nature and the scientific fields of theoretical biology and semiotics provide a creative context for the principal study areas of Jakob von Uexküll Centre — biosemiotics, ecosemiotics and the philosophy of nature. Roots, schools and different periods of those discourses in Estonia have been analysed elsewhere (Kull 1999; 2001; Maran, Tüür 2001, Sebeok 1998; Sutrop, Kull 1985), in this brief review we focus only on the activities of the Uexküll Centre of the last dozen years. It should also be mentioned that this has been a decade of a new wave of academic contacts between eastern Europe (including Estonia) and western scientific communities. Extensive dialogues between different fields of science about various aspects of nature–culture relations have also taken place throughout this period (about these relations and dialogues in Estonia, see Lehari, Sarapik 2000; Sarapik *et al.* 2002).

Founding. The motives for the founding of Jakob von Uexküll Centre in Tartu included (a) the formation of an international network of biosemiotics in the beginning of 1990s, (b) the need to organize several meetings on semiotic biology, and (c) the lack of any organisation dealing with the heritage of Jakob von Uexküll until that time. The Centre was established on November 16, 1993 by a group of scientists and students in Tartu. Most of the students involved were those attending a course in biosemiotics, which was lectured for the first time at Tartu University in the same fall semester of 1993. The Centre was established as a branch-organisation of Estonian Naturalists' Society, one of the oldest academic societies in the Baltic States. From the beginning until today, Uexküll Centre has been in close contacts with the section of Theoretical Biology of Estonian Naturalists' Society and

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Department of Semiotics of Tartu University. The nominated international committee with advisory function included Thomas A. Sebeok (after whose death Torsten Rüting was elected as a new member), Jesper Hoffmeyer, late Thure von Uexküll, Jakob von Uexküll jr., Peeter Torop, and Kalevi Kull. Everyday activities are maintained by a Board of seven members.

Concurrently with the establishment of the Centre the outstanding environmentalist Jakob von Uexküll jr. became interested in his Estonian roots, making several visits to the University of Tartu and participating in the activities of the just-founded Centre (Uexküll 1994). As a co-operation between Jakob von Uexküll jr. and the Centre, Estonian Renaissance Award was annually given in the years 1993–1997 to persons with serious commitment to rebuild Estonia and to solve the problems Estonia was facing by cultural and academic means. The statute of the award and the overview of the winners' activities have been also published by Uexküll Centre (Tiivel *et al.* 2000).

Archive. One of the Centre's main goals is to keep and maintain Jakob von Uexküll's legacy. The archive-library contains a collection of Uexküll's publications, manuscripts as well as publications about Uexküll, and some of Jakob von Uexküll's personal correspondence (e.g., between Uexküll and F. Brock, H. S. Chamberlain, F. Huth, H. von Keyserling, K. Lorenz). The library also keeps a small number of publications by the contemporaries of Uexküll and works from fields related to Uexküll's studies. The library is open to researchers from Estonia as well as from abroad and the Centre tries to foster and support Uexküll-studies both on local and international level. Many scholars of special interest in study Uexküll-materials have visited the Centre, among them Myrdene Anderson, Sabine Brauckmann, Sergey Chebanov, Tobias Cheung, Jui-Pi Chien, Barend van Heusden, Kari Lagerspetz, Florian Mildenberger, Aldona Pobojewska, Torsten Rüting, Morten Tønnessen, and others. The library has been a great help in the period of preparations of the large special issue of *Semiotica* (vol. 134, 2001): *Jakob von Uexküll: A Paradigm for Biology and Semiotics*, including an Uexküll-bibliography (Kull 2001).

Events and publications. The Centre's activities have also been shaped by orientations towards international science as well as to the local cultural sphere. In co-operation with different academic institutions, Uexküll Centre has organized various seminars, conferences and work-shops. Together with the University of Tartu, Department of Semiotics and Aarhus University the conference on semiotics, social anthropology and phenomenological ethnography "*Uses of Nature — towards an anthropology of the environment*" was held in 1998. The presentations of the conference were published as a collection of articles (see Roepstorff et al. 2003). Several international conferences or workshops have taken place in the field of biosemiotics in recent years in Tartu: " *Uexküll and the Living Environment*" (July 7–9, 1999), "*Gatherings in Biosemiotics 2*" (June 14–17, 2002) and "*Cassirer, Lotman, Uexküll — between biology and semiotics of culture*" (May 13, 2004).

Since Jakob von Uexküll was, after all, a theoretical biologist, his Centre should certainly have this field in attention. Accordingly, it has been a co-organizer of Estonian spring schools in theoretical biology, particularly the ones on the topic of "Methodology of life sciences" (1994), "Theory of recognition" (1995), "Languages of life" (1996), "Theory of lie" (2005) (the papers of these meetings being published in the series *Schola Biotheoretica*, vols. 20, 21, 22, 31, accordingly).

At the same time the Centre has also paid attention to the promotion of nature-related discourses in Estonian culture, for instance in the forms of the youth nature photography contest (which has grown by now into the largest contest of nature photography in Estonia), local seminars on culture–nature studies and some translation projects of ecophilosophic literature. On the local academic level one-day spring work-shops ("*Estonian culture and nature*" 2001, "*Staging nature*" 2002, "*Mediated natures*" 2003) and summer outdoor seminars on theoretical biology (Kaplinski 1995) and ecosemiotics have taken place. The favourable place for outdoor events has been the historical Puhtu peninsula in western Estonia, where Jakob von Uexküll with his family spent the summers between 1927 and 1939. The former Uexküll's house in Puhtu houses the Puhtu Biological Station of the Estonian University of Life Sciences now.

Beginning from 1995, regular seminar series under the general title "*Text and Nature*" have been held together with Estonian Literary Society. The seminars have set an aim to develop discussions between humanities and natural sciences and to provide a common dialogue ground for different perspectives on the role of culture in our understandings of natural phenomena. Different aspects of culture-nature studies e.g textuality of the natural world, communication between humans and animals, representation of nature have been observed. The collected papers of the seminars were published by Estonian Literary Society in 2000 (Maran, Tüür 2000).

Uexküll Centre and Department of Semiotics often share the responsibility for inviting well-known scientists to Tartu in order to vitalise intellectual debate in Estonia and make Tartu the meeting place of different views in culture-nature studies. Among others we have been honoured by the visits of Norwegian eco-philosopher Arne Naess, anthropologist Tim Ingold, semioticans Thure von Uexküll, Thomas Sebeok, Jesper Hoffmeyer, Winfied Nöth and John Deely.

Despite the small number of members and some periods of minor activity, Jakob von Uexküll Centre has continued its activities in order to contribute to the development of biosemiotics on international level. In Estonia our intention remains to provoke interest in local nature and to discuss its various connections with cultural sphere.

Tartu as the town of Uexküll's student years and Estonia as his birth-country, with what he remained connected throughout his life, has kept not just the memory of Uexküll, but has retained the research fields and his ecological thought in a lively manner. The opening of the Uexküll archive also in Hamburg (in January 2004, organised by Torsten Rüting; see also Rüting 2004) provides a supportive proof for the continuing importance of research on Uexküll's legacy and his place in today's scientific thought.

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Signs and the design of life – Uexküll's significance today: A symposium, its significant history and future

Torsten Rüting [1]

One may find many reasons to commemorate and celebrate Jakob von Uexküll in 2004: the 140th anniversary of his birth, the 60th anniversary of his death or 70 years since the publication of his famous book *A Stroll through the Umwelten of Animals and Men* (Uexküll, Kriszat 1934). Hamburg University may celebrate that it had called Uexküll to Hamburg 80 years ago. However the plan to organise an international symposium taking place on January 9th to 11th 2004 at the University of Hamburg was not driven by the wish to venerate biographical history. Though taking place at the *Centre for the History of Science, Mathematics and Technology*, the symposium celebrated primarily a very recent occasion and its agenda demonstrated the contemporary interest in Jakob von Uexküll among international academia: The inauguration of a *Jakob von Uexküll Archive for Umweltforschung and Biosemiotics* at the University of Hamburg, housing and maintaining a part of the scientific *Nachlass* of Uexküll and the library of the former *Institut für Umweltforschung* was the foremost reason to celebrate. It had taken many years and problems until this plan was finally realised. It had been projected in 1983 by Thure von Uexküll (1908–2004), who had therefore gifted the scientific library of his father to Hamburg. So the successful realisation of the maintenance of an essential element of the famous tradition of the still young University of Hamburg is already an episode of the university's history itself. The story of the Nachlass seems to reveal and repeat the difficulties that Uexküll had to face, when he tried to institutionalise his biology at the university. Uexkülls's approach, that would be called "interdisciplinary" today, was untimely and did not fit into the scheme of institutions. After 35 years of struggling in a no-man's-land between faculties the *Institute für Umweltforschung* was closed in 1960. The wealth of Uexküll's work and the

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tradition that had formed in Hamburg remained unacknowledged by most of the established biologists there. The Nachlass of the *Institut für Umweltforschung* was seen more or less as a collection of curiosities and the plan for an archive was long neglected. It was through the commitment of colleagues and students of Tartu University that Hamburg University came to acknowledge the significance of its own famous biologist. The founding and the engaged activities of the *Jakob von Uexküll Centre in Tartu* (described by Magnus et al. 2004) convinced Thure von Uexküll to suggest to send the collected materials to Tartu, where the tradition of his father and his biosemiotic approach had found obvious followers and fruitful continuation. The following request to send the *Nachlass* to Tartu provoked a heated debate among officials at Hamburg University. As an effect, scholars like Eckart Krause, head of the Hamburger Bibliothek für Universitätsgeschichte, who were aware of the significance of Uexküll and the *Institute für Umweltforschung* for their university spoke out against the transfer of the Nachlass. It was emphasised that the materials were part of the university's possessions, represented its tradition and were to be kept and presented to its academia.

During the 2nd *Gatherings in Biosemiotics* taking place in 2002 in Tartu, a founder of the Jakob von Uexküll Centre, Kalevi Kull, from Tartu University and Torsten Rüting from the *Centre for the History of Science, Mathematics and Technology* of Hamburg University met and agreed to cooperate in the further maintenance of the Nachlass in order to make it available to the international community, interested in the history of Uexküll and the development of alternative approaches in the interdisciplinary fields between biology and the humanities that he had encompassed. These plans were presented to officials of Hamburg University. The director of the Zoological Institute and Museum, Olav Giere, proposed to give the materials to the *Centre for the History of Science Mathematics and Technology*. The head of the Centre, Karin Reich and the head of the department of mathematics, Alexander Kreuzer, agreed to house and to maintain the archive in their building. It was decided to celebrate the opening of the archive and to hold an international symposium, which was generously funded by the department and different foundations. All of the invited scholars agreed to give a talk in Hamburg and others, like Myrdene Anderson from Purdue University and Wolfgang Alt from Bonn came just to attend the symposium. Unfortunately Thure von Uexküll, who was pleased to see his plans realised became ill and the paper that he had prepared had to be read to the audience. But another prominent member of the Uexküll-family, Jakob von Uexküll's grandson, Jakob von Uexküll Jr., founder of the Right Livelihood Award, the so called "Alternative Nobel Prize", came in from London to explain what the visionary ideas of his grandfather might mean for the struggle for right livelihood in a world threatened by the destruction of the environment and the diversity of Umwelten in a globalised world.

As already indicated by its name the archive's agenda is to integrate the tradition of Uexküllian *Umweltforschung* and the conception of biosemiotics. In this sense the work of the archive should primarily contribute to studies about epistemology and ethics in the life-sciences that are integrating studies of nature and studies of culture. This means on the one hand to continue the lifework of Uexküll, whose prime motive at the outset of his profession was to ground biology on a sound epistemological and ethical basis and make it a modern experimental science (Rüting 2004). On the other hand it means to catch up with the recent progress in an interdisciplinary movement that gathers under the label of *biosemiotics* and represents a broad initiative of developments that are integrating biological, cognitive and cultural scientific approaches.

To many of the German audience of Jakob von Uexküll and those who see him primarily in the context of ethological and ecological research it might be necessary to explain how Uexküll came to be recognized as a pioneer of biosemiotics. In 1977, after Thomas A. Sebeok (1920–2001) had described Uexküll as a "Neglected figure in the history of semiotic Inquiry" on a conference in Vienna (Sebeok 1989), Sebeok and Jakob von Uexküll's son Thure, professor at Ulm and founder of psycho-somatic medicine in Germany, met and the work of the elder Uexküll was introduced to a wider circle of scholars interested in the semiotic analyses of life. The further story has already been published by Sebeok (1998) and Kull (1989, 1999, 2001) and will also be addressed by Deely in this volume. The new approach of *Biosemiotics* flourished especially in Tartu and finally led to the foundation of the *Jakob von Uexküll Centre* there in 1993. Inspired by the tradition of the Tartu semiotic school of Juri Lotman, the concerned intellectual scope of Thomas A. Sebeok (Deely 2004) and backed by a new discovery of the semiotic contents of the philosophy of Charles S. Peirce mainly by Danish scholars, the rediscovery of Jakob von Uexküll was pushed forward for modern academia.

These exciting developments have at least now reached Hamburg. The Symposium was a starting point for a rediscovery of one of its members as a pioneer thinker for the international development of science. This volume also shows that the university of Hamburg has a rich tradition which can be seen as a part of the vanguard in modern thought that might constitute new foundations for science and research in the 21st century. The exceptional cooperation and communication of scientists like Ernst Cassirer, William Stern, Heinz Werner and Jakob von Uexküll in the 1920ies and early 1930ies led to innovative ideas (Steckner and Krois, this volume) and after inspiring postmodern philosophy (Chien, Weber, this volume) the seeds of these untimely developments might now help to overcome the stasis of postmodernity.

Already a look at the program of the symposium and the table of contents of this special issue documenting it, show that Uexküll has again become a focal point for international academia and links scholars in different parts of the world covering very different fields of research. Han-liang Chang from National Taiwan University traced the traditions of phenomenology and hermeneutics as a field of context and influence around Uexküll. The second scholar from National Taiwan University, Juipi Chien, discussed Uexküll's concept of form by examining the different contexts in which he reasons with expressions like *Schema*, *Form*, *Gestalt* and comes to situate Uexkülls theory near the paradigm of structural linguistics. Tobias Cheung who had come from the University of Paris and now teaches at Humboldt University in Berlin emphasised how deeply Uexküll's theorising was founded in contemporary research and debate about biological self-organisation in developing cells and organisms.

John Deely, professor from the University of St Thomas in Houston, who witnessed how Thomas A. Sebeok introduced Thure von Uexküll to the Semiotic Society of America in the early 1980ies and since then accompanied the development of biosemiotics from the critical stance of Thomist philosophy, gave an account of his understanding of the significance of Uexküll's concept of Umwelt in this process. Matthias Gutmann, professor for philosophy in Marburg, started with a critical revaluation of Uexküll's theory of organism and gave an elaborated constructivist reinterpretation and reformulation of it, which may be used to systematise and to structure future biological research. Another critical evaluation was presented by Jesper Hoffmeyer, professor at the Institute of Molecular Biology of the University of Copenhagen. In order to save the initiative of biosemiotics from unfruitful discussions, he conversed the problem of Uexküll's notion of *design* or *Planmäßigkeit* and their inherent impression of teleology and determinacy. The paper by John Michael Krois, professor at the Institute of Philosophy at Humboldt University of Berlin, who is currently editing the correspondence and unpublished works of Ernst Cassirer, documented how deeply Cassirer's later works were influenced by Uexküll, his collegue at Hamburg University. Also tracing the influence of Uexküll on Cassirer, Andreas Weber then tried to formulate a comprehensive semiotic anthropology for the integrative understanding of human nature and culture. Seeing Uexküll as an early pioneer overcoming of neodarwinian theories, Anton Markoš, professor at Charles University in Prague, explained the ideas of the biophysicist Stuart Kauffman and semiotic linguist Juri Lotman, who according to him best described the continuous negotiation (semiosis) of 'laws' that govern the evolution of organisms, minds and cultures, driving them to ever larger autonomy. The paper by Magnus, Maran & Kull described the decade long activities on the fields of biosemiotics, ecosemiotics and the philosophy of nature that were organised and promoted by the Jakob von Uexküll Centre in Tartu. The art historian Cornelius Steckner from Cologne described the context of artistic and philosophical studies around the concept of Uexküll and Cassirer in the 1920ies and 30ies. Torsten Rüting brought to memory the historical and biographical developments that led to the historical and present significance of Jakob von Uexküll.[2]

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Index 00662

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