Sign Systems Studies 39(2/4), 2011

Time-plans of the organisms: Jakob von Uexküll's explorations into the temporal constitution of living beings

Riin Magnus

Department of Semiotics, University of Tartu
Jakobi 2, 51014 Tartu, Estonia
e-mail: Riin.Magnus@ut.ee

Abstract. The term "time-plan" is introduced in the article to sum up the diversity of temporal processes described by Jakob von Uexküll (1864–1944) in the framework of the general *Planmässigkeit* of nature. Although Uexküll hardly had any connections with his contemporary philosophies of time, the theme of the subjective times and timing of the organisms forms an essential part of his umwelt theory. As an alternative to the dominance of evolutionary time in biological discussions, Uexküll took perceptual and developmental times of organisms as his natural scientific priorities. While discussing the characteristics of the latter, Uexküll departs from an epigenetic position. Discussion about perceptual time entails detecting the primary units of time (moments) as well as how the succession of moments results in the perception of movement. The last part of the article will explicate the significance of the "time plan" concept for biophilosophical discussions. It is suggested that the bioethical question rising from Uexküll's works may take the following form: do other biological subjects besides humans have a right to their own timing?

In 1973 the Ukrainian evolutionary biologist Theodosius Dobzhansky — one of the founding figures of modern evolutionary synthesis — published a popular-scientific article *Nothing in biology makes sense except in the light of evolution* (Dobzhansky 1973). The title of the article soon became a catchphrase that sums up the seminal paradigm of all

biological sciences in the last 150 years. But besides the elaboration and empirical confirmation of evolutionist ideas through Neo-Darwinism and the modern synthesis, there has always existed a minor strand of sceptical thought contesting the monism of evolutionary ideas.

Scientific confrontations with Darwinism in European life sciences were probably strongest at the end of the 19th century and especially well expressed in Germany, where Ernst Haeckel's popular and often misguided re-interpretations of Darwin had contributed to raising the sceptical and cautious front. Also in the University of Tartu, the academic staff of which was overwhelmingly German until the 1880s, the fact of being a Darwinist or non-Darwinist was often decisive when appointing someone to an academic position in natural sciences (see Mildenberger 2007b). Scientists who argued against the so-far described mechanisms of evolution as well as the ideological conclusions often drawn on their basis served as the main enemies as well as initiators of the development of the evolutionary thought itself (see Mildenberger 2008). Several of them were not denying evolution as such, but rather aimed at drawing attention to the fact that clinging to the mechanisms of selection too dogmatically may at a certain point become an obstruction that diverts attention away from other essential characteristics of life.

One of the authors, who considered evolutionary perspective as insufficient for explaining the laws of life, was an Estonian born Baltic-German biologist, Jakob von Uexküll (1864–1944). While introducing a combination of Goethean and Kantian philosophies of nature, Uexküll relied on a premise that life processes run in a coordinated, plan-like manner. Each species and organism possesses its own perceptual as well as ontogenetic time and space plans, the interplays of which together form a common plan of natural processes. The perceptual space plan itself is divided by Uexküll into visual space (depending for example on the resolution, view angle of the eye, the ability to distinguish shapes and colours), tactile space (depending on the number of tactile receptors) and operational space (related to coordination and motor system of the body). Perceptual time plans of different species vary above all

due to differences in the duration of one moment (the length of time within which no movement can be noticed). Ontogenetic space and time are bound with the average lifetime, the length of different life-phases and the corresponding morphological organisation of the organism (Uexküll 1973[1928]). Thus several works of von Uexküll can be seen as attempts to revive the importance of other types of time that living beings entail besides evolutionary time. Perceptual and developmental times of organisms are his natural scientific priorities.

Dobzhansky's thesis, cast into Uexküllian convictions, would take the following form: "Nothing in life makes sense except in the light of *Planmässigkeit*". It might be put into modern terms, by replacing the term *Planmässigkeit* with self-organisation or self-regulation, but only if the terms retain the idea of "animal subjects" as experiencing agents who relate to their environment in an active and meaningful way (for similar ideas see Canguilhem 1994: 354–357; Hoffmeyer 2008: 177–182; Goldstein 1934). "Time-plan" is the term that could be used here to sum up all temporal processes that Uexküll described in the framework of the general *Planmässigkeit* of nature.

The major part of the following text will concentrate on the background as well as the specificity of Jakob von Uexküll's theories about organic times. The last part of the article will explicate the significance of the "organic times" theme for biophilosophical discussions.

Uexküll's ideas about time in relation to his contemporary time-philosophies

Jakob von Uexküll is certainly not a time-philosopher or at least he could not be called one for the reasons that his contemporaries Martin Heidegger, Henri Bergson and Edmund Husserl have been. Unlike the latter, who have published extensive monographs on the topic, for Uexküll, the question of time in itself is not in the focus of his interests. In fact, there are hardly any abstract concepts that would interest him *per se,* unless they can be turned into specific ones by explaining the

perception and action of living beings. Although the time of Uexküll's most intensive theoretical contribution coincides with the publication of the main works of the abovementioned philosophers, his own works are almost untouched by their argumentation. Uexküll only mentions Bergson's concept of *dureé* (in German, *Dauer)*[1], but more as a point of reference than as an important theoretical platform (Uexküll 1973[1928]: 87).

The reason why Uexküll's own theories about the perception of temporal phenomena in turn remained practically unnoticed to his contemporary philosophers is probably the scarce attention paid by him to time perception by man, the philosophical object *par excellence*. Heidegger, although discussing Uexküll's umwelt concept in his *Die Grundbegriffe der Metaphysik* (Heidegger 2004[1929–1930]), does not mention it in his most important time-philosophical treatise *Sein und Zeit* (Heidegger 2006[1927]). Also Maurice Merleau-Ponty, who discusses Uexküll's Umwelt theory and the question of animal subjectivity in his lectures held at the Collège de France at the end of the 1950s (Merleau-Ponty *et al.* 2003: 167–178) has focused his attention solely on the human cognition and consciousness of time in the chapter "Temporality" of his phenomenological key-work *Phenomenology of Perception* (Merleau-Ponty 2002[1945]: 476–503; Toadvine 2007). Henri Bergson and Edmund Husserl[2] do not relate themselves to Uexküll in any of their works. The themes recurrent in the works of those authors (the conditions and character of differentiating past, present and future; the ordering of moments in respect with each other on the three-fold timeline; possibilities for comprehending all times simultaneously, etc.) are not present in any of Uexküll's reflections on time.

---

[1] Bergson had introduced the concept of *durée* to describe the individual sensation of time, which can not be divided into separate measurable units in the manner the objectified, "outer" time is calculated (Bergson 1898). Uexküll uses it to denote a difference between the intuition of time and its intellectual definition.

[2] Although, as Florian Mildenberger has detected from Husserl's private library, Husserl had read at least one of Uexküll's articles dating from 1931 (see Mildenberger 2007a: 87).

The main sources of inspiration for Uexküll's own contemplations about time were the works of Karl Ernst von Baer and Immanuel Kant. The distribution of Uexküll's ideas about time between the fields of developmental biology and sensory physiology coincides with the areas of influence of the two authors, Baer providing the principles of embryonic development (although extending also partly to perception with his discussion about moments) and Kant providing those concerning the mind (extended to perception by Uexküll). In the following paragraphs, we shall see how the notion of time is itself provided with a twofold meaning, depending on the field where it is used and on the author upon whom Uexküll relies.

Ontogeny: The time of becoming and the time of being

Although Uexküll's own experimental work never included empirical research on embryology, the heated debates about the fundamental principles of embryonic development, held at the turn of the 20th century, were of theoretical as well as empirical interest for him. His discussions about the developmental pathways of organisms even express his philosophical views on the symphonic, plan-based structure of nature in the most figurative, but also clearest manner (for example, Uexküll 1912a, 1922, 1924).

The ontogenetic time of the organism can be divided into the time of becoming and the time of being. The time of becoming equals the time needed for developing functioning organs; the time of being on the other hand covers the time when the organs have acquired their final form and as such are ready for use. Although the time of becoming as developmental time could, in its turn, be divided into the time of formation and the time of further growth, it is above all the first of the two that is central for Uexküll's descriptions of organic formative processes. The time of becoming, which at least in the case of mammals equals embryogenesis, is described by Uexküll as a technical phase of the organism, and the time of being, which equals the post-embryonic

phase, is characterised as a mechanical phase (Uexküll 1973[1928]: 87–90; 1922; 1924: 6–8). Before applying such metaphors, Uexküll used the terms formation plan (*Entstehungsplan*) and performance plan (*Leistungsplan*) for differentiating between the developmental processes and the processes going on between the subjective outer and inner worlds (*Umwelt und Innenwelt*) of an animal (Uexküll 1912a).

Technical and mechanical phases, as two periods in the organism's morphological-physiological time, are characterised by the following properties:

1) The technical phase presupposes a linear, irreversible flow of time with the full-formed organism as its endpoint. The mechanical phase, in contrast, is based on a serial, repetitive and cyclical concept of time. Once formed, all organs are restricted in their activities due to anatomical constraints on the one hand and adjustments to certain environmental conditions on the other. Habits and repetitive behaviour produced via habits will now replace the former novel events of developmental time. The harmonic adjustment of the organism and the environment mediated by habits, results in the congruity of perceptions and actions (called functional cycle (*Funktionskreis*) by Uexküll). Such an ideal correspondence between the subject and its subjective world (umwelt) leaves little or no room for changes in habits and adjustments and has been interpreted as problematic for modern biology, where differences in fitness are of central importance for evolution (see also Hoffmeyer 2008: 172; Stjernfelt 2001).[3]
2) The technical as well as mechanical phases are characterised by certain goal-directed and self-referential activities. In the case of the developmental processes of the technical phase, the end-state is prospective, that is, the totality of the organism yet to be formed.

[3] Uexküll himself has contested such a closure with his training of seeing-eye dogs for the blind. The possibility to change the meanings of objects in the umwelt of the dog served as a key premise while teaching the dogs to beware of things important for blind people (Uexküll 1933; Sarris, Uexküll 1931).

The organism of the mechanical phase is rather an entity of maintenance — the persistence of normal life activities is the objective here.

3) The technical phase is based on an intra-organismic timing — the time needed for the development of a certain organ is rather independent of extra-organismic conditions. The end of the mechanical phase on the other hand depends mainly on environmental impulses. Uexküll uses the terms duration *(Dauer)* and time span *(Zeitspanne/ Zeitlange)* for drawing a demarcation between those two. "The technical period belongs to becoming and has duration, the mechanical period belongs to being and lasts for a time span" (Uexküll 1973[1928]: 88).[4]

The terms Uexküll uses to describe the times of different animals are strikingly "technical" compared with the other musical or theatrical metaphors (the symphony or melody of nature) he uses elsewhere (for example, Uexküll, Brock 1935: 46–47; Uexküll 1973[1928]: 116–122, 1940).[5] Uexküll's Baerian and Goethean inclination to characterise life processes with the term "melody" is interpreted by Frederik Stjernfelt as follows: "The melody […] articulates an organised 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" (Stjernfelt 2001: 88). Paradoxically, the same explanation would also apply for Uexküll's technical and mechanical phases, as the proceedings of the first always "bear in mind" the functions of the latter as an outcome. The notions of the techniques of nature and the symphony of nature are finally synthesised in one of Uexküll's latest works *The Theory of Meaning* (Uexküll 1940: 43–47).

A comparison with a machine can open up some aspects of biological processes — it can even tell half a story — but telling half a story can just as well be telling a misleading story. Uexküll thus admits in

[4] "Die technische Periode gehört dem Werden an und hat Dauer, die mechanische Periode gehört dem Sein und währt eine Zeitlang" (Uexküll 1973[1928]: 88).

[5] Other non-artistic metaphors that Uexküll used for explaining the plan-based structure of life extend from crystal building (1924: 1–2) to house (1912a: 1086–1087) and automobile (Uexküll 1912b: 26–27) constructions.

one of his articles that as long as we take a look just at the *Wirkorgane* (functional organs) or at the mechanical phase of the animal life, we can find striking similarities with machines in their processing of the environment, but as soon as we include other essential parts — perceptual organs *(Merkorgane)* and the developmental or technical phase — the comparison appears to break down.[6] For the same reason the "animal-machines" concept that explicates the most primitive reactions of simpler animals (by starfish, jellyfish, urchin) is only half sound (compare Merleau-Ponty *et al.* 2003: 169).

Two possible reasons could be discussed, why such technical metaphors have entered the otherwise artistic philosophies of Uexküll in the first place. They combine metaphysical as well as cultural-historical causes. The "organism as a machine" simile that found its peak time in the physiological research of the 16th and 17th centuries was influential only in certain fields of biology, leaving for example the subject matter of embryology practically untouched (see Canguilhem 1994: 77–80; also Bowler 2008 for the persistence of embryological models until the end of the 19th c.). Derived from physiological investigations, all such comparisons touched upon the question of how the organism functions, at the same time ignoring the questions of its origin. The properties that according to Kristian Köchy are revealed in the "machine model" of life — self-movement, regularity, functional purposefulness, organisation, concurrence of partial structures and functions, rational transparency and plan-basedness *(Planhaftigkeit)* (Köchy 2008: 108) — characterise above all the operations of a final structure. From the above-mentioned shared properties of machines and organisms, plan-basedness *(Planhaftigkeit)* is most significant for Uexküll. By exchanging the externally created causal connections of the machine-parts with the internal teleological actions of organs, Uexküll ascribes the role of the constructor

[6] "If one exchanges the world processing organ, just one tool is exchanged for the other. If the world creator is exchanged, so is the world also exchanged." — " Tauscht man ein weltbearbeitendes Organ, so tauscht man bloss ein Werkzeug gegen das andere. Tauscht man die Weltbildner, so taucht man die Welt." (Uexküll 1926: 182)

of the machine to the organism in the formation and to the activity of organs.

Explaining the cultural background of biological metaphors, Uexküll claims that most of the Anglo-American authors use similes with human artefacts, whereas Germans prefer comparisons with inorganic nature (for example, Bütschli's comparison with a geyser, Helmholtz's candle-flame) (Uexküll 1928). It seems astounding that in several of his own analogies, Uexküll rather follows the Anglo-American path, although there is no way he would have identified himself with those traditions.

If we divide the positions of his contemporaries concerning the principles of embryonic development between the two opposites — epigenetics[7], a position which holds that the final form of the organism depends on the mutual influences of different developmental processes; and preformationism, which assumes that the organism is preformed and predetermined even in its most basic units of development (that is, in the zygote) — then Uexküll rather follows the first line of thought (Uexküll 1973[1928]: 216–220). In addition to Baer, who served as the main source for Uexküll's discussions on embryogenesis, Hans Driesch and Hans Spemann, two of the most significant representatives of epigenetic thought at the beginning of the 20th century, also played a significant role as his sources.

The confrontation between epigeneticists and preformationists dates back to the very early days of biological thought. Due to a significant development of experimental and observational methods at the end of the 19th century, the earlier philosophical debate acquired an empirical character with the works of Wilhelm Roux, August Weismann, Oscar Hertwig and Hans Driesch. The philosophical implications, however, were preserved in the interpretations of experimental data and are also revealed in Uexküll's comments on his contemporary embryological research.

---

[7] Note that the term "epigenesis" carries a rather different meaning in the biophilosophical and historical context compared with the meaning of the term in modern genetics. The meaning of "epigenetics" in genetics stems from C. H. Waddington and refers to the origination of the phenotype from the genotype.

Perceptual time: A moment after a moment

Research in sensory physiology served as Uexküll's main biological research field throughout his scientific career. His reflections on the ontogenetic time of organisms revealed some of his metaphysical positions on nature. A strong semiotic viewpoint can be detected in his research on the perceptual time of animals. This is expressed in his ideas about the correspondence between physiological processes, morphological structures and environmental objects as realised only through the mediation of perceptual signs *(Merkzeichen*) and operational signs *(Wirkzeichen*) (Uexküll, Kriszat 1956; Schiller 1957: xiii).

According to Uexküll, the perceptual time and space of all organisms consist of moments as the smallest units of time *(Momenten)* and places *(Orten*) as the smallest units of space. But the two terms carry a rather unconventional meaning in his works, referring just as much to the anatomical-physiological specificities of animals as to the forms in the outside world, caused by the specific anatomies.

The anatomical equivalents of places are the retinal points or seeing elements of the retina (that is, cone and rod cells), which bring about local signs. Local signs serve as mediators between two material realities — the physiological and environmental. The number of seeing elements determines the number of places as well as the sharpness of vision. The image of the same setting, formed by the fly's eye and by the human eye, differs like the picture made with a low resolution and a high resolution camera — the smaller number of seeing elements results in a lower resolution of the image and thus a coarser picture than that produced by an eye possessing a higher frequency of seeing elements (Uexküll, Kriszat 1956: 38–42; Uexküll 1973[1928]: 17–21; compare Rüting 2004: 56–58).

A moment is the time when the world stands still, where the dynamics of the world have been lost to the immanence of presence. Like his reflections about ontological time, Uexküll's ideas and concepts about perceptual time also have some connections with the similar ideas of Karl Ernst von Baer. While discussing the etymology of the smallest

units of time, Baer considers both initial bodily perceptions and reactions as the sources for the specific time concepts. "The Romans named the smallest time span *momentum*, or also *punctum temporis*. *Punctum* means a stab, *punctum temporis* is maybe the time that I need to perceive a stab; the word *momentum* is derived from the verb *movere*, to move. A jerk that follows a stab was probably meant with that" (Baer 1992[1862]: 22).[8]

The separation of perception and action in such an explanation suited Uexküll's own separation between the perceptual world (*Merkwelt*) and the reactive world (*Wirkwelt*) well, which together form the species-specific umwelt of an animal. Moments are thus just formative parts of the *Merkwelt*, and for the *Wirkwelt* other measures of time, depending on the contraction times of specific muscles, are to be applied (Uexküll 1973[1928]: 85–87).

Just like the local signs served as mediators between places outside the organism and seeing elements *(Sehelementen)* of the organism, moment signs *(Momentzeichen)* are the means for projecting a time span to the processes taking place outside the organism. But unlike the correspondence between seeing elements and outer places, there are no such corresponding specific sensory elements for the moments. The colleague of Jakob von Uexküll at the Institute for Umwelt Research in Hamburg, Gerhard Brecher distinguished between three types of human moments — acoustic, optical and tactile. But as far as their durations are the same (1/18 sec), they cannot depend on the specific organs or receptors. Rather, concludes Brecher, a moment is a property of our nervous system (as far as our ganglion cells are not capable of receiving more than a certain number of stimuli per time unit as separate stimuli) (Brecher 1932: 209–210).

Time unites the intra- and extraorganismic processes, binds them to the same moments, whereby the simultaneous flow of outer events

[8] "Die Römer nannten das kleinste Zeitmass *momentum*, oder auch *punctum temporis*. Punctum heisst ein Stich, *punctum temporis* ist vielleicht die Zeit, welche ich brauche, um einen Stich zu empfinden; das Wort *momentum* leitet man ab vom Zeitworte *movere*, bewegen. Man hat damit wahrscheinlich die Zuckung im Sinne gehabt, die auf einen plötzlichen Stich folgt" (Baer 1992: 22).

and perceptions is guaranteed. Time thus does not make a separation between the body and the environment, like space does. Uexküll is referring here to Kant and his notion of apperception, claiming that apperception, through which the unity of Self is created, possesses a moment sign, but not a local sign (Uexküll 1973[1928]: 70–71).

The concept of a moment was not merely a theoretical one for Uexküll — its connections with the subjective properties of a place helped to measure the species-specific sensations of time while recording the perception of movement[9]. The same time span *(Zeitspanne)* includes different numbers of moments in the umwelten of different species. The organisms that have more moments in one time span *(Zeitspanne)*, feel the world passing more slowly than we do, and those that have less (like a snail for example, whose moments are as if stretched out) feel the movements faster.

Uexküll's notion of moment as the primary unit of perceptual time also reveals a significant difference between the concept of time he uses for ontogenetic and perceptual processes. In the case of ontogenetics, the development of organs was already "bearing in mind" their functions in the future. Perceptual time in the form of moments does not possess any other dimensions than "now" or presence. Time here is not discussed as a universal perceptual connector, which unites the standstills following one another. As the duration of a moment, its variability in different species can be reached only via an inter-species comparative analysis.

Certainly, there are several problematic points and questions left open with such generalisations of animal time-perception, but the value of such an analysis lies in the fact that while it provides an experimental method for detecting the multitude of time-perceptions, it also remains explicit in its philosophical assumptions about the qualitative perceptual differences lying behind the quantitative characteristics.

[9] Besides G. Brecher also M. Beniuc was conducting experimental work on the moments of animals, namely Siamese fighting fish *(Betta splendens)* (Beniuc 1933).

Time-plans in relation to three planes of *Planmässigkeit*

To stress the mutuality of the relations between the organism and the environment, Uexküll did not use the word adaptation, but was talking about adjustment *(Einpassung)* instead (see Cheung 2004: 16; Kull 2004: 108). He differentiated between three levels of adjustment: (1) the adjustment of organs to the organism; (2) the adjustment of the body and the umwelt; (3) the adjustment of different umwelten (Uexküll 1927: 696). Next, I will sum up the central conclusions that can be drawn from Uexküll's idea about time-plans by organising and explaining them in the framework of those three levels of adjustment.

First, the adjustment of the organs to the organism demonstrates that compared with the physical phenomena, where what happens next can be predicted from what has happened before, life always includes the influence of the coming events on the former. A final function determines therefore the development of the form (the mechanical phase determines the technical). The prospective character of organ-building lies in their development into a particular form as if already considering what the animal will need for sustaining itself. How the development of organs is determined by the animal's needs is even directly observable in the case of some simpler animals, which are not just using the already existing organs, but are constantly during their lifetime building organs according to their needs. Good examples are *Paramaecium* or *Amoeba proteus*, which form a food vacuole when a certain amount of food has entered the body. The other examples are various archaeocytes of sponges that can take up the function and form most needed at the moment.

The second conclusion fits in the level where the plan-like adjustment of an organism and its umwelt is under question: time-plan is immanent to the organism, it is subject-bound and it unfolds according to the species-specific time schedule. The way time is organised in each subject depends on its perceptual properties and abilities as well as species-specific developmental constraints and possibilities. This could be best articulated in Uexküll's own words: "If we think of the umwelt

of an animal at a certain moment as a circle, then we could add each following moment as a new umwelt-circle. In this way we get a tube that would correspond to the lifetime of the animal" (Uexküll 1973[1928]: 108).[10] Just like each species possesses a specific and fixed set of sensory organs that determine the form of outside objects for its members, it also possesses a specific timing for different life activities as well as for the length of life itself. Such an *Umwelttunnel* seems to be bound with individuality; it is hard to imagine how it could be applied to collective organisms (like corals or polyps) or modular plants whose growth and lifetime are strictly bound with prevailing environmental conditions and for whom death is not an individual loss of existence, but rather a matter of restrictions to further reproduction.

On the other hand, we can find examples of variable species-specific umwelt-circles even by organisms with rather simple organisations. For some insects, amphibians and crustaceans that undergo metamorphosis, new life periods and activities are bound with a corresponding transformation in form. The switches from the technical phase to the mechanical thus take place several times throughout one's lifetime. The multifarious transitions from developmental phases to functional stages are well demonstrated by Uexküll on the example of the protozoan *Plasmodium vivax,* a malaria parasite, whose lifecycle includes the succession of at least four different forms, four metamorphoses all dependent on the phase and place of development (Uexküll 1922). In the lifecycle of this microscopic protozoan, the technical and mechanical phases are alternating, while one always prepares the conditions for the other to appear. The protozoan starts its life in a form called a sporozoit, which enters the salivary glands of the mosquito. As the next step it migrates through the bite of the mosquito into human blood and from there to the liver tissues. In the liver it grows and acquires another form known as a schizont; it lives like that for a while, and then starts

[10] "Wenn man die Umwelt eines Tieres in einem bestimmten Moment als Kreis darstellt, so kann man jeden darauffolgenden Moment als einen neuen Umweltkreis hinzufügen. Auf diese Weise erhielte man eine Röhre, die der Länge des Lebens dieses Tieres entspräche" (Uexküll 1973[1928]: 108).

to divide into smaller merozoites, the life activity of which makes the tissues dissolve. The merozoites enter the human erythrocytes where they multiply again, and some of the merozoites start forming sexual forms (micro- and macrogamets), which get into the intestines of the mosquito and the cycle may start again.

The third conclusion of Uexküll's time-concept demonstrates the interplay of time-plans between different organisms: the living world consists of different lifetimes, each unfolding according to their specific timelines. This can be seen as an ecological conclusion of the first statement. As all organisms live according to their own species-specific times, we would get a nearly endless diversity of times, if we take into consideration the whole network of inter-species' as well as intra-species' timings. A disturbance in the time-plan of a certain living being also brings about a change in the time plans of other species related to it. Contracting the duration of a snail's moment would bring it to noticing objects it hasn't been able to detect before. By changing the flowering time of entomogamous plants, a corresponding shift in the time of its co-evolutionary insects' activities has to be assumed.

Technological time and organic time-plans

Biotechnology today seems to have to deal with a paradoxical notion of organic time. On the one hand, biotechnologies are working with organisms brought about by natural, that is, evolutionary time. On the other hand the immanent character of the trials and errors of evolution is denied by an introduction of scientific and human time into the organisms. Technological time[11] is thus a time that balances between the past reality of evolutionary time and the possibility of shortcutting the time by one product of the same evolutionary process itself. It seems

[11] 'Technological time' is used in this article as a term that denotes any kind of temporal organisation where technological devices are involved (those might be means of transportation, means of communication, etc.)

as if natural selection has found an effective, but self-bound tool that works solely as a means of its own existence.

Technological time, a fundamental part of human existence, is expressed in a wide variety of phenomena, starting from everyday tools and ending with genetically modified organisms. The technological time of such artefacts means that they are above all created with the aim of compressing and saving other time-types — be it evolutionary time in the case of GMOs or the time needed for warranting subsistence in the case of tools. The presence of technological time in all human activities means that defining what is a natural time for humans cannot be done in the same manner as was done by other animals. The tempo and rhythm of one's lifetime are obviously dependent on lifestyle and thus bound with cultural as well as individual contexts and choices. Also the average human life expectancy, itself an expression of the current social as well as economic umwelt of people, can vary in as wide borders as from 82,7 years in Japan to 45,9 years in the Central African Republic (data for the years 2005–2010; World Population Prospects: The 2010 Revision[12]).

On the background of the indeterminacy of human time, it is easy to make the same assumption about all other living beings. Uexküllian idea about time-plans warns us about falling into such an anthropomorphic fallacy. The above-sketched idea about the subjective time-plans of all organisms could enrich the debates of bioethics as well as the philosophies of nature conservation, by showing how the subjective timings of different organisms are essential for the biodiversity of the natural world. Such subjective timings induce diversity on three levels at least: evolutionary, ecological and perceptual.

Stressing the reality of different evolutionary and ecological timings would confirm that the categories of "too fast" and "too slow" for a species are objective categories, the measures of which are set by all present environmental conditions and not just one of those — man. Considering the categories of "too slow" and "too fast" on an evolutionary and ecological time scale could enrich for example the discussions

[12] http://esa.un.org/wpp/Excel-Data/mortality.htm

in bioethics about genetic engineering as well as the discussions about the introduction of foreign species. In the latter case that might open up some new perspectives in the so-far seemingly unproductive ping-pong between two opposing claims about something being absolutely possible or not possible (the impossibility to cross the natural borders *vs.* "they could do it anyway in some time" — due to climate change, for example). As mentioned above, from the ecological point of view, the notion of time-plans also explicates how the time of each organism is attuned according to the times of other organisms related to it. Changing the length of the life-periods of a species certainly influences the established adaptations.

From the perceptual side, time-plans could be integrated to the explanations of the subjective character of experience, inseparable from the conscious mental states of organisms (see Nagel 2002[1979]: 166). Timing in the human world helps to plan and thus guarantee a certain order and security for the future, which in its unplanned form appears as a generator of uncertainty. The wrong timing is a source of stress in the world of humans as well as of other animals. Well-being in both cases is guaranteed only if all processes are running in time. Being forced to fit totally into someone else's time schedule and being thus deprived of one's own choices in planning future events is a deprivation of subjectivity. Thus the discussions of animal rights could just as well include the question of whether other biological subjects besides humans have a right to their own timing.

Conclusion

I have used the notion of "time-plans" to explain the temporal part of Jakob von Uexküll's theory about the general *Planmässigkeit* of nature, where neither chance mutations nor causal determinations form the core of the biological world, but meaningful relations between different organisms as well as between the organisms and the environment. When discussing the lifetime of an organism, Uexküll divided it into a

technical phase or the time of formation and the mechanical phase or the time of functioning. By expanding the ideas of Immanuel Kant, time as a perceptual category was added to them. The perceptual organs, the nervous system of the animal and the time-perception induced by them has been attuned so that the animal can recognise and react to the objects essential for its life. Although in the formative stage the organism does not possess full-formed sensory organs, the cell divisions and the reactions of cells to each other's signals work as if the developing organism is sensing what it has to become. Uexküll compared such plan-based developments with a melody and was talking about a developmental rule *(Regel)* that guarantees the right developmental pathways.

Human technologies are making use of the products of time (either developmental or evolutionary forms) that have existed long before the birth of mankind. Modern biotechnologies are working with a substrate that has been formed by the same natural processes that have moulded man, who now serves as a channel through which the former pathways of selection can be directed. Against this background, the Uexküllian perspective draws attention to the fact that technology itself is just part of one umwelt, which exists side-by-side with many others and that the preservation of the diversity of subjective time-plans plays a significant role in the persistence of biological diversity in general. [13]

[13] Earlier version of this article has been published as Magnus, Riin (2011), The biological and philosophical implications of Jakob von Uexküll's time-plans. In: Lukas, Liina; Plath, Ulrike; Tüür, Kadri (eds.), *Umweltphilosophie und Landschaftsdenken im baltischen Kulturraum/Environmental Philosophy and Landscape Thinking*. (Collegium litterarum 24.) Tallinn: Underi ja Tuglase Kirjanduskeskus, 137–153. This research was supported by the European Union through the European Regional Development Fund (Center of Excellence for Cultural Theory, CECT) and by the Estonian Science Foundation Grants ETF 8403 and SF0182748s06.

References

Baer, Karl Ernst von 1992[1862]. *Welche Auffassung der Lebendigen Natur ist die richtige?* Tartu: Tartu ülikooli kirjastus.

Beniuc, M. 1933. Bewegungssehen, Verschmelzung und Moment bei Kampffischen. *Zeitschrift für vergleichende Physiologie* 19(4): 724–746.

Bergson, Henri 1898. *Essai sur les données immédiates de la conscience.* 2e éd. Paris: F. Alcan, Bibliothèque de philosophie contemporaine.

Bowler, Peter J. 2008. The biology that might have been. *Isis* 99: 560–567.

Brecher, Gerhard 1932. *Die Entstehung und biologische Bedeutung der subjektiven Zeiteinheit, des Moments.* Inaugural-Dissertation, Kiel.

Canguilhem, Georges 1994. *The Vital Rationalist: Selected Writings from Georges Canguilhem.* New York: Zone Books.

Cheung, Tobias 2004. From protoplasm to Umwelt: Plans and the technique of nature in Jakob von Uexküll's theory of organismic order. *Sign Systems Studies* 32(1/2): 139–167.

Dobzhansky, Theodosius 1973. Nothing in biology makes sense except in the light of evolution. *The American Biology Teacher* 35: 125–129.

Goldstein, Kurt 1934. *Der Aufbau des Organismus. Einführung in die Biologie unter besonderer Berücksichtigung der Erfahrungen am kranken Menschen.* Haag: Nijhoff.

Heidegger, Martin 2004[1929–1930]. *Die Grundbegriffe der Metaphysik. Welt — Endlichkeit — Einsamkeit.* Frankfurt am Main: Verlag Vittorio Klostermann.

— 2006[1927]. *Sein und Zeit.* 19. Auflage. Tübingen: Max Niemeyer Verlag.

Hoffmeyer, Jesper 2008. *Biosemiotics: An Examination into the Signs of Life and the Life of Signs.* Scranton: University of Scranton Press.

Kull, Kalevi 2004. Uexküll and the post-modern evolutionism. *Sign Systems Studies* 32(1/2): 99–114.

Köchy, Kristian 2008. *Biophilosophie: zur Einführung.* Hamburg: Junius.

Merleau-Ponty, Maurice 2002[1945]. *The Phenomenology of Perception*. Routledge.

Merleau-Ponty, Maurice; Séglard, Maurice; Vallier, Robert 2003. *Nature: Course Notes from the Collège de France.* Northwestern University Press.

Mildenberger, Florian 2007a. *Umwelt als Vision: Leben und Werk Jakob von Uexkülls (1864–1944).* Stuttgart: Franz Steiner Verlag.

— 2007b. Wissenstransfer gegen den Zeitgeist — Antidarwinistische Gelehrte aus Dorpat in Mitteleuropa nach 1870. In: Schmidt, Burghart (ed.), *Von der Geschichte zur Gegenwart und Zukunft: Wissenstransfer und Innovationen rund um das Mare Balticum.* Hamburg: Dokumentation & Buch, 59–82.

— 2008. Steter Stachel fördert die Evolution. *Laborjournal* 6: 30–31.

Nagel, Thomas 2002[1979]. *Mortal Questions*. Cambridge: Cambridge University Press.

Rüting, Torsten 2004. History and significance of Jakob von Uexküll and of his institute in Hamburg. *Sign Systems Studies* 32(1): 35–72.

Sarris Emanuel G.; Uexküll, Jakob von 1931. Der Führhund der Blinden. *Die Umschau* 35(51): 1014–1016.

Schiller, Claire H. 1957. Note by the Translator. In: Schiller, C. H. (ed. and transl.), *Instinctive Behavior: The Development of a Modern Concept.* (Introduction by Karl S. Lashley.) New York: International Universities Press, xiii

Stjernfelt, Frederik 2001. A natural symphony? To what extent is Uexküll's *Bedeutungslehre* actual for the semiotics of our time. *Semiotica* 134 (1/4): 79–102.

Toadvine, Ted 2007. "Strange kinship": Merleau-Ponty on the human-animal relation. *Analecta Huserliana* 93: 17–32.

Uexküll, Jakob von 1912a. Wie gestaltet das Leben ein Subjekt? *Die neue Rundschau* 23: 1082–1091.

— 1912b. Vom Wesen des Lebens (I und II). *Österreichische Rundschau* 33: 18–28; 420–431.

— 1922. Technische und mechanische Biologie. *Ergebnisse der Physiologie XX Band*. München und Wiesbaden. Verlag von J. F. Bergmann, 129–161.

— 1924. Mechanik und Formbildung: Ein Gespräch. *Deutsche Rundschau* 201: 51–64.

— 1926. Ist das Tier eine Maschine? *Bausteine für Leben und Weltanschauung von Denkern alter Zeiten* 4(6): 177–182.

— 1927. Die Einpassung. In: Bethe, Albrecht; Bergmann, Gustav von; Embden, G.; Ellinger, A. (eds.), *Handbuch der normalen und pathologischen Physiologie: Mit Berücksichtigung der experimentellen Pharmakologie*. Berlin: J.Springer, Bd. 1: 693–701.

— 1928. Über den Einfluß biologischer Analogieschlüsse auf Forschung und Weltanschauung. *Archiv für systematische Philosophie und Soziologie* 29(1/2): 78–81.

— 1931. Der Organismus und die Umwelt. In: Driesch, Hans; Woltereck Heinz (eds.), *Das Lebensproblem im Lichte der modernen Forschung.* Leipzig: Verl. Quelle und Meyer, 189–224.

— 1933. Das Führhundproblem. *Zeitschrift für angewandte Psychologie* 45(1–3): 46–53.

— 1940. *Bedeutungslehre* (= Bios, Abhandlungen zur theoretischen Biologie und ihrer Geschichte sowie zur Philosophie der organischen Naturwissenschaften. Bd. 10). Leipzig: Verlag von J. A. Barth.

— 1973[1928]. *Theoretische Biologie*. Frankfurt a. M.: Suhrkamp Taschenbuch Wissenschaft.

Uexküll, Jakob von; Brock, Friedrich 1935. Vorschläge zu einer subjektbezogenen Nomenklatur in der Biologie. *Zeitschrift für die gesamte Naturwissenschaft* 1(1/2): 36–47.

Uexküll, Jakob von; Kriszat, Georg 1956. *Streifzüge durch die Umwelten von Tieren und Menschen. Bedeutungslehre*. Hamburg: Rowohlt.

Временные планы организмов: путешествия Якоба фон Юкскюля в темпоральность живых существ

Термином «временной план» в статье обозначаются разнообразные временные процессы, описанные Якобом фон Юкскюлем (1864–1944) в рамках концепции общей планомерности (или упорядоченности: *Planmässigkeit)* природы. Несмотря на то, что Юкскюль мало соприкасался с современными ему представителями философии времени, тема субъективного времени организмов формирует основную часть его теории *Umwelt*. В качестве альтернативы господствующей эволюционистской концепции времени в биологических дискуссиях той эпохи, Юкскюль считал понятия «время восприятия» и «время развития» своими исследовательскими приоритетами. Обсуждая особенности этих параметров, Юкскюль занимает эпигенетическую позицию. При исследовании перцепционного времени важным становится обнаружение мелчайших единиц времени (моментов) и исследование восприятия движения, оформленного на основе последовательности этих моментов. Последняя часть статьи объяснит значение понятия «временного плана» для биофилософских рассуждений. Биоэтический вопрос, вырисовывающийся из работ Юкскюля, мог бы прозвучать так: могут ли другие биологические субъекты — помимо людей — иметь право на свое собственное время?

Organismide ajaplaanid: Jakob von Uexkülli retked elusolendite ajalisusse

Artiklis tähistatakse terminiga “ajaplaan” mitmeid erinevaid ajalisi protsesse, mida Jakob von Uexküll (1864–1944) kirjeldas üldise looduse plaanipärasuse (*Planmässigkeit)* raames. Kuigi Uexküllil oli vähe kokkupuuteid tollaste ajafilosoofidega, moodustab organismide subjektiivsete aegade ja ajastuse teema olulise osa tema omailmateooriast. Uexküll pidas organismide taju- ning arenguaega oma loodusteaduslikeks uurimiskeskmeteks, vastandades neid bioloogia tollastes aruteludes domineerinud evolutsioonilisele ajale. Arenguajast kõneldes lähtub Uexküll epigeneetilisest positsioonist. Tajuaja uurimustes on oluline väikseimate ajaühikute (momentide) tuvastamine ning nende järgnevuse põhjal kujuneva liikumistaju uurimine. Artikli viimases osas selgitatakse “ajaplaani” mõiste olulisust biofilosoofiliste arutelude jaoks. Bioeetiline küsimus, mis Uexkülli töödest välja koorub, võiks kõlada järgnevalt: kas teistel bioloogilistel subjektidel peale inimese on õigus oma ajale?