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Kant's Transcendental Idealism Revamped in Biology: On Uexküll and the *Umwelt* Theory

O idealismo transcendental de Kant renovado na biologia: Uexküll e a teoria do Umwelt

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Abstract

On the occasion of Immanuel Kant's birth tercentenary (1724-2024), this paper examines Jakob von Uexküll's *Umwelt* theory as a unique example of the influence of Kant's thought on theoretical biology. Uexküll adapts Kant's transcendental idealism to biology and semiotics by extending Kant's transcendental approach to non-human animals. To trace this particular adaptation, the paper first revisits Kant's doctrine of transcendental idealism, his perspectives on nature's purpose, and his views on biological life. Then, it explores Uexküll's *Umwelt* theory and its Kantian origins in the context of subjectivity, teleology, time and space. Finally, the paper evaluates the potential for Kantian biology within Uexküll's *Umwelt*.

Keywords: *Kant. Transcendental idealism. Teleology. Uexküll. Umwelt.*

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Resumo

Por ocasião do tricentenário do nascimento de Immanuel Kant (1724-2024), este artigo examina a teoria Umwelt de Jakob von Uexküll como um exemplo único da influência do pensamento de Kant na biologia teórica. Uexküll adapta o idealismo transcendental de Kant à biologia e à semiótica, estendendo a abordagem transcendental de Kant aos animais não humanos. Para traçar esta adaptação específica, o artigo revisita primeiro a doutrina do idealismo transcendental de Kant, as suas perspectivas sobre o propósito da natureza e as suas opiniões sobre a vida biológica. Em seguida, explora a teoria Umwelt de Uexküll e suas origens kantianas no contexto da subjetividade, da teleologia, do tempo e do espaço. Finalmente, o artigo avalia o potencial para uma biologia kantiana dentro do Umwelt de Uexküll.

Palavras-chave: *Kant. Idealismo transcendental. Teleologia. Uexküll. Umwelt.*

Introduction

The best way to celebrate the 300th anniversary of a philosopher's birth is to remember the impact of his philosophy on subsequent generations. However, if this thinker is Kant, it would be very challenging to map his influence on the history of thought. Kant legendarily redefines the subject as the center of its world, the producer of its knowledge and the one with the sole initiative. After Kant's Copernican Revolution, it was almost impossible to move forward in the history of philosophy without, in Borgesian[1] terms, reinventing Kant. Among the countless, this paper aims to focus on one specific reinvention of the philosopher in biology.

Kant's name usually rises in biology due to his teleological views, which he expounded in 1790 in his last and third Critique, the *Critique of Judgment*[2], about ten years before the founding of modern biology in 1800. In his day, Kant was assumed to be the thinker who offered a sophisticated explanation of biological life. His ideas anticipated the modern interpretation of living organisms, and he even coined the term self-organization for the first time (Weber and Varela, 2002, p. 97). Although his assertions on the purpose of nature and the individuality of living things did not receive their deserved attention from biologists who adopted the Darwinian approach, or his biological naturalism was rejected entirely, Kant influenced the field of theoretical biology at some level.[3] His thoughts on teleology, displayed in 1790, contributed to the emergence of biological sciences. He influenced eighteenth-century English thinkers (Jones, 2023), and in the early nineteenth century, the biological sciences in Germany were grounded in Kant's ideas (Lenoir, 1982). Moreover, Kant's influence on nineteenth-century Romantic naturalists considerably impacts twentieth-century biologists (Esposito, 2016). Still, Kant's contribution to the field of biology remains controversial or indirect.

The impact of Kant's transcendental idealism, on the other hand, is openly recognizable in the well-known writings on theoretical biology of the famous biologist Jakob Johann Baron von Uexküll (1864-1944) who was an ethologist, the pioneer of biosemiotics and an influential figure in cybernetics and theoretical biology. His work carries traces of a natural philosophy influenced by neovitalism, such that he is called a "biologist-shaman" who tries to visit the worlds of non-humans (Sagan, 2010, p. 20). The criticism of Darwin's approach to the theory of evolution is the basis of Uexküll's thought. According to Uexküll, Darwin declares Nature as an *idiotic being* by proposing *chance* as its cause of existence because the notion of chance can also imply total perishment at once without reason (Uexküll, 2004, p. 332). Due to this bitter tone against Darwin, Uexküll is known as anti-Darwinian in biology. However, rather than rejecting the Darwinian natural selection theory altogether, he criticizes Darwin for his effort to understand the causality of evolution only at a mechanistic level. In that sense, Uexküll's approach is not Cartesian but seems ecological (Kull, 2004, p. 101). Uexküll interprets Darwin's natural selection not as a creator but as an editor (Sagan, 2010, p. 25) and believes that what is missing in this mechanistic approach is the ability to consider living life from a semiotic perspective besides an evolutionary approach. Thus, the biologist balances a mechanistic research practice with a vitalistic theoretical framework (Brentari, 2015, p. 236) and distinguishes between physiology and biology (Kull, 2001, p. 4; Brentari, 2015, p. 57). He believes that though

[1] Esposito proposes this Borgesian perspective (2020, p. 37).

[2] Hereafter, abbreviated as "CJ", followed by the section, volume and page numbers, respectively.

[3] See (Weber and Varela, 2002; Esposito, 2016; Jones, 2023; Lenoir, 1982; Brentari, 2015).

physiology is the science of merely physical and chemical cause-effect relations, it must also evaluate living beings as perceiving and acting subjects to be completed (Michelini, 2020; Brentari, 2015; Kull, 2001). This belief drives Uexküll to associate "the passion of the observing zoologist with the rigorous approach of an experimental physiologist, the mindset of an empirical biologist with the theoretical breathing space of a philosopher" (Michelini, 2020, p. 8-9). Uexküll's views and studies have come to the fore again with the rise of ethology in the twentieth century.[4] Although he wrote that rather than pioneering a new branch of science, he desired to introduce unknown worlds to us, it is accepted that the biologist proposed both a novel philosophy and a new and original way of doing philosophy (Buchanan, 2020, p. xii).[5]

Asking many questions regarding epistemology and ontology, Uexküll is a neo-Kantian (Sagan, 2010, p. 4) who participates in the calling for prompting Kant's philosophy within physiology (Michelini, 2020, p. 3). Further, some researchers think that the Kantian reference provides Uexküll with an autonomous conception of organism and an autonomous status of biology as a science (Borges de Souza and Araujo, 2021, p.18). Although Uexküll focuses directly on Kant in only two short writings, he admits that Kant's impact on his general thought is noteworthy. Sagan (2010) writes that Kant's idea that things-in-themselves are not the object of knowledge is also the source of Uexküll's thought, and many German scientists also agree with this idea. According to him, Kant's emphasis on *a priori* intuitions and categories such as time, space and causality, that is, the emphasis on the cognitive structure, and the idea of the impossibility of absolute objectivity helps Uexküll to think that there are other possible categories in which non-human animals perceive the world (Sagan, 2010, p.11). Similarly, Brentari writes that to fully understand Uexküll's thought, its Kantian roots must be recognized, and this begins with understanding how the *Umwelt* theory was formulated (2015, p. 234). At this point, it is essential to indicate that Kant's influence on Uexküll was based mainly on the *Critique of Pure Reason*[6] rather than on Kant's views on teleology in CJ (Esposito, 2020, p. 37; Brentari, 2015, p. 65). The present study will take this hermeneutical clue and trace in the following sections how Kant's idea of transcendental idealism was translated into biology by Uexküll.

1. Kant's Views on Transcendental Idealism, Nature and Purposiveness

Kant's critical philosophy forms an architectonic system that is necessarily transcendental by nature. It can be described as the exposition of the affiliation of the faculties of pure reason (namely sensitivity, understanding, and reason) while they produce different forms of cognitive content (knowledge, morality, and aesthetics) in their given areas of execution. By this view, Kant claims that we can only know what appears to us in the world (phenomena), but we cannot know entities as things-in-themselves (c.f. CPR A37; A42; A239). In other words, phenomena refers to the experience of the world, while noumena refers to the presumed reality that we have no access to. This is what is called transcendental idealism. To describe transcendental idealism without delving into the depths of Kant's teaching or, as Cassirer puts it, without getting involved in Kant's thorny terminology, we can quote Kant from the *Critique of Pure Reason* (1781)

[4] See Kull, 2001; Kull, 2020; Klinke, 2023 for detailed records.

[5] Uexküll's approach is discussed by many influential thinkers like Canguilhem, Merleau-Ponty, Heidegger, Agamben, Deleuze and Guattari. For instance, Heidegger quoted Uexküll the most when he criticized Darwin, and Deleuze and Guattari turn to Uexküll for the possibility of "a biology that takes becoming into account" (Koyuncu, 2020, p. 183).

[6] Hereafter abbreviated as "CPR," followed by ("A") for the first and ("B") second editions and the page numbers.

where he writes "I understand by the transcendental idealism of all appearances the doctrine that they are all together to be regarded as mere representations and not as things-in-themselves…" (CPR A369). Following this, Kant's philosophy reveals the *a priori* conditions of the mind under which the phenomena appear to us.

Kant's understanding of nature or teleology can only and inevitably be possible within the boundaries of the transcendental idealism mentioned above. If we follow Kant's path, we see that nature and its empirical laws are special cases and applications of the *a priori* rules of the understanding. What we call special laws of nature are due to particular perceptions under the general laws of understanding. However, the general laws of nature (or pure laws of nature) do not depend on any particular perception. On the contrary, they "contain merely the conditions for the necessary unification of such perceptions in one experience" (Kant, 2004, p.71). Thus, regarding general laws of nature, lawfulness means that the phenomenon, by definition, necessarily complies with the *a priori* laws of the understanding. Otherwise, we could not talk about the phenomenon or its knowledge.

In this sense, nature and possible experience are precisely the same thing; they both necessarily comply with the laws of the understanding in existence. Therefore, Kant continues as follows: "Even though it sounds strange at first, it is nonetheless certain, if I say with respect to the universal laws of nature: the understanding does not draw its (*a priori*) laws from nature, but prescribes them to it" (2004, p. 72). Based on this, nature appears as the existence of things determined according to general laws. In this case, when we talk about the experience of a particular in nature, we do not mean an experience based solely on perception. If this were so, or if the experience were a pure coexistence of sensory perceptions, it would be a *rhapsody of perceptions*. However, for Kant, transforming experience into knowledge always requires more than a unity of sensible data. It mainly depends on the synthetic unity of phenomena.

The Kantian notions of nature, finality and organism should also be understood within this framework and always within the functioning and unfolding of the subject's cognitive faculties. The second chapter of the Critique of Judgment, devoted to teleological judgment, exposes *a priori* conditions of how the concept of purposiveness of nature is formed in the architectonics of the human mind. Such a concept is the product of reflexive judgment in Kantian philosophy. If we think that there is finality or purposiveness in nature, which presents itself as a set of phenomena, according to Kant, we might be right to think so. Still, we should be aware that "the concept of a thing as in itself a natural end is therefore not a constitutive concept of the understanding or of reason, but it can still be a regulative concept for the reflecting power of judgment" (CJ, §65, 5: 375).[7]

Kant's thoughts that influence the field of developmental biology germinate within the framework of transcendental thought mentioned above. In the second part of the *Critique of Judgment*, Kant writes on the nature of living things (organisms), defines the organism as an organized entity, and states that organized beings are not mere machines. They are possible in nature only as ends of nature. Moreover, they are the only beings that should be considered as ends of nature (CJ, §65, 5: 375-6). It is precisely this claim that makes us think that Kant's position on biological life is contradictory. Contrary to the epistemological position of the sceptics, Kant believes that physics is the natural science of knowledge and that Newtonian

[7] One reason for this is that Kant finds it impossible to gain knowledge about the historical origins of nature, and according to the philosopher, such an investigation can only be described as the archaeology of nature, and this is undoubtedly "a bold adventure of the mind" (CJ, §80, 5: 419).

physics is its predecessor. With this thought, he reveals a need for a different way of thinking other than the mechanical to deal with the notion of organism. In the case of living things, purposiveness should not be based on a mechanical explanation. We should be careful that the natural purpose mentioned here is not a practical purpose. Kant here (similar to the noumenon vs. phenomenon distinction) states that self-organizing entities have their own natural purposes, but this is different from the understanding of the purpose of nature. In other words, we cannot understand organized beings as natural ends according to *a priori* principles. However, organized beings, as the object of our knowledge, "first provide objective reality for the concept of an end that is not a practical end but an end of nature", and as such, "they provide natural science with the basis for teleology, i.e., a way of judging its objects in accordance with a particular principle" (CJ, §65, 5: 376). Thus, the notion of purpose is a principle of spiritual (*geistige*) connection that enables us to judge the multiplicity of phenomena (Cassirer, 1981, p. 335), and that is why we do not look for the idea of purpose in nature. It is never the object of a mechanical and causal inquiry carried out by the understanding or reason. Hence, when Kant says, "the end of existence of nature itself must be sought beyond nature" (CJ, §67, 5: 378), he means that it is a subject of reflexive judgment.

Let us consider organized entities in this context. The internal purposiveness (*inneren ZweckmaBigkeit*) of organized entities demands that an organized entity is both an end and means. According to Kant, this principle is "a maxim for the judging of the inner purposiveness of organized beings" (CJ, §66, 5: 376). The mechanical change of organized entities in nature, for example, the growth of a tree, can be grasped by causal explanations of mass and quantity. These determinations lead to determinate judgment about the phenomenon. However, we can also evaluate the tree's growth, which ensures the continuation of the tree's own species, as an individually emerging aspect and quality of the tree, that is, as its goal. Now, this kind of approach is teleological by nature and demands teleological judgment. According to Kant, that is why we cannot base our understanding of living things on a purely mechanical explanation, even though all empirical events have a mechanical or physical cause and a possible explanation. Moreover, Kant writes, "We must always subordinate all such mechanical grounds to a teleological principle" (CJ, §78, 5: 415). He believes that the causality-based determinations and explanations of our discursive and image-dependent understanding (*intellectus ectypus*), which see living things only as they appear and regard them as objects of knowledge, do not satisfy us sufficiently. Teleology instead judges the continuous self-production of nature intuitively as a whole in reflexive thought, and this corresponds to a different kind of understanding (*intellectus archetypus*) (CJ, §78, 5: 408), which does not contrast the causality-based thinking mentioned above.

Although Kant's views on this subject are elusive, his assertion that nature cannot be understood solely through mechanical principles attracted considerable attention in the eighteenth century. Uexküll received the philosopher's idea of transcendental idealism with great enthusiasm due to the possibilities it would offer to biology. The following section examines Uexküll's stimulating *Umwelt* theory and its components influenced by Kant.

2. Uexküll and the theory of *Umwelt*

In 1920, Uexküll wrote a long article entitled *Theoretical Biology*, which intended to ground biology fundamentally on vital processes. He opens the essay with a reference to Kant due to his profound interest in Kant's philosophy, commanding the future science of biology to pay close attention to Kant's philosophy. According to him, the task of biology lies in extending the results of Kant's investigations in two main

directions: "(1) by considering the part played by our body, and especially by our sense-organs and central nervous system, and (2) by studying the relations of other subjects (animals) to objects" (Uexküll, 1926, p. xv). Uexküll begins this task by challenging the traditional philosophy by questioning the ontological and epistemological status of non-human animals. He ponders over animals as the subjects and agents establishing their own world by governing the relations in their *milieu*. This ethological approach proposed by Uexküll is also contrary to classical biology, which considers animals as machines. Kant also opposed the idea that organized entities are mere machines. According to him, unlike machines with mere motion, organized beings have a self-propagating formative force (CJ,§ 23, 5:246). Uexküll takes this claim further. His speculative ethology, which expresses a critical engagement with animal behaviour, emotions and minds, asserts that animals are also subjects. As subjects, animals hold the absolute agency of their own unique worlds. Moreover, the development of living things or organic beings is based on an internal force that acts according to a morphological plan. In other words, we cannot evaluate organisms only by a part-whole relationship or as created by external forces/influences. Human and non-human, as autonomous creatures with an internal morphological development ability, all living things are subject to the laws of physics and their own laws (Uexküll, 1926, p. 223).

As Kant, inspired by Newton, tries to open a position between crude materialism and an extreme teleology in CJ via his views on organism and finality (Weber and Varela, 2002, p. 99), Uexküll shows a similar attitude when he wants to bypass mechanical thinking in biology. He sees Nature as a "solemn symphony" (Uexküll, 2004), and in contrast to the infinite laws of an absolute and material world, it is the laws of the subject that make the world meaningful. Thus, he introduces the concept of *Umwelt* in his 1909 book *Innenwelt und Umwelt der Tiere*. He declares *Umwelt* as the original world around each animal, which is irreducible to any other in terms of its content and formal coordinates. Therefore, each animal is a little machinist at the center of its world (Uexküll, 2023, p. 40).[8] Unlike Kant, who puts the transcendental subject at the center of his Copernican Revolution, Uexküll places all living things at the center, with their bodies, sensory organs and nervous systems (if any) (Michelini, 2020, p. 3).

The tick is undoubtedly the most famous of the little machinists living in the heart of its *Umwelt*. A tick is an obligate blood-sucking external parasite with no ability to see or hear. It relies on its sense of smell and touch to locate a suitable host. Thanks to the sensitive light senses on its skin, it finds a secured spot like a tree branch or leaf to wait for its prey until it smells the butyric acid secreted by the skin of mammals. As soon as it smells the scent, which signals to take action, the tick jumps on its prey, targeting a hot spot. Using its sense of taste, it finds a less hairy area on the skin, settles in it and sucks the blood of its host. According to Uexküll, among the many stimuli of mammals, only three perception-mark carriers (*Merkmalträger*), the olfactory stimulus (butyric acid), tactile stimulus and heat stimulus, turn into an effect for the tick. When they do, the rich world that surrounds the tick opens. This invitation presents us with the *Umwelt* of the tick (Uexküll, 2010, p. 45-8). This world has two primary subdivisions connected by a functional circle:

[8] Humans can be thought of as an example of the cooperation of these little machinists since we now know that more than half of our bodies are not human. We live in our bodies in the company of many invisible friends, each having their own *Umwelt*. When we think about body health in this context, for example, nutrition, which affects the perception and effect worlds of intestinal bacteria, basically supports or sometimes disrupts the relationship between the intestine and the human body. Thinking of the human body as a semiotic communication network in this way will undoubtedly change our perspective on the world.

Perception world (*Merkwelt*), which includes everything that the animal as a subject perceives, and effect world (*Wirkwelt*), which consists of a subject's all productions (Uexküll, 2010, p.42). Due to its unique structure, each animal subject chooses its stimulus among the countless stimuli in the outside world and responds to it in a certain way. These responses create effects in the outside world that will eventually affect the animal's stimuli, creating a periodic cycle that Uexküll calls the living creature's functional circle (*Funktionskreis*). The functional circle is the most basic and straightforward meaning-generating mechanism. Even a single-celled creature is a complex structure that can have a functional circle (Kull, 2020, p. 224). Each living thing has an isolated functional circle. The functional circles of different living things are in an interactive relationship, creating the function-world of living things in the relevant environment, including plants (Uexküll, 1926, p. 126). In this case, *Umwelt* appears as a closed unit or environment formed by the worlds of perception and influence (Uexküll, 2010, p. 42). In other words, *Umwelt* points to the existence of a unique world created by each animal via its sensory and operational experiences and the relationships specific to it. This means there are as many worlds as subjects (Uexküll, 1926, p. 70).

In the initial pages of *A Foray into the Worlds of Animals and Humans*, Uexküll invites us on a trip to the wondrous worlds of animals "on a sunny day before a flowering meadow in which insects buzz and butterflies flutter." The biologist continues his invitation as follows:

> We make a bubble around each of the animals living in the meadow. The bubble represents each animal's environment and contains all the features accessible to the subject. As soon as we enter into one such bubble, the previous surroundings of the subject are completely reconfigured. Many qualities of the colorful meadow vanish completely, others lose their coherence with one another, and new connections are created. A new world arises in each bubble (Uexküll, 2010, p. 43).

The bubble here depicts an animal's world, its *Umwelt*, which consists of everything it perceives in its physiological and biological environment. Uexküll writes that every animal sees a particular "soap bubble around them, closed on all sides, which closes off their visual space and in which everything visible for the subject is also enclosed" (2010, p. 69). Here, *Umwelt* reminds us of Kant's idea of transcendental idealism, as it is a material and epistemic space (Esposito, 2020, p. 42) that constitutes the beginning and end of the organism's meaningful world. According to Uexküll, reacting, an affective functional action in the organism's relationship with its environment, is a semiotic process and a meaning-giving activity. So, we can say that in Uexküll's theoretical biology, non-human subjects also have a transcendental ability to determine the conditions of their own experience. As a result, Uexküll puts forward a possible understanding of transcendental biology by assuming a relationship between the inner world (*Umwelt*) of all organisms and the outer world (*Welt*) that is established through a series of feedback loops (Esposito, 2020). Uexküll postulates "pure subjective realities" in Umwelts. Still, the objective realities of *Umgebung*, the world closed to the non-human subject, do not emerge in umwelts like subjective realities. Objective realities always turn into signs of perception or signs of influence (Uexküll, 2023, p. 123). For example, an oak tree can take on very different roles as an object in the *Umwelt* of perhaps hundreds of living beings. That is, it can turn into different signs of perception and effect. The same oak tree is a piece of wood to be cut for the lumberjack, a monster with a scary face for a little girl, a nest for the fox, and a sheltered stop for the owl. The bark beetle can play different roles in different Umwelts, both as food and home (Uexküll, 2010, p. 128). The living creature's *Umwelt* reveals a species-specific, transcendental, semiotic structure through

the flow between perception-mark carriers and effects within this entire feedback loop and dynamic structure.

If teleology is considered in this transcendental semiotic structure, Uexküll recommends that expressions such as purpose or purposiveness be excluded from the scope of biology (1926, p. 270). Because the idea that nature has a higher plan is inevitably the product of an anthropomorphic way of thinking, instead, he puts forward the notion of conformity to plan, which we can think of as "a second subjective rule that allows us to systematize objects" in addition to objectivity (Uexküll, 1926, p. 103). The plan, as a rule, existing in the world of the living, reveals itself in the mechanical processes of the organism and is one of the two fundamental components of the *Umwelt* (the other one being subjectivity). Then, we can say that *Umwelt* is "the creation of a subject which perceives meaningful objects according to its morphological plan" (Esposito, 2020, p. 46). In comparison to Kant's notion of inner purposiveness, which is the mechanical development or the interaction between parts and wholes in organisms, Uexküll's *Umwelt* theory extended to an understanding of purposive order between the organism and its *Umwelt* (Köchy, 2020, p. 64).

Another issue on which the philosopher's and biologist's thoughts enter into dialogue is the doctrine of time and space. Uexküll, by sharing experiments proving that a tick can live for up to eighteen years without feeding in the absence of a mammal to feed on, underlines that the perception of time may be pretty different for ticks than humans. This means that every subject is capable of its own time, and for Uexküll, it also means that we should alter the principle "there can be no living subject without time" into "without a living subject, there can be no time." (2010, p. 52). Furthermore, Uexküll also renews this determination for space and states that "there is no space independent of subjects. If we still want to cling to the fiction of an all-encompassing world-space, that is only because we can get along with each other more easily with the help of this conventional fable" (2010, p. 69). Uexküll also clearly emphasizes the relevance of these two claims to Kant's teaching (2023, p. 52). However, he also criticizes Kant: In his theory of consciousness, Kant neglected the *a priori* forms of perception and limited himself to the levels of intuition and intellect (Esposito, 2020, p. 38; Brentari, 2015, p. 109). According to Kant, space and time are neither the conditions under which objects exist as things-in-themselves nor their relations to each other. Space and time are *a priori* sensible forms of intuition (CPR A26/B42). However, Uexküll finds these forms tremendously important (Brentari, 2015, p. 109) and states that in the biological perspective, space and time should be differentiated not only according to the biological type of the perceiving subject but also according to the unique sense or specific sensory qualities examined. Using examples of humans, birds and snails, he underlines the different time perceptions of these three creatures (Uexküll, 2010). In other words, for Uexküll, we face a multiplicity of time and space specific to every living being and even to every sense.

3. On the Possibility of a Kantian Biology Inspired by Uexküll

Nobody is the product of their milieu—each is the master of his *Umwelt*

(Uexküll quoted in Winthrop-Young)

Let us imagine the role that Uexküll assigns to biology in a Kantian fiction for the Kantian subject: The animal studied by a biologist is a mere phenomenon. As the inside of the bubble, the *Umwelt* expresses the conditions the animal can be aware of, while the *Umgebung*, as the outside of the *Umwelt*, is closed or

inaccessible to the animal. But this closed world lies within the *Umwelt* of the biologist. The *Umgebung* of the biologist is the subject's universe consisting of all possible phenomena for transcendental idealism in the Kantian sense. Therefore, claiming that humans can know animal worlds is based on a speculative ethology approach rather than a universal and absolute act of knowing based on cause-effect-oriented observation of the relationships that non-human animals establish in their habitats. Let us hear Uexküll on this:

> I take the example of a fly having a walk on a desk… 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 (2004, p. 333-334).

In line with Kant, for Uexküll, knowing the world does not mean knowing noumena. Uexküll, just like Kant, writes that the noumena cannot be the object of experience.[9] For Uexküll, too, "objects, equipped with all the possible sensory characteristics always remain products of the human subject, they are not things that have an existence independent of the subject", and "they become "things' in front of us only when they have become covered by all the sensory envelopes that the island of the senses can give them" (2001, p. 107).[10] At this point, it should be remembered that neither Kant nor Uexküll doubts the reliability or certainty of what is presented to us by the mind as an object of knowledge regarding nature or living things. Kant thought that the reliability and certainty of natural sciences are derived not from the world's order but rather from the subjective and the universal architectonics of pure reason that organizes experience. Influenced by Kant, Uexküll correlates phenomena with the empirical field in which living things are observed. On the other hand, noumenon shows itself via signs; thus, reality corresponds to a collection of interpreted or interpretable signs. The world beyond these signs is incomprehensible and remains outside our semiotic activities.[11] In this case, using unverifiable assumptions and hypotheses associated with the noumenon can only have a heuristic and guiding value (Brentari, 2015, p. 54).

Both Kant's and Uexküll's approaches are criticized for being solipsistic. Kant's views are solipsistic because he bases the reality of the world that appears to the subject on a transcendental objective reality. Uexküll's approach, on the other hand, cannot escape the criticism of environmental solipsism (Heredia, 2020, p. 17) because he claims that we can know the *Umwelt* of animal subjects. Questions such as how we can be sure of the reality of the organism or, to use Uexküll's terminology, how a person can be sure whether his *Umwelt* is nothing but a delusion, are not answered in Kant's philosophy. According to Kant's view of transcendental philosophy, the organism derives its reality not from the object that affects it or from empirical intuition but from the principle that it is necessary for our experience. In Kant's philosophy, the unity of experience can only be thought through the subject. The transcendental object, a part of this unity

[9] Furthermore, when he writes "all reality is subjective appearance" in *Theoretical Biology* (1926, p. xv) he uses the term *Erscheinung* for the word appearance as Kant does when he writes "an appearance is an object of empirical intuition" (CPR A20/B1, A35/B52).

[10] Buchanan writes that this idea points to a possible ontology of Uexküll's biology (2008, p. 13).

[11] According to Esposito, this perspective can defend Kant against the claim that the noumenon is an unnecessary addition to an over structured philosophical system. Noumenon can be seen as the fundamental and elusive source of meaning carriers that constitute the milieu that human and non-humans live (2020, pp. 46-7).

of experience, is a product of the mind's structure of the subject. Thus, in Kant, the reality of the organism is based on experience in which it is regarded as an agent affecting the subject. Let us quote Kant's view on pure mathematics to clarify this point. Since pure mathematics is not grounded on empirical experience, Kant says in a footnote that "in pure mathematics, there can never be an issue of the existence of things, but only of their possibility, namely the possibility of an intuition corresponding to their concept" and as a result "there can never be an issue of cause and effect, all of the purposiveness that has been noted there must therefore be considered merely as formal, never as a natural end" (CJ, § 63, 5:367). From this basic argument, we can infer that to confirm the knowledge of the existence of an organism, the philosopher finds it sufficient for it to appear to us as affecting sensation. In other words, we can say that the data coming from the sense organs is taken as evidence for the existence of organisms in nature. To verify that we are not hallucinating about our world perception, species-specific communication and meta-thinking abilities might be helpful, and they can provide the ground for normal and abnormal perceptions and eliminate the idea of delusion.

Similarly, Uexküll, as the observing subject, cannot know the animal's *Umwelt* as it is in itself. Still, he examines numerous animals of the same species and sees that those species respond to the same perception-effect markers. Then, thanks to the speculative ethology approach, he brackets the question of reality. Addressing the issue as a problem of relativity, Brentari states that in the face of the problem of possible divergence in the interpretation of the subjects, Uexküll benefits from the universality of transcendental structures in the Kantian sense:

> [...] if the constitution of environmental elements beginning with sensory material… depends on a priori principles and transcendental schemata which the subjects possess, and if (Kantianly) such shapes are constant for the various typologies of the subjects (for the various biological species), then we should no longer fear falling into relativism of experience (2015, p. 108).

Besides all this, we can see that Uexküll wrote the following to Driesch, who was also a biologist, in a letter dated 1938:

> For me, it is solipsism, which fundamentally allows every subject to understand itself as the only form of existence and its world as the only one, which has become a pillar of my *Umwelt* theory. Nature builds itself up out of these closed worlds. The frame which holds each of these worlds consists of space, time and plan. The relationships within these worlds are all subject-bound and therefore designed (*planmäßig*) and non-causal (Uexküll quoted in Klinke, 2023, p. 468).

In this case, we see that Uexküll uses solipsism as a method. Moreover, we can determine that the biologist's claim that the *Umwelt* of the animal we observe is only a part of the *Umgebung* we see around it, and this *Umgebung* is none other than the *Umwelt* we live in, is in tune with Kant's understanding of nature and the notion of the transcendental object. Since we cannot think of the transcendental object separate from sensory data, it cannot be an object of knowledge. The object is, therefore, only the representation of phenomena under the concept of an object in general and can only be determined through the manifold of these phenomena (Kant, CPR A250–1). In this respect, Uexküll defines the first essential task for environmental research as designing each animal's own *Umwelt* by separating the perception signs of animals from the perception marks of their *Umwelt* (Uexküll, 1926, p.78). By this, he gives a Kantian biologist his first assignment. According to Klinke, since "even the simplest life form reads the signs in his universe,

rather than interacting directly with the material world," the biologist offers us a theory of meaning that covers all subjects (2023, p. 463). According to Sagan, these signs are "read in a language much older than the language of words" in a meaning-producing semiosis (2010, p. 6).

At this point, the biologist's original contribution to a possible Kantian theory of biology regards all organisms in the given world as meaning producers. This claim is compatible with the transcendental object in Kant's thought. Still, since Kant did not see non-human animals as subjects, the idea of animals as meaning-producing subjects is not addressed. However, it is worth noting that transcendental architectonics does not exclude this possibility. It is Kant, who did not consider the possibility of a subjectivity other than human subjectivity. In this sense, although Uexküll reinterpreted Kant's transcendental philosophy from a physiological perspective, he offers us much more than a consistent version of "physiological Kantianism". He emphasizes the need to redefine biology as the science of subjectivity, which defines both the concept of life and the organism according to Kant's transcendental approach but based on agency (Esposito, 2020, p. 49). In other words, by rethinking Kantian transcendental in terms of the building plan of an organism in biology, Uexküll "creates a biological constructivism *avant la lettre*" and proposes a new kind of rationality where any categories of perception of the particular organism are seen as "the embodied process of cognition" (Weber, 2004, p. 299). In this case, it can be said that Uexküll's *Umwelt* theory expands the boundaries of the field of biology and extends the horizon of Kant's thought regarding forms of subjectivity.

Final Considerations

This paper focused on Kant's influence in theoretical biology through Uexküll, who described himself as unconditionally devoted to Kantian transcendental idealism. Uexküll's intention to extend the results of Kantian philosophy opens him to the subjective worlds of non-human animals. In his thought, transcendental philosophy transforms into transcendental biology as a new scientific discipline called *Umweltlehre* (environmental theory), which asserts the existence of species-specific subjective worlds both from an empirical and theoretical perspective. Uexküll considers animals as non-human subjects that cannot be fully grasped if they are studied only anatomically and physiologically. In his understanding, a biologist, as a transcendental subject, interprets and translates other non-human subjects and their environmental experiences. This draws attention to how humans relate to human and non-human subjects. Stating that Kant's transcendental subject is just another subject amongst non-human subjects in the world and that nature must be addressed with the sciences of semiology and biology, which are inevitably in contact with each other, Uexküll proposes a reinvention of Kantian philosophy. He reinvents the notion of phenomenon as the subject's interpretation of the outside world and transcendental philosophy within a semiotic and biological understanding. In this way, he offers the opportunity for a non-anthropocentric reconstruction of Kant's philosophy by expanding Kantian understanding of the subject to include non-human animals. The human subject is invited to consider the world at different non-human scales through biology. The notions of time and space as *a priori* regulators of all possible human experience are reconstructed to vary by the species-specific architecture of each living being. Overall, Uexküll's Kant-influenced thought guides the subject through contemplating life in a non-mechanistic manner and thus envisions life as a layered but holistic whole by examining the lives of non-human animals.

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