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# SINNLICHKEIT AND PLANMÄßIGKEIT: JAKOB VON UEXKÜLL'S KANTIAN BIOLOGY

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## Introduction

The present thesis analyzes the theoretical work of the Baltic-German biologist and physiologist Jakob von Uexküll (1864–1944) in light of his explicitly Kantian metaphysical commitments. The acknowledgment that such commitments exist is a central feature of the overwhelming majority of the academic literature on Uexküll. Publications by numerous scholars, among them Araújo & Borges de Souza (2021), Brentari (2020; 2015), Esposito (2020), Hoffmeyer (2004), Kull (2004), Mildenberger (2007), and Pobojewska (1993, 2001), among others, have touched upon the importance of and the extent to which Uexküll's commitment to Kantian metaphysics influenced the development of the suite of theoretical concepts for which he is well-known, both in the history and philosophy of the life sciences and in the field of biological semiotics, or biosemiotics. However, the scope of these engagements is relatively limited, and reference to the Kantian metaphysical system underlying Uexküll's work is often added for historical context or subjugated to some other end. I contend that a prolonged and thorough examination of Uexküll's idiosyncratic Kantian biology is worthwhile in its own right. Moreover, few, if any, of the existing sources elaborate to a sufficient extent why Uexküll placed such remarkable emphasis on the faculty of sensibility (*Sinnlichkeit*) in Kant's *Critique of Pure Reason* (1781/1787) rather than merely the faculty of judgment (*Urteilskraft*) in Kant's *Critique of the Power of Judgment* (1790). Those that do acknowledge the faculty of sensibility and the constitution of transcendental subjectivity in Uexküll's work have nonetheless failed to articulate the precise manner in which Uexküll departed from Kant's system of transcendental idealism, which despite inaugurating a Copernican revolution in philosophy, remained committed to an essentially Aristotelian scholastic conception of the human as *animal rationale*. The implication of this formulation is, of course, that non-human animals are non-rational. Moreover, among the most common assertions encountered in the academic literature is that 'Uexküll extended transcendental subjectivity to non-human animals'; how precisely this was accomplished and in what ways Uexküll felt justified in departing from Kant, who, in Uexküll's own words, was

"the greatest thinker brought forth by mankind since Plato"[1] (Uexküll 1902: 5), remains unelaborated. The central aim of this thesis is to investigate in depth what precisely Uexküll gained from Kant's metaphysics and in what ways these metaphysical assertions were augmented to be made amenable to Uexküll's biological worldview. I assert that it is in two of Uexküll's most central concepts — sensibility (*Sinnlichkeit*) and conformity to a plan[2] (*Planmäßigkeit*) that this departure is most readily discernible.

Only by amending the former concept to encompass both the passivity of sense perception and the spontaneity of the action did Uexküll affirm the transcendental subjectivity of non-human animals. The essential unity of perception and action in the functional cycle endows non-human animals with the capability to constitute a phenomenal world for themselves *without* reliance on a discrete faculty of understanding, which, according to Kant, is necessary for the possibility of any experience, where experience is understood as the capacity to cognize objects. In his *On the Form and Principles of the Sensible and the Intelligible World* (1770), also called the Inaugural Dissertation, Kant writes that "[…] there is no way from appearance to experience except by reflection in accordance with the logical use of the understanding" (ID 2: 394). Uexküll, on the other hand, asserts that insofar as "*All reality is subjective appearance*"[3] (Uexküll 1928: 2; emphasis original); in other words, appearances are sufficient for the constitution of phenomenal experience. The precise nature of such phenomenal experience in Uexküll's writings is unclear. Still, it should be noted that the capacity for experience which all living beings possess in no way implies the necessary *unity of appearances* into a single coherent and comprehensive experience. Humans generally experience life in a single, all-encompassing, and unitary phenomenal present. However, the nature of our phenomenological experience gives us no reason whatsoever to adduce that this

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[1] "[…] der größte Denker, den die Menschheit seit Plato hervorgebracht hat […]" (Uexküll 1902: 5). All translations mine unless otherwise noted.

[2] In this thesis, I translate Uexküll's concept of *Planmäßigkeit* as 'conformity to a plan.' There exists precedence for such a translation both in English and in several other languages: Several authors in Michelini & Köchy's (2020) volume on Uexküll translate the term into English as 'conformity to a plan'; Brentari (2015: 59) has rendered *Planmäßigkeit* as "correspondence to a plan"; Castro Garcia (2009: 10) translated the term into Spanish as '*conformidad a plan*'; Araújo & Borges de Souza (2021: 37) translated the term into Portuguese as '*conformidade a um plano*.' This interlingual agreement regarding translation notwithstanding, the translation of a single German noun into an English noun phrase at times poses difficulties for the translation of longer passages and discussions thereof; in these instances, I opt to retain the German original.

[3] "*Alle Wirklichkeit ist subjektive Erscheinung*" (Uexküll 1928: 2; emphasis original).

is the case for all, or even the majority, of living beings. For Uexküll, experience is a direct consequence or entailment of sensibility, where sensibility is understood as a necessary quality of all living beings. Experience signifies a much more rudimentary referent for Uexküll than the word does in its colloquial sense.

In his treatment of the latter concept, Uexküll augments Kant's notion of purposiveness (*Zweckmäßigkeit*) to give it a constitutive/determinative, rather than regulative, place in judgment. Stated otherwise, organic purposiveness or teleology is something that exists in the world and is not just something that our human faculty of understanding adds to the world in order to make sense of natural purposes inaccessible to us. This aberration from Kant's account of teleological judgment came about in light of Uexküll's belief that experimental biology had supplied sufficient evidence to justify belief in an immaterial, yet in-itself unknowable, natural factor (*Naturfaktor*) which was operative in all living beings during morphogenesis. In line with the biology of his time, Uexküll asserted that the material results of this immaterial natural factor were nonetheless perceptible in the activity of the protoplasm, a now-defunct concept that designated the fluid interior of the cell insofar as it embodied the vital life force (*Lebenskraft*; *vis vitalis*) of an organism. As will be demonstrated, *Planmäßigkeit* was Uexküll's unique solution to two crucial biological problems: the problem of the relation of the part to the whole and the problem of purposiveness/teleology in biology. Although vitalism has now fallen into disrepute in light of empirical evidence to the contrary, holistic, teleological, and non-reductive approaches remain of contemporary import to the life sciences, particularly insofar as we are currently witnessing a gradual shift towards more organism-centered, 'horizontal' approaches in biology. Contemporary theoretical biologists are moreover increasingly coming to the realization that "there are reasons to think that contemporary biological theory is no less committed to teleology than its eighteenth-century counterpart" (Ginsborg 2022); indeed, teleology has scarcely received as thorough and enduring a treatment as in did in Kant's *Critique of the Power of Judgment* (1790). In this way, Uexküll's Kantian biology represents but one early attempt to synthesize Kantian ideas about the purposiveness of nature and organisms with empirical biological data.

With this, I conclude my exposition of the motivations for the research question and the thesis statement to be defended in this work; moreover, the brief overview of the argument developed above should give the reader a sense of the preliminary conclusions of this thesis. Before investigating the matters previously discussed, it is necessary to articulate the precise position of this research in relation to general biosemiotics.

Uexküll's unique position in the history and philosophy of the life sciences has occasioned a widespread reevaluation of his works, as evidenced by the appearance of several dedicated journal issues and conferences, particularly in the past two decades.[4] The rediscovery of Uexküll is in no small part due to Uexküll's appraisal by Thomas A. Sebeok (1979: 187) as a "neglected figure in the history of semiotic inquiry." As a result, the majority of scholarship on Uexküll has taken place under the auspices of biologically-inclined semioticians. The latter have asserted Uexküll's foundational role in biosemiotics, here understood as the scientific study of prelinguistic meaning-making processes.[5] Defining Uexküll as a semiotician is undoubtedly anachronistic, yet, his theoretical works from the period of 1902 until 1940 — the period under examination in this thesis — display a "remarkable, if altogether implicit, semiotic orientation" (Sebeok 1979: 193). How is this so?

The primary thesis of biosemiotics, also known as Sebeok's thesis, asserts that "the semiosic/non-semiosic distinction is coextensive with [the] life/non-life distinction, i.e., with the domain of general biology" (Kull et al. 2011: 25). Insofar as semiosis is possible only by means of the interpretive capacity of living beings, biosemiotics may also be said to be coextensive with the domain of general semiotics. Semiotics may be understood as the study of signs and sign processes (semioses); alternatively, as "the study of 'forms of knowing'" (Kull 2014: 48). The Danish theoretical biologist and biosemiotician Jesper Hoffmeyer asserted that "According to the biosemiotic perspective, living nature is understood as essentially driven by, or actually consisting of, semiosis, that is to say, processes of sign relations and their signification — or function — in the biological processes of life" (Hoffmeyer 2008: 4). Biosemiotics is a naturalistic theory of meaning; by this it is understood that it is not at all in conflict with the findings of well-conducted empirical natural science.

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[4] Cf. *Semiotica* volumes 134(1/4), 127(1/4), 120(3/4), 89(4), and 42(1).

[5] For the history of biosemiotics, see Favareau (2009).

Some natural scientists have expressed concerns that biosemiotics introduces teleology or metaphysics into biology insofar as biosemiotics speaks to the inherent meaning-making or sense-making capacity of living systems.[6] But biosemiotics does not introduce metaphysics where there was before none; instead, biosemiotics aims to articulate *explicitly* the metaphysical assumptions already *implicitly* extant in a scientific discipline that, to a large extent, continues to refuse to acknowledge that it possesses such implicitly semiotic foundations in the first place. It is in this understanding that this thesis justifies its recourse to Kantian metaphysics, on which Uexküll endeavored to ground the science of biology and on top of which biosemiotics builds its inquiry into the species-specific phenomenal worlds of animals (*Umwelten*).

This thesis is structured as follows: In Chapter 1, I first elucidate the roles which the faculties of sensibility and understanding play in Kant's critical philosophy and reconstruct Uexküll's close reading of Kant's Transcendental Aesthetic, placing particular emphasis on the means whereby non-human animals are argued to possess species-specific non-empirical intuitions of space and time. This chapter concludes with two sections dedicated to two of the most central concepts of Uexküllian biology, the species-specific phenomenal world (*Umwelt*) and the functional building or body plan (*Bauplan)*. In Chapter 2, I focus on the unity/ continuity of the processes of perception and action in the functional cycle. As with the previous chapter, I begin with an account of Kant's theory of sense perception before turning to Uexküll's writings. Crucial for understanding perception as a semiotic phenomenon is the inner world, a neglected part of the functional cycle. In Chapter 3, I turn to the analysis of the concept of purposiveness (*Zweckmäßigkeit*) and conformity to a plan (*Planmäßigkeit*) in Kant and Uexküll, respectively. I first set forth Kant's account of judging organisms as natural ends/purposes from the Critique of the Teleological Power of Judgment in his *Critique of the Power of Judgment* (1790). Then, I turn to Uexküll's concept of the *Planmäßigkeit,* which entails an identical understanding of living beings as natural ends/purposes but, more enigmatically, entails a relation of purposiveness between the *Umwelt* and the environment/

[6] Several researchers in the philosophy of mind have been promoting an acknowledgment of semiosis as a tenet of autopoietic enactivist theory under the term 'sense-making': "Organisms do not passively receive information from their environments, which they then translate into internal representations whose significant value is to be added later. […] They actively participate in the generation of meaning in what matters to them; they enact a world" (De Jaeger & Di Paolo 2007: 488).

surrounding world (*Umgebung*) of an organism. Finally, I conclude this chapter by discussing the role of purposiveness and teleology in contemporary biology and biosemiotics. I close the thesis with a reiteration of the thesis statement and thesis' central premises and briefly recount how the argument's conclusions follow from such premises.

## Chapter 1. Sensibility and Subjectivity

This chapter compares and contrasts the role of the faculty of sensibility in the respective works of Immanuel Kant and Jakob von Uexküll. The chapter is structured as follows: In Section 1.1., I describe Immanuel Kant's two faculties of human cognition: sensibility and understanding. This is a necessary undertaking for two reasons: firstly, the differentiation of the faculty of sensibility from the faculty of understanding and the description of their functions and purposes in relation to one another is the distinction on which my central argument rests. Secondly, insofar as Uexküll was heavily influenced by Kant, he adopted much of the metaphysical terminology coined by him in his *Critique of Pure Reason* for use in his own *Theoretical Biology* (1920, 1928).[7] For conceptual clarity, I employ such Kantian terminology in the discussions of both authors. However, a difficulty accompanies this decision insofar as terms with a highly specific Kantian meaning, such as 'cognition,' 'intuition,' and 'representation,' often have different meanings in colloquial language. The first section attempts to resolve this by explicating Kant's general conceptual apparatus to make employing such terminology throughout the thesis feasible. Should conceptual confusion arise in the reader, they may return to this section to gain closer acquaintance with Kant's metaphysical architecture. In section 1.2., I focus on the first two chapters of Uexküll's theoretical biology, which constitute the biologist's unique reading of Kant's Transcendental Aesthetic. In section 1.3., I describe Uexküll's concept of *Umwelt*, the concept for which he is most well known, in relation to the Kantian notions of appearances and phenomena. In section 1.4., I elaborate on what Uexküll means by the building/body plan (*Bauplan*) of organisms, the role played by the scientific observer, and the distinction between the biological and physiological worldviews or models. This last point will become highly relevant in the third chapter when discussing purposiveness and *Planmäßigkeit*. To conclude the chapter, I briefly demonstrate how contemporary biosemiotics benefits from understanding experience in Uexküllian rather than in Kantian terms.

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[7] The first and second editions of *Theoretical Biology* differ; all references in this thesis are to the second edition, published in 1928, which I take as the definitive or standard edition.

## Section 1.1. On the faculties of sensibility and understanding in Kant

Jakob von Uexküll's citations of Kant's *Critique of Pure Reason* (1787; henceforth *CPR*) belong overwhelmingly to the first part of the transcendental doctrine of elements, entitled the Transcendental Aesthetic. The Transcendental Aesthetic, concerned with the elaboration of "all principles of *a priori* sensibility" (*CPR* A21/B35), is the cornerstone of the first critique, and it is upon these principles which Kant endeavored to determine the possibility and scope of metaphysics in general. It is precisely the division of the Transcendental Aesthetic into two sections, entitled 'On Space' and 'On Time,' which motivated Uexküll to begin his *Theoretical Biology* (1928) with two similarly titled chapters. The introduction, first, and second chapters of *Theoretical Biology* entail the bulk of Uexküll's physiological reading of the Transcendental Aesthetic, which aimed to assert the transcendental subjectivity of all living beings given their endowment with a faculty of sensibility. The conceptual framework developed in the course of the Transcendental Aesthetic (§§ 1–8) and its subsequent reformulation in light of contemporaneous empirical physiological research, which Uexküll conducted in these initial chapters of the *Theoretical Biology*, constitutes the focus of this section.

In the introduction to his *Theoretical Biology* (1928), Uexküll summarizes in a few sentences his vision for the science of biology: "The task of biology is to expand the results of Kant's research in two directions: 1. To take into account the role of our body, in particular our sense organs and our central nervous system, and 2. To explore the relationships of other subjects (i.e., of animals) to objects"[8] (Uexküll 1928: 3). Kant's influence on the biologist was perceptible from at least as early as 1902, when, in a relatively short piece entitled *Im Kampf um die Tierseele*, Uexküll first asserted that it would be in the best interests of biologists to "place ourselves unreservedly and from the outset on the ground of transcendental idealism"[9]

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[8] "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 Beziehung anderer Subjekte (der Tiere) zu den Gegenständen zu erforschen" (Uexküll 1928: 3).

[9] "Um alle Unklarheit zu vermeiden, tun wir am besten, uns von Anfang an ohne Reserve auf den Boden des transzendentalen Idealismus zu stellen, und uns dann zum Schluss die Frage vorzulegen: Was leistet die Lehre Kants für unser Problem?" (Uexküll 1902: 6).

(Uexküll 1902: 6). Unconvinced that the reductionist and mechanistic physiology which had "learned to view living beings as physico-chemical machines"[10] (Uexküll 1928: 1) was sufficient to explain how non-human animals endow their world with significance through experience, Uexküll endeavored to articulate a distinctly Kantian notion of sensibility, which would entail the empirical reality, but transcendental ideality of space and time. The Kantian paradigm was fruitful for Uexküll because it allowed for the continued refinement of empirical research in physiology and biology while accommodating species-specific phenomenal experience. In both Kant and Uexküll's view, space and time are the pure (non-empirical) forms of outer intuitions. For Uexküll, however, the manner in which these intuitions are endowed with their material or content depends upon the species-specific constitution of the *Umwelt* of the organism in question. With this, I turn to an explication of Kant's Transcendental Aesthetic.

The first division of the *Critique of Pure Reason*, entitled the Transcendental Doctrine of Elements, concerns itself with an inventory of all the faculties of the mind (*Gemüt*) and is subsequently divided into the Transcendental Aesthetic, which concerns the *a priori* forms of the faculty of sensibility and the Transcendental Logic, which concerns the *a priori* forms of the faculty of the understanding. At the outset of the Transcendental Aesthetic, Kant asserts that "there are two stems of human cognition, […], namely sensibility and understanding, through the first of which objects are given to us, but through the second of which they are thought" (*CPR* A15/B29). Both faculties will be discussed within the course of this chapter. Ultimately, both Kant and Uexküll believe that humans possess a faculty of understanding. For Kant, humans are the only living beings that possess such a faculty; whether non-human animals possess understanding, in Uexküll's view, is never addressed, but Uexküll's silence on this question is understandable. This is because, *according to Uexküll, the understanding is not needed for experience*.

Kant defines sensibility (*Sinnlichkeit*) as "the capacity (receptivity) to acquire representations through the way in which we are affected by objects" (*CPR* A19/B33). Representations (*Vorstellungen*) are the product of any mental activity that puts something

[10] "So kam es, daß man die Lebewesen als physikalisch-chemische Maschinen zu betrachten lernte" (Uexküll 1928: 1).

before the mind. Representations are moreover shown to be, on the one hand, either conscious or unconscious and, on the other hand, either subjective or objective. Unconscious mental representations are "not well understood" (Leland 2018: 257) and, as such, are beyond the scope of this thesis. Subjective mental representations[11] "do not purport to refer to objects" and are, therefore, "mere modifications of the subject and do not allow us to cognize objects" (Jauernig 2021: 372). The most commonly noted subjective mental representations are feelings such as pleasure and displeasure; they are "internal or immanent to consciousness — i.e., contained in what Kant calls 'inner sense' — and lack fully determinate form or structure" (Hanna 2021: 389). Objective mental representations, more commonly referred to as cognitions[12] (*Erkenntnisse*), in contrast, "are determinate ways of referring the mind to any sort of objects" (Ibid). Unlike their subjective counterparts, objective mental representations are structured in determinate ways: "Every conscious objective mental representation has both (i) a 'form' (*Form*) and (ii) a 'matter' (*Materie*) or 'content' (*Inhalt*)" (Ibid). "The form of an objective mental representation is its *intrinsic structure*" (Ibid; emphasis original). The content of an objective mental representation lies indeterminate until it is 'filled out,' so to speak, by some "qualitative sensory content" (Ibid). There are several species of objective mental representations (cognitions), only two of which are of importance for the purposes pursued in this thesis: intuitions (*Anschauungen*) and concepts (*Begriffe*) (Ibid).

Intuitions are objective mental representations (cognitions) that arise from the faculty of sensibility and relate immediately to their object. It should be noted that the quality of immediacy characteristic of intuitions should *not* be conflated with immediate access; rather, the immediacy of intuitions should be read as 'without the intervention of the faculty of understanding.' I will return to this point later when discussing the faculty of the understanding proper. On the relation between sensibility and intuitions, Kant writes: "Objects are therefore given to us by means of sensibility, and it [sensibility] alone afford us intuitions" (*CPR* A19/B33). Kant's idiosyncratic syntax here is deliberate — sensibility is the

[11] Because I have limited the scope of this thesis to only conscious representations, I omit this modifier for the sake of brevity. Strictly, speaking, however, wherever 'subjective mental representations' is written, one could have written 'conscious subjective mental representations' and, likewise, wherever 'objective mental representations' is written, one could have written 'conscious objective mental representations.'

[12] All cognitions are representations, but not all representations are cognitions; cognitions are a species of representation.

faculty whereby objects "are given to us." Sensibility is essentially a passive faculty; it is not under our control and is, therefore, sometimes referred to as "the lower […] faculty" (*Anth* 7: 140).

Intuitions may be either pure (non-empirical) or empirical. Pure intuitions are those in which "nothing is to be encountered that belongs to sensation" (*CPR* A20/B34). According to Kant, pure intuitions may have one of two forms: spatial (in accordance with the outer sense) or temporal (in accordance with the inner sense). It should be noted that insofar as every outer intuition also occurs within time, temporal intuitions necessarily accompany all spatial intuitions; the converse, however, does not hold. Indeed, it is entirely possible to have intuitions with temporal but no spatial form. Empirical intuitions involve sensation and are, therefore, *a posteriori*. All empirical intuitions have an "intrinsic spatial and temporal form or structure" (Hanna 2021: 390). Uexküll was a believer in the category *a priori*, in contrast to many contemporary biologists, and the first two chapters of *Theoretical Biology* reflect this belief; like the Transcendental Aesthetic, they concern merely the *a priori* forms of intuition, namely, space and time. Space and time will be the subject of the two proceeding subsections, but first, it is necessary to briefly contrast the faculty of sensibility to the faculty of the understanding. This involves introducing the notion of concepts.

Concepts (*Begriffe*), in contrast to intuitions, result from the faculty of understanding (*Verstand*) and relate mediately to objects. To be clear, neither the faculty of sensibility nor the faculty of understanding *alone* affords us (human beings) any experience or cognition of objects whatsoever. Cognition, and thus experience, is only possible, in Kant's view, in instances where intuitions are united with concepts. This is reflected most explicitly in Kant's statement, "The understanding is not capable of intuiting anything, and the senses are not capable of thinking anything. Only from their unification can cognition arise" (*CPR* A51/ B75–76). Cognition of objects is only achieved by the cooperation of sensibility, the passive element of the mind with its receptivity to sensations, and the understanding, the active element of the mind with its spontaneous ability to bring intuitions under a concept. Sensibility, considered alone, gives us only disorganized and disparate sensations/appearances devoid of any rule or relational architecture that would allow them to be cognized. The understanding, considered alone, gives us only that which sensibility lacked, namely the

relational architecture between intuitions. This is the meaning behind Kant's oft-quoted statement: "Without sensibility no object would be given to us, and without understanding none would be thought. Thoughts without content are empty, intuitions without concepts are blind" (*CPR* A51/B75).

Another source crucial for comprehending the distinction between the faculty of sensibility and the faculty of understanding is Kant's *Anthropology from a Pragmatic Point of View* (1798; henceforth, *Anth*). The primary task of the *Anthropology* was "to know the human being according to his species as an earthly being endowed with reason" (*Anth* 7: 119). The pragmatic point of view referenced in the title implies that the investigation is not concerned with what "nature makes of the human being" but rather what the human being "as a free-acting being makes of himself, or can and should make of himself" (Ibid). As such, the *Anthropology* contains Kant's most explicit thoughts on what distinguishes the human animal from the non-human animal. Perhaps unsurprisingly, in light of his metaphysical architecture discussed above, Kant asserted that humans are the only living beings that are self-conscious through their endowment with a faculty of understanding; it is the exercise of this faculty in reason, humanity's unique possession, that they raise themselves "infinitely above all other living beings on earth" (*Anth* 7: 127). Of particular importance for the purposes of this thesis is §§ 7–11, which discuss sensibility in relation to the understanding and mount a 'defense' of sensibility against common misconceptions regarding their activity. In §8, for instance, Kant writes that the origin of all criticism of the faculty of sensibility lies in its "passive element"; however, "without sensibility there would be no material that could be processed for the use of legislative understanding" (*Anth* 7: 144). In §9, Kant asserts, "The senses do not confuse" (Ibid). This is because "Sense perceptions (empirical representations accompanied by consciousness) can only be called inner *appearances*. The understanding, which comes in and connects appearances under a rule of thought (brings *order* into the manifold), first makes empirical cognition out of them; that is, *experience*" (Ibid; emphasis original). Likewise, In §11, Kant asserts that "The senses do not deceive" (*Anth* 7: 146), "not because they always judge correctly, but rather because they do not judge at all. Error is thus a burden only to the understanding" (Ibid). §10 may be seen as a generalized conclusion of the entire section of the *Anthropology* on the senses: "The senses do not have command over understanding" (*Anth* 7:

145). This is because, in their passivity, in their complete ambivalence, or rather their strict independence to the will, they [the senses] "offer themselves to understanding merely in order to be at its disposal" (*Anth* 7: 145). This bears repeating because some scholars, such as Esposito (2020), have claimed that what drew Uexküll to Kant's *Critique of Pure Reason* was Kant's rejection of the view of organisms as merely passive subjects in favor of the "glorious spontaneity of the transcendental subject" (Esposito 2020: 37). But, as has been demonstrated, if Uexküll was searching for the spontaneity or active faculty in Kant, then he would have found it in the understanding, not in sensibility. Uexküll would have, and indeed did, notice that Kant reserves the spontaneity of the understanding for the human animal. If Uexküll were looking for a means to ground the subjectivity of non-human animals, he would not have found such a thing in Kant's *Critique of Pure Reason*. This is the reason why I assert that Uexküll departs from Kant here. For Uexküll, sensibility alone, which encompasses perception and action, both passivity and spontaneity, is sufficient to afford animals cognitions of the world, which can only ever be a subjective phenomenon.

## Section 1.2. Jakob von Uexküll's reading of Kant's Transcendental Aesthetic

This section is tasked with elucidating Jakob von Uexküll's interpretation of Kant's Transcendental Aesthetic. In accordance with the first two chapters of *Theoretical Biology*, I explicate Uexküll's views on space and time in subsections 1.2.1. and 1.2.2., respectively.

### Subsection 1.2.1. On space (*Raum*)

This subsection is devoted to understanding precisely how Uexküll interpreted Kant's transcendental and metaphysical expositions of space (*Raum*) in his *Theoretical Biology* (1928). At the end of this subsection, it should be clear how both Kant and Uexküll conceptualize space and to what extent the latter's conception departs from the former.

The first chapter of Uexküll's *Theoretical Biology* (1928) begins with a direct quotation of the *Critique of Pure Reason*: "Space is nothing other than merely the form of all appearances of outer sense, i.e., the subjective condition of sensibility, under which alone

outer intuition is possible for us" (*CPR* A26/B42). In the Kantian conceptual terminology formulated in the previous section, space is the pure (non-empirical) form of our (human) outer intuitions. Space is the condition of the very possibility of any outer, that is, objective, intuitions whatsoever. Kant states alternatively, but still in accordance with the definition provided above, that "Space is a necessary representation, *a priori*, that is the ground of all outer intuitions. […] It is therefore to be regarded as the condition of the possibility of appearances" (*CPR* A24/B38–39). According to Uexküll, contemporary biology may adapt this purely philosophical assertion into one which is relevant to its own purposes, where those purposes are conceived in the manner explicated by Uexküll: "Space owes its existence to the inner organization of the human subject, which clothes the sensory qualities in spatial form"[13] (Uexküll 1928: 4). Uexküll undoubtedly did away with much of the Kantian terminology, but the essential components remain: Space is not something which exists independently of our faculty of sensibility; this faculty, moreover, is a direct result of the inner organization of our individual (both the transcendental constitution of our subject and the physiological aspects of our body). The blindness to meaning (*Bedeutungsblindheit*), which Uexküll finds characteristic of mechanistic biology, may be remedied by understanding other living beings as transcendental subjects constituted in a similar manner to our own. This line of thinking might be called something like 'subjectivity by analogy,' and its roots, as will be explicated in Chapter 3, reside not in the *CPR* but rather in the *Critique of the Power of Judgment*. As transcendental subjects, every living being each possesses a unique relationship to space and time, which is, strictly speaking, a part of them and not a part of the world. Indeed, Uexküll is in many ways more idealistic than Kant insofar as the former holds that there is no single objective reality behind the world of appearances. In other terms, there is no noumenal world that underlies the phenomenal world to which all appearances are related; for Uexküll, all living beings must make do with only appearances. Humans are unique insofar as they can utilize language in order to form an intersubjective reality, but this reality still is no more metaphysically real than the phenomenal experiences of the individuals who comprise it.

[13] "Der Raum verdankt sein Dasein der inneren Organisation des Subjekts Mensch, welche die Sinnesqualitäten in räumliche Form kleidet" (Uexküll 1928: 4).

For Kant, space, as an a priori intuition, "is essentially single," whereas, for Uexküll, space was not such that all senses of space could be reduced to "one and the same unique space" (*CPR* A25/B39), as Kant had written. Uexküll seems to depart from Kant here as well; for example, he writes, "But this spatial form is not the same for the different sensory areas, and therefore each sensory area requires separate consideration"[14] (Uexküll 1928: 4). How precisely each sensory domain can have its own unique form of space remains unclear and the argument for it underdeveloped. This fact notwithstanding, it is in the chapter on space that Uexküll attests to the existence of a "qualitative conformity to plan (*Planmäßigkeit*) in our mind (*Gemüt*),"[15] which he equates with the Kantian "transcendental form of our cognition" (Ibid: 5–6). As stated earlier, the role of *Planmäßigkeit* is central to understanding Uexküll's biological work, and it is for this reason that it takes the place of a capstone in this thesis in the final chapter on action and purposiveness. In this instance, one may state that the relationship which Uexküll defines as 'conformity with plan' might be described as the *conformity which objects have to our faculty of sensibility*. Likewise, the phenomena encountered by non-human animals accord with their faculty of sensibility and, as will be seen, with their holistic physiological constitution — which we, as observers of animals, cognize as the *Bauplan* of organisms. In the preface to the second edition of the *Critique of Pure Reason*, Kant inaugurates his Copernican revolution with a familiar thought: "Up to now it has been assumed that all our cognition must conform to the objects" and he asserts that perhaps metaphysics would be better off to "assume that the objects must conform to our cognition" (*CPR*: Bxiii). It is this perfect conformity, namely the fact that the objects of experience given to us by our own faculty of sensibility appear to us in such a way that *they simply could not be otherwise,* which one sense of the term *Planmäßigkeit* tries to capture. The perfect unity of what is sensible in objects and what senses one possesses to sense the qualities of those objects could never, Uexküll argues, be a matter of mere natural fact or contingency (*Zufälligkeit*) but rather must be a consequence of the transcendental constitution of all living beings. In the concluding subsection of the chapter dedicated to space, entitled

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[14] "Diese räumliche Form ist aber für die verschiedenen Sinnesgebiete nicht die gleiche und bedarf daher für jedes Sinnesgebiet einer gesonderten Betrachtung" (Uexküll 1928: 4).

[15] "[…] eine in unserem Gemüt vorhandene 'qualitative Planmäßigkeit.' Sie ist, um mit Kant zu reden, eine 'transzendentale Form' unserer Erkenntnis, […]" (Uexküll 1928: 4–5).

‘Space as Law,’ Uexküll reiterates his Kantian commitments and articulates the means whereby they differ from Kant’s. He writes with repeated urgency that “we may say that space, as a general form of intuition[16], exists before all experience and that its lawfulness […] is completely *a priori*”[17] (Uexküll 1928: 23). Moreover, “[…] space is not a representation. It is an essential component of our organization and as such a real natural law of both subjective and objective validity”[18] (Ibid). The claim to objective validity here may seem strange, given that for Uexküll a single objective reality does not exist. However, the full quotation explains the context; by ‘objective,’ Uexküll means to say that ‘space is not a representation’ but rather an integral and constitutive natural law of the physiological structure of organisms.

### Subsection 1.2.2. On time (*Zeit*)

For Kant, time is the pure form of inner intuitions *a priori*. However, since every outer intuition takes place in time — that is, it is formulated in some relation to our inner sense — time is discovered to be the pure form of both inner *and outer* intuitions *a priori*. Uexküll expounded on the work of Kant by asserting “that there are forms for all kinds of qualities, which are present wholly *a priori* and before all experience, and which affords every quality with a firm place in the relational system [of temporal appearances] as soon as it appears”[19] (Uexküll 1928: 71). Of particular interest to Uexküll was Karl Ernst von Baer’s investigations into the perception of time in different organisms. Uexküll wrote, “We owe the discovery of a species-specific material for time to K. E. von Baer, who based his brilliant explanations on the subjective character of time on the moment as the specifically temporal quality”[20]

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[16] Strictly speaking, this should read: ‘outer intuition.’

[17] “[…] dürfen wir sagen, daß der Raum als allgemeine Anschauungsform aller Erfahrung vor aller Erfahrung vorhanden ist, und daß seine Gesetzmäßigkeit, die wir nur durch innere Erfahrung unserer eigenen Bewegungen erforschen, völlig *a priori* dastehen” (Uexküll 1928: 23).

[18] “[…] der Raum selbst is keine Vorstellung. Er ist ein wesentlicher Bestandteil unserer Organisation und als solcher ein wirkliches Naturgesetz von subjektiver wie objektiver Gültigkeit” (Uexküll 1928: 23).

[19] “Wir müssen daher in diesem Punkte die Lehre Kants erweisen und feststellen, daß es Formen für alle Arten von Qualitäten gibt, die gänzlich *a priori* vorhanden sind und aller Erfahrungen vorausgehen, und die jeder Qualität, sobald sie auftritt, ihren festen Platz innerhalb eines Systems anweisen”

[20] “Die Entdeckung eines spezifischen Materials für die Zeit verdanken wir K. E. von Baer, der den Moment als die spezifisch zeitliche Qualität seinen glänzenden Ausführungen über den subjektiven Charakter der Zeit zugrunde legte” (Uexküll 1928: 44).

(Uexküll 1928: 44). In accordance with von Baer's findings, Uexküll asserted that each organism has its own unique *Moment*, the duration of which is determined as the shortest time period in which no movement is perceptible. Life is not measured by some external objective standard but in the number of "moments lived-through"[21] (Uexküll 1928: 50). In Uexküll's view, "the theory of relativity has caused this theory [that is, the theory of a single objective time] to falter badly"[22] (Ibid: 51). The existence of objectively valid natural laws was the cause of disagreement between Uexküll and the preeminent German physiologist Hermann von Helmholtz, who himself developed a primitive sign theory of perception: "What Helmholtz demands of us is the belief in the existence of eternal, natural laws independent of us [of our faculty of sensibility]" (Uexküll 1928: 2). Instead of these eternal and independent laws, Uexküll argued for the existence of subjective time plans. Riin Magnus has written the most detailed account of this concept: "The technical phase [of the organism] presupposes a linear, irreversible flow of time with the full-formed organism as its endpoint. The mechanical [dynamic] 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" (Magnus 2011: 42). Crucial for the aims of this thesis, Magnus remarks that '[t]ime-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" (Ibid: 39). This gives significant support for the thesis I put forward above, namely, that *Planmäßigkeit* is at least descriptive of the conformity, perfect fitting (*Einpassung*; cf. Kull 2004; Kull 2020), or functional unity of the possible objects of experience with the cognitive faculties (of whatever living being). Magnus goes on to suggest that Uexküllian *Planmäßigkeit* "might be put into modern terms, by replacing the term *Planmäßigkeit* with self-organization 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" (Magnus 2011: 39). This is certainly a step in the right direction.

[21] "[…] durchgelebte Momente […]" (Uexküll 1928: 50).

[22] "Die Relativitätstheorie hat bekanntlich diese Lehre arg ins Schwanken gebracht" (Uexküll 1928: 51).

## Section 1.4. On the species-specific phenomenal world (*Umwelt*)

Jakob von Uexküll's most enduring contribution to physiology, philosophy, and biosemiotics is undoubtedly encompassed in his concept of *Umwelt*, as a species-specific phenomenal world. Much has been written about *Umwelten*, one of the most thorough accounts being Pobojewska (1993). This is in no small part due to the in-depth treatment which Pobojewska gives to Uexküll's departure from Kant. In a passage worth quoting at length, she details the scope of Uexküll *Umwelt* analysis:

> "First: According to him [Uexküll], all living beings are subjects. They react not merely like machines, but rather, they also follow their autonomous plan. Second: The inner psychic life of animals remains closed to us. We cannot say anything about the sensory qualities [they experience] using objective scientific methods. […] The *Umwelt* theory does not inquire about the experiences of animals; it is not interested in them […]. It is concerned with the sensually perceptible effects of the outer world on the body of the animal and with their [the animal's] equally sensually perceptible counter-effects on the outer world"[23] (Pobojewska 1993: 59).

In Kantian terms, the Uexküllian *Umwelt* theory endeavors not to go beyond the limits determined by Kant in the *CPR*. While it is undoubtedly more complex than this, one may state succinctly that Kant held that whatever lies beyond the bounds of all possible experience is something that is unknowable to us. To make assertions about the phenomena which other living beings experience, what it *feels like to be them*, is pure speculation — it has no basis in scientific thinking.

Unsurprisingly, in his *Anthropology*, Kant had already begun to formulate something quite similar to Uexküll's *Umwelt* concept: "For what kind of sensible intuition there will be depends not merely on the constitution of the object of the representation, but also on the constitution of the subject and its receptivity, after which thinking (the concept of the object) follows" (*Anth* 7: 141). It is unknown whether Uexküll was acquainted with or ever read Kant's *Anthropology*; regardless of this fact, what is undeniable is that Uexküll converged on his *Umweltlehre* by considering the notion that phenomenal experience depends upon sensibility and a transcendental constituted subjectivity (Brentari 2018).

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[23] "Erstens: Alle Lebewesen sind nach ihm Subjekte. Sie reagieren nicht nur wie Maschinen, sondern sie folgen auch ihrem autonomen Plan. Zweitens: Das Seelenleben der Tiere bleibt uns verschlossen. Wir können mit Hilfe objektiver wissenschaftlicher Methoden nichts über ihre Empfindungsqualitäten aussagen. […] Die Umweltlehre fragt nicht nach den Erlebnissen der Tiere, sie interessiert sich nicht dafür, […]. Sie befaßt sich also mit den sinnlich wahrnehmbaren Einwirkungen der Außenwelt auf den Körper der Tiere und mit ihren genauso sinnlich wahrnehmbaren Gegenwirkungen auf die Außenwelt" (Pobojewska 1993: 59).

Since its introduction into biosemiotic discourse, Uexküll's *Umwelt* concept has undergone reformulation in explicitly semiotic terminology. Paul Cobley, in his introduction to *The Routledge Companion to Semiotics*, explains Jakob von Uexküll's concept of *Umwelt* in the following manner: "[…] all species live in a 'world' that is constructed out of their own signs, the latter being the result of their own sign-making and receiving capacities" (Cobley 2009: 4). This is by no means an uncharitable rendering; indeed, Uexküll contended very strongly, particularly in his later works such as *The Theory of Meaning* (*Bedeutungslehre*; 1956 [1940]), that any object which enters into an organism's world must necessarily have been the product of interpretations (semioses).

## Section 1.4. On the functional building/body plan (*Bauplan*)

To answer the question, posed above, how living beings react to the stimuli which they are passively subject to via their faculty of sensibility, it is necessary to articulate a distinction between living and non-living, yet nonetheless organized beings. The abiotic organized being par excellence is, of course, the machine. Indeed, much of Uexküll's work was devoted to articulating the relation of the organism to the machine. The answer he would give was quite idiosyncratic and set him apart from both the mechanists and the vitalists, who waged a battle for supremacy in the first decades of the twentieth century. According to Uexküll, "Without doing violence to either concept, one can address machines as imperfect organisms, because all the basic properties of the machine are reflected in organisms"[24] (Uexküll 1921: 9). He continues: "On the other hand, it is impossible to simply call organisms machines" (Ibid). Where organisms depart from machines is in their possession of what Uexküll calls 'super-mechanical properties' (*übermaschinelle Eigenschaften*). Uexküll identifies two stages of the organism's life in which super-mechanical properties are manifest: development of form (*Formbildung*) and regeneration (*Regeneration*). Contemporary biology understands these two phenomena under a single term: morphogenesis, which also includes regular homeostatic cellular and tissue maintenance in the mature organism. Uexküll was undoubtedly influenced

[24] "Man wird, ohne beiden Begriffen Gewalt anzutun, die Maschinen als unvollkommene Organismen ansprechen können, weil alle prinzipiellen Eigenschaften der Maschine sich bei den Organismen wiederfinden. Dagegen ist es unmöglich, die Organismen ohne weiteres als Maschinen zu bezeichnen" (Uexküll 1921: 9).

on this issue not only by Wilhelm Roux and Hans Driesch's experiments on blastulae, but also by Karl Ernst von Baer's writings on developmental morphology and comparative embryology (Brentari 2015). Beyond these super-mechanical properties, however, Uexküll issues a provocative statement that will place him awkwardly in the middle of the mechanist-vitalist debate: "Mature organisms, with their fully developed tissues, exhibit no super-mechanical properties. On one point of principle there is certainly agreement between machines and organisms"[25] (Uexküll 1921: 9). Both machines and organisms share another crucial feature: “Both consist of individual parts that combine to form a whole. In both cases [in machines and organisms], the union of the parts to form a whole is not merely formal, but functional; that is, the achievements of the individual parts of a machine or an organism combine to form the overall achievement of the whole”[26] (Ibid). The way we represent this functional whole to our human faculty of understanding presented another problem to Uexküll; here, he introduced the term *Bauplan*.

The functional building or body plans of organisms (*Baupläne*) are conceptual schemata that we (humans), as scientific observers of nature, formulate in order to make sense of the spatial and temporal structure and functional unity of organisms as they appear in our species-specific phenomenal world (our *Umwelt*). It is a common misconception that the *Bauplan* is something that the organism itself possesses or something that exerts a causal influence on the organism. It is important to recognize this fact, and Uexküll explicitly warns against this interpretation:

> “Only when one holds firmly to this meaning of the word *Bauplan*, will he [the biologist] safeguard himself against errors that necessarily arise as soon as he concedes to the *Bauplan* some influence on the course of events in the organism or in the machine” (Uexküll 1921: 10).

As a conceptual apparatus belonging to the exercise of our human faculty of understanding, the *Bauplan* may be thought of as a general model applicable to both machines and organisms. Uexküll writes that, through the functional building/body plan, we can

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[25] “Demgegenüber zeigen die erwachsenen Organismen in all ihren ausgebildeten Geweben keine übermaschinellen Fähigkeiten. In einem prinzipiellen Punkt ist auch sicher eine Übereinstimmung zwischen den Maschinen und Organismen vorhanden” (Uexküll 1921: 9).

[26] “Beide bestehen aus einzelnen Teilen, die sich zu einem Ganzen zusammenfügen. Die Vereinigung der Teile zum Ganzen ist in beiden Fällen keine bloß formale, sondern eine funktionelle, d. h. die Leistungen der einzelnen Glieder einer Maschine oder eines Organismus vereinigen sich zur Gesamtleistung des Ganzen” (Uexküll 1921: 9).

"conceptualize the coordination of parts in a spatial schema"; moreover, "[e]very building plan is in this sense nothing other than a blueprint which we draft/conceptualize (*entwerfen*) after we have won closer acquaintance with an organism or a machine" (Uexküll 1921). Again, as a conceptual schema, the *Bauplan* itself is causally inert; no living being 'possesses' a *Bauplan* in the sense that it possesses some natural property. The utility of the *Bauplan* consists in showing us in which form the processes inside of the object under inquiry proceed in space and time. In the second edition of *Umwelt and Innenwelt of Animals* (1921), the *Bauplan* merely represented the spatial aspects of the model, whereas the temporal aspects were encompassed in something called the formation rule (*Bildungsregel*). By 1928, in the second edition of the *Theoretical Biology*, Uexküll seems to have augmented his understanding to include both aspects within the *Bauplan*, as evinced by the following quote: "By a *Bauplan*, one understands two things, firstly the spatially given ordering of parts into a whole […]. Secondly, one understands by *Bauplan* the operational plan of a machine and the functional plan of a living being,"[27] which is understood to include the temporal aspects of perception and action (Uexküll 1928: 105). Equally as crucial to clear up is the misconception that Uexküll identifies the *Bauplan* as the aforementioned immaterial, in-itself unknowable natural factor (*Naturfaktor*). Italian philosopher and biosemiotician Carlo Brentari recognized this ambiguity and likewise concluded that "Uexküll maintains that the building-plan does not coincide with the immaterial formative force which, in a typically vitalistic manner, guides the formation of the organism" (Brentari 2015: 77). What this natural factor (*Naturfaktor*) precisely entails remains an open question; however, it is safe to say that the *Bauplan*, insofar as it cannot represent the unknowable, is unconcerned with the activity of the natural factor.

[27] "Unter einem Bauplan versteht man zweierlei, einmal die räumlich gegebene Anordnung der Teile in einem Ganzen, […]. Zweitens versteht man unter Bauplan den Betriebsplan einer Maschine und den Funktionsplan eines Lebewesens" (Uexküll 1928: 105).

## Chapter 2. Perception and Action

The previous chapter was concerned with the elaboration of the form of animals — (i) their faculties of sensibility (receptivity) and activity (spontaneity), (ii) their pure (non-empirical) a priori intuitions of space and time, (iii) their species-specific phenomenal worlds (*Umwelten*), and (iv) their functional body plans (*Baupläne*). This chapter is concerned with how animals endow the form of their intuitions with the matter (*Materie*)/content (*Inhalt*) of experience so as to constitute the phenomena that appear in their *Umwelten*. In section 2.1., I elaborate on how Kant understands sense perception, placing particular emphasis on the role the faculty of understanding plays in the process. In section 2.2., I discuss how Uexküll unites perception and action in the functional cycle (*Funktionskreis*); here, I also discuss the role of the inner-world (*Innenwelt*) of organisms and clear up ambiguities surrounding its place in the functional cycle.

### Section 2.1. On sense perception in Kant

This section is dedicated to articulating how sense perception takes place according to Kant. As with the majority of Kant's writings, humans are the intended target of his theory. However, in a lengthy footnote of the *Anthropology*, Kant speculates about the mental faculties of non-human animals, which, as he believes, are non-cognitive because animals lack the faculty of understanding to bring disparate appearances under a concept:

> "The irrational animal <perhaps> has something similar to what we call representations, […] but which may perhaps be entirely different — but no cognition of things; for this requires *understanding*" (*Anth* 7: 141).

Experience, in Kant's terms, is something quite difficult to obtain, insofar as "Cognition of an object in appearance (that is, as phenomenon) is *experience*" (*Anth* 7: 141; emphasis original). As demonstrated in the previous chapter, Uexküll believed that the faculty of sensibility, understood as *both* the passive capacity to be affected by any sensation whatsoever and the *active* capacity to integrate those sensations, could be extended to all living beings. Likewise, it should be apparent that, although never articulated in explicitly Kantian terminology,

Uexküll's theoretical biology commits him to the existence of an abstract category of directed mental activities roughly analogous to what Kant calls objective mental representations. Uexküll, a physiologist by training, refers only to the particular species of representations — sensations (*Empfindungen*), intuitions (*Anschauungen*), and perceptions (*Wahrnehmungen*). The elaboration of the precise meaning of these terms, according to Kant's usage of them, is a highly contested enterprise within contemporary Kant scholarship; specific sources (in particular Wuerth 2021) have made enormous strides in ameliorating this state of affairs. For purposes pursued in this chapter, it is first and foremost necessary to inquire how perceptions differ from other objective mental representations (i.e., sensations and intuitions) according to Kant. I follow philosopher Corijn van Mazijk (2020) in defining perception as possessing three distinct characteristics. Firstly, perception involves "the representation of receptively given objects"; that is, of objects given to a subject by means of its passive faculty of sensibility (2020: 15). Secondly, perception, like intuition, "cannot of itself make knowledge of objects available, that is to say: perceiving isn't judging" (Ibid). Thirdly and finally, perceptions differ from intuitions insofar as "only the former must come with conscious awareness" (Ibid). Comparing this with the entry on perception in Wuerth (2021)'s edited volume written by Andrew Roche confirms this definition: "Perceptions are a type of representation, a type that Kant tends to depict as sensible […] and conscious" (Roche 2021: 326). Without contradicting Van Mazijk's definition, Roche elaborates: "Where there is perception, there is empirical intuition (*Anschauung*) and sensation (*Empfindung*)" (Ibid). Additional exegetical questions about perception (e.g., whether it is itself a conscious species of intuition) are unnecessary to address here. What is perhaps the most important characteristic of perceptions is Van Mazijk's second and third definitional criteria: neither sensations, nor intuitions, nor perceptions can, on their own, afford us any cognition of objects. Perception is, moreover, a conscious act. Cognition or experience of objects, which for Kant is equated with experience in general or 'knowledge of objects of sense' (*Anth* 7: 128), "does not belong to sensibility, nor to the understanding, but exclusively to their cooperation" (Van Mazijk 2020: 15). What perceptions *alone* afford us is appearances, which according to Kant are "undetermined" (*CPR* A20/B34). The undetermined quality of appearances refers, again, to the fact that they are "undetermined by an effort of the

understanding" (Ibid). Appearances have not yet been subjected to the synthesizing activity of the faculty of the understanding in which objects are formed from out of the manifold of appearances. Van Mazijk elaborates this crucial point in eloquent terms which are worth quoting: "If an act of understanding is in place, an appearance can be put under rules of understanding and thereby cognized — but this is an additional activity which transforms the initially subjective appearance into an object of cognition" (Ibid). This 'additional' activity is that of the faculty of understanding. It is precisely because animals lack the faculty of understanding that, in Kant's view, animals are unable to cognize objects. This point is taken up again later in the *CPR*'s Transcendental Logic (which concerns the faculty of understanding), where it is subjugated to Kant's metaphysical argument for the existence of the pure concepts of the understanding (the categories). Kant elaborates, "The same function that gives unity to the different representations in a judgment also gives unity to the mere synthesis of different representations in an intuition" (*CPR* A79/B104–105). For Kant, "there is in fact something involved in intuition which essentially relies on the understanding" (Van Mazijk 2020: 41). All of this is well and good, but what does this have to do with Uexküll's account of perception — the very subject matter of this chapter?

Uexküll never once speaks of the faculty of understanding, and yet he insists that all animals are capable of perceiving objects (*Gegenstände*). Uexküll's account of perception is the place where Uexküll departs the furthest from Kant. For Uexküll, (i) every perception is accompanied by action; (ii) all animals, not just humans, synthesize the manifold of appearances into objects, and this happens not by means of a distinct faculty of the understanding but by means of the physiological constitution of the organism itself — its physiological organization and its inner-world (*Innenwelt*); (iii) the spontaneous activity of an animal is not due to its possession of a faculty of understanding but is rather included in the faculty of sensibility and the possession of an *Umwelt*. Possessing an *Umwelt*, moreover, entails the existence of a phenomenal present that presents logical incompatibilities which the animal must choose or interpret between. This final quality of perception is what endows Uexküll's writing with a distinctly semiotic quality and which led him to be understood as a pioneer of contemporary biosemiotics.

## Section 2.2. Uniting perception and action: The functional cycle (*Funktionskreis*)

The functional cycle is, first and foremost, a conceptual schema "which represents the relationships of every animal to the world"[28] (Uexküll 1921: 45). It is important to clarify that conceptual schemata, such as the *Bauplan* and the functional cycle are, according to both Kant and Uexküll, representations which arise through the exercise of the human faculty of understanding (*Verstand*), in particular through the logical operations of comparison, reflection, and abstraction[29] (Jäsche 1800: 94). Recall that, for Kant, concepts are a species of representation which relate a subject to an object mediately (*mittelbar*), and that this is in contradistinction to intuitions, which relate a subject to an object immediately[30] (*unmittelbar*). The mediated quality of concepts arises *in part* from the fact that "what concepts present to cognition is merely a 'mark' (*Merkmal*) — a characteristic, feature, or property of an object — "that can be common (*gemein*) to several objects" (Tolley 2021: 115). The concepts of the human faculty of understanding (e.g., hardness and softness) cannot, on their own, afford us cognition of any object whatsoever. "[I]t is only when a concept is 'united' with a corresponding intuition that cognition of the object in question can 'arise' (*CPR* A52/B76)" (Tolley 2021: 118). What may here seem at first glance as a digression from the topic under discussion; namely, the functional cycle, is relevant insofar as the functional cycle is a schema that natural scientists *add* to nature. The functional cycle, again like the *Bauplan*, is a model which serves as a rule in accordance with which we align our empirical observations of the proceedings of living beings. In talking of whether this or that living being 'possesses' a functional cycle, we err — we reify our conceptual schema into something which exists in nature itself, and in so doing, the functional cycle becomes, mistakenly, a property. This is not to say that animal does not *actually* execute perception-action routines. We know this clearly to be true. To be more precise, the question which we may ask is: To what degree, and in what

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[28] "[…] wird es vorteilhaft sein, unseren Betrachtungen ein allgemeines Schema zugrunde zu legen, das die Beziehungen eines jeden Tieres zur Welt darstellt" (Uexküll 1921: 45).

[29] "To make concepts out of representations one must thus be able *to compare*, *to reflect*, and *to abstract*, for these three logical operations of the understanding are the essential and universal conditions for generation of every concept whatsoever" (Jäsche 1800: 94; Emphasis original).

[30] There is debate surrounding in what sense intuitions are immediate; for purposes here, I follow Smit (2000), who has argued that "our intuitions, being sensible, are also objective perceptions that relate to objects through marks" (Smit 2000: 238).

manner, does the functional cycle qua model fit the observed behavior of the animal under analysis? With this clarification complete, I turn now to the analysis of the functional cycle proper.

The functional cycle was inaugurated into Uexküll's biological theory with the publication of the first edition of *Umwelt and Innenwelt of Animals* (1909). The functional cycle is a holistic structure; however, its constituent parts admit to analysis on a conceptual level. Any analysis thereof must, however, simultaneously "keep the whole schema in mind," in order to "never lose the unity that each animal forms with its world"[31] (Uexküll 1921: 45). The functional cycle consists of *Innenwelt* and *Umwelt*, and together these form "A whole built in conformity to plan, in which each part belongs to the other and nothing is left to chance"[32] (Uexküll 1928: 100). Here, Uexküll not only begins to outline a crucial conceptual distinction necessary for an understanding of the functional cycle, but he also explicitly contrasts conformity to plan (*Planmäßigkeit*) to chance or contingency (*Zufälligkeit*). This particular opposition is important for Uexküll's theoretical biology in general and will be explored in greater detail in Chapter 3, which includes a discussion of what it means for *Innenwelt* and *Umwelt* to conform to a plan. What, however, are *Innenwelt* and *Umwelt,* and what is the relation between them?

The functional cycle is centered upon the body of the animal, and it is by means of the activity of this cycle that an animal constitutes a species-specific phenomenal world (*Umwelt*) for itself. The *Umwelt* may be understood as the conditions of possibility for any outer sensible experience whatsoever; one may be tempted to equate it, therefore, with the Kantian faculty of sensibility (receptivity), which furnishes the forms of all possible experience, but this would be an error. Crucially, the *Umwelt* also encompasses the animal's spontaneous ability for action, understood by Uexküll as entailed in the faculty of sensibility. This is evinced by Uexküll's claim that animals are characterized by a "twofold relationship to the things in their *Umwelt*" (Ibid) in accordance with their faculties. On the one hand, this

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[31] "Bewahren wir aber das ganze Schema im Gedächtnis, so wird uns die Einheit, die jedes Tier mit seiner Welt bildet, niemals verloren gehen" (Uexküll 1921: 45).

[32] "Der ganze Funktionskreis, der Innenwelt und Umwelt umschlingt (die wiederum in Wirkwelt und Merkwelt zerfällt), bildet ein planmäßig gebautes Ganzes, indem jeder Teil zum anderen gehört und nichts dem Zufall überlassen bleibt" (Uexküll 1928: 100).

relationship consists of *merken* (perception) and, on the other hand, *wirken* (action). It is for this reason that the *Umwelt* may, in turn, be analytically decomposed into the *Merkwelt* (perceptual-world) and *Wirkwelt* (effectual-world). The perceptual-world of an organism consists of the "sum of the perceptual-cues" (Uexküll 1928: 100). The effectual-world is the the sum of "the effects that the animal exercises on the outer-world" (Ibid).

Working on the Kantian understanding that "[t]he matter of intuition and experience is furnished by sensation as the matter of perception" (Edwards 2021: 290), Uexküll found it necessary to give an empirical account of the means whereby sense qualities are perceived and subsequently synthesized into the objects of phenomenal experience. This account, informed by Uexküll's physiological reading of Kant, held that all intuitions receive their matter from the activity of functional cycles (*Funktionskreise*) — biological structures which (i) form a functional whole; (ii) mediate between the capacity for receptivity and capacity of action of an animal; and (iii) occasion interface between the animal and the outer-world (*Außenwelt*).

What does it mean for the functional cycle to form a whole? The answer lies in the distinction Uexküll makes between the physiological model of the world with the biological model of the world; it is this contrast that has been the cause of much confusion in scholarship on Uexküll. Not least of all because the biological model encompasses the entire domain of the physiological model. What is relevant from this discussion to the conceptual analysis pursued here is that, according to Uexküll, a researcher may adopt one of two frames of reference in researching living beings: the physiological view or the biological view. This distinction is a crucial one for Uexküll's theoretical project in general: A physiological view/ outlook (*Betrachtung*) or handling (*Behandlung*) admits to efficient causality and explanation according to law and chance (*Zufälligkeit*), whereas a biological view admits to both efficient and final causality, and thus purposiveness (*Zweckmäßigkeit*) or conformity with a plan (*Planmäßigkeit*). Uexküll contends that it is the holistic study of organisms, their utilization of meaning-making processes, and their goal-directed behavior that distinguishes biology from physiology.

### Subsection 2.2.1. The inner-world (*Innenwelt*) of animals

The overwhelming majority of studies of the functional cycle have focused on the *Umwelt*, to the neglect of the *Innenwelt*. There is good reason to be skeptical of those accounts which fail to account for this crucial latter aspect of the functional cycle. It is Uexküll's holistic approach and his insistence that "all parts [of the functional cycle] are, in the same sense, equally important, however diverse they may be" and his contention, again, that "one must not lose sight of the interrelationship of this seamless whole when one deals more closely with the individual parts"[33] (Uexküll 1928: 100) which necessitates its inclusion within reconstructions of his position. Nonetheless, that the *Innenwelt* has not received much attention from Uexküll scholars is due in part to the fact that Uexküll himself does not provide an extended treatment of its structure or function. This very fact, however, already indicates something crucial, namely, that the study of the *Innenwelt* falls outside of the domain of what Uexküll envisions as the scope of biology proper. In what follows, I argue for a conception of the *Innenwelt* as a wholly physiological, cybernetic apparatus of reafferent control in the organism.

The inner-world "encompasses the entire structure of the body"[34] (Uexküll 1921: 46). The inner-world functions as a physiological interface between the two constituent parts of the animal's species-specific phenomenal world (*Umwelt*): the perceptual world (*Merkwelt*) and effectual world (*Wirkwelt*). The inner world of the animal may be more precisely defined as the material organization of the animal's body, which (i) perceives stimuli from the outer world (*Außenwelt*), (ii) synthesizes these stimuli into signs of objects (*Gegenstände*)[35], and (iii) acts on the outer world after having interpreted those signs. The inner world is species-specific and varies in direct accordance with the physiology of the organism. An organism's physiology may afford it one or more types of sensory receptors, each of which is delicately

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[33] "Alle Teile in demselben sind gleich wichtig, so verschiedenartig sie sein mögen. Den Zusammenhang dieses lückenlosen Ganzen darf man nicht aus den Augen verlieren, wenn man sich mit den einzelnen Teilen näher befaßt" (Uexküll 1928: 100).

[34] "Die Innenwelt, die das gesamte Körpergefüge umfaßt, stößt auf der einen Seite an die Merkwelt, die ihr durch die Bauart der Rezeptoren zugewiesen ist" (Uexküll 1921: 46).

[35] Uexküll maintains the distinction between objects [*Gegenstände*], as that which is counterposed/constituted to the subject and is thus formed in accordance with its appearances and objects [*Objekte*], noumenal objects inaccessible to cognition.

attuned or fitted to receive a particular stimulus; the diversity of sensory receptors gives rise to the existence of different sensory modalities. Not all stimuli in the outer world are perceived by an animal through its sensory receptors. Indeed, there are numerous 'potential' stimuli for which an animal lacks the appropriate sensory receptors. In cases such as these, the stimuli are never perceived, they never enter into that animal's *Umwelt*, and therefore it is wholly justified to say that these stimuli simply do not exist for that animal. This is so because they lie beyond the domain of the animal's faculty of sensibility, the domain of possibility of their sensible experience. Human eyes, for example, possess several types of sensory receptors attuned to perceive particular wavelengths of light (where light is understood as electromagnetic radiation). The wavelengths of light that the human eye is capable of perceiving are what is collectively known as the visible light spectrum, corresponding roughly to electromagnetic radiation with a wavelength between 380 and 750 nanometers. Infrared light (wavelengths roughly between 750 and 1000 nanometers) is invisible to humans as our *Umwelt* is qualitatively different from that of various species of snakes, for instance, which "possess a unique sensory system for detecting infrared radiation, enabling them to generate a 'thermal image' of predators and prey" (Gracheva et al. 2010: 1006). "The task of the receptors, Uexküll writes, "consists not only in acquiring particular stimuli but also in blocking out all the rest" (Uexküll 1921: 46). All perceived stimuli are then "transformed into the excitation of different nerves, which come together in a nervous perceptual net (*Merknetz*) and thereby yield the unity of the perceptual-cue (*Merkmal*)" (Ibid). The perceptual net incorporates the totality of the stimuli perceived (and therefore, which enter into the *Umwelt*) by the nerve cells of all sensory modalities afforded to an animal by its physiology and produces a singular, unified feature from these disparate sensations. According to Uexküll, among the higher animals, every nervous perceptual net is accompanied by a nervous effectual net, "which coordinates particular muscle groups into a coherent action" (Uexküll 1921: 46).

The concept of Innenwelt was heavily indebted to the work of a number of German physiologists, in particular Johannes P. Müller (1801–1858). Müller was and remains a towering figure in the history of German biological science; his two-volume work entitled *Handbuch der Physiologie des Menschen* (1833; 1840) is widely regarded to have laid the

foundation for that science as it exists today. Uexküll conceived of his research as belonging to the paradigm begun by Müller (Kull 1999). Müller conducted extensive empirical research on the human nervous system and articulated what he called the "law of specific sensory energies" (*Gesetz der spezifischen Sinnesenergien*), a discovery that had far-reaching implications for general physiology, as well as epistemology. Muller laid out the principle in the following manner: "It does not matter what kind of stimuli are to the senses; their effect is always in the energies of the senses"[36] (Müller 1826: 45). By energies, Müller means the modality of sensation such that one and the same stimulus, an electric current, for example, creates different phenomenal experiences according to what sense modality is stimulated. Electric stimulation of the ear is experienced as sound, whereas electric stimulation of the eye is experienced as light, etc. Uexküll called the unique response of each sensory modality to the same stimulus "tones." Individual cells, whose sensory receptors are undifferentiated, possess their own *Ichton* (Uexküll 1931a: 209). In the philosophy of perception, the law concerns the nature of phenomenal experience and its relation to the outer stimuli: "direct objects of sensation are the activities of sensory nerves, *not* qualities external to the body" (Isaac 2019: 1). Müller was, crucially, also of a Kantian metaphysical persuasion, something which was not lost on Uexküll.

Overall, the inner-world, despite its crucial place between the two halves of the *Umwelt*, does not belong to the domain of that science which Uexküll denotes as biological. This is because the inner-world is strictly concerned with the necessary relation between cause and effect; accounts of the inner-world in purely physicochemical terms are sufficient to describe their activity. Nonetheless, this activity is reafferent insofar as the outputs of the physical system are fed back into the inputs of the same system. This accounts for various biological behaviors of organisms, such as anticipation and tracking.

[36] "Es ist ganz gleichgültig, von welcher Art die Reize auf den Sinn sind; ihre Wirkung ist immer in den Energien des Sinnes" (Müller 1826: 45).

## `Chapter 3. Purposiveness and Nature

In Chapter 1, I explicated how Jakob von Uexküll's interpretation of Immanuel Kant's *Critique of Pure Reason* in light of the empirical discoveries of late nineteenth- and early twentieth-century physiology led him to augment the Kantian faculty of sensibility to include both perception and action, both passivity and spontaneity, united in the species-specific phenomenal world of the organism — the *Umwelt*. I elaborated on Uexküll's assertion that we, as humans, inhabit our own *Umwelt*, and I demonstrated that our empirical observations of other living beings are brought into conformity with our human faculty of understanding through the formation of conceptual apparatuses or schemata known as functional building/ body plans (*Baupläne*). Conceptualizing animals according to a functional body plan enables us (human beings) to bring order to the manifold of our representations of spatial and temporal processes that occur both inside and outside living beings. Additionally, I asserted that Uexküll, in another significant departure from Kant, acknowledges that the faculty of sensibility and the pure (non-empirical) forms of sensible intuitions (i.e., space and time) are sufficient for the cognition of objects (*Gegenstände*). As such, at least all animals have a sense of experience, understood as the capacity for cognition of the objects that enter their respective *Umwelten*. In Chapter 2, I first discussed the role of perception in Kant's critical philosophy. I demonstrated how this account, again reinterpreted by Uexküll in light of the discoveries of the empirical sciences, resulted in his sign theory of perception and the notion of the functional cycle.

Here, in Chapter 3, I bring the conclusions of the previous chapters to bear to answer the thesis's central question, namely, what precisely Uexküll gained from Kant's metaphysics. Over the course of the previous chapters, I examined the first of two notions that I identified as crucial for Uexküll's theoretical biology — the transcendental subjectivity of living beings. This chapter concerns the second of those two notions: the purposiveness of nature and living beings. Uexküll's departure from Kant in regards to purposiveness is immediately perceptible due to Uexküll's utilization of the term 'conformity with a plan' (*Planmäßigkeit*), where Kant employed the term 'purposiveness' (*Zweckmäßigkeit*). It would be a mistake, however, to

think that the former term may be simply substituted by the latter. Conformity with plan entails for Uexküll more than what Kant understood by 'purposiveness' or the 'faculty of judgment'; however, these are not altogether unrelated notions. It is the central aim of this chapter to discuss these issues and thereby articulate an understanding of *Planmäßigkeit*, and understand how it derived from the Kantian notions

The concept of *Planmäßigkeit* is both the cornerstone and the capstone of Uexküll's Kantian biology, and the explication of this concept is the end to which all the concepts discussed in previous chapters are subjugated. According to Uexküll, biology begins and ends with *Planmäßigkeit*, conformity to a plan; the study of the purposive quality of life is, moreover, what distinguishes biology from physiology and justifies its status as a science. Uexküll contends that it is only by understanding *Planmäßigkeit* as a real force of nature (*Naturkraft*) that we can understand the purposive relation between the part and the whole (the organism and its organs) on the one hand, and the purposive relation between the cognitive faculties of the organism, its *Umwelt*, and the surrounding environment (*Umgebung*).

This chapter is structured as follows: In Section 3.1., I reconstruct Kant's account of teleological judgment as it appears in his Critique of the Power of Judgment. In section 3.2., I give an account of Uexküll's highly enigmatic concept of *Planmäßigkeit*, demonstrating that it generally constitutes a teleological/purposive notion that Uexküll believes to belong to the realm of determinative/constitutive judgments rather than regulative judgments. As such, Planmäßigkeit explains the complex relations between the organ and organism at one level, and between the organism and environment at another level. In section 3.4., I conclude by discussing the relevance of purposiveness and *Planmäßigkeit* for contemporary biosemiotics. I explore an influential biosemiotic account of Uexküllian *Planmäßigkeit* written by Jesper Hoffmeyer and probe the likelihood of this interpretation.

## §3.1. Kant's account of teleological judgment

The second part of Kant's third critique, the *Critique of the Power of Judgment* (1790; henceforth *CPJ*), entitled 'Critique of the Teleological Power of Judgment,' is "concerned

with the idea of ends or purposes (*Zwecke*) in nature" (Ginsborg 2022). The philosopher Hannah Ginsborg has summarized the Critique of the Teleological Power of Judgment in accordance with its two constituent parts: In the Analytic of Teleological Judgment, Kant asserts that "organisms must be regarded by human beings in teleological terms, i.e., as 'natural purposes'"; in the Dialectic of Teleological Judgment, Kant aims "to reconcile this teleological conception of organisms with a mechanistic account of nature" (Ginsborg 2022). In this section, I reconstruct Kant's account of teleological judgment, at least insofar as it is relevant to the purposes pursued in this chapter, by clarifying the following three ambiguities: (i) The role of the faculty of judgment in general; (ii) the distinction between determining judgments and reflecting judgments, and (iii) the distinction between subjective and objective purposiveness. The paragraphs dedicated to (i) also include a brief discussion of what it means, in Kantian terminology, for a living being to be considered a natural end or purpose.

In §10 of the *CJ*, entitled 'On purposiveness in general,' Kant defines a purpose as "the object of a concept insofar as the latter is regarded as the cause of the former (the real ground of its possibility); and the causality of a *concept* with regard to its *object* is purposiveness (*forma finalis*)" (*CPJ* 5: 220; emphasis original). Objects crafted by humans constitute purposes insofar as the concept determines the object, and not vice versa. The form and material of a chair, for example, are the result, the effect, of the fact that the one who fashioned it had in mind that the object should possess the capacity to be sat upon. The example of the chair was chosen deliberately because Uexküll, in his *Streifzüge durch die Umwelten von Tieren und Menschen* (1956 [1934]: 67), remarks on the purposive quality of objects. For the human, a chair possesses a "seat-tone" (*Sitzton*), whereas a ladder may possess a "climbing-tone" (*Kletterton*). For Uexküll, that an object appears purposeful to an observer, be they human or non-human, means that the subject has endowed that object with some meaning. Biosemioticians, following Uexküll, would concur; however, they would claim, more specifically, that where purposes exist, semiosis, or sign action, has taken place. Indeed, that semiotics is chiefly concerned with purposeful activity is reflected in its general methodology: "[…] in semiotics (as a general logic of sign action) we see the world from the perspective of sign action, process, mediation, purposefulness, interpretation, and generality" (Emmeche 2011: 94). The majority of biosemioticians regard semiosis as an irreducible

triadic process; insofar as "[t]he form of causality governing triadic processes is final causation," biosemiotics may be understood, at least in certain circumstances, as the study of natural purposiveness (Ibid). This understanding will prove instrumental at the conclusion of this chapter, where I reflect on Kant and Uexküll's notions of *Zweckmäßigkeit* and *Planmäßigkeit*, respectively, and their relevance to contemporary biosemiotics. This brief digression notwithstanding, Kant's conception of purposes needs additional clarification. When a being, inanimate or animate, functions as a purpose, "the object itself (its form or its existence) as an effect is thought of as possible only through a concept of the latter [that object], there one thinks of an end" (*CPJ* 5: 220). In the case of purposes/ends, the effect constitutes "the determining ground" of the cause; this is in stark opposition to efficient causation, which moves from causes to necessary effects. In this section, Kant also identifies the will as that desire "to act in accordance with the representation of an end" (Ibid). Any object is called purposive that "can only be explained and conceived by us insofar as we assume as its ground a causality in accordance with ends, i.e., a will that has arranged it so in accordance with the representation of a certain rule" (Ibid). However, this does not necessarily imply that, when conceiving of animals as natural ends/purposes (*Naturzwecke*), we must posit the existence of some supernatural power (i.e., God) whose will exerts a causative influence in bringing about these living beings. Kant's meticulous phrasing allows for another, much more feasible, possibility: The will which acts as a cause by arranging representations according to a certain rule may be our very own human will. As will be shown, this is what enables Kant to hold steadfast to his Enlightenment mechanistic worldview while nonetheless allowing humans to conceive of animals as natural ends/ purposes, where purposiveness is an inherently teleological notion. For Kant, the most that our faculty of reason allows us to claim is that living beings qualify as natural ends/purposes in accordance with the faculties of our mind. Ultimately, this is a kind of 'as if' or heuristic teleology — we speak, act, or conduct biological inquiries *as if* animals are natural purposes. In actuality, this is something we can never constitutively or demonstrably prove, and as such, we would not be acting rationally, according to Kant, if we ascribed teleology a real place in the world, rather than being an organizing principle that our mind brings to order the representations it finds in nature.

In the First Introduction (henceforth, *FI*) to the *CPJ*, Kant introduces the faculty of judgment, a faculty of the mind distinct from both sensibility and understanding. The teleological power of judgment constitutes "the faculty for judging the real purposiveness (objective) of nature through understanding and reason" (*FI* 5: 193). The faculty of judgment is quite idiosyncratic insofar as it is "not at all self-sufficient"; "it provides neither concepts, like the understanding, nor ideas, like reason, of any object at all, since it is a faculty merely for subsuming under concepts given from elsewhere" (*FI* 20: 202). This is quite similar to the definition given earlier in the *CPR* of the faculty of judgment as "the capacity to subsume under rules, that is, to distinguish whether something falls under a given rule" (*CPR* A132/ B171). The non-self-sufficient quality of the faculty of judgment is important because it means that the judgments it produces are entirely contingent. In judging nature in general, and thus forming a concept of a property of nature "insofar as nature conforms to our power of judgment", "it [the concept we form] would have to be the concept of a purposiveness of nature in behalf of our faculty for cognizing it" (*FI* 20: 202). In simpler terms, according to Kant, if we judge nature or living beings to be purposive, we can never do so without acknowledging that the thing being judged is purposive *for us*, that is, *for our faculties of understanding*. We can never 'remove ourselves from the picture,' so to speak, of the judgments which we make. Indeed, "our concept of a subjective purposiveness of nature in its form, in accordance with empirical laws" is "only a principle of the power of judgment for providing concepts in the face of this excessive multiplicity in nature (in order to be able to be oriented in it), we nevertheless hereby ascribe to it as it were a regard to our faculty of cognition, in accordance with the analogy of an end" (*FI* 5: 193). Likewise, we can regard living beings as "natural ends" — "the presentation of the concept of a real (objective) purposiveness," which we judge through "understanding and reason (logically, in accordance with [our human] concepts)" (FI 5: 193). Nature thereby appears to us as "a system of purposes standing in purposive relations to one another" (Ginsborg 2022).

Kant distinguishes between two aspects of the faculty of judgment: the determining aspect and the reflecting aspect. A judgment is called determining (*bestimmend*) if it begins with a universal, and searches for a particular to subsume under it. A judgment is called reflecting (*reflektierend*) if it begins with a particular, and searches for a universal under

which the particular may be subsumed (*CPJ* 5: 179). The reflecting aspect or power of judgment is of great importance for the purposes pursued here. Kant writes that "The reflecting power of judgment […] is under the obligation of ascending from the particular in nature to the universal" (*CPJ* 5: 180). The aspect of reflective judgment includes the capacity for teleological judgments, which Ginsborg (2022) describes as "judgments which ascribe ends or purposes to natural things, or which characterize them in purposive or functional terms." Biology is often considered unique due to its apparent reliance on teleological judgments, perhaps the most notable of which is the use of the notion of 'functions.' The precise meaning of functions in biology has been a widely discussed topic among both philosophers and biologists (cf. Cummins 1975; Godfrey-Smith 1994; Millikan 1989; Neander 1991; Wright 1973), and many of these contemporary accounts have taken inspiration, in one way or another, from Kant's writings on organisms as natural ends/ purposes. In the *CPR*, Kant states that regulative principles derived through teleological judgment function to form "the systematic unity of the manifold of empirical cognition in general, through which the cognition, within its proper boundaries, is cultivated and corrected" (*CPR* A671/B699). According to Ginsborg's reading of Kant's third critique, "We cannot assert that nature is, as a matter of objective fact, purposive for our cognitive faculties, but it is a condition of the exercise of reflecting judgment that we assume nature's purposiveness for our cognitive faculties" (Ginsborg 2022). Stated otherwise, "The extension of the principle of purposiveness to all of nature is an idea of reason […]"[37] (Quarfood 2015: 2259).

Kant makes another distinction between *subjective purposiveness* and *objective purposiveness*. Subjective purposiveness is associated primarily (but not exclusively) with aesthetic judgments and, as such, does not concern the present chapter. Nonetheless, Kant understands that judgments concerning the "purposiveness displayed by nature as a whole insofar as it is comprehensible to human beings" count as subjective judgments (Ginsborg 2022). […] Objective purposiveness, on the other hand, refers to "the purposiveness displayed by organisms qua 'natural ends/purposes' and by arrangements of natural things or processes

[37] "Die Ausweitung des Prinzips der Zweckmäßigkeit auf die gesamte Natur ist eine Idee der Vernunft; […]" (Quarfood 2015: 2259).

which stand to one another in means-end relations" (Ibid). Judgments regarding the biological functions of organs appeal to objective purposiveness insofar as functions constitute means-end relations. For example, the judgment 'the function of the heart is to pump blood ' may be adequately restated as 'the heart is a means to the end of pumping blood.'

In this section so far, I have clarified what Kant means by the faculty of judgment, purposes in general, and natural purposes in particular; likewise, I have discussed the distinction between determining and regulating judgments on the one hand and subjective and objective purposiveness on the other. What remains to be elucidated before moving onto Uexküll's account of *Planmäßigkeit* is the end to which all of these concepts and distinctions are directed in the 'Critique of Teleological Judgment'; namely, what it means for us (human beings) to make objective material judgments about living beings other than ourselves. These objective material judgments are, as discussed, merely regulative — "they do not state how nature really is, but only present principles which we must follow in investigating nature" (Ginsborg 2022). That we human beings cannot say for certain how affairs stand truly in nature is due to the very innate structure of our mental faculties (i.e., our sensibility and understanding). Kant contends that,

> "[…] if we depart from this restriction of the idea to a merely regulative use, then reason will be misled in several ways, by forsaking the ground of experience, which has to contain the markers for its course, and by venturing *beyond experience* into the incomprehensible and inscrutable, in whose heights it [reason] necessarily becomes dizzy because from this standpoint it sees itself cut off from every use attuned to experience (*CPR* A688/B716–A689/B717; emphasis added).

In other words, Kant believes that understanding objective material judgments about living beings as expressing the determinative [*bestimmend*] aspect of teleological judgment is an error of reasoning, for we have no grounds whatsoever to claim to know how natural beings function, conceived apart from our sensibility; it is necessary beyond all experience.

What makes an organism a natural purpose? According to Kant, a living being is a natural purpose (also called a natural end) "if it is cause and effect of itself" (*CPJ* 5: 371). To be considered as a natural purpose, it is moreover necessary that (i) "its parts (as far as their existence and their form are concerned) are possible only through their relation to the whole" (*CPJ* 5: 373); (ii) "its parts be combined into a whole by being reciprocally the cause and effect of their form" (Ibid). In §65 of the *CPJ*, Kant states these criteria in a more concise manner: A natural purpose/end is "related to itself reciprocally as both cause and effect" (*CPJ*

5: 372). Organisms, qua natural purposes, are not a *nexus effectivus*, because in these cases one and the same object cannot be both a cause and an effect, but rather the organism is a *nexus finalis* — the means to some end, namely, itself. The philosopher Marcel Quarfood has written the following about this understanding of organisms: "That there must be a special principle for judging organisms as natural ends [*Zwecke*] is justified by their characteristic capabilities such as reproduction, growth (including nourishment), and the interdependence of the individual parts on one another. This includes the regeneration of parts as well as the self-preservation of the whole organism. These capabilities show, that in an organism 'everything is an end and reciprocally a means as well' (*CPJ* 5: 376)"[38] (Quarfood 2015: 2259). Kant uses a tree as an example of the principle that organisms are both means and ends. He writes:

> "In such a product of nature each part is conceived as if it exists only *through* all the others, thus as if existing *for the sake of the others* and *on account of* the whole, i.e., as an instrument (organ), which is, however, not sufficient […]; rather it must be thought of as an organ that *produces* the other parts (consequently each produces the others reciprocally), which cannot be the case in any instrument of art, but only of nature, which provides all the matter for instruments (even those of art): only then and on that account can such a product, as an *organized* and *self-organizing* being, be called a *natural end*" (5: 373–374; emphasis original).

A very similar principle is understood by Uexküll in the concept of *Planmäßigkeit*; however, Uexküll believes that *Planmäßigkeit* is an actually existing force of nature (*Naturkraft*). It is this force of nature, moreover, which, in his view, constitutes the research object of biological science.

## §3.2. Purposiveness and conformity to Plan (*Planmäßigkeit*)

In the previous section, I elaborated Kant's Critique of Teleological Judgment and established precisely what Kant and Uexküll meant by 'purposes/ends', what 'purposiveness' entails, and how the exercise of the human capacity of reflective judgment allows us to conceive of other living beings as 'natural ends' (*Naturzwecke*). In this section, I aim to demonstrate that Uexküll conceives of biology as the science which studies, and orders its

[38] "Dass es ein spezielles Prinzip für das Urteil über Organismen als natürliche Zwecke geben muss, ist durch deren charakteristische Fähigkeiten begründet wie Fortpflanzung, Wachstum (einschließlich Ernährung) und die wechselseitige Abhängigkeit der einzelnen Teile voneinander. Dazu gehört die Regeneration der Teile sowie die Selbsterhaltung des gesamten Organismus. Diese Fähigkeiten zeigen dass in einem Organismus, 'alles Zweck und wechselseitig auch Mittel ist' (5: 376)" (Quarfood 2015: 2259).

empirical observations in accordance with, the purposiveness of organisms and nature. Uexküll asserts, in what I believe to be his most important departure from Kant, that the human conception of living beings as natural ends no longer be understood as a regulative judgment, that is, as an idea of reason that we (humans) formulate in order to bring the concepts of nature in general and living beings in general within our understanding. Rather, Uexküll asserts that teleology/purposiveness, conceived of as the principle of conformity with a plan (*Planmäßigkeit*), is a determinate/constitutive[39] concept. As a determinate judgment, purposiveness or conformity with a plan must be concretely instantiated in particulars which themselves are 'given' or manifestly 'present' in the world. Kant denied this possibility, and saw regulative judgments as the only justifiable way of judging nature and living beings as purposive, insofar as "one cannot at all understand the possibility of such a kind of causality *a priori*" (*CPJ* 5: 376). I conclude the section with a discussion of what I believe Uexküll means when he asserts that *Planmäßigkeit* is an active force of nature (*Naturkraft*).

In the foreword to his first book *Leitfaden in das Studium der experimentellen Biologie der Wassertiere* (1905), Uexküll contrasts the sciences of physiology and biology. Whereas physiology "arranges its experiences according to causality, biology "arranges its experiences according to purposiveness"[40] (Uexküll 1905: v). "Both sciences," moreover, "have their full justification [for doing so]"[41] (Ibid). But physiology is unsuited to answer the questions that biology seeks to answer. Uexküll conceives of biology as the science which orders its empirical observations in accordance with purposiveness (*Zweckmäßigkeit*), understood as one aspect of *Planmäßigkeit*. Moreover, Uexküll characterizes biology as "the science that inquires about the performance of the individual parts and the whole body in the life of animals"[42] (Uexküll 1905: 4). In other words, biology concerns itself with the relation between the part and the whole, with the organization and coordination of the individual parts of the organism. "The *Planmäßigkeit* of organisms was and is the problem of biology, and it is

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[39] Translations differ; Friedman (1991) translates '*bestimmend*' as 'constitutive', whereas Ginsborg (2022) translates '*bestimmend*' as 'determinate' or 'determining.' In this chapter, I opt for the latter translation.

[40] "[…] die Physiologie, die ihre Erfahrungen nach der Ursächlichkeit ordnet, die Biologie, die ihre Erfahrungen nach der Zweckmäßigkeit ordnet" (Uexküll 1905: v).

[41] "Beide Wissenschaften haben ihre volle Berechtigung" (Uexküll 1905: v).

[42] "[…] die Biologie, das heißt die Wissenschaft, die nach den Leistungen der einzelnen Teile und des ganzen Körpers im Leben der Tiere fragt […]" (Uexküll 1905: 4).

to it which we return"[43] (Uexküll 1913: 26). Physics and chemistry are unable to subjugate biology, or to reduce biology to physics and chemistry because "all living beings […] must possess a plan-conforming (planmäßige) structure," and it is the possession of this quality, of conforming to a plan, which makes them not merely organic machines, but organisms — natural ends. "Biology begins with the cognition, that all organisms are [concrete] instantiations of purposiveness [*Zweckmäßigkeiten*]. It is the discovery of the purposiveness of organisms which constitutes the task of biology"[44] (Uexküll 1905: 6). This purposiveness manifests itself in several ways: (i) The purposiveness or fit between the organization of the organism with the stimuli it is capable of receiving from the outside-world via its faculty of sensibility, (ii) The purposiveness of the organisms Umwelt to its environment or surroundings (*Umgebung*), and (iii) The purposiveness of organisms as natural ends for our own human faculty of judgment. It is through the last of these aspects that we judge organisms as "lead[ing] an autonomous (*selbstständig*) existence"[45] (Uexküll 1905: 7).

It was in his *Theoretical Biology*, where *Planmäßigkeit* received its most in-depth treatment. It is here that Uexküll asserts, contra Kant, that purposiveness belongs to determinate judgment: "Kant attributed causality to the constitutive activity of the understanding, while assigning *Planmäßigkeit* to the regulative use of reason. This gives the impression that a plan can never be the integral part of an object, but is merely a human rule, albeit a necessary one. Driesch dealt with this question in detail and proved that Planmäßigkeit is also to be counted among the constitutive properties. This eliminates this difficulty"[46] (Uexküll 1928: 199). It was the outcome of Driesch's experiments on blastulae

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[43] "Die Planmäßigkeit der Organismen war und ist das Problem der Biologie und ihm wenden wir uns wieder zu. Unter Planmäßigkeit sol weiter nichts verstanden werden als eine bestimmte Anordnung der einzelnen Teile eines Gegenstandes, die diesen zu einer Einheit macht" (Uexküll 1913: 26).

[44] "Mit der Erkenntnis, daß alle Organismen Zweckmäßigkeiten sind, beginnt die Biologie. […] Ist doch die Erforschung der Zweckmäßigkeit der Organismen die Aufgabe der Biologie" (Uexküll 1905: 6).

[45] "[…] ein selbstständiges Dasein führt" (Uexküll 1905: 7).

[46] "Kant hat die Kausalität der konstitutiven Tätigkeit des Verstandes zugerechnet, dagegen die Planmäßigkeit dem regulativen Gebrauch der Vernunft zugewiesen. Das erweckt den Eindruck, als könne ein Plan niemals der integrierende Teil eines Gegenstandes sein, sondern sei bloß eine, wenn auch mit Notwendigkeit hinzugedachte menschliche Regel. Driesch hat diese Frage eingehend behandelt und nachgewiesen, daß die Planmäßigkeit ebenfalls zu den konstitutiven Eigenschaften zu rechnen sei. Damit ist diese Schwierigkeit beseitigt" (Uexküll 1928: 199).

that Uexküll provided as evidence for the fact that a real *Planmäßigkeit* was operative in nature.

Returning to his 1905 *Leitfaden*, Uexküll elaborates more on the *planmäßige* relation between the part and the whole: "Life can only be an organism, and every organism consists of living organs and the living organs, in turn, from other living organs [i.e., the organelles of cells]. And so long as the whole [organism] lives, the parts live with one another through one another according to a firm plan"[47] (Uexküll 1905: 5). Uexküll at times refers to *Planmäßigkeit* as that force of nature which brings objective harmony to the beings found in nature; for him, organisms are harmonious natural ends/purposes, and as such are both the cause and effect of themselves. It is this harmonizing influence that he identifies as *Planmäßigkeit*, and again, he cites *Planmäßigkeit* as the research object of biology. He states, "We call these harmonious objects 'living beings' and consider them from two sides according to their dual nature: as physiologists when we examine their causality, as biology when we examine their purposiveness"[48] (Uexküll 1905: 129).

## §3.3. Contemporary biosemiotics and teleology

As an empirical, natural science, biology is in the business of providing naturalistic explanations for the processes involved in living systems. Naturalistic explanations may be roughly understood as causal explanations with certain restrictions on what may count as a 'cause' or an 'effect,' and/or restrictions on how causes may relate to effects. An essential restriction to naturalistic explanations of the first kind is that causes and effects must accord with (i.e., not be defeated by) empirical observations and measurements of the natural phenomena they seek to explain. A typical restriction to naturalistic explanations of the second kind is that effects may not explain causes. In other words, naturalistic explanations typically admit only to efficient causality and not to final causality. Whether final causation is

[47] "Leben kann nur ein Organismus und jeder Organismus besteht aus lebenden Organen und die lebenden Organe wiederum aus anderen lebenden Organen. Und so lange das Ganze lebt, leben die einzelnen Teile miteinander und durcheinander nach einem festen Plan" (Uexküll 1905: 5).

[48] "Wir nennen diese harmonischen Gegenstände 'lebende Wesen' und betrachten sie entsprechend ihrer Doppelnatur von zwei Seiten aus: als *Physiologen*, wenn wir ihre *Ursächlichkeit*, als *Biologen*, wenn wir ihre *Zweckmäßigkeit* untersuchen" (Uexküll 1905: 129).

a naturalistically valid form of causation constitutes a debate that was ongoing already in Descartes' time (Clatterbaugh 1999) and that continues into the present day. As a general rule, however, biology does not view final causation as a valid naturalistic explanation for phenomena; stated more precisely, event Y at time $t_2$ cannot explain event X at time $t_1$, where t2>t1. As such, any speak of the 'aims,' 'goals,' or 'purposes' of organisms or nature, conceived as a whole, are typically taken to be expressions analogical to our goal-directed experience and formulated simply to aid in our human understanding. Should the strict need arise, however, the necessary reductions of final-causal terms into efficient-causal terms could be accomplished, or so it is typically assumed. It is with this understanding that I undertook an analysis of Uexküll's concept of *Planmäßigkeit*, which must undoubtedly be understood as a constitutive "teleological principle" (Hoffmeyer 2004: 75) — a principle that invokes the existence of final causation in nature.

Jesper Hoffmeyer has articulated the most systematic treatment of teleology and final causation from a biosemiotic perspective. Moreover, Hoffmeyer was among the first, besides Thure von Uexküll (Uexküll 1992), to discuss Uexküll's concept of *Planmäßigkeit* in relation to contemporary biology and biosemiotic theory. Hoffmeyer immediately dispels any reading of Uexküllian *Planmäßigkeit* as entailing "a gradual, if majestic, unfolding of Nature's own master plan, i.e., [an unfolding in which] evolution would not figure as a real historic process in the sense that something happened through evolution which was not already determined beforehand" (Hoffmeyer 2004: 75). Hoffmeyer asserts that *Planmäßigkeit* aligns with the underlying metaphysical framework of biosemiotics and, insofar as "biology is immature biosemiotics" (Hoffmeyer 2011), with biology itself. In this section, I first recount Hoffmeyer's interpretation of *Planmäßigkeit* in terms of Peircean cosmology. Although I find Hoffmeyer's Peircean reading of Uexküll highly amenable to the aims of biosemiotics, I put forward an argument that Uexküll's concept of *Planmäßigkeit* is far better understood as Uexküll altering Kant's position that judging natural purposes is a task of reflective judgment into his own view that it constitutes a task of determinative judgment. For Kant, teleology is something that we bring to the world in order to bring natural purposes under the domain of our understanding; for Uexküll, teleology is a constitutive part of the natural world.

Hoffmeyer openly asserts that "biosemiotics is in fact deeply dependent on the acceptance of […] final causation," where final causation is understood according to Peircean cosmology (Hoffmeyer 2004: 77). For Peirce, and for many contemporary biosemioticians, "indeterminacy is primary"; natural science is, as such, tasked with explaining the emergence and continued existence of organized processes and systems. Peirce understood final causation accordingly:

> "[…] 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).

In terms of Peirce's definition, even the strict laws of physics "operate like final causes when they are used as explanatory tools" (Hoffmeyer 2004: 78). For Hoffmeyer, following Peirce, the nature of organisms requires a "historical account of the situatedness of the organism in question in the holistic semiotic dynamics to which it belongs" (Ibid: 84). Hoffmeyer understands Uexküll *Planmäßigkeit* as "[…] 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" (Hoffmeyer 2004: 88). This is very much related to Stuart Kauffman's notion of the 'adjacent possible': "[…] 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). Hoffmeyer acknowledges the anachronism of his interpretation, but defends its validity: "And although the telos involved in Planmäßigkeit is of course very different from Pierce's vision of evolutionary cosmology, it is not necessary antagonistic either to Peirce or to the modern-day biosemiotic understanding" (Hoffmeyer 2004: 79).

Ultimately I find Hoffmeyer's interpretation very amenable to contemporary biosemiotics' understanding of purpose and teleology in nature. However, I would contend that when reviewing or explaining Uexküll's works, we limit our resources to those that Uexküll himself cites as formative for his conceptual framework. Kant is undoubtedly the foremost influence for Uexküll, and any treatment of his philosophical or semiotic contributions should interpret his works in light of this fact.

## Conclusion

In this thesis, I have argued both how Uexküll's theoretical biology was thoroughly Kantian, but also how he departed in certain demonstrable ways from the prolific eighteenth-century philosopher in light of the advances of late nineteenth- and early twentieth-century empirical physiology and biology. I asserted that Uexküll's two main takeaways from Kant were the concept of sensibility (*Sinnlichkeit*) and the concept of conformity to plan (*Planmäßigkeit*). The former concept encompasses the organism's *Umwelt*, its passive receptivity to sensation, and its spontaneous capacity for action. The latter concept encompasses the purposiveness/constitutive natural force, which may be understood as having three aspects: (i) the purposiveness of the organism's transcendental subjecthood to the objects of its own experience; (ii) the purposiveness of the organism's *Umwelt* to its environment or surroundings (*Umgebung*); and (iii) the purposiveness of organisms as natural ends/purposes to our human faculty of reflective judgment.

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**Summary (English)**

This thesis examines the theoretical work of Baltic German-Estonian biologist Jakob von Uexküll (1864–1944) in light of his Kantian metaphysical commitments. The central aim of the thesis is to elaborate on what precisely Uexküll gained from Kant's critical philosophy, particularly the *Critique of Pure Reason* (1787) and *Critique of the Power of Judgment* (1790). I assert that Uexküll's two main takeaways from Kant were the concept of sensibility (Sinnlichkeit) and the concept of conformity to plan (*Planmäßigkeit*). The former concept encompasses the organism's *Umwelt*, its passive receptivity to sensation, and its spontaneous capacity for action. The latter concept may be understood as a purposiveness operative in nature having three aspects: (i) the purposiveness of the organism's transcendental subjectivity in relation to the objects of its experience; (ii) the purposiveness of the organism's Umwelt to its environment or surroundings (*Umgebung*); and (iii) the purposiveness of organisms as natural ends/purposes to our human faculty of reflective judgment.

**Summary (Eesti)**

Käesolev töö uurib Baltisaksa-Eesti bioloogi Jakob von Uexkülli (1864–1944) teoreetilisi töid tema kantilike metafüüsiliste arusaamade valguses. Töö keskseks eesmärgiks on läbi mõelda, mida täpselt Uexküll Kanti kriitilisest filosoofiast juurde sai, seda eriti „Puhta mõistuse kriitikast“ (1787) ja „Otsustusvõime kriitikast“ (1790). Ma väidan, et kaks peamist asja, mille Uexküll Kantilt üle võtab, on tunnetuse mõiste (*Sinnlichkeit*) ja plaanile vastavuse mõiste (*Planmäßigkeit*). Esimene neist mõistetest hõlmab organismi omailma, tema passiivset vastuvõtlikkust aistingutele, ja tema spontaanset võimet tegutseda. Teist mõistet võib mõista looduses toimiva eesmärgipärasusena, millel on kolm tahku: (i) organismi transtsendentaalse subjektiivsuse eesmärgipärasus tema kogemuse objektide suhtes; (ii) organismi omailma eesmärgipärasus tema keskkonna või ümbruskonna (*Umgebung*) jaoks; ja (iii) organismide kui loomulike lõpptulemuste/eesmärkide eesmärgipärasus meie inimliku reflektiivse otsustusvõime jaoks.

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