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***Technology in Umwelt Theory:
The Extension of Functional Circles***

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Abstract

This study re-examines the relationship between humans and technology by focusing on the concept of the "*Umwelt*" (environment) proposed by Jakob von Uexküll (1864–1944)—the unique world experienced by every living organism. In today's digital era, sophisticated information network and autonomous systems have changed the nature of "knowledge." It is no longer just something stored in the human mind but has become an active network that shapes our daily reality and how the world appears to us. This shift forces us to rethink where the human ends and technology begins.

To understand this connection, this paper analyzes "technique" in *Umwelt* theory in three stages. First, it explores how nature itself behaves as a principle, building the physical bodies of living things according to an internal *plan*. Second, it shows that an organism's world is not just a passive reflection of its surroundings; instead, it is a meaningful "work" created through the constant loop of sensing and acting. Third, the paper explains how human-made tools and machines serve as extensions of our own bodies, expanding our ability to perceive and interact with the world.

By linking these stages, the research demonstrates that technology is not merely an external tool we use. Rather, it is deeply integrated into our physical and mental processes. The paper concludes that as technology becomes more advanced, it actively reorganizes our relationship with our environment, constantly transforming what it means to be a human *subject* in a technological world.

Keywords: Umwelt, environment, technology, subjectivity, cognition

Introduction

"*Knowledge*" is not something that remains limited to information possessed personally by individual humans; rather, it is a network-like system produced within social contexts and shared or transmitted through media. Since ancient times, books and letters have been responsible for the preservation and transmission of *knowledge* beyond the individual, but contemporary technology does not stop at being a mere auxiliary tool for such externalization of *knowledge*. Today's sophisticated information network environment possesses autonomous algorithms that automatically collect, analyze, predict, and systematize information. Generative artificial intelligence, which has proliferated explosively in recent years, responds to users' questions, provides counsel, and proposes solutions as if it "*knows*" various things. This reorganization of *knowledge* by technology calls into question the boundary between humans and technology: where does the *subjectivity* of "*knowing*" reside, and how does the technology that constitutes *knowledge* prescribe the *appearance* of the world? The purpose of this paper is to examine a new framework for reconceiving the linkage between humans, the environment, and the *technique* that mediates between them, in order to understand this recursive relationship where technology—as one *appearance* of *knowledge*—simultaneously prescribes the very nature of *knowledge*. To this end, this paper reconsiders the relationship between technology and humans by focusing on the concept of "*Umwelt*" (environment/self-world) proposed by the early 20th-century biologist Jakob von Uexküll (1864–1944).

Uexküll sought to describe the functional world that animals construct as cognitive *subjects*¹—that is, the *Umwelt*—by analyzing the structure and functions of animal bodily organs. He treated living beings not as mere machines, that is, not as objective objects of observation within the human cognitive world, but as subjects that open up their own domains of action within the physical world. Only in this way, Uexküll argued, is it possible to connect the dynamic interactions between an organism and its environment with the functioning of bodily organs, and thereby to take the life process as a whole as the proper object of biological inquiry. According to Uexküll, organisms are not mere objects that react passively to stimuli from the external world. Rather, through their bodily structures and the "*functional cycle*" (*Funktionskreis*)—a circular coupling of perception and action—organisms constitute an *Umwelt* as a domain of action. Insofar as living beings actively construct the world in which they live, they are *subjects*.

¹ The term "subject" is consistently used for the German *Subjekt*. This choice prioritizes the epistemological tradition—where the subject is the locus of the world's *appearance*—over the concept of "agency," which emphasizes active, intentional behavior.

Christopher Loughnane (2025) adds *technique* as “the third component” within Uexküll’s cyclical relationship of *body-Umwelt*, and proposes “a triadic Umwelt model in which technics, alongside body and environment, forms a foundational element of human evolution and perceptual experience” [Loughnane (2025): 1]. Loughnane’s aim, in contemporary society where advanced digital technologies that take over and automate human tasks are ubiquitous, is to provide conceptual tools and ethical guidelines for better understanding cultural transformation accompanying human evolution and technological progress by describing the human perceptual and experiential worlds within the triadic framework of *body-technique-Umwelt*.

While Loughnane’s attempt is extremely important for understanding the profound influence *technique* exerts on the formation of the *Umwelt*, remains insufficient. This is because Loughnane goes no further than grasping *technique* as a tool as an extension of the body or as an externalized intermediary. While such an understanding of *technique* does not necessarily fall outside the framework of *Umwelt* theory, it is extremely limited. This nature of *technique* as both an environment and an extension of the body does not simply derive from the fact that *technique* is a mediator between the body and the environment, but from the fact that *technique* in *Umwelt* theory is, in the first place, the principle of an organism’s body formation and, at the same time, the principle of *Umwelt* formation that prescribes the mode of appearance of the world to the organism.

In this paper, I will understand *technique* in *Umwelt* theory by dividing it into three phases and analyze the positioning of each in their respective sections. The three phases are: namely, “Naturtechnik” (Section 1), which functionally organizes the body itself; the formative and artistic *techné* (Section 2), in the sense of living within a work created by the organism itself; and *technique* as a tool or machine that extends the *Funktionskreis* as an extension of physical organs (Section 3). The various forms of “*technique*” in these three phases are not synonymous, but they are interrelated at a fundamental level. They are concepts that capture the processes through which the relationship between the body and the *Umwelt* is generated, maintained, and transformed at different levels, and the term *technique* is used to demonstrate that continuity.

While taking Loughnane’s triadic model as an important reference point, this paper does not subscribe to an understanding that fixes *technique* as a “third component.” Rather, by grasping *technique* in multiple phases, I will reconceptualize the multilayered and fluid role of “*technique*” as something that is simultaneously the body and the *Umwelt* for the *subject*. In this way, I will clarify that *technique* is something that moves transversally across both the phases of the body (internal) and the *Umwelt* (external), and demonstrate that the boundary

between the two (the outline of the *subject*), which has traditionally been regarded as fixed, is constantly redrawn along with the operation of *technique*.

Section 1: "Naturtechnik" as the Principle of Body Formation

1-1 *Technische Biologie*

Generally, Technik refers to specific techniques or skills for creating and organizing things in some way, and its system is called technology. As evident from the examples of tools, machines, and digital infrastructure, what is at issue in Loughnane (2025) is Technologie positioned within the scope of this modern meaning. In contrast, it must be noted that in Umwelt theory, the concept of "Technik" primarily appears not as an artifact created and utilized by humans, but as an immanent formative principle that constitutes the organism's body itself. In his book *Umwelt und Innenwelt der Tiere*², Uexküll called the study of body formation in living organisms "technical biology" (Technische Biologie). This concept is clearly contrasted with what Uexküll himself designated as "mechanistic biology."

In mechanistic biology, the organism's body is presupposed as a pre-given apparatus, and its operation is explained as a causal chain of external stimuli and internal reactions. In contrast, Uexküll's interest is directed toward the principle of how such reactive apparatuses come into being—that is, how organs themselves are formed and functionally organized. The *Funktionskreis*, a central concept in *Umwelt* theory, should likewise not be understood as a self-contained mechanism built into a pre-established body. According to Uexküll, the protoplasm of the living organism is "active throughout life, restructuring and forming pathways" and the *Funktionskreis* itself is not a fixed structure but is in the midst of becoming [Uexküll (1921): 48].

In this regard, Uexküll found the specific task of biology to be the investigation of the functions of completed physical organs in conjunction with the principles by which such organs are formed. As Yoshihiko Maeno (1957–), the Japanese translator of *Umwelt und Innenwelt der Tiere*, points out, the term "technisch" used here should not be understood in the sense of "technical" as it is used in today's everyday language [Maeno (2012): 363–364]. Rather, it should be understood in its original sense derived from the Greek *techné*—that is, as *technique as a principle of creation*; in other words, as an immanent formative principle that makes latent forms hidden in nature *appear*. This autonomous principle of body formation is precisely what

² von Uexküll (1921). Originally published in 1909; this paper cites the 1921 revised second edition (Zweite vermehrte und verbesserte Auflage). All page references are to this edition.

distinguishes the living organism from a mere object that moves according to physical laws of causality. Uexküll sought to find, behind the diverse functional structures appearing in the bodies of individual organisms—which he called the *Bauplan*—a higher-order principle of self-organization that cannot be reduced to chance or external constraints³.

1-2 The Concept of "Naturtechnik"

In his later work, *The Theory of Meaning (Bedeutungslehre, 1940)*, Uexküll came to grasp this principle of body formation as a contrapuntal morphogenesis by nature and termed it "Naturtechnik" (nature's technique). *Naturtechnik* does not refer to human intentional productive activities, but rather to the process in which nature itself elaborately organizes the correspondence between the organism's body and the external world. According to Uexküll, by possessing physical organs that correspond to objects in the external world, living organisms are mutually linked with the external world—including other organisms—and as a result, an organic system of meaning is formed. The *Umwelt* emerges as a result of such contrapuntal composition by *Naturtechnik*.

The "contrapuntal" relationship here is a metaphor referring to a state in which the organism's bodily structure and the properties of the environment are semantically aligned in advance, much as independent melodies harmonize with each other in music. For instance, Uexküll cites the relationship between a spider's web and a fly's body as an example. A spider is able to construct a web with the mesh size and strength sufficient to withstand the physical dimensions of a fly and the impact of its collision because, even before the spider physically encounters the fly, "the spider has already incorporated certain elements of the fly into its structure" [Uexküll (1940): 48]. This means that the *Funktionskreis* of the web-weaving spider and the *Bauplan* that forms the fly's body complement each other like a melody and a counter-melody in music, playing together a single harmony of meaning (a symphony). Nature's counterpoint does not signify a physical causal relationship brought about by the interaction between *subject* and object; rather, it means that the *subject's Funktionskreis* aligns with the properties of the object through the formative principles inherent in each *subject*.

If one were to interpret *Technik* in this sense directly in its modern meaning—as skills or *knowledge* utilized by some *subject*—one would fall into the error of excessively anthropomorphizing "nature" as the user of *technique* and regarding living organisms as its arbitrary creations. However, as stated at the beginning of this section, *Technik* in *Umwelt* theory is an immanent principle within the living organism; it is a

³ Uexküll believed that biology at the time was fragmented into physiology and anatomy, each of which was falling into physical and chemical reductionism [Uexküll (1921): 3].

formative principle at a level where the producing *subject* and the produced object are not separated.

The philosopher Martin Heidegger (1889–1976) points out that "the essence of technology is by no means anything technological" (*das Wesen der Technik ganz und gar nichts Technisches*) [Heidegger (2000): 9]. Explanations that define technological matters as "a means to an end" (*ein Mittel für Zwecke*) and as "a human activity" (*ein Tun des Menschen*) merely describe the human relationship to technology [Heidegger (2000): 10]. To clarify the essence of technology itself—rather than a human-centered view—Heidegger traces its etymology back to the definition of the Greek *techné* (τέχνη) and redefined technology as bringing forth (*Entbergen*), allowing that which exists to manifest in its primordial way of being [Heidegger (2000): 38]. *Techné* was understood not as mere instrumental manipulation, but as art—the principle that guides how something ought to be when it is generated and shaped. "*Naturtechnik*," which makes a functionally organized body *appear* out of the chaos of matter, is also *technique* in precisely this sense; it is not something that nature utilizes as a "means," but rather a principle of bringing forth immanent within nature and the various living organisms therein.

As described above, in *Umwelt* theory, *technique* primarily appears as a principle immanent in the very formation of the organism's body. By establishing this first phase, it becomes clear that the formative and artistic *techné*—to be examined in the next section—as well as *technique* as tools and machines, fluctuate between the dual statuses of being an extension of physical organs and being an object within the *Umwelt*.

Section 2: Technique as the Principle of Umwelt Formation

2-1 The Umwelt as a Work

When *technique* is interpreted as bringing forth—that is, as making an invisible order appear—another phase of *technique* in *Umwelt* theory comes into view. While *Naturtechnik* makes the *Bauplan* appear as the physical body of the organism, this planed body, in turn, also makes the organism's *Umwelt* appear.

Living organisms are not beings that merely react passively to stimuli from the external world. Based on their own physical structure, they select only specific stimuli from the vast and constant stream of external inputs that match the organs equipped in their bodies, and convert them into unique bodily signals (nerve impulses composed of a certain rhythm). These impulses act upon the organism's physical organs to induce specific actions, and as these

actions alter the relationship with the external world, they bring about new encounters with subsequent stimuli. Uexküll termed this cyclical process, where perception and action alternate repeatedly, the "*Funktionskreis*." Through the mesh-like combination of multiple *Funktionskreis*, a closed world of meaning surrounding each individual organism—namely, the "*Umwelt*"—is formed. Living organisms live within this *Umwelt*, which is "their own work" (*ihr eigenes Werk*) [Uexküll (1921): 215]. For instance, he describes the *Umwelt* of an amoeba as follows:

This small excerpt of the world is a coherent world in itself, simpler and less contradictory than ours, but just as planned, just as artistic. [Uexküll (1921): 32]

According to Uexküll, the *Umwelt* of an amoeba consists of only three elements: the intensity (strong or weak) of stimuli and the stimulus specific to food. Other more complex factors—such as whether a stimulus is chemical or a physical impact—are not reflected in the amoeba's *Umwelt*. Furthermore, even regarding food stimuli, the specific types of organisms that serve as food are abstracted away. In the *Umwelt* of a terrestrial amoeba, even its own body *appears* merely as an edible object. This is because they do not possess a physical structure that could be harmed by "Autophagie" (autophagy) [Uexküll (1921): 32]. An amoeba possesses an extremely simple body. The amoeba's *Umwelt*—that is, the fragment of the world carved out as meaningful by the amoeba—is therefore extremely simple in this way. This simplicity clarifies the *Umwelt*'s character as a *work*, in the sense that it is created by carving out only what is necessary from the world according to physical organs.

Heidegger pointed out that the essence of technology does not lie in the relationship between means and ends of a human *subject*; likewise, *techné* as the principle of *Umwelt* formation is not a means, and consequently, the *Umwelt* is not an end. Within the bodily process of the organism itself, there is an immanent *techné* that determines the *appearance* of the world.

2-2 What is the Subject of the Umwelt?

In this paper, I have thus far interpreted Uexküll's "*Naturtechnik*" using Heidegger's philosophy of technology as a guide. At this point, it must be noted that Uexküll and Heidegger do not share identical positions regarding the definition of the *Umwelt* itself. The *Umwelt* that Heidegger discusses in *Being and Time* refers to the world of "average being-in-the-world" (*durchschnittliches In-der-Welt-sein*) in which humans live their everyday lives [Heidegger (1967): 66]. In this context, things are experienced not as objective beings in themselves, but as things that are used, related to, and possess roles—that is, as *for-the-purpose-of* (*für...*)—

much like how a hammer *appears* as *something for hammering*. Heidegger defines "world" as an ontological horizon where the meaning of Being can be questioned, and he positions the *Umwelt* as the way in which this total structure of meaning called "world" concretely *appears* within human everyday activities. In this sense, it is only the human being—namely, *Dasein* (being-there)—as the one who questions the meaning of Being, that discloses the world. In contrast, animals are completely captured within a constant linkage of perception and effect; they do not recognize the objects of perception or effect as Being itself, nor do they question its meaning. In this sense, animals are considered "*weltarm*" (poor in world) and are fundamentally distinguished from humans, who are "*weltbildend*" (world-forming) [Heidegger (2004): 284]. Conversely, for Uexküll, the human cognitive world is merely one aspect of a complex *Umwelt* created by a living organism with a certain complex physical organ and nervous system. What is crucial is that the *Umwelt* is a *work* composed through the contrapuntal meaning-linkage between the *subject* and the environment. This is common to the *Umwelt* of all living beings—from humans to dogs, ticks, and amoebas—regardless of their complexity or richness of content.

What must be emphasized here is that the "*subjectivity*" here by no means implies *arbitrariness*. As argued in the previous section, what Uexküll termed "*Naturtechnik*" was not a position that regarded living organisms as the arbitrary creations of a producing *subject* standing outside of nature. Rather, it was a concept referring to the fact that the formation and functional organization of the organism's body are ordered according to certain immanent principles.

The *subjectivity* that forms the *Umwelt* is likewise inseparable from this *Naturtechnik*. The *subject* is not a being that freely *plans* a world of meaning; rather, it is a being that organizes the external world as something meaningful in accordance with the *Funktionskreis* prescribed by *Naturtechnik*. In this sense, *subjectivity* should be understood not as the antithesis of *arbitrariness*, but rather as the capacity to undertake the generation of meaning under immanent constraints.

In this paper, the purpose of addressing the second phase of *technique*—that is, the body as *techné*—was to examine the fluctuations of the boundary between the body and the external world. This section has presented a view that grasps the *Umwelt* as a *Werk* (work) created by the *subject*. However, this does not mean that the *Umwelt* is formed arbitrarily or unilaterally by the *subject*. The relationship between the *subject* and the *Umwelt* is entirely different from the relationship between an observer independent of the object and an objective thing fixed outside the *subject*. The *Umwelt* is not an observed world, but a lived world. The *Umwelt* and the *subject* are always in close interaction and are inseparable from one another.

Only by clarifying such a dynamic relationship between the body and the *Umwelt* are we prepared to consider the position of the third phase of *technique*: namely, *technique* as tools and means. In the next section, I will examine how Uexküll positioned the role of *technique* in *Umwelt* theory, based on Ernst Cassirer's (1874–1945) interpretation of the *Umwelt*.

Section 3: Technique as an Extension of the Body

The Extended *Funktionskreis*

The linkage of perception and effect known as the *Funktionskreis*, possessed by each living organism, makes the world *appear* as the *Umwelt* of that specific organism. Citing this concept of the *Funktionskreis*, Cassirer claimed that “B[b]etween the receptor system and the effector system, which are to be found in all animal species, we find in man a third link which we may describe as the symbolic system” [Cassirer (1944): 42–43]. Cassirer grasped various cultural forms, ranging from language, art, religion, culture, and science to *technique*, as symbolic forms. He found the qualitative specificity of humans compared to other organisms as “*animal symbolicum*”, whose relationship with nature is mediated by these symbolic forms [Loughnane (2025): 8].

In this paper, I characterize the third phase of *technique* as something that exists outside the body and mediates between humans and the environment (such as language, *knowledge*, skills, tools, and culture). Uexküll himself did not systematically discuss *technique* in this sense. However, his fragmentary remark that machines are nothing more than “extensions of human organs” [Uexküll (1920): 157] provides an important clue for reconsidering the positioning of external tools used by humans in their actions within the framework of *Umwelt* theory. Uexküll, asserting that machines do not possess an *Umwelt*, states: “the external world of our machines, which are nothing but extensions of our human organs (*Fortsetzungen unserer menschlichen Organe*), is therefore never anything other than a part of the human world” [Uexküll (1920): 157]. Machines are *planned* by humans to be functional for human action. The *Bauplan* of a machine belongs to humans, and it only *appears* through human assembly and operation. Here, the term *Bauplan* (plan of organization), similar to “*Naturtechnik*,” refers to an immanent principle that controls the formation of the biological body. In the formation of a machine's “body,” “*Naturtechnik*”—which enables a contrapuntal relationship with the external world according to an internal order—is not at work. Therefore, a machine itself does not possess an *Umwelt* as its own unique relationship with the external world. For example, a steam locomotive drastically extends human mobility, but such a *plan* is not functional *for the*

machine. Thus, it is said that because they lack an internal principle of *plan* and a closed *Funktionskreis*, machines are merely extensions of human physical organs.

Although not directly linked to Uexküll's own words quoted above, Loughnane introduces the notion of *technique* as an "extension of organs" from Kapp's theory of organ projection. Kapp "pioneered the organ-projection idea in the philosophy of technology which portrays tools as projections of the human body" [Loughnane (2025): 6], presenting a co-evolutionary relationship between the body and technological objects. Technological artifacts that mediate between the body and the environment are formed by human hands, while simultaneously transforming human modes of action, perception, and thought. Through such close interaction, *technique* is essentially and inseparably tied to the human body.

Although no evidence has been found that Uexküll directly referenced Kapp's argument, they both coincide in that they grasped *technique* not as a foreign object external to the body, but as a continuum of the body that extends physical functions and expands the domains of perception and effect. However, while Kapp emphasized the unconscious externalization of physical structures and the co-evolutionary relationship between humans and *technique* arising from the transformation of human action, Uexküll positioned the machine strictly as a non-autonomous appendage lacking an immanent **Bauplan** and subordinated to the human *Funktionskreis*.

3-2 Function and Plan

In *Umwelt* theory, the reason such non-autonomous machines can serve as extensions of physical organs is that Uexküll grasps living organisms as "functional units" (*funktionelle Einheiten*) [Uexküll (1921): 116]. The key point here is that the extension of function does not merely mean a spatial extension of physical organs, but rather a reorganization of the entire *Funktionskreis* consisting of the linkage of perception and effect. Therefore, for a machine to function as an extension of a physical organ means that the machine is incorporated as part of the organism's *Funktionskreis* and constitutes the very conditions of action. In this sense, although the emphasis of the justification differs from Kapp's case, in *Umwelt* theory as well, *technique* is not an external object unilaterally used by a human *subject*. Rather, from the standpoint of *Umwelt* theory—which defines the living organism as a functional unit—it suggests the possibility that the totality of the *Funktionskreis*, including technological artifacts, appears as a single *subject*, rather than the human conscious self or a body independent of the environment.

Of course, this interpretation—that the totality of the *Funktionskreis* including technological artifacts can be understood as a single *subject*—is not one that Uexküll himself explicitly presented. What he sought to emphasize through the expression "extensions of human organs"

was simply that living organisms and machines are clearly distinguished by whether or not they possess an immanent *plan* of body formation (*Bauplan*). In this paper, in order to actively re-examine the relationship between *technique* and humans within the framework of *Umwelt* theory, I would like to summarize the relationship between the human body and technological artifacts as follows, based on the perspectives of function and *plan* examined since Section 1.

First, as individual living organisms, humans are functional units possessing an immanent principle of *plan* (namely, "*Naturtechnik*"). Second, however, humans can expand their own possibilities of perception and action by *planning* machines, tools, and institutions. In this sense, the possibility of interpreting the human body as extended by *technique*, or a composite *subject* of humans and technological artifacts, is suggested. *Technique* possesses a dual nature: it is an object to be *planned* and an object of action, while simultaneously serving as the bodily condition that makes action possible. In each respective action, humans reorganize the relationship between body, environment, and *technique*.

As seen in Section 2, through this contrapuntal relationship with the external world, the living organism incorporates stimuli from the outside into a unique linkage of perception and effect. Through this linkage of perception and effect (*Funktionskreis*), the *Umwelt* is formed as a world of unique relationships between the organism and the external world. In this way, determining the *appearance* of the world to the *subject* constitutes the second phase of *technique*: *techné* as art.

In Section 3, based on the "technicality of the body" and the "work-character of the *Umwelt*" established in the previous two sections, I positioned the machine as a technological artifact as an "extension of organs." In particular, by contrasting Kapp's theory of organ projection with Uexküll's view of machines, I demonstrated that in *Umwelt* theory, the machine extends the *subject's Funktionskreis* and reorganizes the entire mode of perception and effect. In the third phase, *technique* is an extension of physical organs in the sense that it is planned by humans and fulfills human functions; simultaneously, it is *techné* involved in the formation of the human *Umwelt*.

Conclusion

In this paper, I have categorized "*technique*" in *Umwelt* theory into three phases and interconnected them from the perspectives of *plan* and function, clarifying that the

body, *technique*, and the environment form a multilayered and dynamic relationship within human action.

In Section 1, I confirmed that in *Umwelt* theory, *technique* is first and foremost themed not as artifacts such as tools, *knowledge*, institutions, or culture, but as "*Naturtechnik*" (nature's technique)—the internal principle of the formation of the biological body—and I termed this the first phase of *technique*. "*Naturtechnik*" integrates the organism's physical organs into the whole of its bodily functions, while simultaneously constructing a contrapuntal relationship between the physical organs and objects in the external world.

By delineating the connection between these three phases, it is possible to link the understanding of *technique* as a "third constituent" proposed by Loughnane (2025) with the more fundamental role of *technique* in *Umwelt* theory. *Technique* is not an additional mediating term placed between the body and the *Umwelt*. Rather, *technique* is the principle of body formation and the very principle of *Umwelt* construction itself. By technically organizing the circuit of the *Funktionskreis* that links the body and the *Umwelt* in action, the way of being of the human as a *subject* of action also continues to transform.

Building upon the considerations in this paper, a future task will be to explore the points of contact with contemporary cognitive theories that fluidize the boundary between the body and *technique*. The concept of "Natural-Born Cyborgs" [Clark (2003)]—which posits that humans inseparably incorporate external technological tools as part of their own bodily and cognitive systems—and Hayles's concept of "Cognitive Assemblages" [Hayles (2016)] between humans and non-human *technique*, are useful for discussing the extension of the *Funktionskreis* by contemporary technology. If one takes a strong interpretation of Uexküll's theory, which links *planning* with *subjectivity*, it could even be said that when automated contemporary digital technology begins to actively *plan* human action, *technique* itself becomes the *subject*, incorporating humans as components of its massive *Funktionskreis* and utilizing them as "extensions of its own organs." Based on these circumstances of contemporary society, discussing what kind of *subjectivity* humans, or human-technological composites, can possess will be an urgent task for the philosophy of contemporary technology.

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Declaration of Generative AI and AI-assisted Technologies in the Writing Process

The author utilized AI-based language models, specifically ChatGPT and Gemini, to assist with English language editing and grammatical corrections. The final manuscript has been carefully reviewed and verified by the author.

References

Citations are provided at the end of each quoted or referenced passage in the format [Author (Year of original publication): Page number]. Translations from Japanese and German sources are my own.

Cassirer, E. (1944). *An essay on man: An introduction to a philosophy of human culture*. Yale University Press.

Clark, A. (2003). *Natural-born cyborgs: Minds, technologies, and the future of human intelligence*. Oxford University Press.

Hayles, N. K. (2016). Cognitive assemblages: Technical agency and human interactions. *Critical Inquiry*, 43(1), 32–55. <https://doi.org/10.1086/689565>

Heidegger, M. (1967). *Sein und Zeit*. Max Niemeyer. (Original work published 1927)

Heidegger, M. (2000). Die Frage nach der Technik. In *Vorträge und Aufsätze* (Gesamtausgabe Vol. 7). Vittorio Klostermann.

Heidegger, M. (2004). *Die Grundbegriffe der Metaphysik: Welt – Endlichkeit – Einsamkeit (Freiburger Vorlesung Wintersemester 1929/30)* (Gesamtausgabe Vol. 29/30). Vittorio Klostermann. (Original work published 1929)

Loughnane, C. (2025). The technical milieu and its evolution: Uexküll, Kapp, Cassirer, Simondon. *Humanities and Social Sciences Communications*, 12, Article 1329. <https://doi.org/10.1057/s41599-025-05579-0>

von Uexküll, J. (1920). *Theoretische Biologie*. Verlag von Gebrüder Paetel.

von Uexküll, J. (1921). *Umwelt und Innenwelt der Tiere* (2nd ed.). Julius Springer.

von Uexküll, J. (1940). *Bedeutungslehre*. Barth.

von Uexküll, J. (2012). *Dobutsu no kansekai to naiteki sekai* [Umwelt und Innenwelt der Tiere] (Y. Maeno, Trans.). Kosakusha. (Original work published 1921)

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